

2013

# Interconnecting Generating Facilities to the Electrical Distribution System

## Model Practices and Procedures for the Publicly Owned Utilities

The Efficient Solar Market Partners of Northern California

### ROOFTOP SOLAR CHALLENGE



Powered by SunShot

April 25, 2013

# Interconnecting Generating Facilities to the Electrical Distribution System

## Model Practices and Procedures for the Publicly Owned Utilities

### **The Efficient Solar Market Partners of Northern California Partnership**

This material is based upon work supported by the U.S. Department of Energy under Award  
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This work is prepared by the *Efficient Solar Market Partners of Northern California*  
RoofTop Challenge Team.



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## Preface

The U.S. Department of Energy SunShot Initiative Rooftop Solar Challenge provides incentives to regional awardees to address the differing and expensive permitting, zoning, metering, and connection processes required to finance and install residential and commercial solar systems. The 22 diverse Rooftop Solar Challenge teams bring together city, county, and state officials, regulatory entities, private industry, universities, local utilities, and other regional stakeholders to clear a path for rapid expansion of the use of solar energy and serve as models for other communities across the nation.

Teams will implement step-by-step actions with the goal of cutting red tape to make it faster, easier, and less expensive for Americans to go solar. Teams are streamlining permit processes, updating planning and zoning codes, improving standards for connecting solar power to the electric grid, and increasing access to financing.

The Rooftop Solar Challenge is part of the SunShot Initiative, which strives to make solar energy cost-competitive with other forms of energy by the end of the decade, and part of the Department's larger effort to position the United States as a global leader in the rapidly-growing solar market.

For more information visit <http://www.eere.energy.gov/solarchallenge/>

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Bob Woerner, Sr., Senior Director in Electric Operations, Pacific Gas & Electric

## **Summary: Model Interconnection Procedures**

### **Features and Improvements**

1. Emphasize support for well planned applications and predictable responses to interconnection requests – in terms of timeliness, conclusions, and costs - for a quick transparent process with minimal surprises and firm conclusions
2. Focus first on making relevant information accessible to applicants to promote and assist in establishing realistic Customer expectations and eliciting well sited and scaled proposals, optimizing available grid capacities and resulting in a high proportion of proposals proceeding to development (rather than being withdrawn due to information that could have been made available in advance), including defining low cost areas and criteria for interconnection. This may be provided through maps and databases, in addition to scoping meetings and pre-application data requests supported by modest fees.
3. Adopt variable levels of review incorporating developments in the new California Rule 21 and additional modifications. Well-defined review screens determine eligibility for simplified interconnection based on the particular combination of location and project.
4. Allow up to 20% peak load penetration under the simplest review.
5. Avoid predetermined size limits on Fast Track Review eligibility in order to accommodate well-sited and optimally scaled projects.
6. Allow all projects serving up to “100% of coincident minimum load” to be considered for approval based on simple screening rather than detailed studies since these projects will only deliver power locally.
7. Adopt timeframes for completing each step in the interconnection process, and emphasize avoiding undefined or unnecessarily long standard review periods common in existing tariffs. In contrast to the SGIP, the time allotted for a detailed study is reduced from 150 to 90 days, with the expectation that it will usually be much shorter. Provisions for extenuating circumstances are included.
8. Address telemetry requirements, allowing utility access to data but placing the cost responsibility for data transmission with the utility to ensure proper cost-benefit determination
9. Reduce uncertainty and the potential for inconsistency in customer costs. This may be achieved through local standardization of the cost of studies and the costs of interconnection where practical, or firm estimates based on the adoption of published pre-defined charges for specific work and materials, avoiding the complexities of trying to assign individual cost responsibility, which is dependent upon both waiting for all related studies to first be completed, and for all related projects to make subsequent decisions

10. Allow Third-Party development of required upgrades where costs are born by the applicant to ensure installation costs are competitive since high costs both discourage development and are ultimately passed on to ratepayers through the energy charges required to cover the costs.
11. Support publication of study results as information to prospective applicants and to promote transparency and consistency (both the circumstances requiring a detailed Interconnection Study (IS), and the results of such studies, should be consistently applied.)
12. Adopt simple dispute resolution, modeled on Hawaii's Rule 14H procedure.
13. Limit required liability insurance to the coverage in a typical property owner's insurance policy, and avoid requiring customers to add the utility as an additional insured party.
14. Inactive applications and projects are addressed through deadlines and reservation maintenance or development deposits. Site control is required in connection with execution of an Interconnection Agreement (IA), but is not required to submit an application.
15. Eliminate any requirement for an external disconnect switch (EDS) for small (< 25 kW), inverter-based systems that export low-voltage electricity onto the grid.<sup>1</sup> The external disconnect switch is not necessary for smaller systems since inverters provide the safety measures of an external disconnect switch without the extra cost of installing the switch.
16. The limit placed on the size of the aggregate generation on a single phase shared secondary is now defined as a percentage of the nameplate power rating relative to peak line section load.
17. Equal access to service and facilities, including use of existing capacity – a customer will not be required to bear the cost of having additional facilities installed if existing facilities are available; facilities will be made available on a 'first come - first served' or 'first ready – first served' basis with consistent cost responsibility unless otherwise directed by law. Equipment otherwise required to provide service to load customers in the absence of a specific generating facility shall not be charged against that generating facility.
18. Establish appropriate cost-based "ready-to-serve" charges related to insurance, replacement and O&M for equipment and upgrades uniquely required to maintain interconnection of the customer's generating facility.

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<sup>1</sup> This approach was recently taken in New York, where the state Commission eliminated the requirement for an EDS for all systems below 25 kW that use a UL 1741 certified inverter.

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## **Principles & Guidelines for Interconnection Review**

The guiding principles for these recommended interconnection practices emphasize predictability and efficiency in adapting to changing customer needs, market opportunities, and technical capabilities while utilizing existing capacity and maintaining safety and reliability of the grid. This is largely achieved through providing prospective applicants with simplified and clearly defined application and review processes appropriate to the nature of the proposed facility, as well as access to information that will help applicants assess site-specific constraints and develop appropriate project proposals before submitting an application.

The following guidelines have been developed in conjunction with these Model Practices and Procedures, and are recommended in the development and implementation of associated policies. Continuing improvements should be pursued in both interconnection processes and technical solutions:

### **1. Clear processes**

The use of common statewide and national standards, practices, procedures and contracts is encouraged; where changes are appropriate to reflect local circumstances, these should be clearly identified to facilitate review.

Interconnection procedures should be designed to handle the expected scale of requests across all categories of distribution level interconnection, including residential and commercial, self generation for non-exporting onsite use, intermittent export net metered credit, or exported for sale to the distribution system operator or host utility (Wholesale Distributed Generation or WDG)<sup>2</sup>. This includes a common application and associated qualification date for review and any necessary studies.

Clear and simple standards and procedures reduce errors and uncertainty, allowing applications to be handled consistently and without delay. Timely decisions avoid complications that may arise when a prior unresolved application is electrically related to a subsequent application.

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<sup>2</sup> Note that interconnections for export of energy for sale beyond the host utility and into the Federally regulated wholesale market will, under the Interstate Commerce clause, be subject to FERC Wholesale Distribution Access Tariff rules in place of those of the local regulatory agency.



Clearly delineated timelines define both the applicant's and Utility's responsibilities for timeliness and the significance of missing a deadline, while allowing for flexibility by mutual agreement or under extenuating circumstances.

Review processes should emphasize predictability, flexibility and objectivity, including screening and solution options to support:

1. Simplified review of appropriate projects
2. Default approval of conforming projects
3. Rapid resolution of most common issues
4. Identification of issues that will require further study if they cannot be addressed through supplemental review or simple project modification
5. Determination of specific technical study requirements where needed.

## **2. Clear costs and responsibilities**

Clear cost determination is the overriding issue for customer decisions and for a successful interconnection process. Regardless of whether a customer is seeking interconnection for load, generation, or a combination of the two, establishing the cost of an interconnection should be timely, reasonable, consistent, predictable, and firm, to the extent practical, including either standard flat rate fees or estimates with binding "not to exceed" provisions, as is common in customer oriented business practices. Standardized, predictable, and appropriate fees are recommended both for application review, detailed studies, and specified upgrades, thereby addressing the needs of the vast majority of applicants.

Both parties to an Interconnection Agreement (IA) should understand the basic needs of the other. Customers and their lenders require firm information to determine whether or not to proceed with a project. Contract provisions such as non-binding estimates and the potential for future additional costs to be applied after a contract is signed or a project is in operation are extremely problematic for interconnection applicants and adversely impact to cost of providing electricity to the utility from impacted projects. Utilities likewise require timely action and firm commitments from applicants where a project may impact the subsequent plans of other customers, and must meet obligations to assure that costs and risks are properly allocated to each individual customer or customer class in accord with locally applicable standards.

Standards should be forward looking and consider the current and anticipated cost effective capabilities of grid communications, advanced inverters, automated demand response, energy storage, electric vehicle integration, and

updated standards such as IEEE 1547.8. The Utility should retain the right, at no cost to the customer, to provide or change equipment or adjust settings on inverters and protective devices in keeping with evolving operational standards and requirements. Requirements should not be imposed where the additional cost exceeds the projected levelized value of those requirements over the operational life of the equipment or project.

Fees, schedules, milestones and modest penalties support timely response from all parties and ensure projects progress through review, construction, and physical interconnection. These should be reasonable and sufficient to deter speculative applications while not discouraging interest among customers.

Customers should be informed that changes in their design or equipment may impact interconnection costs and the Utility is only responsible for cost commitments related to the design as reviewed. Likewise, if a customer wishes to delay executing an IA, the applicable costs and review requirements may change to reflect current circumstances. Once executed, the IA represents a commitment from the Utility to allow and/or provide interconnection as specified, and from the customer to either proceed with interconnection plans or provide timely notification of a cancelation or change of schedule. The Utility may require reasonable interim project development deposits or fees from the customer to ensure an IA remains active and that the Utility is compensated for any allowable costs incurred up to that point.

In addition, Utilities have a duty to avoid excess cost overrun risk and subsequent ratepayer liability. Standardized charges should be reviewed periodically to ensure that they reasonably reflect the Utility's actual costs. Where estimates and "not to exceed" provisions are used, these should incorporate sufficient headroom to address reasonable contingencies while remaining effective in providing actionable information to the applicant. Customers and staff should be aware that a small percentage of projects, typically the largest ones, will require extensive review, site investigation, and even field work, before accurate estimates are possible and to ensure the utility does not fail to recognize significant factors related to such estimates and "not to exceed" agreements. Allowing qualified and approved independent contractors to participate, perform, and assume bid responsibility for installations specified by the Utility, addresses ratepayer considerations regarding those projects while also offering the potential for reduced costs for all parties.

Utilities are strongly encouraged to avoid creation of unintended tax liabilities through the transfer of ownership of facilities upgrades per IRS Safe Harbor Provision (per IRS Notice 2001-82 and 88-129). The tax consequences of such

transfers can be substantial where significant facilities or upgrades are required, including as taxable income to the Utility and associated depreciation and Investment Tax Credit consequences. Alternatives include original and continuing ownership by the Utility with costs recovered through standard fee schedules for provision of services; or, if a customer is directly paying for upgrades for their own use, retention of ownership by the customer with sole operational rights and maintenance agreements granted to the Utility.

### **3. Clear information**

Knowing “what can go where” with little or no modification to the existing grid helps customers establish realistic expectations regarding interconnection at their property, or choose between locations to site new generation, and submit appropriate designs. This is easily achieved by making grid information accessible, including public maps and data regarding existing and planned system capacities and interconnections to support appropriate project siting and design proposals. Access to information early in the decision making process, including pre-application data or meetings, supports well planned and appropriate applications resulting in a high percentage of applications leading to successful deployments with minimal delays.

Application information and study results may be published in the interest of transparency and on behalf of prospective applicants seeking optimal siting to promote cost sharing between projects and cost effective use of existing or proposed grid capacity.

There is great value in potential applicants having the ability to understand and estimate when a proposed facility may necessitate upgrades on the grid. This will allow proposals to be designed to fit within any local constraints, make optimal use of existing capacity, and avoid submitting proposals which would prove non-viable or result in avoidable rounds of review by the utility staff and resubmission of modified proposals. Well-informed applicants reduce the time staff spends reviewing proposals and increased the likelihood that applications will lead to successful installations and happy customers.

Current grid information should be maintained and readily available to generation interconnection staff and customers in order to:

- Address qualification screens, predict costs, reduce potential redesign and restudy, and generally know "what can go where" early in the project development process
- Efficiently process interconnection requests
- Track the progress and outcomes of interconnection requests

Where warranted by demand, existing grid information should be made available in map and spreadsheet formats with viewer/user search and rank order ability enabled, and published on the utility's website for ease of access.<sup>3</sup>

This information will support conclusions regarding:

- What matching load limits exist at each line segment, circuit, and substation, including current and pending interconnections.
- What standard categories of upgrades would be triggered by exceeding these limits.
- What the approximate costs would be for each level of upgrades required.
- Expected capacity increases related to planned system upgrades and new loads.

For small systems well matched to expected loads on the same line section and on circuits with lower DG installation levels (penetration), little information is called for. In other cases, when available, useful information provided to prospective applicants may include:

1. Identification of "preferred" readily available interconnection areas (defined as distribution substations and circuits in areas of

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<sup>3</sup> Examples of maps can be seen at:

California investor owned utilities:

PG&E: <http://www.pge.com/b2b/energysupply/wholesaleelectricssuppliersolicitation/PVRFO/pvmap/> (user account creation required)  
SDG&E: <http://sdge.com/builderservices/dgmap/> (registration required)  
SCE: <http://www.sce.com/EnergyProcurement/renewables/renewable-auction-mechanism.htm> (download of Google Earth required)

Additionally, the Sacramento Municipal Utility District released map in PDF form in support of its feed-in tariff program:

<http://www.smud.org/en/community-environment/solar-renewables/Documents/InterconnectionMap.pdf>

The Ontario Power Authority (OPA) supported its feed-in tariff program with interactive Google maps, one showing in detail all planned or proposed projects under the FIT Program. <http://fit.powerauthority.on.ca/Page.asp?PageID=924&ContentID=10634>, and another pair showing in less detail regional transmission capacity that would be equally adaptable at the distribution level: <http://www.powerauthority.on.ca/Page.asp?PageID=829&ContentID=4061&SiteNodeID=162> and planned new transmission lines. [http://fit.powerauthority.on.ca/Storage/101/11002\\_FITMap06.swf](http://fit.powerauthority.on.ca/Storage/101/11002_FITMap06.swf) OPA also provides access to a pair of spreadsheets with substation level available capacity information

- high load with low distributed generation penetration that, based on initial Utility screening, could potentially minimize interconnection costs and maximize the possibility of passing expedited review procedures).
2. Known power quality or stability issues on the circuit
  3. Load data, by month for each of the last twelve months, including day-time and night-time minimum loads and smaller time increments if available
  4. Line and line segment available capacity (subtracting any other applicants on the same line and segment)
  5. Line and line segment voltage and peak capacity and limiting conductor rating
  6. Distance between substation and line section terminus.
  7. Known electrical dependencies at requested locations related to currently pending applications or plans
  8. Substation voltage and capacity
  9. Existing short circuit interrupting capacity
  10. Location, type, and rating of protective and regulating equipment on circuit (including reclosers)
  11. Location of secondary networks.

Informal conversation between potential applicants and staff is encouraged. If frequent or detailed consultations are requested, the utility may wish to formalize the process or include a reasonable consultation charge.

Simple records should be maintained in an accessible database for all distribution interconnection applications for easy review and tracking. Such records should include:

1. Submission date
2. Queue position
3. Application status
4. Study request type
5. Review deadlines and status
6. Location
7. Energy source
8. Prime mover
9. Seasonal peak capacities
10. Substation name
11. Requested in-service date on application
12. Updated in-service date
13. Actual in-service date
14. Notes

## 1) Overview of the Interconnection Process

**Optional: Location Report** – Prior to submitting an interconnection application, a Customer may request information regarding interconnection constraints at a specific location to assist in appropriate system proposals. If a written response is requested, it shall be provided within ten (10) business days. Fixed fees may apply at the discretion of the Utility in compensation for staff time.

**Optional: Pre-submittal meeting/phone call** - A Customer may request informal review or recommendations regarding a proposed interconnection application. Fixed or hourly fees may apply at the discretion of the Utility in compensation for staff time.

**Step 1:** Interconnection review begins when a Customer submits a completed Interconnection Application.<sup>4</sup> The application shall not be presumed confidential except as specified otherwise in governing rules and regulations.

**Step 2:** Within ten (10) business days<sup>5</sup> of the receipt of an Interconnection Application and supporting material, or such other period as is mutually agreed upon in writing by the Utility and the Customer, the Utility shall review the Customer's Interconnection Application and supporting material and provide written notification of its general completeness, or alternatively, incompleteness. Upon determination of completeness, the Application shall be assigned the next sequential Interconnection Queue Position for determination of applicable priority in allocation of capacity and aggregate generation calculations. If an Interconnection Application is deemed incomplete, the Utility shall specify in a written notice the additional information that is required. The completeness determination cycle will be repeated as necessary until sufficient information is submitted by the Customer to enable the Utility to review the Interconnection Application.

**Step 3:** Within ten (10) business days of the date the Customer's Interconnection Application and supporting materials are deemed complete, the

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<sup>4</sup> Including 8760 hr estimated system output with applications for projects exceeding 25 kW assists evaluation.

<sup>5</sup> All parties are encouraged to expedite these processes in order to support efficient decision making and avoid cumulative delays; specified deadlines represent a maximum time frame, not a typical period. For example, staff may review applications and respond within 2 days of submittal in most cases. Online applications are strongly encouraged.

Utility will complete an Initial Technical Review of the Interconnection Application. The Initial Technical Review will result in the Utility providing either: (a) if all the Initial Technical Review Screens are passed, an executable Interconnection Agreement for the Customer's signature; or, (b) if one or more screens are not passed, notification that Supplemental Review will be required and the results, in writing, of all Initial Technical Review screens.

#### **Optional Initial Review Results Meeting**

Within five (5) Business Days of customer's request for an Initial Review results meeting, the Utility shall contact the customer and offer to convene a meeting at a mutually acceptable time to review the Initial Review screen analysis and related results to determine what modifications, if any, may permit the Generating Facility to be connected safely and reliably without Supplemental Review.

If modifications that obviate the need for Supplemental Review are identified, and the customer and Utility agree to such modifications, an Interconnection Agreement shall be provided within five (5) Business Days of the Initial Review results meeting if no Interconnection Facilities or Distribution Upgrades are required. If Interconnection Facilities or Distribution Upgrades are required, the Utility shall provide the customer with a binding cost determination of any Interconnection Facilities or Distribution Upgrades within fifteen (15) Business Days of the Initial Review results meeting utilizing a standardized requirements and pricing worksheet.

If Applicant and Distribution Provider are unable to identify or agree to modifications that enable Applicant to pass Initial Review, Applicant shall notify Distribution Provider within five (5) Business Days of the Initial Review results meeting whether it would like to proceed with Supplemental Review or withdraw its Interconnection Request.

**Step 4:** If Supplemental Review is required, within fifteen (15) business days of notification by the Utility, the Customer shall notify the Utility, in writing, to proceed with the Supplemental Review, or the Customer shall agree to withdraw its Interconnection Application.

**Step 5:** Within fifteen (15) business days of notification by the Customer that it would like to move forward with Supplemental Review, the Utility shall complete the Supplemental Review. The Supplemental Review will determine what customer facility modifications, or distribution system upgrades, if any, may permit the Generating Facility to be connected safely and reliably without a detailed Interconnection Study (IS). This will result in the Utility providing either: (a) Simplified Interconnection (b) interconnection requirements beyond those for a Simplified Interconnection, and a binding cost determination to perform the interconnection upgrades identified by the Supplemental Review utilizing a



standardized requirements and pricing worksheet<sup>678</sup>, or (c) a determination that a detailed Interconnection Study (IS) is required, and a binding cost determination and schedule for the completion of the IS, including an identification of the specific analyses and/or reviews that will be performed as part of the IS.

**Step 6:** If an IS is required, within thirty (30) business days of notification by the Utility, the Customer shall agree to pay for the IS, or the Customer shall withdraw its Interconnection Application. The Utility shall complete the IS within ninety (90) calendar days of the Customer's agreement to move forward with the IS and payment of the IS fee is received.

**Step 7:** Based on the results of the Initial Technical Review, or Supplemental Review (if needed), or IS (if needed), the Customer and Utility will work together to finalize the single-line diagram, relay list, trip scheme and settings, and three-line diagram, which is required in the circumstances set forth in the Interconnection Application. After finalization of the single-line diagram, relay list, trip scheme and settings, and three-line diagram (if required), the Customer will make any revisions deemed necessary to the Interconnection Application and resubmit the Interconnection Application to the Utility. Resubmission will not impact the Customer's interconnection queue position. The Customer must also complete a Facility Equipment List, which will identify equipment, space and/or data at the Generating Facility location that must be provided by the Customer for use in conjunction with the Utility's Interconnection Facilities. The Facility Equipment List will be included as Exhibit A to an Interconnection Agreement entered between the Utility and the Customer. If requested, the

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6 Under principles of equal access:

- a. Use of existing capacity – a customer should not be required to bear the cost of having additional facilities installed if existing facilities are adequate and available; facilities will be made available on a 'first requested – first served' or 'first ready – first served' basis with consistent cost responsibility unless otherwise directed by law. Equipment otherwise required to provide service to load customers in the absence of a specific generating facility shall not be charged against that generating facility.
- b. Equal charges should be assessed for facilities required to interconnect customers either seeking load service or providing generation, irrespective of whether such charges are paid as a lump sum or apportioned to periodic (monthly) service charges or rolled into energy rates.

<sup>7</sup> The intent of intent of standardized pricing is to ensure equal treatment for similarly situated customers and binding cost determination to provide applicants with adequate cost certainty in order to make a decision.

<sup>8</sup> The Utility may, alternatively, elect to offer "time & materials" pricing that includes an estimated cost range and binding cap on customer charges. As noted elsewhere, the customer may elect to hire a third party installer approved by the Utility to perform the required work as identified by the review and defined by IA.

Utility will provide assistance to the Customer to complete the Facility Equipment List.

**Step 8:** Within fifteen (15) business days of the completion of all activities specified in Step 7 above, or within such other period as is mutually agreed upon in writing by the Utility and the Customer, the Utility will complete an identification of Interconnection Facilities that are necessary to complete the interconnection and that will be owned by the Utility. A list and description of the Utility's Interconnection Facilities will be included as Exhibit B to the Interconnection Agreement entered between the Utility and the Customer. The Utility and Customer shall mutually agree in writing to a schedule by which the Interconnection Facilities will be constructed and a determination of when the Customer's Generating Facility shall be connected to the Utility's Distribution System. The Interconnection Facilities are project-specific, and the time to complete the facilities will depend on the complexity of the facilities required. The Utility may require a periodic reservation deposit to maintain the IA9, and may additionally establish a development deposit schedule if providing the required facilities. The Utility may require the Customer to maintain and show evidence of liability insurance coverage for the property scheduled for interconnection or be self-insured. The Customer Insurance Coverage will be included as Exhibit C to any Interconnection Agreement entered between the Utility and the Customer.

**Step 9:** Within five (5) business days of the completion of all activities specified in Step 8 above, the Utility will provide the Customer with an executable Interconnection Agreement, which must be executed prior to the interconnection and parallel operation of the Customer's Generating Facility. If requested by the Customer, the Interconnection Agreement may be signed by the Customer and a third party that is the owner and/or operator of the Generating Facility.

**Step 10:** The Utility will perform a pre-operation inspection within ten (10) business days of customer request or on other mutually agreed date following completion of facilities and prior to commencement of operation.

The Utility may, for good cause, modify the time limits to conduct the Initial Technical Review, Supplemental Review, or IS, and shall inform the Customer in

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<sup>9</sup> To avoid a project that may not be developed from continuing to impact subsequent applications, an IA reservation maintenance deposit is recommended if the Utility is experiencing significant failure of projects to proceed to interconnect on schedule, or where scheduled interconnection is greater than 12 months and no development deposit is required within that period.

writing of the need to modify the applicable time limit. The modified time limit shall be mutually agreed upon in writing between the Utility and the Customer. Final results of all technical screenings, Supplemental Review, and IS studies will be provided in writing to the Customer.

## **2) Initial Technical Review**

1. The Initial Technical Review process includes a screening to determine if a Generating Facility qualifies for Simplified Interconnection, or if Supplemental Review is needed to determine requirements, if any, beyond those of a Simplified Interconnection. Failure to pass an Initial Technical Review screen means only that further review is required to determine additional requirements, if any, or if an IS is needed before the Generating Facility can be approved for interconnection with the Utility's Distribution System.<sup>10</sup>
2. Within ten (10) business days of the date the Customer's Interconnection Application is deemed complete, the Utility will complete the Initial Technical Review. The Utility may, for good cause, modify the time limit to conduct the Initial Technical Review and shall inform the Customer in writing of the need to modify the applicable time limit. The modified time limit shall be mutually agreed upon in writing between the Utility and the Customer.
3. The Initial Technical Review will result in the Utility providing either: (a) an executable interconnection agreement for the Customer's signature, if all of the Initial Technical Review Screens are passed and the Generating Facility qualifies for Simplified Interconnection; or, (b) notification that Supplemental Review will be required if one or more screens are not passed, and the results, in writing, of all Initial Technical Review screenings

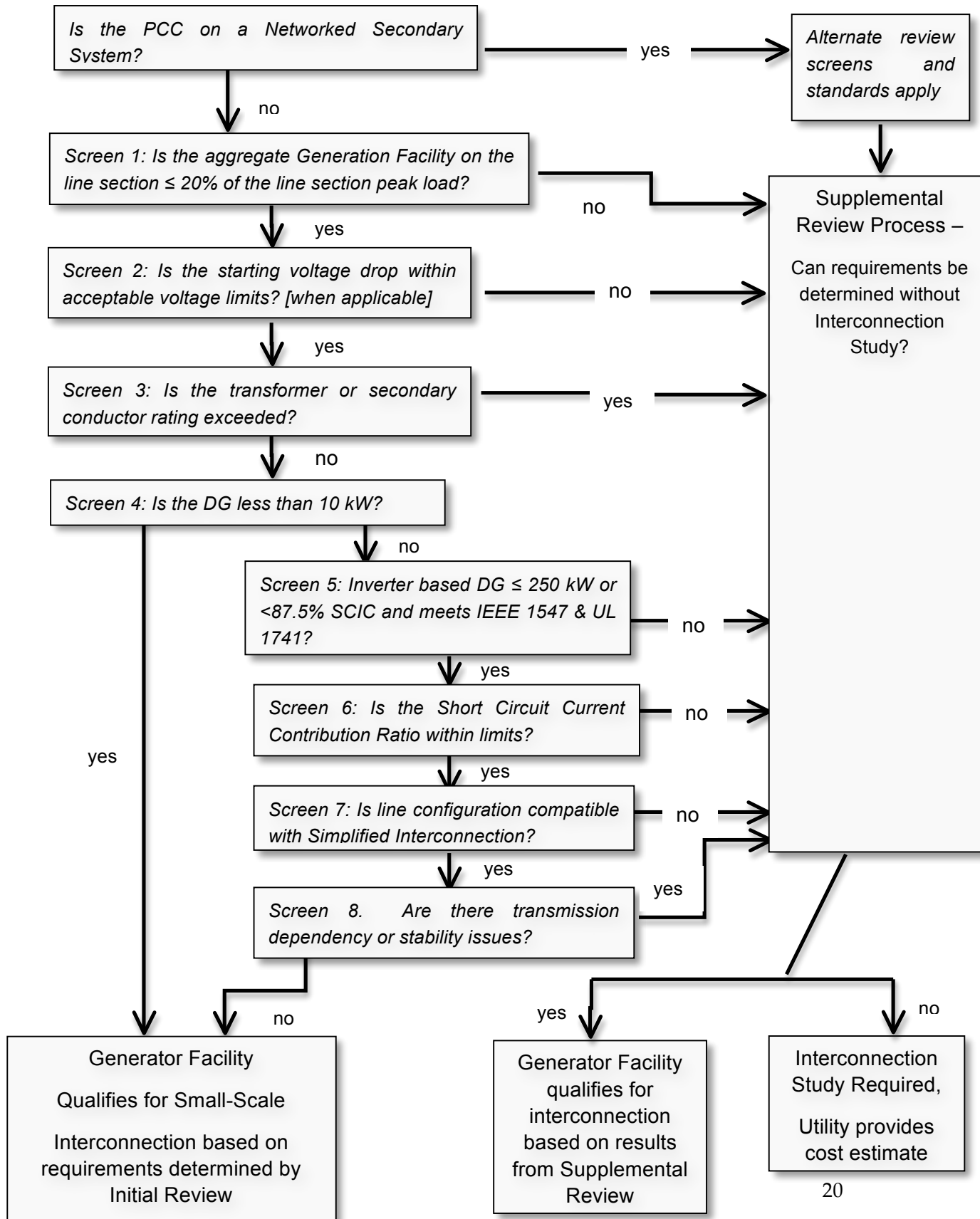
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<sup>10</sup> Note: The Utility has the right to require Supplemental Review if so indicated by the Initial Technical Review Screens, but is not required to do so if, in the opinion of the Utility, local circumstances allow interconnection to proceed while maintaining the safety and reliability of its systems. Likewise, if the Utility becomes aware of any additional factors not addressed by the defined screens that indicate significant safety or reliability concerns it may perform additional review or studies as needed to address these; under these circumstances the Utility must explain its specific technical concerns in writing and participate in the applicable resolution process if so requested by the Customer.

4. Initial Technical Review Screens:

[Note: Special considerations must be given to Generating Facilities proposed to be installed on Networked Secondary Systems because of the design and operational aspects of network protectors. There are no such considerations for radial distribution systems. If the generator is connecting directly to on a Networked Secondary System it must go to Supplemental Review except if the Generating Facility is on a Spot Network, utilizes an inverter-based equipment package and, together with the aggregated other inverter-based generation, shall not exceed the smaller of 5% of a Spot Network's maximum load or 50 kW. Under no condition shall the interconnection of a Generating Facility result in a back feed of a Spot Network or cause unnecessary operation of any Spot Network protectors.]

### Fast Track Interconnection Review Screen Flow Chart (For Radial Distribution Circuits)



**Screen 1:** Is the aggregate Generating Facility capacity on the Line Section less than or equal to 20% of Line Section peak load (or other percentage when so designated on specifically identified circuits or sections or categories of circuits or sections)

- *If Yes*, continue to next screen.
- *If No*, perform Supplemental Review to determine cumulative impact on Line Section.

Significance: Low penetration of Generating Facility installations will have a minimal impact on the operation and load restoration efforts of the Utility's Distribution System. The operating requirements for a high penetration of Generating Facilities may be different since the impact on the Utility's Distribution System will no longer be minimal, therefore requiring additional study or controls. A Utility may be aware of specific areas on its grid with greater resilience or susceptibility to such impacts and clearly identify and designate these for special screening standards.

**Screen 2:** Is the starting voltage within acceptable limits?

[Note: This Screen only applies to Generating Facilities that start by motoring the Generator]

- *If Yes*, continue to next screen.
- *If No*, continue to Supplemental Review.

Significance: Any voltage flicker at the Point of Interconnection caused by the generating facility shall not exceed the limits defined by the "Borderline of Visibility Curve" identified in IEEE Standard 1453-2004 "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems" (or latest version). This requirement is necessary to minimize the adverse voltage effects upon other utility customers on the Distribution System

**Screen 3:** Is the transformer or secondary conductor rating exceeded?

Do the maximum aggregated Gross Ratings for all the Generating Facilities connected to a secondary distribution transformer exceed the transformer or secondary conductor rating, modified per established Distribution Provider practice, absent any customer generators?

- *If Yes*, the Customer will receive an explanation of why the change is needed, and continue to next screen

- *If No*, continue to next screen.

Significance: This screen addresses potential secondary transformer or secondary conductor overloads. When Distribution Provider's analysis determines a transformer or conductor, change is required, Distribution Provider will furnish Applicant with an explanation of why the change is needed.

**Screen 4** Is the gross rating of the Generating Facility 10 kW<sup>11</sup> or less?

- *If Yes*, the Generating Facility qualifies for Simplified Interconnection. Skip remaining screens.
- *If No*, continue to next screen.

Significance: The Generating Facility will have a minimal impact on fault current levels and any potential line over-voltages from loss of the Utility's Distribution System neutral grounding.

**Screen 5a:** Is the Generating Facility inverter-based, compliant with IEEE 1547 and UL 1741, subsequent standards, or Utility practices addressing comparable issues and less than 250 kW?

- *If Yes*, continue to Screen 6.
- *If No*, continue to Screen 5b

Significance: Inverter-based generating facilities less than 250 kW interconnecting through inverters that meet UL 1741, or latest version (the Standard for Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources) and IEEE 1547, or latest version (the IEEE Standard for Interconnecting Distribution Resources with Electric Power Systems) have minimal impact to the short circuit currents. Larger inverter based generation Self-excited Synchronous Generators present more interconnection issues.

**Screen 5b:** Does the proposed Generating Facility, in aggregate with other generation on the distribution circuit, cause any distribution protective devices and equipment (including, but not limited to, substation breakers, fuse cutouts, and line reclosers), or Interconnection Customer equipment on the system to exceed 87.5 % of the short circuit interrupting capability; or is the

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<sup>11</sup> Facility power ratings refer to the nameplate rating of the generator, modeled output will be established by applicable Utility review practices.



interconnection be proposed for a circuit that already exceeds 87.5 % of the short circuit interrupting capability?

- *If No*, continue to Screen 6.
- *If Yes*, continue to Supplemental Review.

Significance: If the generating Facility passes this screen, it can be expected that it will not cause any of Distribution Provider's equipment to be overstressed.

**Screen 6**: Is the Short Circuit Current Contribution Ratio within acceptable limits? When measured at primary side (high side) of a Dedicated Distribution Transformer serving a Generating Facility, the sum of the short circuit contribution ratios of all generating facilities connected to the Utility's Distribution System circuit that serves the Generating Facility must be less than or equal to 0.1 (10%).

- *If Yes*, continue to next screen.
- *If No*, perform Supplemental Review.

Significance: If the Generating Facility passes this screen it can be expected that it will have no significant impact on the Utility's Distribution System's short circuit duty, fault detection sensitivity, relay coordination or fuse-saving schemes.

Note: The ampere rating of the Customer's service equipment to be used in this evaluation will be that rating for which the customer's utility service was originally sized or for which an upgrade has been approved. It is not the intent of this provision to allow increased export simply by increasing the size of the Customer's service panel, without separate approval for the resize.

**Screen 7**: Is the Line Configuration Screen (see below) acceptable for Simplified Interconnection?

- *If Yes*, continue to next screen.
- *If No*, perform Supplemental Review.

Line Configuration Screen: Identify primary distribution line configuration that will serve the Generating Facility. Based on the type of interconnection to be used for the Generating Facility, determine from the table below if the proposed Generating Facility passes the screen.

**Table I.**

Primary Distribution Line Type Configuration	Type of Interconnection to be Made to Primary Distribution Line	Results/Criteria
Three-phase, three wire	Any type	Pass Screen
Three-phase, four wire	Single-phase, line-to-neutral	Pass Screen
Three-phase, four wire (For any line that has such a section OR mixed three wire and four wire)	All others	To pass, aggregate Generating Facility nameplate rating must be less than or equal to 10% of Line Section peak load

**Significance:** If the primary distribution line serving the Generating Facility is of a “three-wire” configuration, or if the Generating Facility’s distribution transformer is single-phase and connected in a line-to-neutral configuration, then there is no concern about over voltages to the Utility’s or other customer’s equipment caused by loss of system neutral grounding during the operating time of the non-Islanding protective function.

**Screen 8. Transmission Dependency and Transmission Stability**

Is the Interconnection Request for an area where: i) there are known, or posted, transient stability limitations, or ii) the proposed Generating Facility has interdependencies, known to the Distribution Provider, with earlier queued Transmission Interconnection Requests.

- *If Yes*, Supplemental Review is required.
- *If No*, the Generating Facility qualifies for Simplified Interconnection.

**Significance:** Special consideration must be given to those areas identified as having current or future (due to currently queued projects) grid stability concerns.

**3) Supplemental Review**

1. If a Generating Facility has failed one or more Initial Technical Review screens, the Utility will notify the Customer and offer to perform a Supplemental Review. The intent of Supplemental Review is to provide a slightly more detailed review of only the conditions that caused the Generating Facility to fail the Initial Technical Review to determine what customer facility modifications, or distribution system upgrades, if any,

may permit the Generating Facility to be connected safely and reliably without a more detailed Interconnection Study (IS).

2. If Supplemental Review is required, the Customer shall notify the Utility, in writing, to proceed with the Supplemental Review, or the Customer shall agree to withdraw the Interconnection Application. If the Customer does not notify the Utility within fifteen (15) business days, the Interconnection Application shall be deemed to be withdrawn.
3. The Supplemental Review shall be completed, absent any extraordinary circumstances, within fifteen (15) business days of receipt of the Customer's authorization, in writing, to proceed with the Supplemental Review. The Utility, for good cause, may modify the time limit to conduct the Supplemental Review and shall inform the Customer, in writing, of the need to modify the applicable time limit. The modified time limit shall be mutually agreed upon, in writing, between the Utility and the Customer.

4. **Supplemental Review Screens**

The Supplemental Review consists of Screens for Penetration Level, Power Quality and Voltage, and Safety and Reliability Tests. If any of the Screens are not passed, a quick review of the failed Screen(s) will determine the requirements to address the failure(s) or that detailed Studies are required. In certain instances, the Distribution Provider may be able to identify the necessary solution and determine that detailed Studies are unnecessary. Some examples of solutions that may be available to mitigate the impact of a failed Screen are:

- Replacing a fixed capacitor bank with a switched capacitor bank.
- Adjustment of line regulation settings.
- Simple reconfiguration of the distribution circuit.

**Penetration Test**

Where 12 months of Line Section minimum load data is available or can be estimated from existing data, including smart meters, or a power flow model, is the aggregate Generating Facility capacity on the line section less than 100% of the section minimum load for all line sections bounded by automatic sectionalizing devices upstream of the Generating Facility?

- *If Yes (pass)*, continue to next screen.
- *If No (fail)*, a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and detailed Studies are required. (Note: If Electrical Independence tests and detailed Studies are required, Applicants will continue to the Electrical Independence Tests and detailed Studies after review of the remaining SR Screens.

Note 1: If 12 months of minimum load data is unavailable or cannot be estimated, this screen defaults to 20% of line section peak load.

Note 2: The type and schedule of generation will be taken into account when determining or estimating circuit or Line Section coincident minimum load. For example: Solar generation systems with no battery storage may use daytime minimum load (i.e. 10 am to 4 pm for fixed panel systems and 8 am to 6 pm for PV systems utilizing tracking systems), while all other generation uses absolute minimum load, in the absence of controlling telemetry and communication.

Note 3: Generating Facility capacity already reflected in the minimum load data will not be considered as part of the aggregate generation for purposes of this screen.

Significance: Penetration of Generating Facility installations that does not result in power flow from the circuit back toward the substation will have a minimal impact on equipment loading, operation, and protection of the Distribution System.

**100% minimum coincident load for Supplemental Review penetration screen**

Concept: When determining penetration levels for generation or storage impact studies, minimum load calculations should accurately reflect the relationship between anticipated export and real load, both in terms of generation or export profile and the coincident demand. Where existing generation or storage affects the measured demand, the load served by this generation should be corrected to avoid double counting and account for the full demand occurring at that time.

Rationale: Penetration levels can only meaningfully be measured against the demand occurring coincident with generation and export, as is most evident in cases where solar PV is studied on a circuit with high daytime load and low night-time load. Generation should not be calculated to produce more than it is capable of at any given hour relative to coincident load. Likewise, generation serving onsite load equipped with protective export limiters should only be considered to be able to export up to the defined limit.

Since generation serves local load, whether the generation is behind-the-meter or in front, the apparent demand on that circuit is reduced and can result in substantial overstatement of impacts if it is not accounted for. For example, a circuit with 6 MW of demand and 3 MW of generation will have a net effective load of 3 MW. Under these circumstances, if the load is measured as 3 MW and 3 MW of generation is attributed to it, the circuit would be seen as having reached 100% penetration even though it is actually only at 50%. Measured load is dependent upon the location of measurement relative to generation and load. Failure to correct for reduced apparent load overstates penetration by a factor of two in this case.

Significance: Penetration of Generating Facility installations that does not result in power flow from the circuit back to the substation will have a minimal impact on equipment loading, operation, and protection of the Distribution System.

**Power Quality and Voltage Tests**

In aggregate with existing generation on the line section,

1. Can it be determined within the Supplemental Review that the voltage regulation on the line section can be maintained in compliance with applicable standards and/or Conservation Voltage Regulation voltage requirements under all system conditions?
2. Can it be determined within the Supplemental Review that the voltage fluctuation is within acceptable limits as

defined by IEEE 1453 or utility practice similar to IEEE 1453?

3. Can it be determined within the Supplemental Review that the harmonic levels meet IEEE 519 limits at the Point of Common Coupling (PCC)?
  - *If Yes to all of the above* (pass), continue to Screen Q.
  - *If No to any of the above* (fail), a quick review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and detailed Studies are required. Continue to Screen Q. (Note: If Electrical Independence tests and detailed Studies are required, Applicants will continue to the Electrical Independence Tests and detailed Studies after review of the remaining SR Screens.)

Significance: Adverse voltages and undesirable interference may be experienced by other Customers on Distribution Provider's Distribution System caused by operation of the Generating Facility(s).

#### **Safety and Reliability Tests**

Does the location of the proposed project or the aggregate generation capacity on the Line Section create impacts to safety or reliability that cannot feasibly be addressed without detailed Study?

- *If yes* (fail), review of the failure may determine the requirements to address the failure; otherwise Electrical Independence Tests and detailed Studies are required.
- *If no* (pass), Supplemental Review is complete

Significance: In the safety and reliability test, there are several factors that may affect the nature and performance of an Interconnection. These include, but are not limited to:

- Generation energy source
- Modes of synchronization
- Unique system topology
- Possible impacts to critical load customers
- Possible safety impacts

The specific combination of these factors will determine if any system study requirements are needed.

The following are some examples of the items that be considered under this screen to determine whether safety and reliability concerns exist. If any of these tests are failed, this screen is failed, except that the Utility may exercise discretion to perform additional tests in order to pass this screen. In the event that this screen is failed, the reason for failure shall be provided in writing with reference to the applicable standards used in this determination:

1. Does the line section have significant minimum loading levels dominated by a small number of customers (i.e. several large commercial customers)?
  2. Is there an even or uneven distribution of loading along the feeder?
  3. Is the proposed project located in close proximity to the substation (i.e. <2.5 electrical line miles), and is the distribution line from the substation to the customer composed of large conductor/cable (i.e. 600A class cable)?
  4. Does the Generating Facility incorporate a time delay function to prevent reconnection of the generator to the system until system voltage and frequency are within normal limits for a prescribed time?
  5. Is operational flexibility significantly reduced by the proposed project, such that transfer of the line section(s) of the generator to a neighboring distribution circuit/substation may trigger overloads or voltage issues?
  6. Does the Generating Facility utilize Certified anti-islanding functions and equipment?
5. The Supplemental Review will result in the Utility providing either: (a) Simplified Interconnection, (b) interconnection requirements beyond those for a Simplified Interconnection, and a binding cost determination to perform the interconnection upgrades identified by the Supplemental Review utilizing a standardized requirements and pricing worksheet<sup>12</sup>, or

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<sup>12</sup> (See notes 6 & 7 regarding standard pricing and binding cost estimates) The Utility may, alternatively, elect to offer “time & materials” pricing that includes an estimated cost range and



(c) a determination that a detailed Interconnection Study (IS) is required, and a binding cost estimate and schedule for the completion of the IS, including an identification of the specific analyses and/or reviews that will be performed. Some examples of solutions that may be identified under Supplemental Review are: Replacing a fixed capacitor bank with a switched capacitor bank, adjustment of line regulation settings, or simple reconfiguration of the distribution circuit.

6. An IS will not be required when:

(a) Supplemental Review is triggered by Screen 7 and a feasible solution to effectively ground the Generating Facility has been agreed upon between the Utility and the Customer; or

(b) Supplemental Review is triggered by Screen 1 and both:

(1) the aggregate generating capacity per distribution feeder is below 100% of the feeder minimum kW load coincident with the proposed generation capacity available during that period (e.g. 10 am to 4 pm for fixed position solar photovoltaic systems and 8 am to 6 pm for PV systems utilizing tracking systems) wherever 12 months of line section minimum load data is available, can be calculated, can be estimated from existing data, or determined from a power flow model; and

(2) it can be determined within the Supplemental Review that Conservation Voltage Regulation the line section can be maintained under normal system conditions; and

(3) it can be determined within the Supplemental Review that the harmonic levels meet IEEE 519 limits at the Point of Common Coupling (PCC) and the proposed Generating Facility's impacts to safety or reliability can be adequately addressed without detailed Study; and

(4) it can be determined within the Supplemental Review that voltage fluctuation is within acceptable limits as defined by IEEE 1453 or comparable utility practice.

If it is determined that and IS is required to address safety or reliability concerns, a written report shall be provided and published identifying the specific issues requiring study, and citing relevant electrical standards, the basis for determination of potential significant violation of these standards, and the circumstances preventing cost determination prior to performing detailed study.

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binding cap on customer charges. Customers may elect to hire a third party installer approved by the Utility to perform the required work as identified by the review and defined by IA.

7. If Supplemental Review results in interconnection requirements beyond those for a Simplified Interconnection, the Customer must complete a Facility Equipment List, which will identify equipment, space and/or data at the Generating Facility location to be provided by the Customer for use in conjunction with the Utility's Interconnection Facilities. The Facility Equipment List will be included as Exhibit A to an Interconnection Agreement entered between the Utility and the Customer. If requested, the Utility will provide assistance to the Customer to complete the Facility Equipment List.

#### **4) Interconnection Study**

1. Electrical Independence Tests

Prior to pursuing an Interconnection Study, each project requiring study shall be evaluated for electrical independence from prior applicants currently engaged in Distribution or Transmission Interconnection Studies.

- If independent of other projects, the applicant will proceed directly with an independent Interconnection Study.
- If found to be dependent upon studies not yet completed, applicants will be studied either sequentially or as a group upon completion of the prior study or studies. Final study results will be dependent upon prior applicants (and group applicants, if any) withdrawal or execution of an interconnection agreement, within timeframes established by the Utility.

2. If an Interconnection Study (IS) is needed, the Utility will provide the Customer a schedule and good faith cost estimate for the completion of the IS, including an identification of specific analyses and/or reviews that will be performed. A cost estimate and schedule for the IS will be provided to the Customer before the IS is started. If the utility is unable to complete the IS within the cost estimate, the IS Agreement shall be canceled, the utility shall provide a revised estimate, and the customer may choose to proceed or cancel the IS without liability for any costs.

3. The IS will assess whether Interconnection Facilities and System Upgrade Facilities, if any, are needed for the Generating Facility to interconnect reliably and safely to the Utility's Distribution System, and for the Generating Facility and the Utility's Distribution System to be operated in parallel in a reliable and safe manner. The Utility shall have the right to specify Facility Protection Devices/Schemes for the Generating Facility. The IS, among other things, will: (i) identify probable impacts of the requested interconnection on the operation, reliability and safety of the

Utility's Distribution System; (ii) assess whether the requested interconnection will require System Upgrade Facilities or System Protection Facilities; (iii) determine the location and configuration of Interconnection Facilities, System Upgrade Facilities and System Protection Facilities; (iv) assess costs of design, engineering, procurement, and construction of such facilities; (v) identify a schedule for constructing, testing, and completing such facilities consistent with the commencement of operation of the Generating Facility; and (vi) designate the Utility operations center that will coordinate the operations of the Generating Facility.

4. The IS may include the following: (i) Load-Flow Study; (ii) Short-Circuit Study; (iii) Circuit Protection and Coordination Study; (iv) Impact on System Operation; (v) Stability Study, and the conditions that would justify including this element in the Impact Study; (vi) Voltage-Collapse Study, and the conditions that would justify including this element in the Impact Study; (vii) A review of the Generating Facility's protective devices for adherence to the Interconnection Standards.
5. The Utility shall complete or have a consultant complete the IS within ninety (90) calendar days of the Customer's payment of the IS fee or deposit. The Utility, for good cause, may modify the time limit to conduct the IS and shall inform the Customer, in writing, of the need to modify the applicable time limit. The modified time limit shall be mutually agreed upon in writing between the Utility and the Customer. The Utility shall provide a written letter to the Customer to explain all delays in completing the IS beyond the completion schedule of ninety (90) calendar days.
6. The Utility may consolidate more than one Generating Facility in an IS if the Generating Facilities are on the same Distribution System feeder that is the subject of the IS, provided that the Customers consent to consolidation and the sharing of technical information between them. Parties to a consolidated IS shall pay study and upgrade costs on a pro rata basis as agreed by the parties that desire to share the costs for the IS. The cost may be prorated based upon the expected annual electricity output of the respective facilities or the capacity of the Generating Facility.
7. During the course of the IS, the Customer and the Utility shall exchange information regarding the design and compatibility of the Interconnection Facilities and System Upgrade Facilities and compatibility of the Interconnection Facilities with the Utility's Distribution System, and shall work diligently and in good faith to make any design changes

reasonably necessary to achieve such compatibility. The Customer and the Utility shall meet periodically during such study to discuss cost effective alternative interconnection options, to exchange information that would be reasonably expected to impact such interconnection options, to analyze such information, and to determine the potential feasible points of interconnection.

8. The Interconnection Study shall reference all data, analyses, and reports employed in establishing conclusions, and the preliminary and final studies shall be made available upon request to the Customer and be retained for use by the Utility. The Customer shall be responsible for payment of standard fees for costs and expenses incurred by the Utility for the IS as established in the study agreement. The Customer shall pay all such amounts not later than thirty (30) calendar days after invoice from the Utility or be subject to penalty.

## **5) Interconnection Agreement**

1. The Utility may identify the need for Interconnection Facilities required to facilitate interconnection of the Generating Facility. The Customer will be responsible for the cost of any Interconnection Facilities associated with the interconnection of its Generating Facility to the degree established by governing law or regulation. An identification of the Utility Interconnection Facilities and an estimated cost of the Utility Interconnection Facilities shall be listed in the Interconnection Agreement entered between the Utility and the Customer. The Customer will be responsible for the cost of Interconnection Facilities necessary for the interconnection of its Generating Facility, or fees assessed by the Utility to recoup the cost of providing facilities to the Customer.<sup>13,14,15,16, 17,18</sup>

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<sup>13</sup> Use of existing capacity – a customer should not be required to bear the cost of having additional facilities installed if existing facilities are adequate and available; facilities will be made available on a ‘first requested – first served’ or ‘first ready – first served’ basis with consistent cost responsibility unless otherwise directed by law. Equipment otherwise required to provide service to load customers in the absence of a specific generating facility shall not be charged against that generating facility.

<sup>14</sup> Equal charges should be assessed for facilities required to interconnect customers either seeking load service or providing generation, irrespective of whether such charges are paid as a lump sum or apportioned to periodic (monthly) service charges or rolled into energy rates.

2. The Interconnection Agreement shall establish mutual commitment to interconnect, defining and assigning responsibility for applicable deposits or development securities, construction milestones, and timelines for completion.
3. Within fifteen (15) days following determination of Simplified Interconnection, or thirty (30) calendar days after the Customer accepts final Supplemental Review or Independent Study results, the Utility shall tender a draft Interconnection Agreement. The Customer shall respond with written comments or accept and return the signed Agreement within thirty (30) calendar days. Parties are obligated to respond in a timely manner and reach agreement or initiate Dispute Resolution within ninety (90) days subsequent.

Within sixty (60) calendar days of execution of the Interconnection Agreement, the Customer shall post an Interconnection Financial Security instrument in an amount equal to the greater of fifteen percent (15%) of the total interconnection cost responsibility assigned to Applicant in the final Interconnection System or \$20,000 per MW of electrical output of the Small Generating Facility or the amount of megawatt increase in the generating capacity of each existing Generating Facility as listed by Applicant in its Interconnection. An equal sum shall be posted each 180 subsequent calendar days until interconnection is achieved unless the Customer withdraws that interconnection request or the Utility is unable to meet its obligations under the Agreement.

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<sup>15</sup> The intent of intent of standardized pricing is to ensure equal treatment for similarly situated customers and binding cost determination to provide applicants with adequate cost certainty in order to make a decision.

<sup>16</sup> The Utility may, alternatively, elect to offer “time & materials” pricing that includes an estimated cost range and binding cap on customer charges. As noted elsewhere, the customer may elect to hire a third party installer approved by the Utility to perform the required work as identified by the review and defined by IA.

<sup>17</sup> Utilities are strongly encouraged to avoid creation of unintended tax liabilities through the transfer of ownership of facilities upgrades per IRS Safe Harbor Provision (per IRS Notice 2001-82 and 88-129).

<sup>18</sup> Utilities may apply appropriate cost-based “ready-to-serve” charges related to insurance, replacement and O&M for equipment and upgrades uniquely required to maintain interconnection of the customer’s generating facility.

4. The Customer shall notify the Utility not less than fifteen (15) Business Days prior to the anticipated start-up date of Generating Facility. Such notification shall be accompanied by an Interconnection Completion Certificate issued by the Utility within ten (10) business days of interconnection. Upon receipt of such notice and certificate, the Utility may contact the Customer to schedule an inspection of the Generating Facility at the Utility's expense. Any inspection shall be scheduled to occur, at a time mutually agreeable to the Utility and the Customer, within ten (10) Business Days of Customer's notice of the anticipated start-up date and Interconnection Completion Certificate. A Generating Facility shall not pass the Utility's inspection unless such Generating Facility fully complies with the applicable technical standards identified in the Interconnection Agreement. If a Generating Facility initially fails a Utility inspection, the Utility shall offer to redo the inspection at Customer's expense within ten (10) Business Days of the Customer's request.
5. After the Utility has received Customer's Interconnection Completion Certificate and the Generating Facility has passed the Utility's inspection, or the Utility has waived, in writing, the right to inspect the Generating Facility, Customer may begin parallel operation of the Generating Facility with the Utility's Distribution System per terms of the Interconnection Agreement.

## **6) Insurance Coverage**

1. Customer is obligated to carry adequate insurance in forms and amounts that are commercially reasonable<sup>19</sup> for each particular situation. Customer bears responsibility for determining its insurance requirements. Prior to execution of an Interconnection Agreement, Customer shall disclose if it will be self-insured (and if so its means and capability to self insure) or if it will obtain an insurance policy (and if so in what forms and amounts). Customer shall provide evidence of such insurance by providing certificates of insurance to the Utility prior to any parallel interconnection, or, if insurance is being modified, within 30 days of any change.

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<sup>19</sup> To avoid unwarranted customer burden, Utilities are discouraged from requiring amendments to a customer's policy naming the Utility, its directors, officers, agents, and employees as additional insured parties.

2. As general guidance, a commercial general liability policy, covering bodily injury and property damage is recommended, with higher amounts of coverage for larger generators. Additionally, it is recommended that the insured consider inclusion of contractual liability coverage for written contracts and agreements, including the standard interconnection agreement, and if applicable, inclusion of provisions stating that the insurance will respond to claims or suits by additional insureds against the Customer or any other insured thereunder. The adequacy of the coverage afforded by the insurance should be reviewed by Customer from time to time, and if it appears in such review that risk exposures require an increase in the coverages and/or limits of this insurance, Customer should make such increase to that extent.

## **7) Dispute Resolution**

- a. If there is a dispute between Customer and the Utility as to whether an IS is required, or as to the scope and cost of the study, then the Utility shall use the following procedures: (1) the Utility shall inform Customer of the reasons for and scope of the study required; (2) if Customer disagrees with the conclusion, then Customer may meet with representatives from the Utility to discuss the matter; (3) if Customer continues to disagree with the conclusion, then Customer may write to the Utility explaining the position of Customer, and the Utility shall respond in writing within fifteen (15) business days (so that any dispute is reduced to writing); (4) if the parties continue to have a dispute, then authorized representatives from the Utility and Customer (having full authority to settle the dispute) shall meet in person, or by telephone conference, or other electronic media, with the meeting to be scheduled within five (5) business days of the request, and for at least one hour, or less than one hour at the option of the party requesting the meeting, and attempt in good faith to resolve the dispute; provided that if the dispute involves technical issues persons with sufficient technical expertise and familiarity with the issue in dispute from each party shall also attend the meeting; and (5) if the parties continue to have a dispute, then the parties may engage in a form of alternative dispute resolution agreeable to both parties, or a party may request that the governing body resolve the matter by [input relevant dispute resolution process].
1. If there is a dispute as to the need for interconnection equipment, protective devices or control systems, then the Utility shall use the following procedures: (1) the Utility shall inform Customer of the reasons for the interconnection equipment/protective devices/control systems; (2) if Customer disagrees with the conclusion, then Customer may meet



with representatives from the Utility to discuss the matter; (3) additional analyses may be conducted by the Utility at the request of a Customer that questions the need for particular interconnection equipment/protective devices/control systems if Customer pays for the analyses; (4) if Customer continues to disagree with the conclusion, then Customer may write to the Utility explaining the position of Customer, and the Utility shall respond in writing within fifteen (15) business days (so that any dispute is reduced to writing); (5) if the parties continue to have a dispute, then authorized representatives from the Utility and Customer (having full authority to settle the dispute), shall meet in person, or by telephone conference, or other electronic media, with the meeting to be scheduled within five (5) business days of the request, and for at least one hour, or less than one hour at the option of the party requesting the meeting, and attempt in good faith to resolve the dispute; provided that if the dispute involves technical issues, persons with sufficient technical expertise and familiarity with the issue in dispute from each party shall also attend the meeting; and (6) if the parties continue to have a dispute, then the parties may engage in a form of alternative dispute resolution agreeable to both parties, or a party may request that the governing body resolve the matter by [input relevant dispute resolution process].

2. Subject to the approval of the Utility, which may not be unreasonably withheld, the Customer may elect to employ a qualified contractor to provide and install Interconnection Facilities or Distribution Upgrades, to be owned and operated by the Utility, on the Utility's side of the Point of Common Coupling. Such Interconnection Facilities and Distribution Upgrades shall be installed in accordance with the Utility's design and specifications.

## **8) Technical Standards**

- a. Technical Standards. Each Generating Facility shall comply with all current applicable codes and standards, applicable laws, and good engineering and operating practices, and with the following standards or successors, as applicable:
  - i. IEEE Standard 1547 series for Interconnecting Distributed Resources with Electric Power Systems, including current draft standards (1547.7 and 1547.8) unless specifically excepted by the Utility with cause.

- ii. UL 1741 Standard for Inverters, Converters and Controllers for Use in Independent Power Systems. UL 1741 compliance must be recognized or certified by a Nationally Recognized Testing Laboratory as designated by the U.S. Occupational Safety and Health Administration. Certification of a particular model or a specific piece of equipment is sufficient. It is also sufficient for an inverter built into a Facility to be recognized as being UL 1741 compliant by a Nationally Recognized Testing Laboratory.
  - iii. NFPA 70 National Electrical Code (latest edition).
  - iv. ANSI C84.1-2006, American National Standard for Electric Power Systems and Equipment—Voltage Ratings (60 Hertz)
  - v. IEEE 1453-2004 IEEE Recommended Practice for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems
  - vi. IEEE 519-1992 IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
  - vii. PV modules and panels must be listed and be in compliance with Underwriters Laboratories (UL) Standard 1703, Standard for Safety: Flat- Plate Photovoltaic Modules and Panels.
- b. Additional Standards and Requirements. In addition, each Generating Facility must comply with the following standards and requirements, or their successors, applicable at the time of approval:
- 1. Permits and Approvals. Customer is responsible for obtaining any necessary local code official approval (electrical, zoning, etc.), as well as all other permits and approvals, for the Generating Facility and Customer's Interconnection Facilities.
  - 2. Commissioning Test. Customer shall conduct commissioning tests of the Generating Facility and Customer's Interconnection Facilities pursuant to IEEE Standard 1547-2003 or its successor and in compliance with all manufacturer requirements.
  - 3. Operations and Maintenance. Customer shall be fully responsible to operate, maintain, and repair the Generating Facility to ensure that it complies at all times with IEEE Standard 1547-2003 or its successor.
  - 4. Monitoring. Each DG facility of 250 kVA or more, or DG aggregate of 250 kVA or more at a single PCC, shall have provisions for monitoring its connection status,

real power output, reactive power output, and voltage at the point of connection. Telemetry shall only be required to the extent that less intrusive and/or more cost effective options for providing the necessary data in real time are not available. Local monitoring provisions, such as panel meters and indicating lights, may be acceptable to meet these requirements in certain cases.

An Internet-based, radio, or cellular SCADA alternative is a reliable and economical alternative to direct SCADA communications with the Transmission Operator (TO). In addition to generally lower installed cost for the Internet SCADA alternative, the Internet ongoing communication costs may be more cost effective relative to other alternatives, especially those that require leased telephone circuits. Applicability is subject to compatibility with NERC reliability rules for security.

5. Periodic Testing. The Utility may require any manufacturer-recommended testing and all interconnection-related protective functions and associated batteries shall be periodically tested at intervals specified by the manufacturer or the Utility. Periodic test reports or a log for inspection shall be maintained.
6. External Disconnect Switch. Inverter Systems that are UL 1741 certified and are less than 10 kW in capacity are exempt from this requirement, larger facilities may be exempt based on standards applied by the Utility. If indicated by the IS, the Utility may require a manual, lockable, load break utility-interface disconnect switch between the output of the photovoltaic inverter and Customer's wiring connected to the Utility's Distribution System. The load break device shall be both visible and accessible to the Utility's employees. Customer hereby grants a full license to access the Property and the PV system to ensure compliance herewith.
7. Disconnection. The Utility may temporarily disconnect the Generating Facility (i) for transmission events, unscheduled outages, or electric system emergencies, or (ii) if the Generating Facility does not operate in the manner consistent with these terms and conditions of the Interconnection Agreement and these interconnection procedures. The Utility shall inform the Customer in advance of any scheduled disconnection, or as is reasonable after an unscheduled disconnection.
8. Testing of Protective Relays. The Utility reserves the right to test the anti-islanding features and the power output quality of inverters.
9. Inspection. The Utility shall have the right to inspect any Generating Facility before and after interconnection approval is granted, at reasonable hours and

with reasonable prior notice provided to Customer. If the Utility discovers a Generating Facility is not in compliance with the requirements of these interconnection procedures, and the non-compliance adversely affects the safety or reliability of the electric system, the Utility may require disconnection of such Generating Facility until the Generating Facility complies with these interconnection procedures.

10. System Equipment Protection. It is the responsibility of the Customer to protect its generating equipment, inverters, protection devices, and other system components from damage by the normal conditions and operations that occur on the part of the Utility in delivering and restoring power to the Utility's Distribution System. The Utility disclaims any liability whatsoever for damage to Customer's equipment.
11. Costs and Expenses. Except as otherwise expressly set forth in these interconnection procedures, or the Interconnection Agreement, Customer is responsible for all costs for the design, development, permitting, engineering, procurement, construction, completion, installation, and testing of the Generating Facility.

## 9) Definitions

- a. **Clearing Time:** The time between the abnormal voltage being applied and the generating facility ceasing to energize the Utility Distribution System.
- b. **Customer Insurance Coverage:** Consistent with Section 6, the Customer shall maintain insurance coverage or be self insured against risks arising under the Interconnection Agreement. Proof of Customer Insurance Coverage will be included as Exhibit C to an Interconnection Agreement entered between the Utility and the Customer.
- c. **Distribution System:** All electrical wires, equipment, and other facilities at the distribution voltage levels owned or provided by the utility, through which the Utility provides electrical service to its customers.
- d. **Facility Equipment List:** Identifies equipment, space, and/or data at the Generating Facility location to be provided by the Customer for use in conjunction with the Utility's Interconnection Facilities. The Facility Equipment List will be included as Exhibit A to any Interconnection Agreement entered between the Utility and the Customer.

- e. **Facility Protection Devices/Schemes**: The protection and synchronizing relays and settings, and protection, synchronizing and control schemes, consistent with the technical requirements of Section 8, that affect the reliability, safety of operation, and power quality of the Utility's Distribution System with which the Generating Facility seeks to interconnect.
- f. **Generating Facility**: Customer or utility-owned electrical power generation that is interconnected to the Utility Distribution System.
- g. **Initial Technical Review**: Pursuant to Section 3, the review by the Utility following receipt of an Interconnection Application to determine the following: a) if the Generating Facility qualifies for Simplified Interconnection; or b) if the Generating Facility can be made to qualify for interconnection with a Supplemental Review determining additional requirements, if any.
- h. **Interconnection Application**: Completion of one of the two applications in Attachments 1 or 3, as appropriate, submitted to the Utility for interconnection of a Generating Facility.
- i. **Interconnection Facilities**: The electrical wires, switches and related equipment that are required in addition to the facilities required to provide electric distribution service to a Customer to allow interconnection. Interconnection Facilities may be located on either side of the Point of Interconnection as appropriate to their purpose and design. Interconnection Facilities may be integral to a Generating Facility or provided separately.
- j. **Interconnection Study (or "IS")**: Pursuant to Section 5, a study to establish the requirements for interconnection of a Generating Facility with the Utility's Distribution System.
- k. **Inverter System**: A machine, device, or system that changes direct-current power to alternating-current power.
- l. **Islanding**: Islanding is a condition in which one or more Generating Facilities deliver power to a the Utility customer or customers using a portion of the Utility's Distribution System that is electrically isolated from the remainder of the Utility's Distribution System. Unintended islanding may occur following an unanticipated loss of a portion of the Utility Distribution System.

- m. **Line Section**: The portion of the Utility Distribution System connected to a Customer bounded by automatic sectionalizing devices, or the end of a distribution line. Where a radial distribution circuit does not have automatic sectionalizing devices, the whole circuit is considered one Line Section. A fuse must be manually replaced and is therefore not considered an automatic sectionalizing device.
- n. **Point of Interconnection**: The point at which the Utility and customer interface occurs.
- o. **Short Circuit Current Contribution Ratio (SCCR)**: The SCCR evaluates the short circuit current contribution of the Generating Facility in two ways. First the SCCR looks at the ratio of the Generating Facility short circuit contribution to the short circuit contribution of the utility system for a three-phase fault at the high voltage side of the customer or utility transformer connecting the generating facility to the utility (aggregate SCCR must be less than or equal to 10%). Second, it compares the Generating Facility short circuit current to the interrupt rating of the customer's service panel to ensure that the customer's equipment will not be overloaded.
- p. **Simplified Interconnection**: Interconnection conforming to the Initial Technical Review requirements of Sections 3 and 4.
- q. **Supplemental Review**: Pursuant to Section 4, a process wherein the Utility further reviews an Interconnection Application that fails one or more of the Initial Technical Review screens. The intent of the Supplemental Review is to provide a slightly more detailed review of only the conditions that cause the Generating Facility generator to fail Initial Technical Review. Supplemental Review may result in one of the following: a) approval of interconnection; b) approval of interconnection with additional requirements; or c) cost and schedule for an Interconnection Study.
- r. **Synchronous Generator**: A rotating machine generator that converts mechanical power into electrical power, in which the rotor current creating the magnetic field comes from a separate DC source or the generator itself.
- s. **System Protection Facilities**: The equipment, including necessary protection signal communications equipment, required: (a) to protect the Utility's Distribution System from faults or other electrical disturbances occurring at the Generating Facility, and (b) to protect the Generating

Facility from faults or other electrical system disturbances occurring on the Utility's Distribution System or on other delivery systems or other generating systems to which the Utility's Distribution System is directly connected, as indicated in the Interconnection Requirement Study, if any.

- t. **System Upgrade Facilities:** The equipment and facilities at or beyond the Point of Interconnection, excluding the Utility's Interconnection Facilities, that are necessary or advisable, if any, to be incorporated into the Utility's Distribution System for the Generating Facility to interconnect reliably and safely, and for the Utility's Distribution System to operate reliably and safely and in a manner that meets the interconnection procedures and associated standards, and in each case including any modification, addition, or upgrades to such equipment and facilities necessary for the Generating Facility to interconnect reliably and safely to the Utility's Distribution System.