

**COMMENTS OF THE SOLAR ALLIANCE**  
**NEW JERSEY INTERCONNECTION RULES**  
**APRIL 29<sup>TH</sup>, 2011**

**I. Background**

The Solar Alliance is a group of approximately 30 of the largest photovoltaic (PV) solar development and manufacturing companies in the United States. We work together to advance state legislative and regulatory policies that support solar energy and help capture associated economic development opportunities. And we strive to increase the number and capacity of solar installations of all types, ensuring the market is vibrant, competitive and diverse.<sup>1</sup>

New Jersey solar installations now provide over 300 MW of installed capacity from more than 8,000 projects. Moreover, the Solar Energy Advancement and Fair Competition Act has set the stage for nearly 5 GW of solar energy by 2026. This will require interconnection of thousands more solar energy systems and more than fifteen times the amount of generation capacity.

The Solar Alliance (SA) endeavors to work collaboratively with all Net Metering and Interconnection Stakeholders and specifically seeks to identify the actions needed to accomplish the goals of higher solar penetration on distribution feeders. In conjunction with this effort, the SA has also engaged E3 Energy Services (E3) to help address specific concerns about the small generator interconnection processes being utilized by various state utilities and the generic concern that the New Jersey interconnection rules (IC) will require updating to accommodate greater numbers of solar installations.

In preparing these comments, the Solar Alliance and/or E3 Energy spoke with various solar developers whose projects were not being approved for interconnection, were required to spend additional sums for interconnection study, or were taking longer to be approved than the time frames set forth in the New Jersey IC rules. E3 also contacted PJM and discussed the potential for interconnection rule improvements with legal and technical representatives from the Interstate Renewable Energy Council (IREC). IREC maintains a model rule for interconnection procedures and has representatives willing to participate in any rulemaking in New Jersey on interconnection. Lastly, E3 and the Solar Alliance team also met with technical and policy representatives from all of the New Jersey electric distribution companies to identify how the interconnection process was currently functioning, to understand issues and concerns from the perspective of the utilities, and to explore ideas for improving the IC rules and processes in New Jersey.

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<sup>1</sup> The views expressed in these comments are those of the Solar Alliance and not necessarily those of any individual member company.

## **II. Today's New Jersey Small Generator Interconnection Rules & Needed Reforms to Accommodate Greater Penetration of Solar PV on Individual Circuits within Appropriate Safety Margins**

The New Jersey small generator interconnection rules were one of the first codified interconnection standards in the country and were developed prior to the promulgation of the FERC SGIP. The rules were groundbreaking at the time but the solar industry has evolved rapidly since their introduction. Expansion of the market and advances in technology now require that these rules be updated to allow for continued efficient and low cost interconnection of customer sited solar PV systems.

The IC rules were originally constructed to allow generators that should not require an in-depth study of grid impact to proceed with limited cost and expedited treatment. If a generator addition, in aggregate with other generators already interconnected will neither adversely affect the protective devices on a particular circuit, nor will they cause power to be injected into the transmission system (effectively operating a substation transformer in reverse), then there are few interconnection issues associated with the proposed generators and interconnection approval can be granted without the need for a time consuming and costly in-depth interconnection study.

### **A. The "15% Rule" is Overly Restrictive for Peak-Oriented Resources Such as Solar**

At the core of these expedited interconnection procedures is what has become known as the 15 percent rule. This rule states that if aggregate generation on a single utility circuit is less than 15 percent of the circuit peak load, then a proposed generator addition can be approved without further in-depth study. The rule is associated with ensuring that the aggregate generation is less than circuit minimum load which means in turn that all the power generated by the interconnected generators will be consumed by load within that single circuit. No power should flow back to the utility substation and affect transmission power flows or protective devices at the substation.

The 15 percent rule was derived by using a rule of thumb ratio of 3:1 between circuit peak load and circuit minimum load then applying a 2x safety factor. While the essence of the rule is related to circuit minimum load, many utilities only track peak load on a circuit and often have no data on minimum load. Applying the two key elements of the rule (minimum circuit load at 33 percent of peak load and safe margin at 50 percent of minimum circuit load) leads to a requirement that generation remain below 16.6 percent of peak load. The 16.6 percent number was rounded down to 15 percent in the codification of the interconnection procedures.

It is important to note that the 15 percent rule is very conservative. Not only is there a slightly greater than 2x safety factor built into the rule, the rule is based on a worst case assumption where every generator on a single circuit is producing power at its nameplate maximum while the circuit load is simultaneously at its minimum. Where the total generation is the sum of a number of individual installations, the probability that all of the generators will be producing maximum power simultaneously with minimum load is very small. When that generation is comprised of non-dispatchable and seasonal resources like solar and wind, that probability becomes infinitesimally small.

Solar generation can in many cases safely be said to be providing no power during the times when utility circuits are at their minimum (typically late evening hours during non-heating and non-cooling seasons). Because solar only produces during daylight hours, reaching its top rated output only during certain times of the day, the minimum load requirement can be limited in time for solar (assuming no storage is included). Focusing a modified rule on these aspects of solar generation will allow for more solar to be approved for interconnection than under the current limited rule.

***Recommendations:***

- 1.1. Increase the current 15% of peak load rule for Level 2 interconnection by clarifying and codifying the Additional Review process, specifically allowing for approval up to 23% (with the differential representing only solar facilities with no storage).** Because solar is a generation resource that only produces power during daylight and only produces nameplate rated power only during a few brief hours of the day, the imposition of the 15% of peak load limit for interconnection approval is too conservative for allowing solar to be approved without a full blown interconnection study. Assuming that the minimum load during times of solar peak production is in reality 50% higher than the all-hours circuit minimum load (typically in the middle of the night) the limit with respect to solar can be safely raised by 50% or to 23% of peak load. There is still a high degree of safety incorporated into this higher number because the probability of all the solar generators on any circuit reaching full nameplate production capacity at the precise time the circuit is at minimum load is infinitesimally small. Moreover, even were that highly improbable condition occur, the 2x safety margin built into the original 15% rule would assure even at the 23% level that collective solar would not reverse power flows on any circuit. Note: solar with storage is excluded because there is no time limit on when storage might be dispatched to the grid. Unlike solar without storage which cannot physically produce power during dark hours, storage in theory could be exporting during the night.
- 1.2. Allow solar to meet up to 75% of minimum load during the hours of 10am to 3pm (daylight peak hours) on radial circuits where real time data is available via the Additional Review process described above.** Where real time minimum data is known, the minimum load point should be used instead of peak. Again if utility engineers know that aggregate distributed generation on a circuit is always producing less power than the minimum load on that circuit, there will always be positive power flow to customers. Collective solar should be allowed to meet up to 75% of circuit minimum load during daylight hours. This still means that 25% of the load on the circuit will be flowing from the substation to customers (positive flow) and to a high degree of probability the minimum will be higher because of the very small likelihood that all solar will be generating at maximum output during minimum circuit load conditions.
- 1.3. Require utilities to add real time minimum load monitoring on radial circuits where proposed solar (or other distributed generation) installations would represent [15%] of the circuit peak load and real time monitoring does not currently exist. Utilities may impose a charge of \$15,000 per MW on all applicants for interconnection on circuits where the aggregated**

**capacity of installed solar and other distributed generation capacity has reached [15%] of peak load to offset the costs of adding real time monitoring to the circuit.** SA has discovered that a high percentage, perhaps the majority, of utility radial circuits do not have real time monitoring to identify both the minimum load and the time that occurs. We are recommending that NJ utilities install this equipment on all circuits where planned solar additions would represent [15%] of the peak load (all circuits are monitored for peak load but not necessarily the time of the peak). With real time data, utilities will be able to apply the proposed minimum daytime standard. To offset the cost of this equipment and properly share the cost among all the benefiting solar companies, a fee on applicants to recover the cost is proposed.

## **B. Differential Treatment for Non-Exporting Generators**

One area for expedited interconnection – non exporting generators-- was excluded from both the New Jersey IC rules and the FERC SGIP. In the case of the development of the New Jersey rules, the issue was simply not considered. For the development of the FERC rules the working group simply ran out of time.

Because the expedited interconnection rules are trying to assure utility engineers that no power flow will reach a circuit's substation, for any installation at a customer's site where the generator installer can assure that no power flow leaves the customer's site, assurance can be provided to the utility engineers that there will be no power flow issues of concern to them. This can be accomplished through the use of a device known as a reverse power relay which can either prevent any power from leaving a customer-generator's site, can assure that some minimum power will always be imported to the customer, or can limit the total amount of exported power to some threshold that provides the assurance to the utility that aggregate generation is less than aggregate circuit load.

As the penetration of solar reaches the 15 percent limit for expedited interconnection, the inclusion of a "non-export" rule would allow additional solar installations on saturated circuits.

### ***Recommendation:***

**2.1. Allow penetration up to 50% of peak load for solar generators that do not export to the grid (all power used on-site).** The underpinning behind the 15% rule is to ensure that distributed generation on any circuit is always less than load on the circuit. If this can be conclusively determined, utility engineers can avoid many aspects of an interconnection study. When utility engineers are assured that power flow will always be to the customer on a radial circuit and not reversed back to a substation, they know that the protective devices on a circuit will function as designed and planned. For a customer installing an on-site generator where that generator cannot export to the grid because of the use of reverse power or minimum import relays, during interconnection review that generator should clear the 15% rule automatically because it can never export. This should allow utility engineers to approve under Level 2 analysis any generator that will not export to the grid and allow much higher penetrations relative to circuit peak load. To ensure that the interaction between non-exporting generators and the reduction in peak circuit load therefore does not adversely affect utility determinations of power flow, the non-exporting generators are limited to 50% of peak load.

### C. Process Changes to Incorporate Minimum Load and Non-Export Standards within Level II Review

Currently under NJAC 14:4-9.8 (Level 2 Interconnection Review) a proposed solar interconnection is subject to a certain number of technical interconnection “screens” to determine whether the proposed installation may be approved for interconnection without further detailed interconnection study. Under subpart (f) of the aforementioned regulation, if the aggregate capacity of solar installations exceeds 15% of the annual peak load on a radial circuit, the proposed interconnection fails this screen.

Under 14:4-9.8 subpart (o)(3) for any proposed interconnection that fails one of more of the technical screens, a utility (EDC) “the EDC shall offer to perform **additional review** to determine whether minor modifications to the electric distribution system (for example, changing meters, fuses, or relay settings) would enable the interconnection to be made consistent with safety, reliability and power quality (Emphasis added)”

Additional review, as used in this regulation, has not been defined or delineated by the BPU and seems to be an elusive concept for the utilities undertaking interconnection analyses. The Solar Alliance proposes that the BPU elucidate, in part, what additional review should entail in the cases where a proposed interconnection has failed the 15 percent Level 2 screen. In cases where the 15 percent screen is not met, Solar Alliance proposes that the following procedures should be employed under additional review. Consistent with the preceding discussion, provided that the proposed solar installation meets the below “additional review” screens, the interconnection would proceed and be approved under the Level 2 Review process:

- a) Provided the aggregate solar generation nameplate capacity connected to the circuit does not exceed 23 percent of the annual peak load the interconnection shall be approved under Level 2 Review
- b) On radial circuits where solar generation nameplate capacity has reached 23 percent and up to aggregate solar generation not exceeding 50 percent of the annual peak load on the circuit, the EDC shall approve additional solar interconnections provided the solar generators use reverse power relays or other mechanisms approved by the EDC or BPU that will ensure that the solar generator cannot export power from the customer’s site (this includes minimum import relays).
- c) Where real time historic feeder load data is available, provided aggregate nameplate solar generator capacity in aggregate does not exceed 75% of minimum circuit load during the hours of 10am to 3pm (daylight peak hours) on radial circuits, the interconnection shall be approved.

A utility may deny the interconnection application in cases under item 3 above when the utility has evidence to believe that the circuit minimum load will decrease substantially within the next [3] years and data supporting that evidence is provided to the applicant or the BPU. A utility may charge the interconnection customer for conducting the additional review at the rates and charges approved by the BPU.

Specific language amending the existing New Jersey interconnection rules to codify the “additional review” procedures is set forth as Attachment A to this document.

#### **D. Interconnection Levels and Timelines**

The current New Jersey IC rules are split into 3 parts; Level 1 for up to 10kW generators, Level 2 for up to 2 MW generators; and Level 3 for all other generators. Two important issues have developed with Level 2 Interconnections. First, Level 2 was limited to generators less than 2MW even though the rules developed there under could apply to generators up to 10MW (the size at which all generators would likely need to undergo PJM interconnection analysis). As system sizes have increased in the last few years, more projects are being forced to Level 3 Interconnection requirements which in many cases add unnecessary time, cost and complexity. Additionally, under Level 2 review, certain timelines were left open ended including the number of business days for utilities testing to be completed, the number of business days to respond to an initial application (indicating completeness), and the number of business days to provide final notice of approval to operate in those circumstances where testing by the utilities was waived.

##### ***Recommendations:***

- 3.1. Raise Level 1 limit to 25kW.**
- 3.2. Remove the 2 MW limit on level 2 and level 3 interconnections.**
- 3.3. Update the area and spot network interconnection requirements to follow the proposed modifications being discussed in the IEEE 1547 working group.**
- 3.4. Require utilities to confirm receipt of Interconnection Applications (indicating whether complete or not) within 5 business days.**
- 3.5. Require utilities to schedule and conduct a witness test for the final approval of a Level 2 generator within 10 days of the time a solar installer notifies the utility that it is ready to operate.**
- 3.6. For projects where the witness test has been waived, utilities shall issue notice of permission to operate within 10 business days of customer notification that inspections are complete.**
- 3.7. Notifications generally required under the NJ IC rules should be encouraged take place by email to reduce notification time. Solar installers should be copied on email notifications to customers.**

### III. Other Ideas for Improving or Advancing Solar Interconnection in New Jersey

In addition to the above rule modifications and clarifications, the Solar Alliance offers the following suggestions based on extensive discussion with utilities and other stakeholders:

- *Consider leveraging the ability of inverters to use active voltage, VAR or Power factor (PF) correction where a utility has identified the need for such services at the point of interconnection and where utility voltage regulation or other parameters would be outside utility or BPU established tolerances without such active control. Allow for these to occur outside of IEEE 1547 standards and be approved under Level 3 review or Level 2 additional review provided there is mutual agreement between the solar installer and utility. Ask BPU to grant an exception to the rule requiring IEEE 1547 compliance in order to qualify for SRECs.*
- *Consider leveraging dynamic load control where, in real time, circuit load data is sent to solar generators on that circuit allowing them to export when circuit load conditions allow. This option would allow a solar generator to be installed with reverse power limitations that were time sensitive. In other words, generation would ordinarily be limited to on-site use only but if circuit load conditions allowed (which could be a substantial portion of time) generation could be exported in excess of customer on-site load. Smart grid technology could be used in this application.*
- *Consider cases where aggregate customer generation exceeds all load on a circuit and makes the circuit appear to be a net generation node in the PJM system. This discussion would entail the interconnection studies needed to accomplish that result as well as the equipment and protective relay upgrades needed. Cost sharing of such broad circuit modifications should be a part of the discussion. Transformation of existing radial circuits to net generation circuits will allow for the full deployment of solar on every customer's site with a suitable solar resource and will eliminate the artificial constraint of relating PV system sizing to customer load.*
- *Encourage more interactive approach between developers and utility system engineers to resolving interconnection issues (e.g., voltage fluctuation) to include consideration of pilot programs or other joint research or development.*
- *Consider development of materials/processes for educating developers and contractors on interconnection process and key considerations which can expedite or delay applications.*
- *Consider dissemination of information and/or mapping to developer community on where networks exist and/or where system is more or less robust to guide more efficient site selection and planning.*
- *Consider new and innovative solutions for load control (AMI, smart grid communications, etc) as complementary solutions to higher renewable penetrations.*
- *Consider more advanced modeling of system impacts and more extensive use of wind or solar forecasting as alternative to hardware upgrades or replacement.*

Solar Alliance

Proposed Revisions to NJAC 14:4-9.8

Level 2 Interconnection Review

Additional Review – Procedures

Each EDC shall adopt an “additional review” interconnection procedure under 14:4-9.8 subpart (o)(3). The EDC shall use the following procedures to approve interconnections under the additional review component of Level 2 interconnection review pursuant to 14:4-9.8

- 1) For a customer-generator facility connected to a radial distribution circuit, the EDC shall undertake additional review and approve an interconnection application provided the aggregate solar generation nameplate capacity connected to the circuit does not exceed 23 percent of the total circuit annual peak load.
- 2) For a customer-generator facility connected to a radial distribution circuit where solar generation nameplate capacity exceeds 23 percent, the EDC shall undertake additional review and approve an interconnection application provided the aggregate solar generation nameplate capacity connected to the circuit does not exceed 50 percent of the total circuit annual peak and provided further that the customer generator will use reverse power relays or other mechanisms approved by the EDC or BPU that will ensure that the solar generator cannot export power from the customer’s site (this includes minimum import relays).
- 3) For a customer-generator facility connected to a radial distribution circuit where real time historic feeder load data is available, the EDC shall undertake additional review and approve an interconnection application provided the aggregate solar generation nameplate capacity connected to the circuit does not exceed 75% of the total circuit annual minimum load during the hours of 10am to 3pm (daylight peak hours).

An EDC may deny the interconnection approval in cases under item 3 above when the EDC has evidence to believe that the total circuit annual minimum load will decrease substantially within the next [3] years and data supporting that evidence is provided to the customer-generator applicant or the BPU. An EDC may charge the customer-generator for conducting the above additional review at the rates and charges approved by the BPU.