

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

<b>Requirements for Frequency and Voltage</b>	)	
<b>Ride Through Capability of Small</b>	)	<b>Docket No. RM16-8-000</b>
<b>Generating Facilities</b>	)	

**COMMENTS OF THE EDISON ELECTRIC INSTITUTE, THE AMERICAN PUBLIC  
POWER ASSOCIATION, LARGE PUBLIC POWER ASSOCIATION, AND THE  
NATIONAL RURAL ELECTRIC COOPERATIVES ASSOCIATION**

The Edison Electric Institute (“EEI”), the American Public Power Association (“APPA”), Large Public Power Council, and the National Rural Electric Cooperative Association, (collectively, the “Trade Associations”) respectfully submits these comments in response to the Notice of Proposed Rulemaking (“NOPR”) issued by the Federal Energy Regulatory Commission (“Commission” or “FERC”) on March 17, 2016, in the above-referenced docket.<sup>1</sup>

In the NOPR, the Commission proposes to revise the *pro forma* Small Generator Interconnection Agreement (“SGIA”), which establishes the terms and conditions under which public utilities must provide interconnection service to small generating facilities no larger than 20 megawatts (“MW”). Specifically, the Commission proposes to require newly interconnecting small generating facilities to ride-through abnormal frequency and voltage events and not disconnect during such events. The NOPR states that the Commission already requires generators interconnecting under the Large Generator Interconnection Agreement (“LGIA”) to have this capability, and small generating facilities should now have comparable ride-through requirements to large generating facilities.

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<sup>1</sup> *Requirements for Frequency and Voltage Ride Through of Capability of Small Generating Facilities*, Notice of Proposed Rulemaking, 154 FERC ¶ 61,222 (2016).

EEI is the trade association that represents all U.S. investor-owned electric companies. Our members provide electricity for 220 million Americans, operate in all 50 states and the District of Columbia, and directly employ more than 500,000 workers. With more than \$85 billion in annual capital expenditures, the electric industry is responsible for millions of jobs related to the delivery of power, including the construction of modified or new infrastructure. Reliable, affordable, and sustainable electricity powers the economy and enhances the lives of all Americans. EEI also has 70 international electric companies as Affiliate Members, and 250 industry suppliers and related organizations as Associate Members. Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums. In addition, its members include Generator Owners and Operators, Transmission Owners and Operators, Load-Serving Entities, and other entities that are subject to mandatory Reliability Standards developed and enforced by the North American Electric Reliability Corporation (“NERC”).

APPA is the national service organization representing the interests of not-for-profit, publicly owned electric utilities throughout the United States. More than 2,000 public power systems provide over 14% of all kilowatt-hour sales to ultimate customers and serve over 48 million people, doing business in every state except Hawaii. Public power systems own approximately 10.3% of the total installed generating capacity in the United States. Approximately 264 APPA members are subject to compliance with NERC standards applicable to users, owners and operators of the Bulk-Power System (“BPS”).

LPPC is an association of the 26 largest state-owned and municipal utilities in the nation. LPPC’s membership is located throughout the nation, both within and outside Regional

Transmission Organization boundaries, and the members comprise the larger, asset owning members of the public power community.

NRECA is the national service organization for America's Electric Cooperatives. The nation's member-owned, not-for-profit electric co-ops constitute a unique sector of the electric utility industry – and face a unique set of challenges. NRECA represents the interests of the nation's more than 900 rural electric utilities responsible for keeping the lights on for more than 42 million people across 47 states. Electric cooperatives are driven by their purpose to power communities and empower their members to improve their quality of life. Affordable electricity is the lifeblood of the American economy, and for 75 years electric co-ops have been proud to keep the lights on. Because of their critical role in providing affordable, reliable, and universally accessible electric service, electric cooperatives are vital to the economic health of the communities they serve. America's Electric Cooperatives bring power to 75 percent of the nation's landscape and 12 percent of the nation's electric customers, while accounting for approximately 11 percent of all electric energy sold in the United States. NRECA's member cooperatives include 65 generation and transmission (“G&T”) cooperatives and 840 distribution cooperatives. The G&Ts are owned by the distribution cooperatives they serve. The G&Ts generate and transmit power to nearly 80 percent of the distribution cooperatives, those cooperatives that provide power directly to the end-of-the-line consumer-owners. Remaining distribution cooperatives receive power directly from other generation sources within the electric utility sector. NRECA members generate approximately 50 percent of the electric energy they sell and purchase the remaining 50 percent from non-NRECA members. Both distribution and G&T cooperatives share an obligation to serve their members by providing safe, reliable, and

affordable electric service.

## EXECUTIVE SUMMARY

Subject to the timing recommendation below, the Trade Associations support the Commission's proposal to modify the *pro forma* SGIA to require interconnecting small generating facilities to ride-through abnormal frequency and voltage events and not disconnect during such events. The Trade Associations agree with the Commission that new technology, such as smart inverters, is now available to newly interconnecting small generating facilities that enable these generators to ride through frequency and voltage disturbances. However, it is equally important that these facilities safely and effectively disconnect from utility systems whenever required to do so to avoid islanding conditions.

Although there is a need for reform, the Trade Associations are concerned that the Commission is proposing to change the *pro forma* SGIA in advance of the finalization of key industry standards and without the benefit of a broader discussion with industry regarding essential reliability services that are needed to meet the changing generation resource mix and other factors. Although the Trade Associations recognize that some regions, such as California and PJM,<sup>2</sup> had to move more quickly to address changes with respect to distribution interconnection processes in light of renewable portfolio standards, such changes are not in play in all regions of the country at this time. The Commission should acknowledge the many regional differences in how small generators are interconnected. Furthermore, not all companies

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<sup>2</sup> See e.g. CPUC Decision 14-12-035, "Interim Decision Adopting Revisions to Electric Tariff Rule 21 for Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company to Require 'Smart' Inverters", issued December 22, 2014. Also, last year PJM revised its tariff to require among other things that enhanced inverter capabilities be utilized by prospective Interconnection Customers contemplating the interconnection of non-synchronous resources, as well as to adhere to NERC Reliability Standard PRC-024-1 with respect to voltage and frequency ride-through capabilities. See *PJM Interconnection, L.L.C.*, Order Conditionally Accepting Tariff Revisions and Directing Compliance Filing, 151 FERC ¶ 61,097 (May 5, 2015).

have had the opportunity to become sufficiently comfortable with proposed changes to key industry standards, which in many cases remain unapproved and unpublished, as described below. Therefore, the Trade Associations ask the Commission not to impose such broad changes to the *pro forma* SGIA that would obligate all entities to change their SGIA before they have had an opportunity to validate whether such changes can be implemented safely within their company's operating practices.

Specifically, the Trade Associations support the proposed reform but recommend that the Commission act on this NOPR only after industry stakeholders have fully addressed anti-islanding issues in newer versions of IEEE (1547) and UL (UL1741) standards, which are currently undergoing development and approval. In the interim, the Commission should explore issues raised in this NOPR through regional technical conferences such as the three technical conferences EEI suggested that the Commission convene in Docket No. RM16-6-000 with regard to essential reliability services. The Commission could use these technical conferences to encourage entities to propose modifications to their individual *pro forma* SGIA to address their local reliability needs, such as California's Rule 21. The Commission could also explore in these technical conferences how changes made to the FERC *pro forma* SGIA may influence state regulations.

## **BACKGROUND**

In Order No. 2006, the Commission explored whether voltage ride-through requirements proposed for large wind generating facilities should apply to small generating facilities and concluded that generating facilities interconnecting under procedures approved in Order No. 2006 would be small and would have minimal impact on the transmission provider's electric

system and therefore need not be subject to ride through requirements.<sup>3</sup> Subsequently, in Order No. 792, the Commission considered, but declined to adopt, a proposal to revise section 1.5.4 of the *pro forma* SGIA to address the reliability concern related to automatic disconnection of small generating facilities during over- and under-frequency events that could become a concern at high penetrations of Distributed Energy Resources (“DERs”).<sup>4</sup> The Commission recognized that IEEE was in the process of revising requirements under IEEE standard 1547a for frequency ride-through and voltage regulation, and that this allowed opportunity to either correct or address outdated requirements in the standard. The Commission stated it would follow this process and possibly revise the *pro forma* SGIA as it relates to IEEE Standard 1547 in the future, if necessary.<sup>5</sup>

On May 16, 2014, the IEEE approved Standard 1547a-2014, which is an amendment to IEEE Standard 1547-2003. Contained within this amendment are textual changes that:

1. Allow Distributed Energy Resources (“DERs”), if approved by the operating entity, to actively participate to regulate voltage by changes to real and reactive power. *See* 4.1.1.
2. Allow DERs, under mutual agreement with the grid operator, to respond to grid abnormal voltage and frequency conditions, including provisions which allow DERs to ride through voltage and frequency abnormal conditions. *See* 4.2.3 & 4.2.4.
3. Tables 1 and 2 were also replaced to support these changes.

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<sup>3</sup> *See* Order No. 2006, FERC Stats. & Regs ¶ 31,180 at P 24.

<sup>4</sup> *See* Order No. 792, 145 FERC ¶ 61,159 at P 220.

<sup>5</sup> *See id.*

## COMMENTS

### **I. There is a need for reform of disturbance ride-through capability requirements in the *pro forma* SGIA.**

The Trade Associations agree with the Commission that conditions have changed since the Commission last evaluated whether to impose ride-through requirements on small generating facilities. The Trade Associations share the view that there has been significant growth in grid-connected solar photovoltaic (“PV”) generation since the issuance of Order No. 2006, and the growth in small generator interconnection requests driven by state renewable portfolio standards. As the Commission points out, DERs have had an increasing presence and impact on the electric system.<sup>6</sup>

The Trade Associations also share the Commission’s concern that the absence of ride-through requirements for small generating facilities increases the risk that an initial voltage or frequency disturbance may cause a significant number of small generating facilities to trip off-line across a particular area or Interconnection.<sup>7</sup> Further, the Trade Associations agree with the Commission that small generating facilities, in the aggregate or in significant combination, could exacerbate an initial disturbance by tripping off-line instead of riding through a disturbance.<sup>8</sup>

In principle, the Trade Associations therefore support the concept of requiring newly interconnecting small generator facilities to ride through abnormal frequency and voltage events, and for the Commission to reflect this requirement in the *pro forma* SGIA. However, the Trade Associations recommend that the Commission defer taking such action at this time. Specifically,

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<sup>6</sup> See NOPR at P 7.

<sup>7</sup> See *id.* at P 8.

<sup>8</sup> See *id.*

the Trade Associations believe a more prudent approach would be to allow entities to resolve outstanding concerns involving the adoption of proposed ride-through requirements within the *pro forma* SGIA. Among those concerns include personnel and asset safety, as well as the ability to effectively coordinate protection systems between the local utility and interconnecting resources without which the Commission could unintentionally disrupt the balance between dependability and security. For example, protection systems need to be properly coordinated with downstream protection systems in order to ensure those utility assets, as well as company personnel and the general public, are protected against the errant operation of assets both within the control of the local utility and those assets beyond their immediate control. As part of each interconnection, utilities still need to validate that the smart inverter technology, used by an interconnection customer, disconnects in a manner that aligns with their own internal operating practices for the purpose of protecting the safety of their own operating personnel and the general public.

**II. The Commission should defer action on modifications to the *pro forma* SGIA until supporting standards have been approved and manufacturers have aligned their products to those standards.**

In Order No. 792, the Commission declined to modify the *pro forma* SGIA because it found that the SGIA already contained language in Section 1.5.4 that required Interconnection Customers to meet or exceed relevant specifications “provided by the National Electrical Safety Code, the American National Standards Institute, IEEE, Underwriter's Laboratory, and Operating Requirements in effect at the time of construction . . . .”<sup>9</sup> Yet the Commission now proposes to add new requirements that are only possible through smart inverter technology, while key

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<sup>9</sup> See Order No. 792 at P 220.

associated specifications contained in the reference standards remain unapproved.

Although small generator interconnections are increasing in many areas of the country, most PV generator interconnections are at the distribution level, presenting different engineering challenges than typically faced on the Bulk Electric System. Distribution feeders are often designed as radial feeders (i.e., single source feeding customer load). Such configurations are difficult to coordinate with distributed generation and depend on remote sources to quickly disconnect whenever the utility source is disconnected; otherwise unintended islands can be created creating safety hazards for personnel and customers as well as liability concerns. Some of the common hazards of an unintentional island that would need to be mitigated by the utility or small generator are outlined below:

- It is complicated to control voltage and frequency in an island condition, creating the possibility of damage to customer equipment in a situation over which the utility has no control. This also presents a liability risk for electrical damage to customer equipment connected to their lines that results from voltage or frequency excursions outside of acceptable ranges (ANSI C84.1).
- Island situations are confusing for protection equipment designed to protect the public and the system. Reclosing into an island may result in re-tripping the line or damaging the distributed resource equipment, or other connected equipment, because of out-of-phase closure. Transient overvoltage conditions could also occur.
- Islanding may interfere with the manual or automatic restoration of normal service by the utility. A utility might have to disable and forgo smart grid automated restoration benefits and might not be able to undertake restoration work without creating a number of additional hazards for restoration workers (fault restoration in island conditions makes for live work requirements initially instead of the normal dead and grounded work). All of this increases restoration time.
- Above all, it is important to recognize the hazards that islanding situations can create for the public, by causing a line to remain energized that may be assumed to be disconnected from all energy sources.

There are technical fixes for islanding related problems, including early detection and

DER system shutdown, but one of the main limitations with local detection schemes is that each scheme has an operating region where islanding conditions cannot be (or are hard to) detected in a timely manner. For example, the frequency of an islanded circuit will depend on the power mismatch between the load and generation (in the island). If there is a large power mismatch in an island, a frequency-based anti-islanding scheme will be able to detect islanding condition quickly. If the power mismatch is small, it could take longer to detect the islanding condition. The longer the islanding condition goes undetected, the more likely one of the islanding related hazards outlined above will be experienced.

Specifically, PV generation presents unique challenges for existing protection systems owned by utilities, and this challenge is increased whenever multiple PV generators reside on the same feeder. Presently, many regional utilities depend heavily on passive voltage and frequency elements being sensitive and fast in order to protect against islanding conditions. The Trade Associations are concerned that modifications to the *pro forma* SGIA, as proposed by the Commission, could lead many small generator owners to desensitize these passive protection elements in order to allow resource ride through, possibly creating islanding conditions and relaxed response to fault conditions, which some fear could result in safety hazards or possible equipment damage. Moreover this technology, although readily available to newly interconnecting small generating facilities, has not been validated as safe and effective by many utility operating companies in this country.

For the above reasons, the Trade Associations ask the Commission to defer action to modify the *pro forma* SGIA to require small generators to ride through abnormal frequency and voltage events until after key industry standards are approved and entities nationally have

validated the safety and effectiveness of this advancing technology. Among the key relevant standards currently under revision include:

- IEEE 1547 - Standard for Interconnecting Distributed Resources with Electric Power Systems, which defines how inverters are to operate at a common point of interconnection between the generator owner and the utility. This standard was published in 2003 prior to the development of smart inverters. IEEE 1547 is being revised and is not expected to be completed and published prior to early 2017.
- IEEE 1547.1 - Standard for Conformance Tests Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems, which specifies the type, production, and commissioning tests that are to be performed to demonstrate that the interconnection functions and equipment of a distributed resource (DR) conform to IEEE Standard 1547.
- UL 1741 - Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, which is an equipment safety standard intended to supplement and be used in conjunction with IEEE 1547. See UL 1741 Scope. This standard was written prior to the development of smart inverters. UL was unable to provide a specific timeline for completion of this standard.
- UL 1741 SA - Supplement for Grid Support Utility Interactive Inverters, which is a supplement to the existing UL 1741 standard that is intended to address advanced/smart inverter functionality as specifically required in California. For the past year, this document has undergone revisions by multiple parties (including California utilities, national laboratories, inverter manufacturers, consultants, etc.) to test smart inverters that will comply with California Rule 21. This document includes the test of each smart inverter's functionality to assess their interaction to ensure their safe interconnection to the grid. UL currently projects this supplement will be published in August 2016.

The current versions of both IEEE 1547 and UL 1741 were written before the advent of smart inverters. The Commission should not overlook the linkage between industry standards and small generator interconnections because it is critical to ensure that the foregoing industry standards are updated, and their application to particular technologies is validated, prior to reflecting the proposed ride-through requirements in the Commission's *pro forma* SGIA

**III. The Commission’s should affirm the ability of entities to address regional differences through variations from the proposed revisions to the *pro forma* SGIA.**

The Commission proposes to permit RTOs and ISOs to seek “independent entity variations” from the proposed revisions to the *pro forma* SGIA with respect to low voltage ride-through. The Trade Associations support this aspect of the Commission’s proposal, but ask the Commission to also affirm the ability of non-RTO/ISO transmission providers to seek variations from the *pro forma* SGIA to ensure consistency with regional reliability requirements. Regional flexibility in interconnection procedures is necessary and preferable to prescribing a uniform approach across the country. Significant differences exist across regions regarding the volume and frequency of various types of interconnection requests and the nature of their transmission systems, particularly within the RTO and ISO regions. Certain regions have experienced recent surges of solar and wind generator interconnection requests as the result of aggressive state renewable portfolio requirements; others have not. Certain regions receive a large number of interconnection requests from wind generators proposing to build their facilities in remote locations, requiring long generator lead lines to interconnect to the bulk transmission system; other regions have few, if any, such proposed interconnections.

In some cases, these differences in resource penetration and configuration have led to regional reliability requirements. The Commission recognized in Order No. 2003 that such regional reliability requirements might justify variations to the *pro forma* LGIP and LGIA.<sup>10</sup> This is similar to, but distinct from, the “independent entity variation” available for RTOs and ISOs.<sup>11</sup>

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<sup>10</sup> See Order No. 2003 at PP 823-24.

<sup>11</sup> See *id.* at PP 822-827; see also Order No. 2003-A at P 48.

The Trade Associations recognize that there are many unique regional and entity variations which often drive the need for variations to both the existing and proposed *pro forma* SGIA. The Trade Associations commend the Commission for their recognition that such variations exist and drive entities to develop variation to their interconnection agreements addressing a variety of issues including safety and customer reliability concerns.

**IV. Issues addressed in this NOPR might be better informed through technical conferences.**

The Trade Associations believe that more industry discussion is needed to ensure that small generators' interconnection meet the unique regional utility safety and reliability concerns before the proposed revisions to Section 1.5.7 of the SGIA are adopted. Presumptive actions taken to comply with the NOPR proposal could lead to unintended consequences in some regions, such as addressing protection coordination concerns through costly modifications at the small generator owner's expense, which might be otherwise avoided if entities are afforded more time to vet the technology. Therefore, the Trade Associations suggest the Commission consider engaging the industry on this issue through the three regional technical conferences recommended by EEI in its comments filed in Docket No. RM16-6-000 with respect to frequency response requirements.<sup>12</sup> In that proceeding, EEI asked the Commission to convene three technical conferences to explore what, if any, tariff and reliability standards changes are necessary to ensure continued availability of essential reliability services. SGIA ride-through requirements would be appropriate for discussion in relation to other broader issues related to the support of BPS essential reliability services. The interplay of industry standards such as IEEE 1547, UL 1741 and the National Electric Safety Code influence appropriate levels of resource

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<sup>12</sup> See EEI Comments filed in Docket No. RM16-6-000 on April 25, 2016.

ride-through at small generating facilities. The technical conferences could inform the Commission's understanding of these issues and their importance, and how best to proceed.

In addition to the technical conferences recommended by EEI, the Commission could explore how changes made to the FERC *pro forma* SGIA often influence state regulations.<sup>13</sup> Small generator interconnections at the level described in the *pro forma* SGIA are largely at the distribution level and fall under state regulation. Distribution level interconnections are broadly supported by industry standards and company interconnection rules. Alignment to FERC's *pro forma* SGIA may be inappropriate for some state regulations.

## CONCLUSION

**WHEREFORE**, for the foregoing reasons, the Trade Associations request that the Commission ensure that any future action ordered as a result of this proceeding is consistent as discussed above.

Respectfully submitted,

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<sup>13</sup> In the NOPR, the Commission expresses the hope that changes made to the FERC *pro forma* SGIA “will be helpful to states when updating their own interconnection rules.” Although there is no obligation for states to follow this interconnection agreement, many states do follow or are highly influenced by the work done by FERC. In most cases, the Trade Associations support these efforts but given supporting IEEE and UL standards are not yet in place to support this effort, we are concerned that such influence may represent unintended risks.

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Dated: May 23, 2016

**CERTIFICATE OF SERVICE**

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Washington, D.C. this 23<sup>rd</sup> day of May.

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