

156 FERC ¶ 61,062  
UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

[Docket No. RM16-8-000; Order No. 828]

Requirements for Frequency and Voltage Ride Through Capability of Small Generating  
Facilities

(Issued July 21, 2016)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Federal Energy Regulatory Commission (Commission) is modifying the *pro forma* Small Generator Interconnection Agreement (SGIA). The *pro forma* SGIA establishes the terms and conditions under which public utilities must provide interconnection service to small generating facilities of no larger than 20 megawatts. The Commission is modifying the *pro forma* SGIA to require newly interconnecting small generating facilities to ride through abnormal frequency and voltage events and not disconnect during such events. The specific ride through settings must be consistent with Good Utility Practice and any standards and guidelines applied by the transmission provider to other generating facilities on a comparable basis. The Commission already requires generators interconnecting under the Large Generator Interconnection Agreement to meet such requirements, and it would be unduly discriminatory not to also impose these requirements on small generating facilities. The Commission concludes

that newly interconnecting small generating facilities should have ride through requirements comparable to large generating facilities.

EFFECTIVE DATE: This Final Rule will become effective [**Insert Date 65 days after publication in the FEDERAL REGISTER**].

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SUPPLEMENTARY INFORMATION:

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Before Commissioners: Norman C. Bay, Chairman;  
Cheryl A. LaFleur, Tony Clark,  
and Colette D. Honorable.

Requirements for Frequency and Voltage Ride Through  
Capability of Small Generating Facilities

Docket No. RM16-8-000

ORDER NO. 828

FINAL RULE

(Issued July 21, 2016)

1. In this Final Rule, the Commission modifies the *pro forma* Small Generator Interconnection Agreement (SGIA) originally set forth in Order No. 2006<sup>1</sup> and revised in Order No. 792<sup>2</sup> to require small generating facilities interconnecting through the SGIA to ride through abnormal frequency and voltage events and not disconnect during such events.<sup>3</sup> Pursuant to section 206 of the Federal Power Act (FPA), the Commission finds

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<sup>1</sup> *Standardization of Small Generator Interconnection Agreements and Procedures*, Order No. 2006, FERC Stats. & Regs. ¶ 31,180, *order on reh'g*, Order No. 2006-A, FERC Stats. & Regs. ¶ 31,196 (2005), *order granting clarification*, Order No. 2006-B, FERC Stats. & Regs. ¶ 31,221 (2006) (Order No. 2006).

<sup>2</sup> *Small Generator Interconnection Agreements and Procedures*, Order No. 792, 145 FERC ¶ 61,159 (2013), *clarified*, Order No. 792-A, 146 FERC ¶ 61,214 (2014) (Order No. 792).

<sup>3</sup> In Order No. 2003, the Commission defined “ride through” to mean a generating facility staying connected to and synchronized with the transmission system during  
(continued ...)

that, given the changes to conditions since the Commission last evaluated whether to impose ride through requirements on small generating facilities, the revisions to the *pro forma* SGIA are necessary to remedy undue discrimination by ensuring that small generating facilities have ride through requirements comparable to large generating facilities.<sup>4</sup>

2. As a result of this Final Rule, small generating facilities are required to not disconnect automatically or instantaneously from the system or equipment of the transmission provider and any affected systems for an under-frequency or over-frequency condition, or an under-voltage or over-voltage condition. Furthermore, the transmission provider must coordinate the small generating facility's protective equipment settings with any automatic load shedding program (e.g., under-frequency load shedding, under-voltage load shedding). The specific ride through settings must be consistent with Good Utility Practice and any standards and guidelines applied by the transmission provider to other generating facilities on a comparable basis. These requirements will apply to new interconnection customers that execute or request the unexecuted filing of an SGIA on or

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system disturbances within a range of over- and under-frequency conditions, in accordance with Good Utility Practice. *Standardization of Generator Interconnection Agreements and Procedures*, Order No. 2003, FERC Stats. & Regs. ¶ 31,146, at P 562 n.88 (2003), *order on reh'g*, Order No. 2003-A, FERC Stats. & Regs. ¶ 31,160, *order on reh'g*, Order No. 2003-B, FERC Stats. & Regs. ¶ 31,171 (2004), *order on reh'g*, Order No. 2003-C, FERC Stats. & Regs. ¶ 31,190 (2005), *aff'd sub nom. Nat'l Ass'n of Regulatory Util. Comm'rs v. FERC*, 475 F.3d 1277 (D.C. Cir. 2007), *cert. denied*, 552 U.S. 1230 (2008) (Order No. 2003). Reliability Standard PRC-024-1 requires bulk electric system generation to ride through over- and under- voltage conditions.

<sup>4</sup> 16 U.S.C. 824e.

after the effective date of this Final Rule. These requirements will also apply to existing interconnection customers that, pursuant to a new interconnection request, execute or request the unexecuted filing of a new or modified SGIA on or after the effective date of this Final Rule.

**I. Background**

3. The *pro forma* SGIA establishes the terms and conditions under which public utilities must provide interconnection service to small generating facilities of no larger than 20 megawatts (MW). Currently, the *pro forma* SGIA does not mandate that small generating facilities have the capability to ride through voltage or frequency disturbances.

4. In Order No. 2006, the Commission explored whether voltage ride through requirements proposed for large wind generating facilities should apply to small generating facilities.<sup>5</sup> A commenter during that proceeding asked the Commission to implement ride through standards for small generating facilities similar to those proposed for large generating facilities. However, other commenters responded that special capabilities, such as low voltage ride through, were not needed for any small generating facility, whether wind-powered or not. The Commission concluded that wind generating facilities interconnecting under Order No. 2006 would be small and would have minimal

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<sup>5</sup> Order No. 2006, FERC Stats. & Regs. ¶ 31,180 at P 24.

impact on the transmission provider's electric system and, therefore, need not be subject to ride through requirements.<sup>6</sup>

5. More recently, the Commission again addressed these requirements with regard to small generating facilities in Order No. 792.<sup>7</sup> In that proceeding, the Commission proposed 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, which could become a greater concern at high penetrations of distributed energy resources.<sup>8</sup> The proposed revisions to section 1.5.4 would have required the interconnection customer to design, install, maintain, and operate its small generating facility, in accordance with the latest version of the applicable standards to prevent automatic disconnection during over- and under-frequency events.<sup>9</sup>

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<sup>6</sup> *Id.* The penetration of small generating facilities has increased since the Commission analyzed the impact of small generating facilities in Order No. 2006. *See infra* P 8.

<sup>7</sup> Order No. 792, 145 FERC ¶ 61,159.

<sup>8</sup> *Small Generator Interconnection Agreements and Procedures*, Notice of Proposed Rulemaking, 142 FERC ¶ 61,049, at P 46 (2013) (Order No. 792 NOPR). NERC defines distributed energy resources to mean resources that are distributed geographically and not centralized like traditional generation resources. NERC, *Essential Reliability Services Task Force Measures Report*, (Nov. 2015), <http://www.nerc.com/comm/Other/essntlrlbltysrvkstskfrDL/ERSTF%20Framework%20Report%20-%20Final.pdf>.

<sup>9</sup> *Id.*

6. The Commission declined to adopt this proposed revision in Order No. 792.<sup>10</sup> Instead, the Commission recognized that the Institute of Electrical and Electronics Engineers (IEEE) was, at the time, in the process of amending IEEE Standard 1547, which is an interconnection standard for interconnecting distributed resources with electric power systems that is referenced in the Small Generator Interconnection Procedures.<sup>11</sup> The Commission also noted that IEEE was about to begin a full IEEE Standard 1547 revision process in 2014, where frequency and voltage ride through requirements in the standard were to be evaluated. The Commission concluded that it would continue to monitor the IEEE Standard 1547 revision process and could revise the *pro forma* SGIA as it relates to IEEE Standard 1547 in the future, if necessary.<sup>12</sup>

7. Since the Commission issued Order No. 792, IEEE has completed a partial revision of IEEE Standard 1547, which is IEEE Standard 1547a. IEEE is now in the process of fully revising IEEE Standard 1547. The partially revised standard, IEEE Standard 1547a, permits generating facilities to have wider trip settings compared with IEEE Standard 1547. These wider trip settings allow generating facilities to stay connected to the grid for greater frequency or voltage excursions facilitating their ability

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<sup>10</sup> Order No. 792, 145 FERC ¶ 61,159 at P 220.

<sup>11</sup> *Id.*

<sup>12</sup> *Id.*

to ride through such excursions. IEEE Standard 1547a also permits – but does not mandate – ride through requirements.<sup>13</sup>

8. Following the Commission’s evaluation of the need for ride through requirements for small generating facilities in the Order Nos. 2006 and 792 rulemaking proceedings, the impact of small generating facilities on the grid has changed, and the amount has increased. For example, as the North American Electric Reliability Corporation (NERC) has noted in multiple reports, the mix of generation resources is changing and the high penetration of distributed energy resources will impact the reliability of the electric grid if sufficient care is not taken to mitigate potential adverse impacts.<sup>14</sup> NERC also has found that a lack of coordination between small generating facilities and Reliability Standards can lead to events where system load imbalance may increase during frequency excursions or voltage deviations due to the disconnection of distributed energy resources, which may exacerbate a disturbance on the Bulk-Power System.<sup>15</sup> In addition, the

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<sup>13</sup> IEEE Standard 1547a contains “must trip” requirements; it does not have “must ride through” requirements. By widening the trip settings, IEEE Standard 1547a permits generating facilities to trip at a later time. This change effectively allows generating facilities to ride through disturbances, but they are not required to do so.

<sup>14</sup> See NERC Special Report, *Potential Bulk System Reliability Impacts of Distributed Resources* (Aug. 2011), [http://www.nerc.com/docs/pc/ivgtf/IVGTF\\_TF-1-8\\_Reliability-Impact-Distributed-Resources\\_Final-Draft\\_2011.pdf](http://www.nerc.com/docs/pc/ivgtf/IVGTF_TF-1-8_Reliability-Impact-Distributed-Resources_Final-Draft_2011.pdf); see also NERC Integration of Variable Generation Task Force Draft Report, *Performance of Distributed Energy Resources During and After System Disturbance* (Dec. 2013), [http://www.nerc.com/comm/PC/Integration%20of%20Variable%20Generation%20Task%20Force%2011/IVGTF17\\_PC\\_FinalDraft\\_December\\_clean.pdf](http://www.nerc.com/comm/PC/Integration%20of%20Variable%20Generation%20Task%20Force%2011/IVGTF17_PC_FinalDraft_December_clean.pdf).

<sup>15</sup> NERC Essential Reliability Services Report at 21.



Commission has observed the growth in grid-connected solar photovoltaic generation since the issuance of Order No. 2006 and the growth in small generator interconnection requests driven by state renewable portfolio standards, reductions in cost for solar panels, and deployment of new technologies.<sup>16</sup> Moreover, technology now available to newly interconnecting small generating facilities, such as smart inverters, permits the capability to ride through frequency and voltage disturbances.<sup>17</sup>

## II. Notice of Proposed Rulemaking

9. On March 23, 2016, the Commission issued a Notice of Proposed Rulemaking that proposed to add new section 1.5.7 to the *pro forma* SGIA,<sup>18</sup> which would require small generating facilities to ride through defined frequency and voltage disturbances.

10. In response to the NOPR, eleven entities submitted substantive comments, which generally support the Commission's proposal.<sup>19</sup> These comments have informed our determinations in this Final Rule.

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<sup>16</sup> See, e.g., Order No. 792, 145 FERC ¶ 61,159 at P 15; Solar Energy Indus. Ass'n, Solar Industry Data, <http://www.seia.org/research-resources/solar-industry-data> (last visited Jul. 5, 2016).

<sup>17</sup> See Electric Power Research Institute, *Recommended Settings for Voltage and Frequency Ride Through of Distributed Energy Resources*, 28-29 (May 2015), <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002006203>.

<sup>18</sup> *Requirements for Frequency and Voltage Ride Through Capability of Small Generating Facilities*, 154 FERC ¶ 61,222 (2016) (NOPR).

<sup>19</sup> Appendix A lists the entities that submitted comments and the shortened names used throughout this Final Rule to describe those entities.

### III. Discussion

11. For the reasons discussed below, we adopt the NOPR proposal and require small generating facilities to ride through abnormal frequency and voltage events comparable to large generating facilities. We find that, given the changes to conditions since the Commission last evaluated whether to impose ride through requirements on small generating facilities, the revisions to the *pro forma* SGIA are necessary to remedy undue discrimination by ensuring that small generating facilities have ride through requirements comparable to large generating facilities.<sup>20</sup> Specifically, since the Commission's last consideration of this issue, IEEE has revised its standards, and IEEE Standard 1547a now provides wider trip settings that allow small generating facilities more leeway to ride through disturbances. In addition, distributed energy resources have had an increasing presence and impact on the electric system. 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 across a particular area or Interconnection, further exacerbating the initial disturbance. Large generating facilities are already subject to ride through requirements to avoid these types of occurrences.<sup>21</sup>

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<sup>20</sup> 16 U.S.C. 824e. The Commission routinely evaluates the effectiveness of its regulations and policies in light of changing industry conditions to determine if changes in these conditions and policies are necessary. *See, e.g., Integration of Variable Energy Resources*, Order No. 764, FERC Stats. & Regs, ¶ 31,331 (2012).

<sup>21</sup> *See* Order No. 2003, FERC Stats. & Regs. ¶ 31,146 at P 562 n.88.

12. The Commission acknowledges that some areas have a greater penetration of distributed resources than others at this time. Nevertheless, the Commission believes that the proposed reforms to the *pro forma* SGIA are appropriate on an industry-wide basis now. The Commission continues to affirm that this Final Rule is not intended to interfere with state interconnection procedures or agreements in any way. The *pro forma* SGIA applies only to interconnections made subject to a jurisdictional open access transmission tariff (OATT) for the purposes of jurisdictional wholesale sales. Similar to the approach in Order Nos. 2006 and 792, the Commission hopes that the changes to the *pro forma* SGIA resulting from this Final Rule will be helpful to states when updating their own interconnection rules, but the states are under no obligation to adopt the provisions of the Commission's proposal.<sup>22</sup>

**A. Revision of the Pro Forma SGIA**

**1. NOPR Proposal**

13. In the NOPR, the Commission proposed to revise the *pro forma* SGIA to include proposed section 1.5.7, which would require interconnection customers to ensure the frequency ride through capability and the voltage ride through capability of small generating facilities that execute or request the unexecuted filing of interconnection agreements following the effective date of the proposed section 1.5.7. Proposed section 1.5.7 would also require a small generating facility not to disconnect automatically or

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<sup>22</sup> Order No. 792, 145 FERC ¶ 61,159 at P 27; Order No. 2006, FERC Stats. & Regs. ¶ 31,180 at P 8.

instantaneously from the system or equipment of the transmission provider and any affected systems for an under-frequency or over-frequency condition, or an under-voltage or over-voltage condition. In addition, the transmission provider must coordinate the small generating facility's protective equipment settings with any automatic load shedding program.

## 2. Comments

14. The substantive comments filed in response to the NOPR generally support the proposal to modify the *pro forma* SGIA.<sup>23</sup> Commenters agree with the need for fair and equitable treatment between small and large generating facilities, the need for effective protections for system operation while also avoiding increased costs, and the potential to improve system stability and reliability over the coming years by adopting the proposed modifications to the *pro forma* SGIA.<sup>24</sup> Commenters acknowledge the proposal's benefits, stating it will simplify operational conditions, especially considering the rising small generator penetration levels on the distribution system.<sup>25</sup> NERC states that revising the *pro forma* SGIA to impose ride through requirements would be consistent

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<sup>23</sup> Peak Reliability Comments at 3; Idaho Power Comments at 2; PNM Comments at 1; SoCal Edison Comments at 2; ISO/RTO Council Comments at 6; Trade Associations Comments at 4; Bonneville Comments at 1; EPRI Comments at 7; NERC Comments at 2; PG&E Comments at 2.

<sup>24</sup> SoCal Edison Comments at 2; Peak Reliability Comments at 3; EPRI Comments at 7.

<sup>25</sup> PNM Comments at 2; Trade Associations Comments at 7.

with the results of a number of NERC's reliability assessments.<sup>26</sup> Trade Associations and PNM agree 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 offline, exacerbating the initial disturbance.<sup>27</sup>

15. Idaho Power claims that if more small generation facilities connect to its system, without the proposed changes to the *pro forma* SGIA, it would become increasingly difficult for it to comply with Reliability Standards PRC-006-2 (Automatic Underfrequency Load Shedding) and BAL-003-1.1 (Frequency Response and Frequency Bias Setting).<sup>28</sup>

16. The ISO/RTO Council recommends that the proposed required characteristics for small generating facilities should be demonstrated "as tested," and that this should be specified in the *pro forma* SGIA section 1.5.7. The ISO/RTO Council notes that demonstrating characteristics "as tested" is already required under section 24 of the large generator interconnection agreement (LGIA). The ISO/RTO Council further explains that, while the *pro forma* SGIA does not presently have such language, the "as tested"

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<sup>26</sup> NERC Comments at 4.

<sup>27</sup> PNM Comments at 2; Trade Associations Comments at 7.

<sup>28</sup> Idaho Power Comments at 2.

requirement applies to small generating facilities pursuant to the directives in Order No. 2006.<sup>29</sup>

17. Some commenters request that the Commission delay implementation of the Final Rule. While EPRI does not believe that additional action is required for other existing interconnected small generating facilities, EPRI comments that additional reliability studies may be required if aggregate penetration levels increase sufficiently before the modifications to the *pro forma* SGIA and revised IEEE Standard 1547 become effective.<sup>30</sup> EPRI notes the need for timely revision and balloting of IEEE Standard 1547, as well as prompt adoption of the standard.<sup>31</sup> Trade Associations suggest waiting until after key industry standards are approved and the safety and effectiveness of smart inverter technology is validated.<sup>32</sup> Trade Associations request time to allow entities to resolve outstanding concerns such as personnel and asset safety, as well as the ability to effectively coordinate protections systems between the local utility and interconnecting resources.<sup>33</sup> EPRI and IEEE assert that relevant stakeholders, including transmission owners and transmission operators, should engage with the IEEE Standard 1547 revision

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<sup>29</sup> ISO/RTO Council Comments at 7 (citing Order No. 2006, FERC Stats. & Regs. ¶ 31,180 at P 59).

<sup>30</sup> EPRI Comments at 7.

<sup>31</sup> *Id.* at 7-8.

<sup>32</sup> Trade Associations Comments at 7-8; EPRI Comments at 7-8.

<sup>33</sup> Trade Associations Comments at 7-8.

process to ensure that the final framework and requirements for ride through can be consistently applied to meet individual system needs.<sup>34</sup>

18. Trade Associations claim that the new ride through capability requirements are only possible through smart inverter technology, but point out that key associated specifications contained in the reference standards remain unapproved. Trade Associations explain that distribution feeders are often designed as radial feeders that depend on remote generation to quickly disconnect when the utility source is disconnected. According to Trade Associations, failure to do so may result in unintentional islands which create safety hazards for personnel and customers, as well as liability concerns. Trade Associations caution that directing small generation facilities to ride through disturbances may create islanding conditions and relaxed response to fault conditions.

19. Further, Trade Associations claim that more industry discussion is needed to ensure that small generators' interconnections meet the unique regional utility safety and reliability concerns before the proposed revisions to section 1.5.7 of the *pro forma* SGIA are adopted. Trade Associations suggest that the Commission include the issues in this proceeding in the three regional technical conferences recommended by Edison Electric Institute in Docket No. RM16-6-000.<sup>35</sup>

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<sup>34</sup> EPRI Comments at 7-8.

<sup>35</sup> Trade Associations Comments at 13-14. In Docket No. RM16-6-000, the Commission issued a Notice of Inquiry seeking comment on the need for reforms to its

20. Trade Associations also suggest that the Commission explore how changes made to the *pro forma* SGIA often influence state regulations. Trade Associations note that distribution level interconnections are broadly supported by industry standards and company interconnection rules; and alignment to *pro forma* SGIA may be inappropriate for some state regulations.<sup>36</sup>

### 3. Commission Determination

21. As discussed above, we find the revisions to the *pro forma* SGIA adopted herein are necessary to remedy treatment that is unjust, unreasonable, and unduly discriminatory and preferential because there is no technical or economic basis to require small and large generating facilities to follow different requirements in regards to voltage and frequency ride through. Our revisions will place similar requirements on large generating facilities and small generating facilities for ride through capabilities. As discussed above, the NOPR proposal received widespread support from commenters. Further, the absence of ride through requirements for small generating facilities may have adverse impacts on the reliability of the electric grid. We find that the lack of ride through requirements for small generating facilities is unduly discriminatory. This is due to the increased presence and impact of small generating facilities, including distributed energy resources, on the electric system, that could create reliability issues if

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rules and regulations regarding the provision and compensation of primary frequency response.

<sup>36</sup> Trade Associations Comments at 14.



they do not have the capability to ride through voltage or frequency disturbances. Further, improvements in technology, such as smart inverters, make it economically feasible for small generating facilities to ride through voltage and frequency disturbances. We acknowledge that some areas have a greater penetration of distributed resources than others at this time. Nevertheless, we believe that the proposed reforms to the *pro forma* SGIA are appropriate on an industry-wide basis now and that deferred action would not be appropriate.

22. We recognize the work of the IEEE 1547 Working Group, but we determine that there is a pressing need to establish ride through capability requirements at this time because we expect a continuing increase in penetration of small generating facilities. The revisions to the *pro forma* SGIA that we now approve will require the small generating facility to implement ride through settings based on a technical standard established by the transmission provider.

23. While Trade Associations point out that IEEE is revising IEEE Standard 1547, the standard does not currently require ride through capability. We are acting now to ensure that all affected jurisdictional small generating facilities will have the ride through capability, as allowed by IEEE Standard 1547a.<sup>37</sup>

24. We are persuaded by the ISO/RTO Council's recommendation to add the "as tested" language to section 1.5.7 of the *pro forma* SGIA to harmonize the requirements

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<sup>37</sup> As we also explained in the NOPR, the Commission's proposal was not intended to impede the ongoing efforts of the IEEE 1547 Working Group, and we reiterate that point here. NOPR, 154 FERC ¶ 61,222 at P 8 n.19.

between the *pro forma* SGIA and the *pro forma* LGIA. Pursuant to this “as tested” language, the interconnection customer must provide the successfully completed test results to the transmission provider in a similar manner as in section 24.4 of the *pro forma* LGIA. We believe that the addition of “as tested” language does not create an extra burden on either party to an interconnection agreement because the *pro forma* SGIA already includes testing requirements in section 2.1.<sup>38</sup> The “as tested” language assures the transmission provider that the required ride through capability can actually be performed by the small generating facility.

25. We hereby adopt new section 1.5.7 of the *pro forma* SGIA showing the changes made to the Commission’s proposal in the NOPR as follows:

1.5.7 The Interconnection Customer shall ensure “frequency ride through” capability and “voltage ride through” capability of its Small Generating Facility. The Interconnection Customer shall enable these capabilities such that its Small Generating Facility shall not disconnect automatically or instantaneously from the system or equipment of the Transmission Provider and any Affected Systems for a defined under-frequency or over-frequency condition, or an under-voltage or over-voltage condition, as tested pursuant to section 2.1 of this agreement. The defined conditions shall be in accordance with Good Utility Practice and consistent with any standards and guidelines that are applied to other generating facilities in the Balancing Authority Area on a comparable basis. . . .

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<sup>38</sup> *Pro forma* SGIA, Section 2.1 “Equipment Test and Inspection.”

26. We recognize the Trade Associations' concern about potential tension between ride through requirements and anti-islanding protection. Ensuring the safety of utility lineworkers is critically important, and an issue the Commission takes seriously. Based on our consideration of the record, we believe that the ride through requirements adopted herein are technically and safely achievable. In particular, we note that this Final Rule provides significant flexibility for transmission providers to account for potential safety and islanding concerns. For example, the transmission provider can determine specific ride through settings needed to address those concerns so long as those settings are consistent with Good Utility Practice and any standards and guidelines applied to other generating facilities on a comparable basis.

27. Furthermore, we note that islanding and personnel safety are not new issues resulting from this Final Rule; to the contrary, they will continue to be important concerns regardless of the reforms adopted in this Final Rule. Accordingly, we emphasize the importance of implementing ride through requirements through careful coordination between the interconnection customer and the transmission provider, as well as the utilization of appropriate safety procedures for utility personnel, particularly effective and thorough communication for lineworkers in the field, when performing remedial actions following a system disturbance. We support the continued efforts by industry to explore innovative ways to detect island conditions in order to mitigate the risk of unintentional islands.

28. In light of our goal to prevent undue discrimination, we seek to provide guidelines that will be applied to generating facilities on a comparable basis, while allowing for

justified differences on a case by case basis. For example, if a transmission provider believes a particular facility has a higher risk of unintentional islanding due to specific conditions on that facility, the revisions to the *pro forma* SGIA will permit the transmission provider to coordinate with the small generating facility to set ride through settings appropriate for those conditions, in accordance with Good Utility Practice and the appropriate technical standards. For facilities with a lower risk of forming an unintentional island, the transmission provider can implement a longer ride through requirement, in accordance with Good Utility Practice and the appropriate technical standards. We believe that the flexibility provided by section 1.5.7 allows for appropriate ride through requirements while recognizing the need to address any safety concerns.

**B. Referencing Specific Technical Standards**

**1. NOPR Proposal**

29. In the NOPR, the Commission proposed to avoid prescriptive frequency and voltage ride through requirements to allow for the development of appropriate system-specific standards, noting that the standards can be based on work developed by recognized standards settings bodies, such as IEEE.

**2. Comments**

30. Commenters request that the proposed rule contain explicit references to standards such as the Reliability Standards and IEEE and UL standards.<sup>39</sup> The ISO/RTO Council states that Reliability Standards already provide requirements for coordination

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<sup>39</sup> ISO/RTO Council Comments at 7.

of automatic under-frequency generator tripping with automatic under-frequency load shedding programs that should be incorporated in the new ride through requirements. The ISO/RTO Council suggests that the *pro forma* SGIA explicitly reference Reliability Standard PRC-024 (Generator Frequency and Voltage Protective Relay Settings) and applicable regional Reliability Standards as part of the definition of “Good Utility Practice” and for the coordination of automatic generator tripping with automatic load shedding.<sup>40</sup> The ISO/RTO Council also recommends that the *pro forma* SGIA refer to the Reliability Standards and regional Reliability Standards for coordination of automatic generator tripping with automatic load shedding, and as appropriate, permit individual transmission providers to also reference their automatic load-shed program.

31. Commenters assert that specifying certain technical standards would be beneficial for consistent enforceability; specifically, some commenters suggest that the *pro forma* SGIA reference IEEE and UL 1741 standards to describe “Good Utility Practice.”<sup>41</sup> EPRI and IEEE comment that failure to harmonize ride through requirements with the proposed draft IEEE 1547 requirements may introduce confusion and ultimately delay testing and compliance, exposing the electric system to an increased reliability risk.<sup>42</sup> PNM recognizes that there are challenges to developing specific settings applicable to

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<sup>40</sup> *Id.* at 6-7.

<sup>41</sup> PNM Comments at 3; EPRI Comments at 13; IEEE Comments at 2.

<sup>42</sup> EPRI Comments at 13; IEEE Comments at 2.

all small generating facilities.<sup>43</sup> However, PNM states that the Commission should still consider documenting some ride through expectation similar to those outlined in the LGIA requirements. PNM requests that the *pro forma* SGIA revisions consider a minimum ride through duration based on fault clearing times and a minimum voltage. PNM also requests that the Commission specify the location where the frequency and voltage measurements are taken to comply with the requirements, such as the point of interconnection.

32. SoCal Edison observes that the California Public Utilities Commission (CPUC) has established, through its retail Rule 21 tariff, smart inverter requirements for small generators interconnecting to the distribution systems of California's investor owned utilities, and low/high voltage ride through and low/high frequency ride through are part of the new required capabilities for small generators.<sup>44</sup> SoCal Edison explains that the CPUC ordered all investor owned utilities "to seek approval as may be needed for conforming changes to harmonize their federal wholesale Tariffs interconnection specifications with the revisions to Electric Tariff Rule 21."<sup>45</sup>

### **3. Commission Determination**

33. We are not persuaded by commenters' arguments for the need to reference specific technical standards and decline to incorporate by reference any specific standard

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<sup>43</sup> PNM Comments at 2.

<sup>44</sup> SoCal Edison Comments at 3.

<sup>45</sup> *Id.*

into the *pro forma* SGIA or to specify ride through duration and voltage and frequency levels. We therefore decline to modify the NOPR proposal in this regard.

34. To accommodate the differences in voltage and frequency ride through capabilities inherent in the different generation technologies, we believe that requiring basic performance expectations without explicitly specifying the duration or voltage and frequency levels allows the flexibility to apply appropriate ride through settings with coordination and approval of the transmission operator. As EPRI and IEEE note, the ride through requirement framework in the draft IEEE Standard 1547 is being structured along “performance categories” that take into account the technological differences of various types of small generating facilities. Once finalized, IEEE Standard 1547 may be used as a technical guide to meet the requirements adopted herein. Until revisions to IEEE Standard 1547 are finalized, however, transmission providers and affected interconnection customers must coordinate appropriate alternative frequency and voltage ride through settings.

35. Furthermore, as a pragmatic matter, by setting minimum ride through capability requirements that are not tied to a specific standard, the requirements in section 1.5.7 of the *pro forma* SGIA would remain applicable following any updates from IEEE Standard 1547 or other applicable standards, without having to modify the *pro forma* SGIA each time any such standard is updated.

36. In response to PNM’s clarification request, we clarify that the point of interconnection is the appropriate place to measure frequency and voltage to comply with the ride through requirements.

**C. Regional Differences**

**1. NOPR Proposal**

37. The Commission proposed to permit RTOs and ISOs to seek “independent entity variations” from the proposed revisions to the *pro forma* SGIA.

**2. Comments**

38. Multiple commenters support the Commission’s proposal to permit RTOs and ISOs to seek “independent entity variations” from the proposed revisions to the *pro forma* SGIA.<sup>46</sup>

39. Trade Associations request that the Commission also affirm the ability of transmission providers that are not members of RTOs or ISOs to seek variations from the *pro forma* SGIA to ensure consistency with regional reliability requirements. Trade Associations explain that differences in resource penetration and configuration (such as state renewable portfolio standards or wind generation in remote locations) have led to regional reliability requirements. Trade Associations note that the Commission recognized in Order No. 2003 that such regional reliability requirements might justify variations to *pro forma* interconnection agreements and procedures.<sup>47</sup> SoCal Edison believes that, to the extent that some regions may need additional time to implement the

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<sup>46</sup> Trade Associations Comments at 12-13; SoCal Edison Comments at 4; ISO/RTO Council Comments at 6.

<sup>47</sup> Trade Associations Comments at 12-13.



proposed ride through requirements on small generating facilities, the Commission should grant such time.<sup>48</sup>

### 3. Commission Determination

40. We adopt the NOPR proposal and permit ISOs and RTOs to seek “independent entity variations” from revisions to the *pro forma* SGIA.<sup>49</sup> Also, as proposed in the NOPR, if a transmission provider seeks a deviation from section 1.5.7 of the *pro forma* SGIA, it must demonstrate that the deviation is consistent with or superior to the principles set forth in this Final Rule.

41. In addition, we clarify that we will also consider requests for “regional reliability variations,” provided that such requests are supported by references to regional Reliability Standards, explain why these regional Reliability Standards support the requested variation, and include the text of the referenced Reliability Standards.<sup>50</sup> While some regions currently have greater penetration of small generation facilities than others, we are acting now to set a national minimum ride through capability before future increases in deployment of small generation facilities.

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<sup>48</sup> SoCal Edison Comments at 4.

<sup>49</sup> See Order No. 792, 145 FERC ¶ 61,159 at P 274 (citing Order No. 2003, FERC Stats. & Regs. ¶ 31,146 at PP 822-827).

<sup>50</sup> See *id.* P 273 (citing Order No. 2006, FERC Stats. & Regs. ¶ 31,180 at P 546).

#### IV. Compliance and Implementation

42. Section 35.28(f)(1) of the Commission's regulations requires every public utility with a non-discriminatory open access transmission tariff OATT on file to also have an SGIA on file with the Commission.<sup>51</sup>

43. We reiterate that the requirements of this Final Rule apply to all newly interconnecting small generating facilities that execute or request the unexecuted filing of an SGIA on or after the effective date of this Final Rule as well as existing interconnection customers that, pursuant to a new interconnection request, execute or request the unexecuted filing of a new or modified SGIA on or after the effective date.

44. We require each public utility transmission provider that has an SGIA within its OATT to submit a compliance filing within 65 days following publication in the Federal Register.<sup>52</sup> The compliance filing must demonstrate that it meets the requirements set forth in this proposal.

45. The Commission recently issued Order No. 827, a final rule in Docket No. RM16-1-000, directing transmission providers to submit SGIA revisions related to reactive

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<sup>51</sup> 18 CFR 35.28(f)(1).

<sup>52</sup> For purposes of this Final Rule, a public utility is a utility that owns, controls, or operates facilities used for transmitting electric energy in interstate commerce, as defined by the FPA. *See* 16 U.S.C. 824(e). A non-public utility that seeks voluntary compliance with the reciprocity condition of an OATT may satisfy that condition by filing an OATT, which includes an SGIA.

power requirements to the Commission.<sup>53</sup> Those compliance filings are due to the Commission on September 21, 2016. To facilitate administrative efficiency, we will require the compliance filings for this Final Rule and Order No. 827 to be filed in one combined filing. Once this Final Rule is published in the Federal Register, the Commission will provide a short extension to the compliance dates in both proceedings such that the compliance dates are the same.

46. As discussed above, we are not requiring changes to interconnection agreements that were executed prior to the effective date of this Final Rule. Instead, the requirements of this Final Rule apply to newly interconnecting small generating facilities that execute or request the unexecuted filing of an interconnection agreement on or after the effective date. The requirements of this Final Rule also apply to existing small generating facilities that, pursuant to a new interconnection request, require new or modified interconnection agreements that are executed or requested to be filed unexecuted on or after the effective date.

47. Some public utility transmission providers may have provisions in their existing SGIA or other document(s) subject to the Commission's jurisdiction that the Commission has deemed to be consistent with or superior to the *pro forma* SGIA or are permissible under the independent entity variation standard or regional reliability

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<sup>53</sup> *Reactive Power Requirements for Non-Synchronous Generation*, Order No. 827, 81 Fed. Reg. 40,793 (Jun. 23, 2016), 155 FERC ¶ 61,277 (2016).

standard.<sup>54</sup> Where these provisions would be modified by this Final Rule, public utility transmission providers must either comply with this Final Rule or demonstrate that these previously-approved variations continue to be consistent with or superior to the *pro forma* SGIA as modified by this Final Rule or continue to be permissible under the independent entity variation standard or regional reliability standard.<sup>55</sup>

48. We find that transmission providers that are not public utilities must adopt the requirements of this Final Rule as a condition of maintaining the status of their safe harbor tariff or otherwise satisfying the reciprocity requirement of Order No. 888.<sup>56</sup>

#### V. Information Collection Statement

49. The following collection of information contained in this Final Rule is subject to review by the Office of Management and Budget (OMB) regulations under section 3507(d) of the Paperwork Reduction Act of 1995.<sup>57</sup> OMB's regulations require approval

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<sup>54</sup> See Order No. 792, 145 FERC ¶ 61,159 at P 270.

<sup>55</sup> See 18 CFR 35.28(f)(1)(i).

<sup>56</sup> *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, Order No. 888, FERC Stats. & Regs. ¶ 31,036, at 31,760-63 (1996), *order on reh'g*, Order No. 888-A, FERC Stats. & Regs. ¶ 31,048, *order on reh'g*, Order No. 888-B, 81 FERC ¶ 61,248 (1997), *order on reh'g*, Order No. 888-C, 82 FERC ¶ 61,046 (1998), *aff'd in relevant part sub nom. Transmission Access Policy Study Group v. FERC*, 225 F.3d 667 (D.C. Cir. 2000), *aff'd sub nom. New York v. FERC*, 535 U.S. 1 (2002).

<sup>57</sup> 44 U.S.C. 3507(d).

of certain information collection requirements imposed by agency rules.<sup>58</sup> Upon approval of a collection of information, OMB will assign an OMB control number and expiration date. Respondents subject to the filing requirements of this Final Rule will not be penalized for failing to respond to this collection of information unless the collection of information displays a valid OMB control number.

50. The reforms adopted in this Final Rule revise the Commission's *pro forma* SGIA in accordance with section 35.28(f)(1) of the Commission's regulations.<sup>59</sup> This Final Rule applies to all newly interconnecting small generating facilities that execute or request the unexecuted filing of an SGIA on or after the effective date of this Final Rule as well as existing interconnection customers that, pursuant to a new interconnection request, execute or request the unexecuted filing of a new or modified SGIA on or after the effective date, to ensure frequency ride through capability and voltage ride through capability in accordance with good utility practice and consistent with any standards and guidelines that are applied to other generating facilities in the balancing authority area on a comparable basis. The reforms adopted in this Final Rule would require filings of SGIA's with the Commission. The Commission anticipates the revisions required by this Final Rule, once implemented, will not significantly change existing burdens on an ongoing basis. With regard to those public utility transmission providers that believe that they already comply with the revisions adopted in this Final Rule, they can demonstrate

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<sup>58</sup> 5 CFR 1320.11.

<sup>59</sup> 18 CFR 35.28(f)(1).

their compliance in the filing required 65 days after the effective date of this Final Rule. The Commission will submit the proposed reporting requirements to OMB for its review and approval under section 3507(d) of the Paperwork Reduction Act.<sup>60</sup>

51. While the Commission expects the revisions adopted in this Final Rule will provide significant benefits, the Commission understands that implementation would entail some costs. The Commission solicited comments on the accuracy of provided burden and cost estimates and any suggested methods for minimizing the respondents' burdens. The Commission did not receive any comments concerning its burden or cost estimates. As explained above, we will require the compliance filings for this Final Rule and Order No. 827 to be filed in one combined filing. We expect that this will reduce the burden on public utility transmission providers at the time the Commission gives notice of the extension of the compliance date and requirement to combine compliance filings. Burden Estimate: The Commission believes that the burden estimates below are representative of the average burden on respondents. The estimated burden and cost for the requirements adopted in this Final Rule follow.<sup>61</sup>

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<sup>60</sup> 44 U.S.C. 3507(d).

<sup>61</sup> Commission staff estimates that industry is similarly situated in terms of hourly cost (wages plus benefits). Based on the Commission 2016 average cost (wages plus benefits), \$74.50/hour is used.

<b>FERC 516A revisions in RM16-8</b>					
	<b>No. of Respondents<sup>62</sup></b> <b>(1)</b>	<b>Annual No. of Responses per Respondent</b> <b>(2)</b>	<b>Total No. of Responses</b> <b>(1)*(2)=(3)</b>	<b>Average Burden (Hrs.) &amp; Cost (\$)</b> <b>Per Response</b> <b>(4)</b>	<b>Total Annual Burden Hrs. &amp; Total Annual Cost (\$)</b> <b>(3)*(4)=(5)</b>
Conforming SGIA changes to incorporate revisions	118	1	118	7.5 hrs.; \$558.75	885 hrs.; \$65,932.50
<b>Total</b>			118	7.5 hrs.; \$558.75	885 hrs.; \$65,932.50

Cost to Comply: The Commission has projected the additional cost of compliance as follows:<sup>63</sup>

- Year 1: \$65,932.50 for all affected entities (\$558.75/utility)
- Year 2 and subsequent years: \$0

After implementation in Year 1, the reforms proposed in this Final Rule would be complete.

Title: FERC-516A, Standardization of Small Generator Interconnection Agreements and Procedures.

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<sup>62</sup> Number of Applicable Registered Entities.

<sup>63</sup> The costs for Year 1 would consist of filing proposed changes to the *pro forma* SGIA with the Commission within 65 days of the effective date of the final revision plus initial implementation. The Commission does not expect any ongoing costs beyond the initial compliance in Year 1.

Action: Revision of currently approved collection of information.

OMB Control No.: 1902-0203

Respondents for this Rulemaking: Businesses or other for profit and/or not-for-profit institutions.

Frequency of Information: One-time during Year 1.

Necessity of Information: The Commission adopts changes to the *pro forma* SGIA in order to more efficiently and cost-effectively interconnect generating facilities no larger than 20 MW (small generating facilities) to Commission-jurisdictional transmission systems. The purpose of this Final Rule is to revise the *pro forma* SGIA so small generating facilities can be reliably and efficiently integrated into the electric grid and to ensure that Commission-jurisdictional services are provided at rates, terms and conditions that are just and reasonable and not unduly discriminatory or preferential. This Final Rule seeks to achieve this goal by amending the *pro forma* SGIA to include new section 1.5.7.

Internal Review: The Commission has reviewed the changes and has determined that the changes are necessary. These requirements conform to the Commission's need for efficient information collection, communication, and management within the energy industry. The Commission has assured itself, by means of internal review, that there is specific, objective support for the burden estimates associated with the information collection requirements.



52. Interested persons may obtain information on the reporting requirements by contacting the following: Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426 [Attention: Ellen Brown, Office of the Executive Director], e-mail: DataClearance@ferc.gov, Phone: (202) 502-8663, fax: (202) 273-0873.

53. Comments on the collection of information and the associated burden estimate in the Final Rule should be sent to the Commission in this docket and may also be sent to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503 [Attention: Desk Officer for the Federal Energy Regulatory Commission], at the following e-mail address:

oira\_submission@omb.eop.gov. Please reference OMB Control No. 1902-0203 and the docket number of this rulemaking in your submission.

## **VI. Regulatory Flexibility Act**

54. The Regulatory Flexibility Act of 1980 (RFA)<sup>64</sup> generally requires a description and analysis of rules that will have significant economic impact on a substantial number of small entities. The RFA does not mandate any particular outcome in a rulemaking. It only requires consideration of alternatives that are less burdensome to small entities and an agency explanation of why alternatives were rejected.

55. The Small Business Administration (SBA) revised its size standards (effective January 22, 2014) for electric utilities from a standard based on megawatt hours to a standard based on the number of employees, including affiliates. Under SBA's

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<sup>64</sup> 5 U.S.C. 601-612.

standards, some transmission owners will fall under the following category and associated size threshold: electric bulk power transmission and control, at 500 employees.<sup>65</sup>

56. The Commission estimates that the total number of public utility transmission providers that would have to modify the SGIAs within their currently effective OATTs is 118. Of these, the Commission estimates that approximately 43% are small entities. The Commission estimates the average cost to each of these entities will be minimal, requiring on average 7.5 hours or \$558.75. According to SBA guidance, the determination of significance of impact “should be seen as relative to the size of the business, the size of the competitor’s business, and the impact the regulation has on larger competitors.”<sup>66</sup> The Commission does not consider the estimated burden to be a significant economic impact. As a result, the Commission certifies that the reforms adopted in this Final Rule would not have a significant economic impact on a substantial number of small entities.

## **VII. Environmental Analysis**

57. The Commission is required to prepare an Environmental Assessment or an Environmental Impact Statement for any action that may have a significant adverse effect

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<sup>65</sup> 13 CFR 121.201, Sector 22 (Utilities), NAICS code 221121 (Electric Bulk Power Transmission and Control).

<sup>66</sup> U. S. Small Business Administration, *A Guide for Government Agencies How to Comply with the Regulatory Flexibility Act*, at 18 (May 2012), [https://www.sba.gov/sites/default/files/advocacy/rfaguide\\_0512\\_0.pdf](https://www.sba.gov/sites/default/files/advocacy/rfaguide_0512_0.pdf).

on the human environment.<sup>67</sup> As we stated in the NOPR, the Commission concludes that neither an Environmental Assessment nor an Environmental Impact Statement is required for the revisions adopted in this Final Rule under section 380.4(a)(15) of the Commission's regulations, which provides a categorical exemption for approval of actions under sections 205 and 206 of the FPA relating to the filing of schedules containing all rates and charges for the transmission or sale of electric energy subject to the Commission's jurisdiction, plus the classification, practices, contracts and regulations that affect rates, charges, classifications, and services.<sup>68</sup> The revisions adopted in this Final Rule would update and clarify the application of the Commission's standard interconnection requirements to small generating facilities.

58. Therefore, this Final Rule falls within the categorical exemptions provided in the Commission's regulations, and as a result neither an Environmental Impact Statement nor an Environmental Assessment is required.

### **VIII. Document Availability**

59. In addition to publishing the full text of this document in the Federal Register, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through the Commission's Home Page (<http://www.ferc.gov>) and in the Commission's Public Reference Room during normal

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<sup>67</sup> *Regulations Implementing National Environmental Policy Act*, Order No. 486, FERC Stats. & Regs. ¶ 30,783 (1987).

<sup>68</sup> 18 CFR 380.4(a)(15).

business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, NE, Room 2A, Washington, DC 20426.

60. From the Commission's Home Page on the Internet, this information is available on eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number of this document, excluding the last three digits, in the docket number field.

61. User assistance is available for eLibrary and the Commission's website during normal business hours from the Commission's Online Support at (202) 502-6652 (toll free at 1-866-208-3676) or email at [ferconlinesupport@ferc.gov](mailto:ferconlinesupport@ferc.gov), or the Public Reference Room at (202) 502-8371, TTY (202) 502-8659. E-mail the Public Reference Room at [public.referenceroom@ferc.gov](mailto:public.referenceroom@ferc.gov).

#### **IX. Effective Date and Congressional Notification**

62. The Final Rule is effective [**INSERT DATE 65 days from publication in FEDERAL REGISTER**]. However, as noted above, the requirements of this Final Rule will apply only to all newly interconnecting small generating facilities that execute or request the unexecuted filing of an SGIA on or after the effective date of this Final Rule as well as existing interconnection customers that, pursuant to a new interconnection request, execute or request the unexecuted filing of a new or modified SGIA on or after the effective date. The Commission has determined, with the concurrence of the Administrator of the Office of Information and Regulatory Affairs of OMB, that this Final Rule is not a "major rule" as defined in section 351 of the Small Business

Regulatory Enforcement Fairness Act of 1996. This Final Rule is being submitted to the Senate, House, Government Accountability Office, and Small Business Administration.

By the Commission.

( S E A L )

Nathaniel J. Davis, Sr.,  
Deputy Secretary.

## Appendix A

### List of Substantive Commenters (RM16-8-000)

<b>Bonneville</b>	Bonneville Power Administration
<b>Trade Associations</b>	Edison Electric Institute/American Public Power Association/Large Public Power Council /National Rural Electric Cooperative Association
<b>EPRI</b>	Electric Power Research Institute
<b>Idaho Power</b>	Idaho Power Company
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>ISO/RTO Council</b>	ISO/RTO Council
<b>NERC</b>	North American Electric Reliability Corporation
<b>PG&amp;E</b>	Pacific Gas and Electric Company
<b>Peak Reliability</b>	Peak Reliability
<b>PNM</b>	Public Service Company of New Mexico
<b>SoCal Edison</b>	Southern California Edison Company

In addition, Entergy Services, Inc. submitted non-substantive comments.