

155 FERC ¶ 61,277  
UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

[Docket No. RM16-1-000; Order No. 827]

Reactive Power Requirements for Non-Synchronous Generation

(Issued June 16, 2016)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Federal Energy Regulatory Commission (Commission) is eliminating the exemptions for wind generators from the requirement to provide reactive power by revising the *pro forma* Large Generator Interconnection Agreement (LGIA), Appendix G to the *pro forma* LGIA, and the *pro forma* Small Generator Interconnection Agreement (SGIA). As a result, all newly interconnecting non-synchronous generators will be required to provide reactive power at the high-side of the generator substation as a condition of interconnection as set forth in their LGIA or SGIA as of the effective date of this Final Rule.

EFFECTIVE DATE: This Final Rule will become effective **[Insert date 90 days after publication in the FEDERAL REGISTER]**.

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SUPPLEMENTARY INFORMATION:

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FINAL RULE

(Issued June 16, 2016)

1. The Federal Energy Regulatory Commission (Commission) is eliminating the exemptions for wind generators from the requirement to provide reactive power by revising the *pro forma* Large Generator Interconnection Agreement (LGIA), Appendix G to the *pro forma* LGIA, and the *pro forma* Small Generator Interconnection Agreement (SGIA). Under this Final Rule, newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement as of the effective date of this Final Rule will be required to provide dynamic reactive power within the range of 0.95 leading to 0.95 lagging at the high-side of the generator substation. This Final Rule revises the *pro forma* LGIA and *pro forma* SGIA to establish reactive power requirements for non-synchronous generation. Specifically, the *pro forma* LGIA will include the following (the *pro forma* SGIA will include similar language):<sup>1</sup>

**Non-Synchronous Generation.** Interconnection Customer shall design the Large Generating Facility to maintain a

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<sup>1</sup> See Section IV of this Final Rule, *Compliance and Implementation*, for the specific changes to the *pro forma* LGIA and *pro forma* SGIA.

composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 0.95 leading to 0.95 lagging, unless the Transmission Provider has established a different power factor range that applies to all non-synchronous generators in the Control Area on a comparable basis. This power factor range standard shall be dynamic and can be met using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors, or a combination of the two. This requirement shall only apply to newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement as of the effective date of the Final Rule establishing this requirement (Order No. 827).

2. Section 35.28(f)(1) of the Commission's regulations requires every public utility with an open access transmission tariff (OATT) on file to also have on file the *pro forma* LGIA and *pro forma* SGIA "required by Commission rulemaking proceedings promulgating and amending such interconnection procedures and agreements."<sup>2</sup> As a result of this Final Rule, all newly interconnecting non-synchronous generators will be required to provide reactive power as a condition of interconnection pursuant to the *pro forma* LGIA and *pro forma* SGIA. These reactive power requirements will apply to any new non-synchronous generator seeking to interconnect to the transmission system that has not yet executed a Facilities Study Agreement as of the effective date of this Final Rule.

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<sup>2</sup> 18 C.F.R. § 35.28(f)(1) (2015).

3. The existing *pro forma* LGIA and *pro forma* SGIA both require, as a condition of interconnection, an interconnecting generator to design its Generating Facility<sup>3</sup> “to maintain a composite power delivery at continuous rated power output at the Point of Interconnection at a power factor<sup>4</sup> within the range of 0.95 leading to 0.95 lagging”<sup>5</sup> (the reactive power requirement).

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<sup>3</sup> The *pro forma* LGIA defines “Generating Facility” as an “Interconnection Customer’s device for the production of electricity identified in the Interconnection Request,” excluding the Interconnection Customer’s Interconnection Facilities. The *pro forma* LGIA further defines “Large Generating Facility” as a “Generating Facility having a Generating Facility Capacity of more than 20 MW.” The *pro forma* SGIA defines “Small Generating Facility” as an “Interconnection Customer’s device for the production and/or storage for later injection of electricity identified in the Interconnection Request,” excluding the Interconnection Customer’s Interconnection Facilities. For purposes of this Final Rule, unless otherwise noted, “Generating Facility” refers to both a Large Generating Facility and a Small Generating Facility.

<sup>4</sup> The power factor of an alternating current transmission system is the ratio of real power to apparent power. Reliable operation of a transmission system requires system operators to maintain a tight control of voltages (at all points) on the transmission system. The ability to vary the ratio of real power to apparent power (i.e., adjust the power factor) allows system operators to maintain scheduled voltages within allowed for tolerances on the transmission system and maintain the reliability of the transmission system. The Commission established a required power factor range in Order No. 2003 of 0.95 leading to 0.95 lagging, but allowed transmission providers to establish different requirements to be applied on a comparable basis. *See Standardization of Generator Interconnection Agreements and Procedures*, Order No. 2003, FERC Stats. & Regs. ¶ 31,146, at P 542 (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).

<sup>5</sup> Section 9.6.1 of the *pro forma* LGIA and section 1.8.1 of the *pro forma* SGIA.

4. As discussed below, however, wind generators have been exempt from the general requirement to provide reactive power absent a study finding that the provision of reactive power is necessary to ensure safety or reliability. The Commission exempted wind generators from the uniform reactive power requirement because, historically, the costs to design and build a wind generator that could provide reactive power were high and could have created an obstacle to the development of wind generation.<sup>6</sup> Due to technological advancements, the cost of providing reactive power no longer presents an obstacle to the development of wind generation.<sup>7</sup> The resulting decline in the cost to wind generators of providing reactive power renders the current absolute exemptions unjust, unreasonable, and unduly discriminatory and preferential. Further, the growing penetration of wind generators on some systems increases the potential for a deficiency in reactive power.<sup>8</sup>

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<sup>6</sup> *Interconnection for Wind Energy*, Order No. 661, FERC Stats. & Regs. ¶ 31,186, at P 51, *order on reh'g*, Order No. 661-A, FERC Stats. & Regs. ¶ 31,198 (2005).

<sup>7</sup> *See, e.g., Payment for Reactive Power*, Commission Staff Report, Docket No. AD14-7, app. 2, at 1-3 (Apr. 22, 2014).

<sup>8</sup> *See, e.g., PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,097, at P 7 (2015); CAISO Comments at 2-3 (explaining that, in 2014, CAISO had over 11,000 MW of interconnected variable energy resources, the majority of which are non-synchronous generators, but expects to have over 20,000 MW of such resources interconnected by 2024).



5. Given these changes, the Commission finds under section 206 of the Federal Power Act (FPA)<sup>9</sup> that wind generators should not have an exemption from the reactive power requirement which is unavailable to other generators. While we find that requiring non-synchronous generators to provide dynamic reactive power is now reasonable, we recognize that distinctions between non-synchronous and synchronous generators still exist and that these differences justify requiring non-synchronous generators to provide dynamic reactive power at a different location than synchronous generators: non-synchronous generators will be required to provide dynamic reactive power at the high-side of the generator substation, as opposed to the Point of Interconnection. The reactive power requirements we adopt here for newly interconnecting non-synchronous generators provide just and reasonable terms, which recognize the technical differences of non-synchronous generators from synchronous generators. These requirements also benefit customers by ensuring that reliability is protected without adding unnecessary obstacles to further development of non-synchronous generators.

**I. Background**

6. Transmission providers require reactive power to control system voltage for efficient and reliable operation of an alternating current transmission system. At times, transmission providers need generators to either supply or consume reactive power.

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<sup>9</sup> 16 U.S.C. § 824d-e (2012).

Starting with Order No. 888,<sup>10</sup> which included provisions regarding reactive power from generators as an ancillary service in Schedule 2 of the *pro forma* OATT, the Commission issued a series of orders intended to ensure that sufficient reactive power is available to maintain the reliability of the bulk power system.

7. Starting with Order No. 2003, the Commission adopted standard procedures and a standard agreement for the interconnection of Large Generating Facilities (the *pro forma* LGIA), which included the reactive power requirement.<sup>11</sup> Under this requirement, large generators must design their Large Generating Facilities to provide 0.95 leading to 0.95 lagging reactive power at the Point of Interconnection. Synchronous generators have met this requirement by providing dynamic reactive power at the Point of Interconnection, utilizing the inherent dynamic reactive power capability of synchronous generators. The Commission recognized in Order No. 2003-A that the *pro forma* LGIA was “designed around the needs of large synchronous generators and that generators relying on newer technologies may find that either a specific requirement is inapplicable or that it calls for a slightly different approach” because such generators “may have

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<sup>10</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 (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>11</sup> Order No. 2003, FERC Stats. & Regs. ¶ 31,146 at PP 1, 542.

unique electrical characteristics.”<sup>12</sup> Therefore, the Commission exempted wind generators from this reactive power requirement.<sup>13</sup>

8. In June 2005, the Commission issued Order No. 661,<sup>14</sup> establishing interconnection requirements in Appendix G to the *pro forma* LGIA for large wind generators.<sup>15</sup> Recognizing that, unlike traditional synchronous generators, wind generators had to “install costly equipment” to maintain reactive power capability, the Commission in Order No. 661 preserved the exemption for large wind generators from the reactive power requirement unless the transmission provider shows, through a System Impact Study, that reactive power capability is required to ensure safety or reliability.<sup>16</sup> The Commission explained that this qualified exemption from the reactive power

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<sup>12</sup> Order No. 2003-A, FERC Stats. & Regs. ¶ 31,160 at P 407 & n.85.

<sup>13</sup> *Id.* Article 9.6.1 of the *pro forma* LGIA provides: “Interconnection Customer shall design the Large Generating Facility to maintain a composite power delivery at continuous rated power output at the Point of Interconnection at a power factor within the range of 0.95 leading to 0.95 lagging, unless Transmission Provider has established different requirements that apply to all generators in the Control Area on a comparable basis. The requirements of this paragraph shall not apply to wind generators.”

<sup>14</sup> *Interconnection for Wind Energy*, Order No. 661, FERC Stats. & Regs. ¶ 31,186, Appendix B (Appendix G – Interconnection Requirements for a Wind Generating Plant), *order on reh’g*, Order No. 661-A, FERC Stats. & Regs. ¶ 31,198 (2005).

<sup>15</sup> *Id.* P 1.

<sup>16</sup> *Id.* PP 50-51. Appendix G states: “A wind generating plant shall maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the Point of Interconnection as defined in this LGIA, if the Transmission Provider’s System Impact Study shows that such a requirement is necessary to ensure safety or reliability.”

requirement for large wind generators would provide certainty to the industry and “remove unnecessary obstacles to the increased growth of wind generation.”<sup>17</sup>

9. In May 2005, the Commission issued Order No. 2006,<sup>18</sup> in which it adopted standard procedures and a standard agreement for the interconnection of Small Generating Facilities (*pro forma* SGIA).<sup>19</sup> In Order No. 2006, the Commission completely exempted small wind generators from the reactive power requirement.<sup>20</sup> The Commission reasoned that, similar to large wind generators, small wind generators would face increased costs to provide reactive power that could create an obstacle to the development of small wind generators. Additionally, the Commission reasoned that small wind generators would “have minimal impact on the Transmission Provider’s

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<sup>17</sup> *Id.* P 50.

<sup>18</sup> *Standardization of Small Generator Interconnection Agreements and Procedures*, Order No. 2006, FERC Stats. & Regs. ¶ 31,180, Attachment F (Small Generator Interconnection Agreement), *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).

<sup>19</sup> *Id.* P 1.

<sup>20</sup> *Id.* P 387. Section 1.8.1 of the *pro forma* SGIA states: “The Interconnection Customer shall design its Small Generating Facility to maintain a composite power delivery at continuous rated power output at the Point of Interconnection at a power factor within the range of 0.95 leading to 0.95 lagging, unless the Transmission Provider has established different requirements that apply to all similarly situated generators in the control area on a comparable basis. The requirements of this paragraph shall not apply to wind generators.”

electric system” and therefore the reliability requirements for large wind generators that were eventually imposed in Order No. 661 were not needed for small wind generators.<sup>21</sup>

10. Since the Commission provided these exemptions from the reactive power requirement for wind generators, the equipment needed for a wind generator to provide reactive power has become more commercially available and less costly, such that the cost of installing equipment that is capable of providing reactive power is comparable to the costs of a traditional generator.<sup>22</sup> Recognizing these factors, the Commission recently accepted a proposal by PJM Interconnection, L.L.C. (PJM), effectively removing the wind generator exemptions from the PJM tariff.<sup>23</sup> Specifically, the Commission granted PJM an “independent entity variation” from Order No. 661 in accepting PJM’s proposal to require interconnection customers seeking to interconnect non-synchronous generators,<sup>24</sup> including wind generators, to use “enhanced inverters” with the capability to provide reactive power.<sup>25</sup> The Commission observed that, “[a]lthough there are still

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<sup>21</sup> *Id.* P 24.

<sup>22</sup> *See, e.g., Payment for Reactive Power*, Commission Staff Report, Docket No. AD14-7, app. 1, at 6, app. 2, at 4-5 (Apr. 22, 2014).

<sup>23</sup> *PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,097 at P 28.

<sup>24</sup> Non-synchronous generators are “connected to the bulk power system through power electronics, but do not produce power at system frequency (60 Hz).” They “do not operate in the same way as traditional generators and respond differently to network disturbances.” *Id.* P 1 n.3 (citing Order No. 661, FERC Stats. & Regs. ¶ 31,198 at P 3 n.4). Wind and solar photovoltaic generators are two examples of non-synchronous generators.

<sup>25</sup> *Id.* PP 1, 6.

technical differences between non-synchronous generators [such as wind generators] and traditional generators, with regard to the provision of reactive power, those differences have significantly diminished since the Commission issued Order No. 661.”<sup>26</sup> The Commission agreed with PJM “that the technology has changed both in availability and in cost since the Commission rejected [the California Independent System Operator’s] proposal in 2010,” such that “PJM’s proposal will not present a barrier to non-synchronous resources.”<sup>27</sup>

## II. Need for Reform

11. Based upon this information, on November 19, 2016, the Commission issued a Proposal to Revise Standard Generator Interconnection Agreements (NOPR) that proposed to eliminate the exemptions for wind generators from the requirement to provide reactive power as contained in the *pro forma* LGIA, Appendix G to the *pro forma* LGIA, and the *pro forma* SGIA.<sup>28</sup> In the NOPR, the Commission sought comment on: whether to remove the exemptions for wind generators from the reactive power requirement; whether the current power factor range of 0.95 leading to 0.95 lagging, as set forth in the existing *pro forma* LGIA and *pro forma* SGIA, is reasonable given the technology used by non-synchronous generators; whether newly

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<sup>26</sup> *Id.* P 28.

<sup>27</sup> *Id.*

<sup>28</sup> *Reactive Power Requirements for Non-Synchronous Generation*, Notice of Proposed Rulemaking, 80 Fed Reg. 73,683 (Nov. 25, 2015), FERC Stats. & Regs. ¶ 32,712 (2015).

interconnecting non-synchronous generators should only be required to produce reactive power when the generator's real power output is greater than 10 percent of nameplate capacity; and whether the existing methods used to determine reactive power compensation are appropriate for wind generators and, if not, what alternatives would be appropriate.<sup>29</sup>

12. In response to the NOPR, 24 entities submitted comments,<sup>30</sup> most of which generally support the proposed elimination of the exemptions. However, some commenters seek clarification of various issues that fall into six broad categories: (1) comments regarding where the reactive power requirement should be measured (the Point of Interconnection, the generator terminals, or elsewhere); (2) comments contesting the proposal to require fully dynamic reactive power capability; (3) comments contesting the proposal to require non-synchronous generators to maintain the required power factor range only when the generator's real power output exceeds 10 percent of its nameplate capacity; (4) comments on compensation methods for reactive power; (5) comments seeking clarification as to which non-synchronous resources the Final Rule will apply; and (6) comments on the need for regional flexibility.

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<sup>29</sup> *Id.* P 18.

<sup>30</sup> *See* Appendix A for a list of entities that submitted comments and the shortened names used throughout this Final Rule to describe those entities.

### III. Discussion

13. The Commission finds that, given the changes to the cost of providing reactive power by non-synchronous generators, as well as the growing penetration of such generators, the reactive power requirements in the *pro forma* LGIA and *pro forma* SGIA are no longer just and reasonable and are unduly discriminatory and preferential and, thus, need to be revised. We have determined in this Final Rule to apply comparable reactive power requirements to non-synchronous generators and synchronous generators. We recognize technological differences between non-synchronous and synchronous generators still remain. Because of the configuration and means of producing power of synchronous generators, these generators provide dynamic reactive power at the Point of Interconnection. Many commenters point out, however, that the advancements in technology do not permit some non-synchronous generators to provide dynamic reactive power at reasonable cost at the Point of Interconnection. Recognizing the differences between the two categories of generation, we have determined to require non-synchronous generators to provide dynamic reactive power at the high-side of the generator substation.<sup>31</sup>

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<sup>31</sup> This measurement point is different from Order No. 2003 requirement, which measures the power factor at the Point of Interconnection. As an example, the generator substation would be the substation for a wind generator that separates the low-voltage collector system from the higher voltage elements of the Interconnection Customer Interconnection Facilities that bring the generator's energy to the Point of Interconnection. Both the *pro forma* Large Generator Interconnection Procedures and the *pro forma* Small Generator Interconnection Procedures require interconnecting

(continued ...)



14. The requirements adopted by this Final Rule are intended to ensure that all generators, both synchronous and non-synchronous, are treated in a not unduly discriminatory or preferential manner, as required by sections 205 and 206 of the FPA, and to ensure sufficient reactive power is available on the bulk power system as more non-synchronous generators seek to interconnect and more synchronous generators retire.

15. We discuss below the issues raised in the comments.

**A. Reactive Power Requirement for Non-Synchronous Generators**

**1. NOPR Proposal**

16. In the NOPR, the Commission proposed to eliminate the exemptions for wind generators from the reactive power requirement, and thereby to require that all newly interconnecting non-synchronous generators provide reactive power as a condition of interconnection.<sup>32</sup>

**2. Comments**

17. Most commenters agree that the current exemptions for wind generators from the reactive power requirement are unjust, unreasonable, and unduly discriminatory and preferential due to increases in the number and size of non-synchronous generators, and

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generators to provide a simplified one-line diagram of the plant and station facilities, which will be appended to the interconnection agreement.

<sup>32</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 12.

advances in non-synchronous generator technology.<sup>33</sup> Commenters contend that operation and planning of the bulk power system requires adequate levels of voltage support, and that exempting wind generators from the reactive power requirement may inhibit the proper operation of the bulk power system.<sup>34</sup> Specifically, commenters assert that non-synchronous generators are increasingly replacing synchronous generators, which is resulting in a decrease in the amount of dynamic reactive power available to the transmission system.<sup>35</sup> Commenters also contend that the inverters used by most non-synchronous generators today are manufactured with the inherent capability to produce reactive power.<sup>36</sup> Therefore, commenters generally support the Commission's proposal to create comparable reactive power requirements for non-synchronous and synchronous generators.<sup>37</sup> While the Public Interest Organizations support the removal of the

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<sup>33</sup> EEI Comments at 5; Indicated NYTOs Comments at 2-3; ISO/RTO Council Comments at 4; ISO-NE Comments at 9-10; MISO Comments at 2.

<sup>34</sup> CAISO Comments at 2-5; ISO/RTO Council Comments at 5; ISO-NE Comments at 9; NERC Comments at 5-6; Six Cities Comments at 3-4.

<sup>35</sup> CAISO Comments at 2-3; EEI Comments at 4-5; ITC Comments at 1-2; SCE Comments at 2; SDG&E Comments at 2.

<sup>36</sup> CAISO Comments at 3; ISO/RTO Council Comments at 5; MISO Comments at 2-3; NaturEner Comments at 2; NERC Comments at 9; SCE Comments at 2.

<sup>37</sup> CAISO Comments at 3; EEI Comments at 6-7; EPSA Comments at 3; Idaho Power Comments at 1; Indicated NYTOs Comments at 2; ISO/RTO Council Comments at 4; ISO-NE Comments at 7-8; ITC Comments at 1; Lincoln Comments at 1-2; MISO Comments at 1-2; NEPOOL Initial Comments at 6; SCE Comments at 2; SDG&E Comments at 3.

exemptions for wind generators from the reactive power requirement, they ask that the Commission not impose unduly burdensome requirements on non-synchronous generators.<sup>38</sup>

18. Commenters argue that it is more effective to have a standard reactive power requirement for wind generators than requiring transmission providers to show through a System Impact Study the need for reactive power from an interconnecting wind generator on a case-by-case basis because a System Impact Study may not reflect the future needs of the transmission system.<sup>39</sup> CAISO explains that deficiencies in reactive power support may only become apparent when there are high levels of variable energy resources and low demand, or when certain transmission infrastructure or synchronous generators are out of service.<sup>40</sup> Because System Impact Studies do not study all conditions, CAISO contends they may not capture these deficiencies before a wind generator interconnects to the transmission system.<sup>41</sup> Therefore, CAISO, as well as the ISO/RTO Council, assert that transmission providers may need to remedy deficiencies in reactive power support

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<sup>38</sup> Public Interest Organizations Comments at 1.

<sup>39</sup> CAISO Comments at 4-5; EEI Comments at 5-6; ISO/RTO Council Comments at 5; ISO-NE Comments at 2.

<sup>40</sup> CAISO Comments at 4.

<sup>41</sup> *Id.*

that were not identified through a System Impact Study through authorization and development of transmission infrastructure upgrades.<sup>42</sup>

19. Commenters argue that relying on transmission system upgrades after a wind generator interconnects, or relying on more recently interconnected generation resources, to meet reactive power deficiencies may shift the cost of providing reactive power from one interconnection customer to another. Specifically, if a System Impact Study does not show that an earlier interconnecting wind generator needs to provide reactive power, but, as a result of the combination of existing and new wind generators, a System Impact Study for a later interconnecting wind generator does make that showing, the newer interconnecting wind generator would have the entire burden of supplying reactive power instead of sharing equally with the other wind generators creating the need for reactive power.<sup>43</sup> Further, commenters assert that requiring transmission providers to show through a System Impact Study the need for reactive power from interconnecting wind generators leads to delays and increased costs in processing interconnection requests.<sup>44</sup> Commenters argue that a uniform reactive power requirement for non-synchronous generators may result in reduced costs for wind development by allowing standardization

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<sup>42</sup> CAISO Comments at 4; ISO/RTO Council Comments at 5.

<sup>43</sup> ISO/RTO Council Comments at 5; Union of Concerned Scientists Comments at 4-5.

<sup>44</sup> ISO-NE Comments at 2, 4, 10; NEPOOL Initial Comments at 5.

of components and equipment.<sup>45</sup> Additionally, ISO-NE argues that the difficulty in demonstrating a need for reactive power through a System Impact Study has resulted in some wind generators not being required to install reactive power equipment and, consequently, not being able to deliver real power during certain system conditions as a result of insufficient reactive power capability.<sup>46</sup> According to ISO-NE, this situation has resulted in transmission system operators needing to curtail wind generators as a result of unstudied real-time system characteristics.<sup>47</sup>

20. Several independent system operators (ISOs) and regional transmission organizations (RTOs) have been developing new reactive power requirements and procedures to address deficiencies in the current method of requiring transmission providers to show through a System Impact Study that reactive power from an interconnecting wind generator is necessary to ensure safety or reliability.<sup>48</sup>

### **3. Commission Determination**

21. Based on the comments filed in response to the NOPR, and the record in the PJM and ISO-NE proceedings accepting PJM's and ISO-NE's reactive power requirements for

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<sup>45</sup> Indicated NYTOs Comments at 2; Joint NYTOs Comments at 2.

<sup>46</sup> ISO-NE Comments at 5.

<sup>47</sup> *Id.* at 6.

<sup>48</sup> CAISO Comments at 1-2; ISO-NE Comments at 6; NEPOOL Initial Comments at 4.

non-synchronous generators,<sup>49</sup> the Commission adopts in this Final Rule reactive power requirements for newly interconnecting non-synchronous generators, as discussed in greater detail below. We find the continued exemptions from the reactive power requirement in the *pro forma* LGIA and the *pro forma* SGIA for newly interconnecting wind generators to be unjust, unreasonable, and unduly discriminatory and preferential.

22. Non-synchronous generators other than wind generators currently are not exempt from the reactive power requirement in the *pro forma* LGIA and *pro forma* SGIA,<sup>50</sup> although the Commission has treated other types of non-synchronous generators in the same manner as wind generators on a case-by-case basis.<sup>51</sup> We proposed in the NOPR<sup>52</sup>

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<sup>49</sup> On April 15, 2016, after issuing the NOPR and receiving comments, the Commission approved ISO-NE's proposal to eliminate the exemptions for wind generators from the reactive power requirement. *ISO New England Inc.*, 155 FERC ¶ 61,031 (2016). The Commission previously accepted PJM's similar proposal. *See PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,097 (2015).

<sup>50</sup> Order Nos. 2003, 661, and 2006 explicitly exempted only wind generators from the reactive power requirement. *See* Order No. 661, FERC Stats. & Regs. ¶ 31,186 at P 106 ("While we are not applying the Final Rule Appendix G to non-wind technologies, we may do this in the future, or take other generic or case-specific actions, if another technology emerges for which a different set of interconnection requirements is necessary.").

<sup>51</sup> *See Nevada Power Co.*, 130 FERC ¶ 61,147, at P 27 (2010) ("[C]onsistent with our requirements for all wind facilities in Order No. 661, the Commission will require based on the facts of this case, that, before Nevada Power may require El Dorado's solar facility to be capable of providing reactive power, Nevada Power must show, through a system impact study, that such a requirement is necessary to ensure the safety or reliability of the grid."); *id.* P 24 ("We agree . . . that this is not the appropriate proceeding in which to make a generic determination on whether to extend to solar generators wind power's exemption from the requirement to provide reactive power support.").

to apply the Final Rule to all *non-synchronous* generators, and received no adverse comments. This Final Rule will apply to all newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement as of the effective date of this Final Rule.

23. Older wind turbine generators consumed reactive power, but, because they did not use inverters like other non-synchronous generators, they lacked the capability to produce and control reactive power without the use of costly equipment.<sup>53</sup> Based on technological improvements since the Commission created the exemptions for wind generators, requiring newly interconnecting wind generators to provide reactive power is not the obstacle to the development of wind generation that it was when the Commission issued Order Nos. 2003, 661, and 2006.<sup>54</sup> In particular, the wind turbines being installed today are generally Type III and Type IV inverter-based turbines,<sup>55</sup> which are capable of producing and controlling dynamic reactive power, which was not the case in 2005 when

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<sup>52</sup> *E.g.*, NOPR, FERC Stats. & Regs. ¶ 32,712 at P 17.

<sup>53</sup> Order No. 661, FERC Stats. & Regs. ¶ 31,186 at PP 50-51.

<sup>54</sup> As discussed above, in exempting wind generators from the reactive power requirement, the Commission sought to avoid creating an obstacle to the development of wind generation. For example, in Order No. 661, the Commission was concerned with “remov[ing] unnecessary obstacles to the increased growth of wind generation.” *Id.* P 50.

<sup>55</sup> A Type III wind turbine is a non-synchronous wound-rotor generator that has a three phase AC field applied to the rotor from a partially-rated power-electronics converter. A Type IV wind turbine is an AC generator in which the stator windings are connected to the power system through a fully-rated power-electronics converter. Both Type III and Type IV wind turbines have inherent reactive power capabilities.

the Commission exempted wind generators from the reactive power requirement in Order No. 661.<sup>56</sup>

24. We therefore conclude that improvements in technology, and the corresponding declining costs for newly interconnecting wind generators to provide reactive power, make it unjust, unreasonable, and unduly discriminatory and preferential to exempt such non-synchronous generators from the reactive power requirement when other types of generators are not exempt. Further, requiring all newly interconnecting non-synchronous generators to design their Generating Facilities to maintain the required power factor range ensures they are subject to comparable requirements as other generators.<sup>57</sup>

25. The Commission also is concerned that, as the penetration of non-synchronous generators continues to grow, exempting a class of generators from providing reactive power could create reliability concerns, especially if those generators represent a substantial amount of total generation in a particular region, or if many of the resources that currently provide reactive power are retired from operation. In addition, as noted above, maintaining the exemptions for wind generators places an undue burden on synchronous generators to supply reactive power without a reasonable technological or

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<sup>56</sup> *Id.* PP 50-51.

<sup>57</sup> *See, e.g., Sw. Power Pool, Inc.*, 119 FERC ¶ 61,199, at P 29 (“Providing reactive power within the [standard power factor range] is an obligation of a generator, and is as much an obligation of a generator as, for example, operating in accordance with Good Utility Practice.”), *order on reh’g*, 121 FERC ¶ 61,196 (2007).



cost-based distinction between synchronous and non-synchronous generators.<sup>58</sup>

Therefore, the Commission concludes that the continued exemptions from the reactive power requirement for newly interconnecting wind generators are unjust, unreasonable, and unduly discriminatory and preferential. For these reasons, the Commission revises the *pro forma* LGIA, Appendix G to the *pro forma* LGIA, and the *pro forma* SGIA to eliminate the exemptions for wind generators from the reactive power requirement.<sup>59</sup>

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<sup>58</sup> See *PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,097 at P 7; *Payment for Reactive Power*, Commission Staff Report, Docket No. AD14-7, app. 1 (Apr. 22, 2014).

<sup>59</sup> The Final Rule does not revise any regulatory text. The Final Rule revises the *pro forma* LGIA and *pro forma* SGIA in accordance with section 35.28(f)(1) of the Commission's regulations, which provides: "Every public utility that is required to have on file a non-discriminatory open access transmission tariff under this section must amend such tariff by adding the standard interconnection procedures and agreement and the standard small generator interconnection procedures and agreement required by Commission rulemaking proceedings promulgating and amending such interconnection procedures and agreements, or such other interconnection procedures and agreements as may be required by Commission rulemaking proceedings promulgating and amending the standard interconnection procedures and agreement and the standard small generator interconnection procedures and agreement." 18 C.F.R. § 35.28(f)(1) (2015). See *Integration of Variable Energy Resources*, Order No. 764, FERC Stats. & Regs. ¶ 31,331, at PP 343-345 (adopting this regulatory text effective September 11, 2012), *order on reh'g and clarification*, Order No. 764-A, 141 FERC ¶ 61,232 (2012), *order on clarification and reh'g*, Order No. 764-B, 144 FERC ¶ 61,222 (2013). While not revising regulatory text, the Commission is using the process provided for rulemaking proceedings, as defined in 5 U.S.C. § 551(4)-(5) (2012).

**B. Power Factor Range, Point of Measurement, and Dynamic Reactive Power Capability Requirements**

**1. NOPR Proposal**

26. The Commission proposed in the NOPR as part of the reactive power requirements for non-synchronous generators to require all newly interconnecting non-synchronous generators to design their Generating Facilities to maintain a composite power delivery at continuous rated power output at the Point of Interconnection at a power factor within the range of 0.95 leading to 0.95 lagging.<sup>60</sup> Further, the Commission proposed to require that the reactive power capability installed by non-synchronous generators be dynamic.<sup>61</sup>

**2. Comments**

27. Several commenters support the Commission's proposal to measure the reactive power requirement at the Point of Interconnection.<sup>62</sup> Commenters note that measuring the reactive power requirement at the Point of Interconnection is consistent with the current requirement in the *pro forma* LGIA for measuring the reactive power requirement where a transmission provider's System Impact Study shows the need for reactive power from an interconnecting wind generator.<sup>63</sup> Midwest Energy argues that transmission

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<sup>60</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 16.

<sup>61</sup> *Id.* P 14.

<sup>62</sup> CAISO Comments at 6; EEI Comments at 8; Indicated NYTOs Comments at 4; Midwest Energy Comments at 9; NERC Comments at 9.

<sup>63</sup> CAISO Comments at 6; EEI Comments at 7.

providers are only concerned with power factor and voltage at the Point of Interconnection.<sup>64</sup> CAISO asserts that measuring the reactive power requirement at the Point of Interconnection gives interconnection customers flexibility in how they design their generator projects to meet the reactive power requirement.<sup>65</sup> CAISO states that inverter manufacturers informed CAISO that current inverters used by most non-synchronous generators are capable of producing 0.95 leading and 0.95 lagging reactive power at full real power output at the generator's Point of Interconnection.<sup>66</sup> NextEra acknowledges that the common approach within ISOs/RTOs is to measure reactive power at the Point of Interconnection, but suggests that if reactive power is measured at the Point of Interconnection, then the Commission should maintain the flexibility for non-synchronous generators to meet that requirement using static reactive power devices if agreed to by the transmission provider, as provided for in Appendix G to the *pro forma* LGIA.<sup>67</sup> NaturEner asserts that, depending on the length of the collector system, transformer substation characteristics, and the length of the Interconnection Customer Interconnection Facilities from the generator terminals to the Point of Interconnection, it may not be possible for non-synchronous generators to meet the 0.95 leading to

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<sup>64</sup> Midwest Energy Comments at 9.

<sup>65</sup> CAISO Comments at 6.

<sup>66</sup> *Id.* at 3.

<sup>67</sup> NextEra Comments at 10-11.

0.95 lagging reactive power requirement at the Point of Interconnection without installing additional equipment.<sup>68</sup>

28. On the other hand, some commenters disagree with the NOPR proposal and argue that the reactive power requirement should be measured at the generator terminals rather than at the Point of Interconnection for non-synchronous generators. They assert that measuring at the Point of Interconnection would result in significantly higher costs for non-synchronous generators than measuring at the generator terminals. They also argue that, because of the often significant distance between non-synchronous generator terminals and the Point of Interconnection, measuring the reactive power requirement for non-synchronous generators at the generator terminals would result in a reactive power requirement that is comparable to measuring at the Point of Interconnection for synchronous generators.<sup>69</sup> AWEA and LSA contend that synchronous and non-synchronous generators are not similarly situated due to the fact that non-synchronous generators are typically located geographically and electrically farther from the Point of Interconnection than synchronous generators.<sup>70</sup> Therefore, AWEA and LSA request that non-synchronous generators have the option to meet the reactive power requirement at the generator terminals, even if the requirement at that point is more stringent

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<sup>68</sup> NaturEner Comments at 3.

<sup>69</sup> AWEA and LSA Comments at 12; Joint NYTOs Comments at 3-4; Public Interest Organizations Comments at 2; Union of Concerned Scientists Comments at 3.

<sup>70</sup> AWEA and LSA Comments at 12.

(e.g., 0.95 leading to 0.90 lagging) than at the Point of Interconnection.<sup>71</sup> AWEA and LSA note that they supported the independent entity variation from Order No. 661 in PJM in part because the reactive power requirement is measured at the generator terminals.<sup>72</sup>

29. Some commenters argue that, due to the configuration of typical non-synchronous generators, additional investment is required to supplement the inherent dynamic reactive power capability of the generators to meet the reactive power requirement at the Point of Interconnection; therefore, they assert that requiring measurement at the Point of Interconnection would reset the costs for non-synchronous generators to a level higher than that which the Commission considered in approving PJM's independent entity variation.<sup>73</sup> In addition to equipment investment, AWEA and LSA contend that, in many situations, providing excess reactive power at the generator terminals to meet the reactive power requirement at the Point of Interconnection would result in a large decrease in real power output, and accompanying lost opportunity costs and lost zero-emission, zero-fuel cost energy.<sup>74</sup> Similarly, NaturEner argues that the proposed power factor range of 0.95 leading to 0.95 lagging is only reasonable if the reactive power requirement is measured

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<sup>71</sup> *Id.* at 10, 12-13.

<sup>72</sup> *Id.* at 10-11.

<sup>73</sup> AWEA and LSA Comments at 10-12; NextEra Comments at 9; Union of Concerned Scientists Comments at 3-4.

<sup>74</sup> AWEA and LSA Comments at 11.

at the generator terminals.<sup>75</sup> NaturEner contends that measuring the reactive power requirement at the generator terminals will result in sufficient voltage control at the Point of Interconnection.<sup>76</sup> Alternatively, NaturEner also suggests that it would be reasonable to require a power factor range of 0.95 leading to 0.95 lagging at the generator substation.<sup>77</sup> Finally, NaturEner argues that any additional reactive power needs could be determined in a System Impact Study.<sup>78</sup>

30. While CAISO allows synchronous generators to provide reactive power at the generator terminals, CAISO does not support providing this option to non-synchronous generators. CAISO argues that measuring the reactive power requirement at the generator terminals is inappropriate for non-synchronous generators because non-synchronous generators often use multiple transformers, collection circuits, and substations to transmit real power across lengthy Interconnection Customer Interconnection Facilities from the generator terminal to the Point of Interconnection, reducing the amount of reactive power that reaches the transmission system. In contrast, CAISO explains that the configuration of synchronous generators typically involves a single transformer and short Interconnection Customer Interconnection Facilities from

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<sup>75</sup> NaturEner Comments at 3.

<sup>76</sup> *Id.* at 3-4.

<sup>77</sup> *Id.* at 3.

<sup>78</sup> *Id.* at 4; *see also* Midwest Energy Comments at 10.

the generator terminal to the Point of Interconnection, making measuring the reactive power requirement at the generator terminals for synchronous generators appropriate for ensuring that sufficient reactive power is provided to the transmission system.<sup>79</sup>

31. As to the Commission's proposal to require fully dynamic reactive power capability, commenters in support argue that requiring dynamic reactive power capability allows generators to operate across a broader range of operating conditions than allowing static reactive power devices.<sup>80</sup> ISO-NE asserts that requiring fully dynamic reactive power capability is consistent with the historic requirement that synchronous generators provide dynamic reactive power.<sup>81</sup> ISO-NE contends that generators are more effective at providing dynamic reactive power compared to transmission infrastructure.<sup>82</sup>

32. Conversely, other commenters disagree with the proposal to require fully dynamic reactive power capability. SDG&E contends that such a requirement is not necessary and that allowing non-synchronous generators to use static reactive power devices to meet the reactive power requirement will provide flexibility to generator developers and keep costs at a reasonable level.<sup>83</sup> SDG&E suggests that the dynamic reactive power

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<sup>79</sup> CAISO Comments at 6-7.

<sup>80</sup> EEI Comments at 8; ISO-NE Comments at 8.

<sup>81</sup> ISO-NE Comments at 8.

<sup>82</sup> *Id.* at 9.

<sup>83</sup> SDG&E Comments at 3-4.

capability requirement only be for 0.985 leading to 0.985 lagging reactive power capability.<sup>84</sup> Other commenters assert that the existing *pro forma* LGIA and *pro forma* SGIA neither define “dynamic” reactive power capability, nor specify a mix of static versus dynamic reactive power capability that a generator must maintain, and that the Commission should not specify such a mix in this proceeding.<sup>85</sup> Rather, AWEA and LSA argue that it would be discriminatory to require non-synchronous generators to maintain fully dynamic reactive power capability because their configuration results in significant loss of dynamic reactive power from the generator terminal to the Point of Interconnection. Instead, AWEA and LSA argue that static reactive power devices are necessary and effective to supplement the dynamic reactive power capability of the generator to provide reactive power at the Point of Interconnection.<sup>86</sup>

33. NextEra argues that if the proposed reactive power requirement is for fully dynamic reactive power capability, then measuring the requirement at the generator terminals for non-synchronous generators is required to ensure comparable treatment to synchronous generators.<sup>87</sup> NextEra contends that the cost of providing reactive power is manageable at the Point of Interconnection if the flexibility provided in section 9.6.1 of

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<sup>84</sup> *Id.* at 4.

<sup>85</sup> AWEA and LSA Comments at 8; EEI Comments at 8; Midwest Energy Comments at 5; NextEra Comments at 6.

<sup>86</sup> AWEA and LSA Comments at 9; *see also* Midwest Energy Comments at 6.

<sup>87</sup> NextEra Comments at 9-10.



the *pro forma* LGIA is maintained and the reactive power requirement can be met with static reactive power devices, but that the requirement could be cost-prohibitive if non-synchronous generators are required to install dynamic reactive power devices.<sup>88</sup>

Commenters request that the Commission clarify that it did not intend to specify that a non-synchronous generator must meet the reactive power requirement with only dynamic reactive power capability.<sup>89</sup> Specifically, NextEra argues that the Commission should not remove paragraph A.ii of Appendix G to the *pro forma* LGIA because it provides important provisions regarding the types of devices that can be used to meet the reactive power requirement.<sup>90</sup>

### 3. Commission Determination

34. We will require the reactive power requirements in the *pro forma* LGIA and *pro forma* SGIA for non-synchronous generators to be measured at the high-side of the generator substation. Newly interconnecting non-synchronous generators will be required to design their Generating Facilities to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation. At that point, the non-synchronous generator must provide dynamic reactive power within the power factor range of 0.95 leading to 0.95 lagging, unless the transmission provider has

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<sup>88</sup> *Id.* at 9; NextEra Supplemental Comments at 4.

<sup>89</sup> AWEA and LSA Comments at 9; Midwest Energy Comments at 6; NextEra Comments at 7.

<sup>90</sup> NextEra Comments at 8.

established a different power factor range that applies to all non-synchronous generators in the transmission provider's control area on a comparable basis.<sup>91</sup> To ensure there is no undue discrimination, we clarify that the ability of a transmission provider to establish different requirements is limited to establishing a different power factor range, and not to the other reactive power requirements.

35. Non-synchronous generators may meet the dynamic reactive power requirement by utilizing a combination of the inherent dynamic reactive power capability of the inverter, dynamic reactive power devices (e.g., Static VAR Compensators), and static reactive power devices (e.g., capacitors) to make up for losses. In developing this reactive power requirement for non-synchronous generators, the Commission is balancing the costs to newly-interconnecting non-synchronous generators of providing reactive power with the benefits to the transmission system of having another source of reactive power.

36. Although the Commission in the NOPR considered measuring the reactive power requirements for non-synchronous generators at the Point of Interconnection, we are persuaded by commenters' arguments that requiring fully dynamic reactive power

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<sup>91</sup> Under these provisions, transmission providers may establish a different power factor range for synchronous or non-synchronous generators as long as the requirement applies to all generators in each class on a comparable basis. *See* Order No. 2003, FERC Stats. & Regs. ¶ 31,146 at P 542 (“We adopt the power factor requirement of 0.95 leading to 0.95 lagging because it is a common practice in some NERC regions. If a Transmission Provider wants to adopt a different power factor requirement, Final Rule LGIA Article 9.6.1 permits it to do so as long as the power factor requirement applies to all generators on a comparable basis.”).

capability at the Point of Interconnection may result in significantly increased costs for non-synchronous generators in meeting the reactive power requirements.<sup>92</sup> These added costs will ultimately be borne by customers, whether through reactive power payments in regions that compensate for reactive power capability, or through elevated prices for capacity or energy in regions that do not compensate for reactive power capability. In contrast, measuring the reactive power requirements at the high-side of the generator substation, rather than at the Point of Interconnection, will be less expensive for non-synchronous generators because a greater amount of the inherent dynamic reactive power capability of the inverters associated with non-synchronous generators will be available at the high-side of the generator substation than at the Point of Interconnection.

37. In adopting the Point of Interconnection as the point of measurement for large wind plants in Order No. 661, the Commission balanced the case-by-case reactive power requirement with the needs of the transmission system.<sup>93</sup> Here, we remove the case-by-case approach, and require that all newly interconnecting non-synchronous generators provide reactive power as a condition of interconnection. By requiring *all* newly interconnecting non-synchronous generators to provide reactive power, we are increasing the amount of reactive power available to meet transmission system needs, and, at the

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<sup>92</sup> See, e.g., NaturEner Comments at 3 (“Based on the above technological and cost-based reasons, NaturEner believes the +/- 0.95 requirement is reasonable if the Proposed Rule is refined to measure the requirement at the wind turbine terminals (or as an alternative at the wind farm substation), and not at the Point of Interconnection.”).

<sup>93</sup> Order No. 661, FERC Stats. & Regs. ¶ 31,186 at P 59.

same time, balancing the costs to non-synchronous generators of providing that reactive power by measuring the requirements at the high-side of the generator substation.

38. Similarly, in Order No. 661, the Commission was not convinced that dynamic reactive power capability was needed from every wind generator, and so adopted the case-by-case approach.<sup>94</sup> However, with the increasing penetration of wind generation and retirement of traditional synchronous generators, which provided dynamic reactive power capability to the transmission system, we now find it is necessary to require dynamic reactive power capability from all new generators. The dynamic reactive power capability may be achieved at the high-side of the generator substation at lower cost compared to dynamic reactive power at the Point of Interconnection by systems using a combination of dynamic capability from the inverters plus static reactive power devices to make up for losses. Therefore, this Final Rule gives non-synchronous generators the flexibility to use static reactive power devices to make up for losses that occur between the inverters and the high-side of the generator substation, so long as the generators maintain 0.95 leading to 0.95 lagging dynamic reactive power capability at the high-side of the generator substation.

39. While measuring the reactive power requirements at the Point of Interconnection would provide the greatest amount of reactive power to the transmission system, the costs associated with providing that level of reactive power do not justify the added benefit to

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<sup>94</sup> *Id.* P 66.

the transmission system.<sup>95</sup> In fact, one of the reasons for undertaking this rulemaking proceeding was the Commission recognized that the cost of providing reactive power may no longer present an obstacle to the development of wind generation. On the other hand, measuring the reactive power requirements at the Generating Facilities would likely result in very little reactive power being provided to the transmission system but would be relatively inexpensive to implement for the non-synchronous generator. The high-side of the generator substation represents a middle ground. It is located beyond the low voltage collector systems where significant reactive power losses occur, resulting in more reactive power provided to the transmission system than a requirement at the Generating Facilities, while being less expensive to implement than a requirement at the Point of Interconnection. We find that measuring the reactive power requirements at the high-side of the generator substation reasonably balances the need for reactive power for the transmission system with the costs to non-synchronous generators of providing reactive power.

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<sup>95</sup> See *ISO New England Inc.*, Tariff Filing, Transmittal Letter, Docket No. ER16-946-000, at 17 (filed Feb. 16, 2016) (“[T]he proposed requirements provide for the reactive capability to be measured at the high-side of the station transformer rather than at the Point of Interconnection to account for the long generator leads through which many wind generators are interconnecting to the New England system – as long as approximately 50-80 miles between the generator collector transformer and the Point of Interconnection. There is no benefit to the generator, and little benefit to the system, to force the generator to provide voltage support all the way to a Point of Interconnection that is very remote, and it is not necessarily even achievable to effectively transfer such quantities of reactive power over such distances.”); see also NextEra Supplemental Comments at 3-4.

40. We find establishing dynamic reactive power requirements at the high-side of the generator substation preferable to the suggestion in the comments that, at relative equal cost, reactive power could be provided at the Point of Interconnection as long as the inherent dynamic reactive power produced by the generator can be enhanced with static reactive power capability. By establishing dynamic reactive power requirements at the high-side of the generator substation, non-synchronous generators will be able to provide faster responding and more continuously variable reactive power capability than if they provide static reactive power capability at the Point of Interconnection. In addition, requiring dynamic reactive power capability allows generators to operate across a broader range of operating conditions than allowing static reactive power enhancements.<sup>96</sup>

**C. Real Power Output Level**

**1. NOPR Proposal**

41. The NOPR proposed to require newly interconnecting non-synchronous generators to design their Generating Facilities to maintain the required power factor range only when the generator's real power output exceeds 10 percent of its nameplate capacity.<sup>97</sup>

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<sup>96</sup> EEI Comments at 8; ISO-NE Comments at 8; *see also ISO New England Inc.*, Tariff Filing, Transmittal Letter, Docket No. ER16-946-000, at 19 (filed Feb. 16, 2016) (“[I]n New England’s experience, the implementation of the reactive power exemption has disadvantaged wind generators seeking to interconnect, putting burdens on the study process not experienced for conventional generators and compromising their ability to operate through various system conditions once interconnected, a situation that leads system operators to curtail wind farm output for system reliability reasons.”).

<sup>97</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 15 (citing Order No. 661, FERC Stats. & Regs. ¶ 31,186 at P 46).

The proposed *pro forma* LGIA would state: “Non-synchronous generators shall only be required to maintain the above power factor when their output is above 10 percent of the Generating Facility Capacity.”<sup>98</sup> The Commission stated its understanding that the inverters used by non-synchronous generators were not capable of producing reactive power when operating below 10 percent of nameplate capacity.<sup>99</sup>

## 2. Comments

42. Several commenters support the 10 percent exemption given current inverter technology.<sup>100</sup> EEI notes that the Commission uses both “generator nameplate capacity” and “Generator Facility Capacity” in reference to the 10 percent exemption, and requests that the Commission clarify that the correct term is “Generator Facility Capacity.”<sup>101</sup> The ISO/RTO Council states that its ISO/RTO members do not uniformly agree that the 10 percent exemption is appropriate and want to be able to establish rules based on their individual situations.<sup>102</sup> Similarly, the Indicated NYTOs support the Commission allowing regional variation on the 10 percent exemption within a reasonable range based

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<sup>98</sup> *Id.* P 16. The Commission proposed similar revisions to the *pro forma* SGIA: “Non-synchronous generators shall only be required to maintain the above power factor when their output is above 10 percent of the generator nameplate capacity.” *Id.*

<sup>99</sup> *Id.* P 15 (citing Order No. 661, FERC Stats. & Regs. ¶ 31,186 at P 46).

<sup>100</sup> EEI Comments at 9; NaturEner Comments at 4; NERC Comments at 10; SCE Comments at 3; NextEra Comments at 11.

<sup>101</sup> EEI Comments at 9-10.

<sup>102</sup> ISO/RTO Council Comments at 3.

on existing regional requirements (up to an exemption for below 25 percent real power output).<sup>103</sup>

43. AWEA and LSA and the Joint NYTOs argue that the 10 percent exemption should be increased to 25 percent, consistent with what the Commission approved in PJM.<sup>104</sup>

AWEA and LSA assert that the ability of non-synchronous generators to provide reactive power can be reduced when individual generators within the plant are not producing real power, such that the 10 percent operating threshold is insufficient.<sup>105</sup>

44. Other commenters oppose the 10 percent exemption, arguing that it is not necessary given the technology available to non-synchronous generators.<sup>106</sup> These commenters contend that some inverters can produce reactive power at zero real power output.<sup>107</sup> Additionally, ISO-NE argues that requiring non-synchronous generators to be capable of providing reactive power at all output levels will further technological development and advancement.<sup>108</sup> ISO-NE asserts that if the Commission adopts the 10 percent exemption, it should limit the exemption to only wind generators because non-

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<sup>103</sup> Indicated NYTOs Comments at 4.

<sup>104</sup> AWEA and LSA Comments at 13; Joint NYTOs Comments at 3.

<sup>105</sup> AWEA and LSA Comments at 13.

<sup>106</sup> ISO-NE Comments at 13; Midwest Energy Comments at 9; MISO Comments at 3.

<sup>107</sup> ISO-NE Comments at 14; NaturEner Comments at 4.

<sup>108</sup> ISO-NE Comments at 14.



synchronous generators other than wind generators have not had an exemption from the reactive power requirement and it is inappropriate to create a new exemption for these generators.<sup>109</sup>

45. MISO requests that non-synchronous generators be required to produce reactive power at low and zero-voltage conditions to ensure the robustness of the transmission system.<sup>110</sup> Similarly, Midwest Energy argues that the Commission has not fully considered the high levels of reactive power generated by lightly loaded interconnection facilities associated with non-synchronous generators.<sup>111</sup> Midwest Energy explains that its largest events of excess reactive power production have occurred when non-synchronous generators are producing less than 10 percent of their nameplate capacity. Midwest Energy asserts that it may be necessary for non-synchronous generators to install static inductors to absorb reactive power in these situations. Therefore, according to Midwest Energy, requiring non-synchronous generators to provide reactive power at all levels of real power output would prevent potential high voltage reliability concerns.<sup>112</sup>

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<sup>109</sup> *Id.* at 14-15.

<sup>110</sup> MISO Comments at 3.

<sup>111</sup> Midwest Energy Comments at 2-3.

<sup>112</sup> *Id.* at 8.

46. AWEA and LSA request clarification regarding the proposal in the NOPR that non-synchronous generators be required to maintain a “composite power delivery at continuous rated power output at the Point of Interconnection at a power factor within the range of 0.95 leading to 0.95 lagging.”<sup>113</sup> AWEA and LSA argue that this language can be interpreted as either requiring non-synchronous generators to provide reactive power proportionate to the actual output of the generator, or to provide reactive power within the full power factor range based on the maximum output of the generator no matter the actual output of the generator.<sup>114</sup> AWEA and LSA contend that the first interpretation—a reactive power requirement proportionate to actual output—is the most reasonable interpretation.<sup>115</sup> NERC asserts that the second interpretation is correct.<sup>116</sup>

### 3. Commission Determination

47. We will not adopt the 10 percent exemption proposed in the NOPR in this Final Rule and will instead require all newly interconnecting non-synchronous generators to design their Generating Facilities to meet the reactive power requirements at all levels of

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<sup>113</sup> AWEA and LSA Comments at 5; NOPR, FERC Stats. & Regs. ¶ 32,712 at P 16.

<sup>114</sup> AWEA and LSA Comments at 5-7 (explaining that the first interpretation will result in a triangular PQ curve, while the latter will result in a rectangular PQ curve); *see also* NERC Comments at 9.

<sup>115</sup> AWEA and LSA Comments at 6.

<sup>116</sup> NERC Comments at 9.

real power output, as is already required of synchronous generators.<sup>117</sup> Although several commenters support the 10 percent exemption,<sup>118</sup> and some commenters support increasing that threshold to 25 percent,<sup>119</sup> we find, on balance, that requiring non-synchronous generators to provide reactive power at all levels of real power output appropriately recognizes the capabilities of existing non-synchronous generation technologies and creates requirements that are comparable to the existing requirement for synchronous generators. Additionally, by maintaining the reactive power requirement at all output levels, non-synchronous generators will mitigate potential over-voltage concerns on lightly loaded Interconnection Customer Interconnection Facilities of a non-synchronous generator when operating at low real power output.

48. While some commenters argue that technical limitations exist that prevent non-synchronous generators from providing adequate reactive power at lower levels of real power output, and note that the Commission approved a 25 percent exemption in PJM, several commenters indicate that non-synchronous generators *are* capable of providing reactive power at all levels of real power output.<sup>120</sup> Although the Commission approved

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<sup>117</sup> Section 9.6.1 of the *pro forma* LGIA and section 1.8.1 of the *pro forma* SGIA.

<sup>118</sup> EEI Comments at 9; NaturEner Comments at 4; NERC Comments at 10; SCE Comments at 3; NextEra Comments at 11.

<sup>119</sup> AWEA and LSA Comments at 13; Joint NYTOs Comments at 3.

<sup>120</sup> ISO-NE Comments at 13; Midwest Energy Comments at 9; MISO Comments at 3.

a 25 percent exemption in PJM, that was pursuant to a section 205 filing with broad stakeholder support. We now act on a more comprehensive record and take action generically to apply to all transmission providers.<sup>121</sup> Moreover, while not all non-synchronous generators are currently designed to maintain reactive power capability at all levels of real power output, modern inverters can be designed to provide this capability. We agree with ISO-NE's comments that imposing this requirement will help encourage further technological development, such that the bulk power system will ultimately receive higher quality and more reliable reactive power service from all generators.

49. As for AWEA and LSA's and NERC's requested clarifications, we clarify that the amount of reactive power required from non-synchronous generators should be proportionate to the actual output of the generator, such that a 100 MW generator would be required to provide approximately 33 MVAR of reactive power when operating at maximum output (100 MW), and approximately 3.3 MVAR when operating at 10 MW, and so on. This addresses some commenters' concerns that sometimes not all non-synchronous generators at a particular location are operating at a given time (e.g., only 50 of 100 wind turbines are actually spinning or 1/3 of solar panels are covered by clouds), without creating an unnecessary exemption for non-synchronous generators.

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<sup>121</sup> As discussed below, to the extent an ISO or RTO seeks to maintain an existing exemption, it can include such a request in its compliance filing as an independent entity variation and the Commission will consider the request at that time based on the arguments provided.

## **D. Compensation**

### **1. NOPR Proposal**

50. The Commission stated in the NOPR that non-synchronous generators are eligible for the same payments for reactive power as all other generators, consistent with the compensation provisions of the *pro forma* LGIA and *pro forma* SGIA.<sup>122</sup> The Commission proposed that any compensation for such non-synchronous generators would be based on the cost of providing reactive power, but noted that the cost to a wind generator of providing reactive power may not be easily estimated using existing methods that are applied to synchronous generators.<sup>123</sup> Therefore, the Commission sought comment on whether these existing methods are appropriate for wind generators and, if not, what alternatives would be appropriate.<sup>124</sup>

### **2. Comments**

51. Several commenters support the Commission's proposal to require transmission providers to compensate non-synchronous generators for reactive power on a comparable basis as synchronous generators, provided that non-synchronous generators provide

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<sup>122</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 12 (citing Order No. 2003-A, FERC Stats. & Regs. ¶ 31,160 at P 416); *see also* sections 9.6.3 and 11.6 of the *pro forma* LGIA and sections 1.8.2 and 1.8.3 of the *pro forma* SGIA.

<sup>123</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 12 (citing *Payment for Reactive Power*, Commission Staff Report, Docket No. AD14-7, app. 2 (Apr. 22, 2014)).

<sup>124</sup> *Id.* P 18 (citation omitted).

comparable reactive power service.<sup>125</sup> Other commenters seek clarification, or ask that the Commission outline principles for compensation.<sup>126</sup> Other commenters argue that the Commission should not mandate a uniform approach to reactive power compensation.<sup>127</sup> Finally, while some commenters ask that the Commission address the issue of reactive power compensation, they assert that addressing reactive power compensation in this rulemaking is outside the scope of the proceeding.<sup>128</sup>

### 3. Commission Determination

52. We will not change the Commission's existing policies on compensation for reactive power. Sections 9.6.3 and 11.6 of the currently-effective *pro forma* LGIA and sections 1.8.2 and 1.8.3 of the currently-effective *pro forma* SGIA provide that the transmission provider must compensate the interconnecting generator for reactive power service when the transmission provider requests that the interconnecting generator operate outside of the specified reactive power range. These sections also provide that if the transmission provider compensates its own or affiliated generators for reactive power

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<sup>125</sup> CAISO Comments at 9; EEI Comments at 10; ISO/RTO Council Comments at 7; MISO Comments at 3-4.

<sup>126</sup> ISO/RTO Council Comments at 7; SDG&E Comments at 4-5; AWEA and LSA Comments at 2-5; Public Interest Organizations Comments at 2-3; NextEra Comments at 14.

<sup>127</sup> Indicated NYTOs Comments at 4; ISO/RTO Council Comments at 7; SDG&E Comments at 4; CAISO Comments at 8-9; Joint NYTOs Comments at 4; SCE Comments at 3; Six Cities Comments at 2, 5-6.

<sup>128</sup> EPSA Comments at 6; NextEra Comments at 14.

service within the specified reactive power range, it must compensate all generators for this service, and at what rate such compensation should be provided. While the Commission asked for comments on principles for compensating non-synchronous generators for reactive power, the comments, aside from noting that the current *AEP* methodology<sup>129</sup> does not translate to non-synchronous generation, did not provide a sufficient record for determining a new method. Therefore, any non-synchronous generator seeking reactive power compensation would need to propose a method for calculating that compensation as part of its filing. We note, however, that Commission staff is convening a workshop to explore reactive power compensation issues in the markets operated by ISOs/RTOs on June 30, 2016.<sup>130</sup>

**E. Application of the Final Rule**

**1. NOPR Proposal**

53. As a transition mechanism, the Commission proposed in the NOPR to apply the reactive power requirements in this Final Rule to all newly interconnecting non-synchronous generators that, as of the effective date of this Final Rule, either: (1) have not executed an interconnection agreement; or (2) requested that an interconnection agreement be filed unexecuted that is still pending before the Commission. The

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<sup>129</sup> See *Am. Elec. Power Serv. Corp.*, Opinion No. 440, 88 FERC ¶ 61,141, at 61,456-57 (1999).

<sup>130</sup> See *Reactive Supply Compensation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Notice of Workshop, Docket No. AD16-17-000 (issued Mar. 17, 2016).

Commission also proposed to apply the reactive power requirements to all existing non-synchronous generators making upgrades that require new interconnection requests after the effective date of the Final Rule. The Commission stated that it did not believe it would be reasonable or necessary to require all existing wind generators to provide reactive power because not all such generators are capable of providing reactive power without incurring substantial costs to install new equipment. However, the Commission proposed to require existing wind generators that make upgrades that require new interconnection requests to conform to the new reactive power requirements.<sup>131</sup>

## 2. Comments

54. CAISO and MISO support the Commission's proposed application of the new reactive power requirements to new and existing non-synchronous generators.<sup>132</sup> CAISO contends that interconnection customers should be required to adhere to the conditions of interconnection at the time they execute an interconnection agreement. CAISO states that, in its own reactive power stakeholder initiative, it proposed to apply a new reactive power requirement to its April 2016 interconnection queue cluster and to all future clusters. CAISO explains that, depending on the timing of the Final Rule, the new reactive power requirements would apply to this same group of interconnecting generators because they will not execute their interconnection agreements for at least one

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<sup>131</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 17.

<sup>132</sup> CAISO Comments at 5-6; MISO Comments at 5-6.



year after the study process begins. CAISO states that applying reactive power requirements to these interconnecting generators would ensure these generators do not lean on existing generators to provide reactive power.<sup>133</sup>

55. In contrast, some commenters argue that the Commission should not apply the new reactive power requirements to generators that have begun or have already received their System Impact Study, depending on the requirements of the Final Rule.<sup>134</sup> AWEA and LSA contend that applying the proposed reactive power requirements to non-synchronous generators that have begun their System Impact Study, or that have been in the interconnection queue for some period of time without starting their System Impact Study, may result in sizable costs and fundamental unfairness. AWEA and LSA argue that such non-synchronous generators may not have been designed to meet the new reactive power requirements and, therefore, may incur substantial equipment costs to meet those requirements.<sup>135</sup>

56. NextEra argues that the proposed application of the Final Rule to non-synchronous generators that have not yet executed an interconnection agreement is unreasonable if the Commission requires fully dynamic reactive power capability measured at the Point of

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<sup>133</sup> CAISO Comments at 5-6.

<sup>134</sup> AWEA and LSA Comments at 14; NextEra Comments at 13.

<sup>135</sup> AWEA and LSA Comments at 14-15.

Interconnection.<sup>136</sup> NextEra asserts that requiring fully dynamic reactive power capability at the Point of Interconnection would be a significant change to the status quo and would render some investments made by non-synchronous generators that have already received the results of their System Impact Study, but have not yet executed an interconnection agreement, useless. According to NextEra, such a major shift could also impose delays and additional costs related to the redesign, purchase, and installation of additional equipment.<sup>137</sup> NextEra contends that if the Commission allows for the use of static reactive power devices to supplement the dynamic reactive power capability of non-synchronous generators at the Point of Interconnection, the Commission would merely be formalizing what is already common practice, and, therefore, that the proposed application of the Final Rule would be reasonable. However, if the Commission requires fully dynamic reactive power capability at the Point of Interconnection, NextEra asks that the Final Rule not apply to non-synchronous generators that have received their System Impact Study.<sup>138</sup>

57. Some commenters also oppose the Commission's proposal to apply the reactive power requirements to existing non-synchronous generators making upgrades that require

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<sup>136</sup> NextEra Comments at 11.

<sup>137</sup> *Id.* at 12-13.

<sup>138</sup> *Id.* at 12.

new interconnection requests.<sup>139</sup> AWEA and LSA assert that most upgrades do not involve fundamental changes to the original technology, or to the hardware, but instead simply involve software upgrades.<sup>140</sup> Lincoln argues that applying the new reactive power requirements to wind generators making upgrades could result in financial detriment to entities that have previously entered into binding contracts to purchase wind generation by exposing those entities to unforeseen expenses not contemplated when they entered into the contracts.<sup>141</sup> AWEA and LSA request that the new reactive power requirements only apply to upgrades on a case-by-case basis, depending on the outcome of the relevant interconnection study, and only to the incremental capacity requested through the upgrade.<sup>142</sup> AWEA and LSA also request that the Commission clarify what constitutes a “Material change” to a generator that would trigger a new interconnection study.<sup>143</sup>

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<sup>139</sup> AWEA and LSA Comments at 14; Lincoln Comments at 2.

<sup>140</sup> AWEA and LSA Comments at 14.

<sup>141</sup> Lincoln Comments at 2.

<sup>142</sup> AWEA and LSA Comments at 14-15.

<sup>143</sup> *Id.* at 15.

58. SDG&E requests that the Commission clarify that the proposed reactive power requirements would apply to *all* non-synchronous generators and not to just wind generators.<sup>144</sup>

### 3. Commission Determination

59. We will apply the requirements of this Final Rule to all newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement<sup>145</sup> as of the effective date of this Final Rule. We will not apply the requirements of this Final Rule to existing non-synchronous generators making upgrades to their Generating Facilities that require new interconnection requests. However, such a generator may be required to provide reactive power if a transmission provider determines through that generator's System Impact Study that a reactive power requirement is necessary to ensure safety or reliability. The transition mechanism we establish in this Final Rule allows non-synchronous generators currently in the process of interconnecting to complete the interconnection process without unreasonable delay or expense.

#### a. Newly Interconnecting Non-Synchronous Generators

60. While the Commission proposed in the NOPR to apply the requirements of the Final Rule to all newly interconnecting non-synchronous generators that have not yet

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<sup>144</sup> SDG&E Comments at 1, 3.

<sup>145</sup> The *pro forma* Large Generator Interconnection Procedures contain a standard "Interconnection Facilities Study Agreement" as Appendix 4. Similarly, the *pro forma* Small Generator Interconnection Procedures contain a standard "Facilities Study Agreement" as Attachment 8.

executed an interconnection agreement as of the effective date of the Final Rule, or requested that one be filed unexecuted that is still pending, we agree with AWEA and LSA, and NextEra,<sup>146</sup> that applying the Final Rule as proposed may unduly burden non-synchronous generators that have completed their System Impact Study. Such non-synchronous generators may have already purchased equipment needed to interconnect prior to executing an interconnection agreement (or requesting that one be filed unexecuted that is still pending).<sup>147</sup> We are especially concerned with applying new reactive power requirements to non-synchronous generators that have advanced in the interconnection process in light of our decision to measure the reactive power requirements at the high-side of the generator substation, rather than at the Point of Interconnection. Because the Point of Interconnection has been the industry standard under Appendix G to the *pro forma* LGIA, non-synchronous generators that have completed their System Impact Study may have relied on that standard in designing their Generating Facilities, thereby creating an undue burden on such generators.<sup>148</sup>

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<sup>146</sup> AWEA and LSA Comments at 14; NextEra Comments at 13.

<sup>147</sup> AWEA and LSA explain that many non-synchronous generators will have already chosen their collector array cable and transformer or inverter before receiving an interconnection agreement. Rather than being able to choose equipment that could reduce reactive losses, the only compliance option for non-synchronous generators that are “significantly advanced” in the interconnection process to meet the requirements of the Final Rule would be to install potentially expensive reactive power devices. AWEA and LSA Comments at 15.

<sup>148</sup> NextEra Comments at 12-13.

61. To avoid these undue burdens, we will apply the requirements of this Final Rule to all newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement as of the effective date of this Final Rule. Pursuant to the *pro forma* Large Generator Interconnection Procedures and to the *pro forma* Small Generator Interconnection Procedures, and simultaneous with the delivery of the System Impact Study, the transmission provider provides a draft Facilities Study Agreement to an interconnecting generator.<sup>149</sup> The executing of the Facilities Study Agreement immediately follows the completion of the System Impact Study. The execution of the Facilities Study Agreement, and the subsequent completion of the Facilities Study, represents the time in the interconnection process when the transmission provider and generator developer agree to the general technical requirements that will be needed for the generator to reliably interconnect to the transmission system.<sup>150</sup> This point in the

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<sup>149</sup> Section 8.1 of the *pro forma* Large Generator Interconnection Procedures state that, simultaneous with the delivery of the System Impact Study, the transmission provider must provide the interconnection customer with an Interconnection Facilities Study Agreement. Likewise, section 3.5 of the *pro forma* Small Generator Interconnection Procedures state that a transmission provider must provide an interconnection customer a Facilities Study Agreement along with the completed System Impact Study report.

<sup>150</sup> Section 7.3 of the *pro forma* Large Generator Interconnection Procedures explains that the System Impact Study will “provide the requirements or potential impediments to providing the requested interconnection service, including a preliminary indication of the cost and length of time that would be necessary to correct any problems identified in those analyses and implement the interconnection,” along with “a list of facilities that are required as a result of the Interconnection Request and a non-binding good faith estimate of cost responsibility and a non-binding good faith estimated time to

(continued ...)

interconnection process is early enough in the development of a generation project such that the project developer likely has not purchased equipment to interconnect their project because they have not yet reached an agreement with the transmission provider on the interconnection requirements of the project, which occurs after the completion of the System Impact Study. In choosing to apply the reactive power requirements of this Final Rule to projects that have not executed a Facilities Study Agreement, the Commission is ensuring that a majority of newly interconnecting non-synchronous generators are subject to the requirements of this Final Rule without subjecting projects to additional costs after the interconnection requirements of the project have been established.<sup>151</sup> Further, as discussed in the Commission's determination in Section III.B, *Power Factor Range, Point of Measurement, and Dynamic Reactive Power Capability Requirements*, the new reactive power requirement for non-synchronous generators will be measured at the high-side of the generator substation and should not result in the increased costs of providing

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construct.” Section 5.0 of the System Impact Study Agreement attached to the *pro forma* Small Generator Interconnection Procedures as Attachment 7 provides the same.

<sup>151</sup> See, e.g., *Neptune Regional Transmission Sys., LLC v. PJM Interconnection, L.L.C.*, 110 FERC ¶ 61,098, at P 23 (“Each customer knows that subsequent cost allocations will be determined by circumstances that are known as of the time its System Impact Study is conducted. Projects may drop out of the queue and customers may move up the queue, but the cost allocation system insulates an interconnection customer from costs arising from events occurring after its System Impact Study is completed, other than costs arising from changes from higher-queued generators. . . . If an interconnection customer were to be held financially responsible for the costs of events occurring after its System Impact Study is completed it would be impossible for the customer to make reasoned business decisions.”), *order on reh'g*, 111 FERC ¶ 61,455 (2005), *aff'd sub nom. Pub. Serv. Elec. and Gas Co. v. FERC*, 485 F.3d 1164 (D.C. Cir. 2007).

dynamic reactive power at the Point of Interconnection that would substantially affect the financial viability of a non-synchronous generator in the interconnection queue that AWEA and LSA raise in their comments.

62. In addition, using the execution of a Facilities Study Agreement as the point in the interconnection process for transitioning to the requirements of this Final Rule represents a clearly defined point to avoid confusion in applicability. To further ensure clarity for newly interconnecting non-synchronous generators, we include in the revisions to section 9.6.1 to the *pro forma* LGIA and section 1.8.1 to *pro forma* SGIA this transition mechanism,<sup>152</sup> which we require transmission providers to adopt, as part of their compliance with this Final Rule.<sup>153</sup>

63. We also amend Appendix G to the *pro forma* LGIA, which public utility transmission providers are required to adopt, as part of their compliance with this Final Rule. Appendix G to the *pro forma* LGIA applies only to wind generators.<sup>154</sup> Those newly interconnecting wind generators that have executed a Facilities Study Agreement

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<sup>152</sup> See *infra* P 74 (providing the amended text of section 9.6.1 to the *pro forma* LGIA and section 1.8.1 to the *pro forma* SGIA).

<sup>153</sup> In *West Deptford Energy, LLC v. FERC*, 766 F.3d 10, 20 (D.C. Cir. 2014), the court explained that the tariff provisions in effect at the time an interconnection agreement is executed apply to that interconnection customer, “unless the amended tariff has a grandfathering provision.”

<sup>154</sup> See Order No. 661, FERC Stats. & Regs. ¶ 31,186, Appendix B (Appendix G – Interconnection Requirements for a Wind Generating Plant).



as of the effective date of this Final Rule will be subject to the amended Appendix G.<sup>155</sup> If Appendix G is not applicable to any newly interconnecting wind generators, the public utility transmission provider or RTO/ISO should remove Appendix G from its LGIA as part of its compliance filing. When all newly interconnecting wind generators that have executed Facilities Study Agreements as of the effective date of this Final Rule finalize their LGIAs and Appendix G is no longer necessary, we encourage the public utility transmission providers and RTOs/ISOs to file, or to include as part of, an FPA section 205 filing a proposal to remove Appendix G from their LGIA.

**b. Upgrades to Existing Non-Synchronous Generators**

64. Some commenters raise concerns with applying the requirements of this Final Rule to existing non-synchronous generators making upgrades that require new interconnection requests.<sup>156</sup> Generally, such generators would otherwise be exempt from the reactive power requirement. Lincoln argues that the proposed application of the new reactive power requirements to existing non-synchronous generators making upgrades could expose entities with existing power purchase agreements to unforeseen expenses.<sup>157</sup> As noted by AWEA and LSA, most upgrades that require new interconnection requests

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<sup>155</sup> See *infra* P 74 (providing the amended text of paragraph A.ii of Appendix G to the *pro forma* LGIA).

<sup>156</sup> AWEA and LSA Comments at 14; Lincoln Comments at 2.

<sup>157</sup> Lincoln Comments at 2.

do not involve fundamental changes to the original technology, or to the hardware, but instead simply involve software upgrades.<sup>158</sup>

65. We recognize that there are a variety of triggering points for a new interconnection request in the various transmission provider regions, and the fact that an existing non-synchronous generator making an upgrade may not be installing new equipment. We also acknowledge, as the Commission did in the NOPR, that not all existing wind generators are capable of providing reactive power without incurring substantial costs to install new equipment.<sup>159</sup> Therefore, we will not apply the requirements of this Final Rule to existing non-synchronous generators making upgrades that require new interconnection requests.<sup>160</sup> Rather, we will maintain the existing approach in Appendix

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<sup>158</sup> AWEA and LSA Comments at 14.

<sup>159</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 17.

<sup>160</sup> Given our determination not to adopt the NOPR proposal, we find moot AWEA and LSA's request that the Commission clarify what constitutes a "Material change" to a generator that would trigger a new interconnection study. We note that, on May 13, 2016, Commission staff held a technical conference on generator interconnection issues, exploring triggers for restudies, among other things. *See Review of Generator Interconnection Agreements and Procedures*, Supplemental Notice of Technical Conference, Docket Nos. RM16-12-000, RM15-21-000 (issued May 4, 2016); *Review of Generator Interconnection Agreements and Procedures*, Notice Inviting Post-Technical Conference Comments, Docket Nos. RM16-12-000, RM15-21-000 (issued June 3, 2016) (Question 1.10: "Should interconnection procedures be more specific about what constitutes a material modification to a generator interconnection request? Is it clear to interconnection customers what types of modifications to their interconnection requests would and would not affect their place in the queue? Do transmission owners and RTO/ISOs exercise any level of discretion in determining whether a customer has made a material modification? What is the range and nature of that discretion? Please reference provisions in interconnection procedures, as applicable, in your answer.").

G to the *pro forma* LGIA for existing non-synchronous generators making upgrades to their Generating Facilities that require new interconnection requests after the effective date of this Final Rule, meaning that those upgrades will be exempt from the requirement to provide reactive power unless the transmission provider's System Impact Study shows that provision of reactive power by that generator is necessary to ensure safety or reliability.

66. We decline AWEA and LSA's request that the reactive power requirement apply only to the incremental capacity that results from an upgrade in the event the System Impact Study shows the need for reactive power.<sup>161</sup> If a transmission provider's System Impact Study shows the need for reactive power as a result of an upgrade, the transmission provider should have the flexibility to require reactive power capability consistent with the needs identified in the study, including the ability to apply the reactive power requirements of this Final Rule to all of the generator's capacity. Otherwise, allowing a transmission provider to apply the reactive power requirements only to the incremental capacity that results from an upgrade would undermine the Commission's goal of ensuring adequate reactive power support for the transmission system.<sup>162</sup>

Therefore, we will give transmission providers the flexibility to apply the reactive power

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<sup>161</sup> AWEA and LSA Comments at 14-15.

<sup>162</sup> NOPR, FERC Stats. & Regs. ¶ 32,712 at P 11 (explaining the Commission's concern that the growing penetration of wind generators increases the potential for a deficiency in reactive power, and resulting local reliability issues).

requirements to all of an existing non-synchronous generator's capacity when that generator makes an upgrade that requires a new interconnection request, and the System Impact Study shows the need for reactive power.<sup>163</sup>

67. We require transmission providers to propose, as part of their compliance with this Final Rule, tariff revisions implementing the transition mechanism laid out above for existing non-synchronous generators making upgrades to their Generating Facilities that require new interconnection requests.

**F. Regional Flexibility**

68. Multiple commenters request that the Commission recognize independent entity variations for ISOs/RTOs and regional differences for transmission providers outside of ISOs/RTOs in evaluating compliance with the Final Rule.<sup>164</sup>

69. We apply here all three of the methods for proposing variations adopted in Order No. 2003: (1) variations based on Regional Entity reliability requirements; (2) variations that are "consistent with or superior to" the Final Rule; and (3) "independent entity

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<sup>163</sup> As with the existing approach, should an existing non-synchronous generator disagree with the transmission provider that the System Impact Study shows a need for reactive power as a result of the upgrade, it may challenge the transmission provider's conclusion through dispute resolution or appeal to the Commission. *See* Order No. 661, FERC Stats. & Regs. ¶ 31,186 at P 51.

<sup>164</sup> EEI Comments at 11; Indicated NYTOs Comments at 3; ISO-NE Comments at 11-12; ISO/RTO Council Comments at 3; Joint NYTOs Comments at 3; NEPOOL Initial Comments at 6; NEPOOL Supplemental Comments at 3-4.

variations” from ISOs/RTOs.<sup>165</sup> If a transmission provider seeks to justify variations from the requirements of this Final Rule, it may do so in its compliance filing. A transmission provider may propose to include standards developed by NERC or a Regional Entity in its own standard interconnection agreement. The Commission is mindful of the work being done by these organizations in developing standards for the interconnection of non-synchronous generators, and we strongly encourage all interested parties to continue to participate in developing these standards.

### **G. Miscellaneous Comments**

70. CAISO argues that the Commission should allow transmission providers to propose additional technical requirements for interconnecting non-synchronous generators related to voltage support, such as requiring automatic voltage control.<sup>166</sup> Transmission providers may propose additional technical requirements, to the extent they believe those are necessary, in a separate filing pursuant to section 205 of the FPA.

71. MATL requests clarification that the Commission will continue to accept tariff arrangements that require customers on merchant transmission lines to self-supply ancillary services. MATL specifically requests that this clarification be included in the final rule compliance obligation, and in similar future proceedings.<sup>167</sup> We clarify that

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<sup>165</sup> Order No. 2003, FERC Stats. & Regs. ¶ 31,146 at PP 824-827; *see also* Order No. 661, FERC Stats. & Regs. ¶ 31,186 at P 109.

<sup>166</sup> CAISO Comments at 8.

<sup>167</sup> MATL Comments at 5.

merchant transmission lines that have received exemptions from providing ancillary services will not be affected by this Final Rule. Therefore, those entities that do not have reactive power requirements in their Commission-approved OATTs will not need to submit a compliance filing in response to this Final Rule.

72. SCE requests that the Commission expand the scope of the rulemaking proceeding to include low voltage ride-through requirements for synchronous and non-synchronous Generating Facilities smaller than 20 MW.<sup>168</sup> We decline to expand the scope of the rulemaking proceeding to include low voltage ride-through requirements for synchronous and non-synchronous Generating Facilities smaller than 20 MW. We note that the Commission has issued a Notice of Proposed Rulemaking, *Requirements for Frequency and Voltage Ride Through Capability of Small Generating Facilities*, to consider these issues.<sup>169</sup>

73. AWEA and LSA request that the Commission limit the reactive power requirements to a specific range of voltage at the Point of Interconnection.<sup>170</sup> NERC also recommends that the Commission clarify the reactive power requirements by providing a

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<sup>168</sup> SCE Comments at 4.

<sup>169</sup> See *Requirements for Frequency and Voltage Ride Through Capability of Small Generating Facilities*, Notice of Proposed Rulemaking, 81 Fed. Reg. 15,481 (Mar. 23, 2016), 154 FERC ¶ 61,222 (2016).

<sup>170</sup> AWEA and LSA Comments at 7 (explaining the range of voltage and providing a proposed Q-V curve).

reactive capability versus voltage characteristic diagram.<sup>171</sup> We find the request to specify a voltage range for the reactive power requirements to be outside the scope of this proceeding. The existing *pro forma* LGIA and *pro forma* SGIA do not specify a voltage range for the reactive power requirement for synchronous generators, and the Commission does not have a sufficient record on which to create such a requirement.

#### **IV. Compliance and Implementation**

74. Section 35.28(f)(1) of the Commission's regulations requires every public utility with a non-discriminatory OATT on file to also have on file the *pro forma* LGIA and *pro forma* SGIA "required by Commission rulemaking proceedings promulgating and amending such interconnection procedures and agreements."<sup>172</sup> The Commission hereby revises section 9.6.1 of the *pro forma* LGIA to read:

##### **9.6.1 Power Factor Design Criteria**

**9.6.1.1 Synchronous Generation.** Interconnection Customer shall design the Large Generating Facility to maintain a composite power delivery at continuous rated power output at the Point of Interconnection at a power factor within the range of 0.95 leading to 0.95 lagging, unless the Transmission Provider has established different requirements that apply to all synchronous generators in the Control Area on a comparable basis. ~~The requirements of this paragraph shall not apply to wind generators.~~

**9.6.1.2 Non-Synchronous Generation.** Interconnection Customer shall design the Large Generating Facility to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 0.95 leading to 0.95 lagging, unless the Transmission Provider has established a different power

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<sup>171</sup> NERC Comments at 9-10.

<sup>172</sup> 18 C.F.R. § 35.28(f)(1) (2015).

factor range that applies to all non-synchronous generators in the Control Area on a comparable basis. This power factor range standard shall be dynamic and can be met using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors, or a combination of the two. This requirement shall only apply to newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement as of the effective date of the Final Rule establishing this requirement (Order No. 827).

The Commission similarly revises section 1.8.1 of the *pro forma* SGIA to read:

#### 1.8.1 Power Factor Design Criteria

1.8.1.1 Synchronous Generation. The Interconnection Customer shall design its Small Generating Facility to maintain a composite power delivery at continuous rated power output at the Point of Interconnection at a power factor within the range of 0.95 leading to 0.95 lagging, unless the Transmission Provider has established different requirements that apply to all similarly situated synchronous generators in the control area on a comparable basis. ~~The requirements of this paragraph shall not apply to wind generators.~~

1.8.1.2 Non-Synchronous Generation. The Interconnection Customer shall design its Small Generating Facility to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 0.95 leading to 0.95 lagging, unless the Transmission Provider has established a different power factor range that applies to all similarly situated non-synchronous generators in the control area on a comparable basis. This power factor range standard shall be dynamic and can be met using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors, or a combination of the two. This requirement shall only apply to newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement as of the effective date of the Final Rule establishing this requirement (Order No. 827).



In addition, the Commission revises paragraph A.ii of Appendix G to the *pro forma* LGIA, “Technical Standards Applicable to a Wind Generation Plant,” as follows:<sup>173</sup>

The following reactive power requirements apply only to a newly interconnecting wind generating plant that has executed a Facilities Study Agreement as of the effective date of the Final Rule establishing the reactive power requirements for non-synchronous generators in section 9.6.1 of this LGIA (Order No. 827). A wind generating plant to which this provision applies shall maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the Point of Interconnection as defined in this LGIA, if the Transmission Provider’s System Impact Study shows that such a requirement is necessary to ensure safety or reliability. The power factor range standard can be met by using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors if agreed to by the Transmission Provider, or a combination of the two. The Interconnection Customer shall not disable power factor equipment while the wind plant is in operation. Wind plants shall also be able to provide sufficient dynamic voltage support in lieu of the power system stabilizer and automatic voltage regulation at the generator excitation system if the System Impact Study shows this to be required for system safety or reliability.<sup>174</sup>

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<sup>173</sup> The full text of the *pro forma* LGIA will be posted on the Commission’s internet page at: <http://www.ferc.gov/industries/electric/indus-act/gi/stnd-gen.asp>. The full text of the *pro forma* SGIA will be posted on the Commission’s internet page at: <http://www.ferc.gov/industries/electric/indus-act/gi/small-gen.asp>.

<sup>174</sup> Section A.ii of Appendix G to the *pro forma* LGIA.

75. As in Order Nos. 2003<sup>175</sup> and 661,<sup>176</sup> the Commission is requiring all public utility<sup>177</sup> transmission providers to adopt the requirements of this Final Rule as revisions (as discussed above) to the LGIA and SGIA in their OATTs within 90 days after the publication of this Final Rule in the Federal Register.<sup>178</sup> Transmission providers that are not public utilities also 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>179</sup> As discussed above, we are not requiring changes to interconnection agreements already in effect, but are applying the requirements of this Final Rule to newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement. The requirements of this Final Rule also do not

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<sup>175</sup> Order No. 2003, FERC Stats. & Regs. ¶ 31,146 at P 910.

<sup>176</sup> Order No. 661, FERC Stats. & Regs. ¶ 31,186 at P 121.

<sup>177</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) (2012). 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 the *pro forma* LGIA and *pro forma* SGIA.

<sup>178</sup> MISO requests that the Commission extend the requirements of this Final Rule to the MISO *pro forma* Generator Interconnection Agreement and not just to the Commission's *pro forma* LGIA and *pro forma* SGIA. MISO Comments at 4-6. As stated, each public utility transmission provider subject to this Final Rule is directed to adopt the requirements of this Final Rule as revisions to the standard interconnection agreements in its OATT.

<sup>179</sup> Order No. 888, FERC Stats. & Regs. ¶ 31,036 at 31,760-63.

apply to existing non-synchronous generators making upgrades to their Generating Facilities that require new interconnection requests.

76. In some cases, public utility transmission providers may have provisions in the currently effective LGIAs and SGIAs in their OATTs related to the provision of reactive power by non-synchronous generators that the Commission has deemed to be consistent with or superior to the *pro forma* LGIA and *pro forma* SGIA. Where the relevant provisions of the *pro forma* LGIA and *pro forma* SGIA are modified by this Final Rule, public utility transmission providers must either comply with this Final Rule or demonstrate that their previously-approved LGIA and SGIA variations continue to be consistent with or superior to the *pro forma* LGIA and *pro forma* SGIA as modified by this Final Rule.

77. In addition, some ISOs/RTOs may have provisions in the currently effective LGIAs and SGIAs in their OATTs related to the provision of reactive power by non-synchronous generators that the Commission has accepted as an independent entity variation to the *pro forma* LGIA and *pro forma* SGIA. Where the relevant provisions of the *pro forma* LGIA and *pro forma* SGIA are modified by this Final Rule, ISOs/RTOs must either comply with this Final Rule or demonstrate that their previously-approved LGIA and SGIA variations continue to justify an independent entity variation from the *pro forma* LGIA and *pro forma* SGIA as modified by this Final Rule.

## **V. Information Collection Statement**

78. 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>180</sup> OMB's regulations require approval of certain information collection requirements imposed by agency rules.<sup>181</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.

79. The reforms adopted in this Final Rule revise the Commission's *pro forma* LGIA and *pro forma* SGIA in accordance with section 35.28(f)(1) of the Commission's regulations.<sup>182</sup> This Final Rule requires each public utility transmission provider to revise its *pro forma* LGIA and *pro forma* SGIA to: (1) eliminate the exemptions for wind generators from the requirement to provide reactive power; and (2) require that all newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement provide reactive power as a condition of interconnection as set forth in their LGIA or SGIA as of the effective date of this Final Rule. The reforms adopted in this Final Rule require filings of *pro forma* LGIAs and *pro forma* SGIAs with the Commission. The Commission anticipates the revisions required by this Final Rule, once implemented, will not significantly change currently existing burdens on an ongoing

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<sup>180</sup> 44 U.S.C. § 3507(d) (2012).

<sup>181</sup> 5 C.F.R. § 1320.11 (2015).

<sup>182</sup> 18 C.F.R. § 35.28(f)(1) (2015).

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 their compliance in the filing required 90 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>183</sup>

80. While the Commission expects the revisions adopted in this Final Rule will provide significant benefits, the Commission understands that implementation can be a complex and costly endeavor. 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. Therefore, the Commission retains the estimates proposed in the NOPR, with minor changes to reflect updated estimates.

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>184</sup>

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<sup>183</sup> 44 U.S.C. § 3507(d) (2012).

<sup>184</sup> Commission staff estimates that industry is similarly situated in terms of hourly cost (wages plus benefits). Based on the Commission's average cost (wages plus benefits) for 2015, \$72/hour is used.

<b>FERC 516B revisions in Final Rule in RM16-1</b>					
	<b>No. of Respondents<sup>185</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 (\$) Per Response</b> <b>(4)</b>	<b>Total Annual Burden Hrs. &amp; Total Annual Cost (\$)</b> <b>(3)*(4)=(5)</b>
Conforming LGIA changes to incorporate revisions	132	1	132	7.5 \$540	990 hours \$71,280
Conforming SGIA changes to incorporate revisions	118	1	118	7.5 \$540	885 hours \$63,720
<b>Total</b>			250	15 hours \$1,080	1,875 hours \$135,000

Cost to Comply: The Commission has projected the total cost of compliance as

follows:<sup>186</sup>

- Year 1: \$135,000 (\$1,080/utility)
- Year 2: \$0

After implementation in Year 1, the revisions adopted in this Final Rule would be complete.

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<sup>185</sup> Number of Applicable Registered Entities.

<sup>186</sup> The costs for Year 1 consist of filing revisions to the *pro forma* LGIA and *pro forma* SGIA with the Commission within 90 days of the effective date of this Final Rule plus initial implementation. The Commission does not expect any ongoing costs beyond the initial compliance in Year 1.

Title: FERC-516B, Electric Rate Schedules and Tariff Filings.

Action: Revisions to an information collection.

OMB Control No.: TBD

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 revisions in this Final Rule to the *pro forma* LGIA and *pro forma* SGIA to improve the reliability of the bulk power system by requiring all newly interconnecting non-synchronous generators to provide reactive power as a condition of interconnection, and to ensure that all generators are being treated in a not unduly discriminatory or preferential manner.

Internal Review: The Commission has reviewed the requirements in this Final Rule and has determined that such revisions 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.

81. 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](mailto:DataClearance@ferc.gov), phone: (202) 502-8663, fax: (202) 273-0873.

82. Comments on the collection of information and the associated burden estimates in this 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:

[oir\\_submission@omb.eop.gov](mailto:oir_submission@omb.eop.gov). Please reference the docket number of this rulemaking in your submission.

#### **VI. Regulatory Flexibility Act Certification**

83. The Regulatory Flexibility Act of 1980 (RFA)<sup>187</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.

84. 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 standards, some transmission owners will fall under the following category and

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<sup>187</sup> 5 U.S.C. § 601-12 (2012).



associated size threshold: electric bulk power transmission and control, at 500 employees.<sup>188</sup>

85. The Commission estimates that the total number of public utility transmission providers that would have to modify the LGIAs and SGIAAs within their currently effective OATTs is 132. Of these, the Commission estimates that approximately 43 percent are small entities (approximately 57 entities). The Commission estimates the average total cost to each of these entities will be minimal, requiring on average 15 hours or \$1,080. 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>189</sup> The Commission does not consider the estimated burden to be a significant economic impact. As a result, the Commission certifies that the revisions adopted in this Final Rule will not have a significant economic impact on a substantial number of small entities.

## **VII. Environmental Analysis**

86. 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>188</sup> 13 C.F.R. § 121.201, Sector 22 (Utilities), NAICS code 221121 (Electric Bulk Power Transmission and Control) (2015).

<sup>189</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>190</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>191</sup> The revisions adopted in this Final Rule update and clarify the application of the Commission's standard interconnection requirements to non-synchronous generators. 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**

87. 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>190</sup> *Regulations Implementing National Environmental Policy Act of 1969*, Order No. 486, FERC Stats. & Regs. ¶ 30,783 (1987).

<sup>191</sup> 18 C.F.R. § 380.4(a)(15) (2015).

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

88. 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.

89. 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**

90. The Final Rule is effective [**INSERT DATE 90 days from publication in FEDERAL REGISTER**]. However, as noted above, the requirements of this Final Rule will apply only to newly interconnecting non-synchronous generators that have not yet executed a Facilities Study Agreement. 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.

List of subjects in 18 C.F.R. Part 35

Electric power rates; Electric utilities; Non-discriminatory open access transmission tariffs

By the Commission.

( S E A L )

Kimberly D. Bose,  
Secretary.

## Appendix A

### List of Commenters (RM16-1-000)

<b>AWEA and LSA</b>	American Wind Energy Association and Large-scale Solar Association
<b>CAISO</b>	California Independent System Operator Corporation
<b>EI</b>	Edison Electric Institute
<b>EPSA</b>	Electric Power Supply Association
<b>Idaho Power</b>	Idaho Power Company
<b>Indicated NYTOs</b>	Consolidated Edison Company of New York, Inc.; Niagara Mohawk Power Corporation d/b/a National Grid; and Orange and Rockland Utilities, Inc.
<b>ISO/RTO Council</b>	ISO/RTO Council
<b>ISO-NE</b>	ISO New England Inc.
<b>ITC</b>	International Transmission Company d/b/a ITC Transmission; Michigan Electric Transmission Company, LLC; ITC Midwest LLC; and ITC Great Plains, LLC
<b>Joint NYTOs</b>	New York Power Authority; New York State Electric and Gas; Rochester Gas and Electric; and Central Hudson Gas and Electric
<b>Lincoln</b>	City of Lincoln, Nebraska d/b/a Lincoln Electric System
<b>MATL</b>	MATL LLP
<b>Midwest Energy</b>	Midwest Energy, Inc.
<b>MISO</b>	Midcontinent Independent System Operator, Inc.
<b>NaturEner</b>	NaturEner USA, LLC and its subsidiaries
<b>NEPOOL</b>	New England Power Pool Participants Committee
<b>NERC</b>	North American Electric Reliability Corporation
<b>NextEra</b>	NextEra Energy, Inc.
<b>PG&amp;E</b>	Pacific Gas and Electric Company
<b>Public Interest Organizations</b>	Center for Rural Affairs; Clean Wisconsin; Great Plains Institute; Natural Resources Defense Council; Sierra Club; Sustainable FERC Project; Western Grid Group; Wind on the Wires
<b>SCE</b>	Southern California Edison Company
<b>SDG&amp;E</b>	San Diego Gas and Electric Company
<b>Six Cities</b>	Cities of Anaheim, Azusa, Banning, Colton, Pasadena, and Riverside, California
<b>Union of Concerned Scientists</b>	Union of Concerned Scientists