

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

Reactive Power Requirements)
for Non-Synchronous Generation)
_____)

Docket No. RM16-1

Comments of the ISO/RTO Council

The ISO/RTO Council submits comments on the proposal of the Federal Energy Regulatory Commission to revise standard generator interconnection agreements to eliminate the exemptions for wind generators from the requirement to provide reactive power.¹ If adopted, the Commission's proposal would require all newly interconnecting generators that are subject to the interconnection procedures of an independent system operator (ISO) or regional transmission provider (RTO), including both synchronous and non-synchronous generators, to provide dynamic reactive power capability to the electricity grid. This proposal eliminates unduly discriminatory treatment as between synchronous and non-synchronous resources with respect to the requirement to provide reactive power capability. Technology enhancements, as well as the relatively modest incremental cost to non-synchronous resources of providing reactive power capability, support the Commission's proposal as just and reasonable. For these reasons, the ISO/RTO Council urges the Commission to adopt its proposal as soon as possible.

¹ *Reactive Power Requirements for Non-Synchronous Generation*, Proposal to Revise Standard Generator Interconnection Agreements (Proposal); RM16-1 (2015).

The ISO/RTO Council includes the Alberta Electric System Operator (AESO), the California Independent System Operator Corporation (CAISO), the Electric Reliability Council of Texas, Inc., (ERCOT) the Independent Electricity System Operator (IESO), ISO New England, Inc., (ISO-NE), the Midcontinent Independent System Operator, Inc. (MISO), the New York Independent System Operator, Inc. (NYISO), PJM Interconnection, L.L.C., (PJM) and the Southwest Power Pool (SPP). ERCOT, AESO and IESO are not subject to the Commission's jurisdiction and are not joining these comments.

I. Background

Since the adoption of Order 661 and Order 661-A, transmission providers have had to undertake time-consuming interconnection studies to assess whether a wind resource needs to provide reactive power capability in order to safely and reliably interconnect to the grid.² Last year, the Commission approved tariff revisions submitted by PJM Interconnection that require that all non-synchronous resources, including wind resources, seeking to interconnect to the grid use enhanced inverters and provide reactive power capability without requiring PJM to demonstrate the need for this capability in the interconnection study process.³ Other jurisdictions in North America have also established requirements for non-synchronous resources to provide reactive power capability as a condition of interconnection.⁴ Last month, the Essential Reliability Services Task Force of the North American Electric Reliability Corporation (NERC) determined that all new resources need to provide sufficient voltage control as an essential component of a reliable Bulk Power System.⁵

² *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).

³ *PJM Interconnection LLC*, 151 FERC ¶ 61,097 (2015)
<http://www.ferc.gov/CalendarFiles/20150505165917-ER15-1193-000.pdf>

⁴ For example, Electric Reliability Council of Texas, Inc. (ERCOT), a region that has well in excess of 14 GW of installed non-synchronous capacity, has had for years a uniform reactive power requirement that applies to all generation resources. See Protocol Section 3.15, Voltage Support.
<http://www.ercot.com/mktrules/nprotocols/current>.

See also, April 17, 2012 FERC Technical Conference on Reactive Power Resources (AD12-10-000), Transcript at 120:18-121:13. <http://www.ferc.gov/CalendarFiles/20120426074709-AD12-10-04-17-12.pdf>

⁵ See Abstract of NERC Essential Reliability Task Force Measures Framework Report dated December 2015:
<http://www.nerc.com/comm/Other/essntlrbltysrvcsstskfrDL/ERS%20Abstract%20Report%20Final.pdf>

The Commission is proposing to modify its *pro forma* large generator interconnection agreement and *pro forma* small generator interconnection agreement to eliminate the current exemption for wind generators from the requirement to provide reactive power. As a result, all new generators seeking to interconnect to the transmission system and all existing non-synchronous generators making upgrades to their generation facilities that require new interconnection requests will need to provide reactive power capability. The Commission proposes that these resources design their generating facilities to maintain a composite power delivery at continuous rated power output at the point of interconnection at a power factor of 0.95 leading to 0.95 lagging, or a different range if adopted by the transmission provider. Similar to reactive power provided by synchronous resources, the Commission proposes that reactive power capability installed by non-synchronous generators must be dynamic. The Commission also proposes to require that non-synchronous generators maintain the required power factor range only when the generator's real power output exceeds 10 percent of its nameplate capacity.

The ISO/RTO Council generally supports the Commission's proposed technical specifications, but requests that the Commission recognize appropriate independent entity variations and regional differences as part of compliance with a final order in this proceeding. For example, each ISO and RTO in the ISO/RTO Council does not uniformly agree that non-synchronous resources should maintain the required power factor range only when the generator's real power output exceeds 10 percent of its nameplate capacity. Instead, each ISO and RTO believes non-synchronous resources should provide reactive power capability in a manner comparable to synchronous

resources, with each ISO/RTO able to establish rules on a showing that their individual situation merits.

II. The Commission's proposal treats synchronous and non-synchronous resources in a comparable manner for purposes of reactive power.

As the number and size of non-synchronous resources increases, the Commission is appropriately proposing to require that all resources interconnecting to the transmission system provide reactive power capability. By extending this requirement to non-synchronous resources as a condition of interconnection - for those generators subject to an ISO's or RTO's interconnection process - the Commission is treating non-synchronous resources in a manner that is comparable to synchronous resources.

The disparate treatment of wind resources under Order 661 and Order 661-A as compared to synchronous resources may constitute undue discrimination among resource types and can create operational challenges.⁶ Non-synchronous resources use inverters to convert non-synchronized power into synchronized alternating current power that can flow on the transmission system. The ISO/RTO Council understands that current manufacturers routinely include reactive power capability in standard inverters used by non-synchronous resources, thereby making the cost of reactive power capability minimal.⁷ As such, there is no technical reason why non-synchronous resources should not provide this capability in a manner comparable to synchronous

⁶ Absent maintaining sufficient voltages, non-synchronous resources may face operational issues. See e.g. Bonneville Power Administration description of wind facilities having to operate at lower than optimal levels until they could provide voltage control even though Bonneville's interconnection studies did not detect voltage issues. April 17, 2012 FERC Technical Conference on Reactive Power Resources (AD12-10-000), Transcript at 150:24-152:16.

⁷ See e.g. Comments of Siemens. April 17, 2012 FERC Technical Conference on Reactive Power Resources (AD12-10-000), Transcript at 119:21-121:13.

resources. By requiring non-synchronous resources to provide reactive power capability as a condition of interconnection, the Commission can cure this unduly disparate treatment.

Operation and planning of the electric grid requires an adequate level of voltage support, which is provided by the generation and transmission that make up the grid. The most efficient and effective means of ensuring there is adequate voltage support from an operations and planning perspective is to require that all generators subject to the interconnection procedures of an ISO or RTO provide dynamic reactive power capability. This establishes a known and consistent baseline of capability to support system voltage needs. Transmission planners can then remedy any deficiencies through transmission infrastructure that provides voltage support. This approach is far more effective than trying to tailor voltage requirements of specific resources (in this case intermittent resources) relative to a grid that changes all the time. Trying to determine the voltage requirements of a non-synchronous resources through an interconnection study specific to a point in time may not reflect reality relative to a changing grid and creates the potential for voltage deficiencies. Transmission planners must remedy these deficiencies and they can result in shifting the cost to other entities (e.g. load paying for transmission equipment). Alternatively, establishing a known voltage baseline for all resources to provide reactive power capacity mitigates this risk and supports effective and efficient system operations and planning.

III. The cost of providing reactive power capability is not a significant percentage of overall project development costs for non-synchronous resources.

The cost of including reactive power capability as a percentage of total project costs is relatively small.⁸ The ISO/RTO Council recognizes that some entities may contest this fact and argue that applying a uniform reactive power requirement to non-synchronous resources creates significant capital cost.⁹ While the Commission's proposed uniform requirement for asynchronous resources to provide dynamic reactive power capability could impose higher inverter costs on those projects that would otherwise avoid such requirements through the system impact study approach, these costs are not significant capital costs. Inverter manufacturers have informed ISO/RTO Council members that a small percentage of total plant cost is attributable to inverters and associated equipment. This is a required cost because non-synchronous resources must use inverters to transfer synchronous power onto the electricity grid. As referenced above, reactive power capability is now a standard feature of inverters used in both wind and solar photovoltaic applications at the transmission system level. There is, therefore, no significant additional cost for reactive power capability. At most, developers may need to size their inverters appropriately to ensure they can provide reactive power capability as well as real power output they have committed to provide.

⁸ *Id.* at 141:10-124:6.

⁹ See e.g. Comments of the American Wind Energy Association in response to the April 22, 2014 workshop on Third Party Provision of Reactive Supply and Voltage Control and Regulation and Frequency Response Services filed in FERC Docket AD 14-7 at 7-8.
<http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13567273>

IV. Non-synchronous resources should receive compensation comparable to synchronous resources for reactive power capability for the provision/absorption of reactive power.

As part of its proposal, the Commission states that non-synchronous generators would be eligible for the same payments for reactive power as other generators and any compensation would be based on the cost of providing reactive power.¹⁰ The Commission seeks comment on whether the existing methods used to determine reactive power compensation are appropriate for wind generators and, if not, what alternatives would be appropriate.¹¹

The Commission should adopt an approach that takes into account that various approaches to compensate resources for reactive power capability exist in different ISO/RTO regions.¹² In this respect, the Commission should not adopt a uniform approach to compensating synchronous or non-synchronous resources for reactive power capability or the provision/absorption of reactive power in this proceeding. Nor should the Commission direct transmission providers to modify their compensation structures except as necessary to recognize new resource types as eligible to receive compensation for leading and lagging reactive power that they are capable of supplying to the grid. To this end, the Commission should allow synchronous and non-synchronous resources to receive comparable compensation, provided they are providing comparable services. To the extent it is necessary to modify compensation approaches for synchronous and non-synchronous facilities providing reactive power

¹⁰ Proposal at P 12.

¹¹ *Id.* at P 18.

¹² See generally Commission Staff Report, *Payment for Reactive Power* issued in AD14-7 date April 22, 2014 <http://www.ferc.gov/legal/staff-reports/2014/04-11-14-reactive-power.pdf>

capability, the Commission should allow transmission providers the opportunity to fashion any necessary revisions to their compensation rules on compliance.

V. Conclusion

The Commission should adopt its proposal to require all newly interconnecting generators that are subject to an ISO's or RTO's interconnection procedures, including both synchronous and non-synchronous generators, to provide reactive power capability to the electricity grid. The proposal eliminates unnecessary disparate treatment among resource types. Technology enhancements as well as the relatively modest incremental cost to non-synchronous resources of providing reactive power capability support the Commission's proposal as just and reasonable. The ISO/RTO Council generally supports the Commission's proposed technical specifications, but requests that the Commission recognize appropriate independent entity variations and regional differences as part of compliance with a final order in this proceeding.

Respectfully submitted,

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*Designated to receive service

Dated: January 27, 2016

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service lists in the above-referenced proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, California this 27th day of January 2016.

/s/ Anna Pascuzzo

Anna Pascuzzo