ORDER REJECTING TARIFF REVISIONS

(Issued August 6, 2018)

1. On March 14, 2018, Southwest Power Pool, Inc. (SPP) submitted, pursuant to section 205 of the Federal Power Act (FPA), proposed revisions to Attachment V of its Open Access Transmission Tariff (Tariff), to require the installation of Phasor Measuring Units (PMUs) at new generator interconnections. As discussed below, we reject SPP’s proposed Tariff revisions without prejudice to SPP submitting a revised PMU proposal in the future.


2 Attachment V contains SPP’s pro forma Generator Interconnection Agreements (GIAs). Specifically, Appendices 13 and 14 of the Attachment V, respectively, include the GIA and interim GIA applicable when Western Area Power Administration—Upper Great Plains Region is a party to the GIA as the transmission owner and Appendices 6 and 8 of the Attachment V, respectively, include the GIA and interim GIA applicable for all other SPP transmission owners.
I. Filing

2. SPP proposes to add a new Article titled “Phasor Measurement Recording Equipment” to Appendices 6, 8, 13, and 14 of Attachment V of its Tariff. SPP’s proposed Tariff revisions require that prior to the Initial Synchronization Date of a generating facility having capacity equal to or larger than 50 MW, PMU equipment must be installed by the transmission owner on the transmission owner’s side of the point of interconnection. The proposed Tariff revisions further state that the PMU equipment shall be funded by the interconnection customer, or funded by the transmission owner at the transmission owner’s discretion. The proposed Tariff revisions require the PMUs to be capable of gathering phasor measurements as specified in the SPP PMU Communications Handbook, be capable of streaming data to SPP in IEEE C37.118 or equivalent format, and at least be sufficient to determine (i) positive-sequence voltage magnitude and angle; (ii) positive-sequence current magnitude and angle; (iii) frequency; and (iv) rate of change of frequency. The proposed Tariff revisions also require that this data be transmitted over the data circuits specified in Article 8.1.

3. SPP states that the PMU devices and associated data will be used to (1) analyze oscillation modes in the SPP region; (2) analyze and benchmark voltage stability assessments against actual recorded data; (3) record phase angle differences to understand transmission stress; (4) perform model validation for operations and planning system stability studies; and (5) provide enhanced insight while researching grid events in post-event analysis. SPP asserts that the proposed Tariff revisions are just and

3 Proposed Tariff at Attachment V, Appendix 6, Article 8.5.

4 Proposed Tariff at Attachment V, Appendix 8, Article 8.4.

5 Proposed Tariff at Attachment V, Appendix 13, Article 8.5.

6 Proposed Tariff at Attachment V, Appendix 14, Article 8.4.

7 The Initial Synchronization Date is defined in SPP’s Generator Interconnection Procedures as “the date upon which the Generating Facility is initially synchronized and upon which Trial Operation begins.” SPP, Tariff, Attachment V, § 1 (4.0.0).

8 The PMU Communications Handbook is posted at: https://www.spp.org/spp-documents-filings/?id=61283.

9 Proposed Tariff at Attachment V, Appendices 6, 8, 13, 14.

10 SPP Filing at 4.
reasonable because the application of synchrophasor technology has the potential to improve overall system reliability, improve system model validation, and meet compliance with current or future North American Electric Reliability Corporation (NERC) requirements. SPP further states that the proposed Tariff revisions will help increase the number of deployed PMU installations in SPP and in turn support the proposed uses currently under development as part of SPP’s ongoing PMU Project.\(^{11}\)

4. SPP requests an effective date of May 13, 2018 for its proposed Tariff revisions.\(^{12}\)

II. Notice of Filing and Responsive Pleadings

5. Notice of SPP’s filing in Docket No. ER18-1078-000 was published in the Federal Register, 83 Fed. Reg. 12,377 (2018), with interventions and protest due on or before April 4, 2018. Timely motions to intervene were filed by Westar Energy, Inc.; NextEra Energy Resources, LLC; Western Farmers Electric Cooperative; E.ON Climate & Renewables North America LLC; and EDF Renewable Energy, Inc. American Wind Energy Association (AWEA) filed a motion to intervene out of time and comments.

6. On May 8, 2018, Commission staff issued a letter informing SPP that its filing was deficient and requesting additional information (Deficiency Letter). On June 7, 2018, SPP submitted a response to the Deficiency Letter (Deficiency Response). Notice of SPP’s Deficiency Response in Docket No. ER18-1078-001 was published in the Federal Register, 83 Fed. Reg. 27,980 (2018), with interventions and protests due on or before June 28, 2018. None was filed.

III. Comments

7. AWEA argues that SPP’s proposed Tariff revisions raise a number of questions. Specifically, AWEA questions the extent to which transmission owners should be required to fund PMU installations.\(^{13}\) AWEA also questions whether it is appropriate for SPP to not address funding obligations in its proposed Tariff revisions. AWEA states that as drafted, the proposed Tariff provisions allow the transmission owner to exercise market power and force the interconnection customer to fund the installation, otherwise the GIA will not be executed.\(^{14}\)

\(^{11}\) Id.

\(^{12}\) Id. at 5.

\(^{13}\) AWEA Comments at 2.

\(^{14}\) Id. at 2-3.
8. AWEA states that SPP’s proposed Tariff revisions contain no language concerning assessing the costs of the installation of the communications equipment. According to AWEA, the cost of needed communications equipment upgrades varies greatly based on location, the amount of data that must be transmitted, and how soon, relative to real-time, the data must be transmitted.\(^ {15} \) AWEA states that the Commission should consider whether there should be a mechanism for waiving the PMU requirement if the cost of installing communications equipment at a particular location exceeds the incremental benefits.\(^ {16} \) AWEA also argues that SPP provides insufficient evidence that its proposed 50 MW threshold is more appropriate than others, such as the 100 MW threshold under the PJM tariff, or NERC’s registration requirement threshold of 75 MVA.\(^ {17} \)

9. AWEA argues that under PJM’s PMU requirements, which were previously accepted by the Commission,\(^ {18} \) the Commission made it clear that the placement of the PMU equipment on the generator side of the interconnection was a significant reason for why the generator should bear the associated costs. AWEA questions to what degree the interconnection customer is a beneficiary in SPP’s proposal, given the proposed placement of PMUs on the transmission owner’s side of the point of interconnection.\(^ {19} \)

10. AWEA states that SPP should clarify how upfront and ongoing communications costs will be apportioned and recovered from beneficiaries. AWEA notes that unlike in PJM, SPP’s proposal requires the interconnection customer to bear the communication costs.\(^ {20} \) AWEA argues further that SPP should clarify the magnitude and allocation of responsibility and ongoing costs for operating and maintaining the PMUs and associated communications equipment.\(^ {21} \)

11. AWEA questions whether it is appropriate for the interconnection customer or the transmission owner to bear the costs of conducting real-time monitoring of PMU data,

\(^{15}\) Id. at 3.

\(^{16}\) Id.

\(^{17}\) Id. at 6.


\(^{19}\) AWEA Comments at 2.

\(^{20}\) Id. at 3.

\(^{21}\) Id. at 4-5.
when only some of the data uses stated by SPP require data to be provided close to real-time. AWEA states that SPP should clarify how soon real-time data must be reported.\textsuperscript{22}

12. AWEA states that because some generators already deploy PMUs at their facilities, SPP should allow generation owners to comply by providing data from PMUs owned by the generation owner and/or sited on the generator side of the point of interconnection.\textsuperscript{23}

13. AWEA argues that SPP’s proposed Tariff revisions do not include sufficient detail regarding important terms and conditions that affect costs, particularly the extent to which interconnection customers can utilize existing equipment, such as relays or digital fault records with phasor measurement capabilities, and how long PMU data will have to be stored locally.\textsuperscript{24}

IV. Deficiency Letter and Response

A. System Reliability, Model Validation, and NERC Requirements

14. Commission staff requested that SPP explain how the proposed Tariff revisions may improve overall system reliability, system model validation, and ensure compliance with current or future NERC requirements. In response, SPP states that a primary function of PMU equipment is to monitor and detect forced oscillations at substations, an ability which significantly enhances SPP’s ability to maintain reliable system operations. SPP states that under its proposal, streaming data can be continuously analyzed for problems, allowing for more targeted responses to potential system disturbances and quicker restoration. SPP also states that reliability and resiliency improvements will logically follow from PMU applications that will offer enhanced, wide-area situational awareness, oscillation detection, phase angle monitoring and more accurate voltage stability assessments. SPP states that PMU applications are already in use on certain portions of the SPP system, and that these applications have contributed to more effective observation of system conditions and improved post-event analysis.\textsuperscript{25}

15. With respect to system model validation, SPP states that the time granularity and geographic specificity of synchrophasor data make it well-suited for model validation. SPP explains that from the generator owner’s perspective, online verification using high -

\textsuperscript{22}\textit{Id.} at 4.

\textsuperscript{23}\textit{Id.} at 5-6.

\textsuperscript{24}\textit{Id.} at 5.

\textsuperscript{25}SPP Deficiency Response at 2.
resolution PMU data can help demonstrate compliance with NERC Reliability Standards MOD-026-1 and MOD-027-1. SPP states that this validation can be done more frequently and without requiring the generator owner to take the unit offline for testing of model parameters, which can be costly and time consuming. SPP states that PMU devices are also capable of recording on-line events and activity that may not be observable in off-line field generator testing. SPP further states that PMU data can be used as part of system model validation studies related to MOD-033-1 compliance.26

16. With regard to how the proposed Tariff revisions may ensure compliance with NERC requirements, SPP states that PMU devices can be used to comply with portions of the NERC Reliability Standard PRC-002-2, addressing Disturbance Monitoring and Reporting. SPP states that PRC-002-2 requires disturbance monitoring equipment to be installed at critical substations and specifies that these devices be synchronized to Coordinated Universal Time and support data output of at least 30 samples/sec. SPP states that the standards also specify that event data from these devices must be provided within 30 calendar days of request, and that PMUs by design comply with these NERC requirements. SPP states that although PRC-002-2 does not require the data to be streamed in real-time, doing so affords engineers the opportunity to analyze the data with automated tools that can verify the data is recording correctly prior to needing it for compliance after a disturbance occurs.27

B. Point of Installation of PMU

17. Commission staff also requested that SPP explain the factors or considerations leading to the proposal to require that PMU equipment be installed at the transmission owner’s side of the point of interconnection rather than the interconnection customer’s side. In its response, SPP states that NERC’s Reliability Guideline for PMU Placement and Installation instructs that PMUs should monitor at either the high- or low-side of the generator step-up transformer to capture the location of forced oscillations. SPP continues that the guideline notes that placing the PMU on the high-side (i.e., transmission side, as proposed by SPP) supports additional proposed uses such as plant model verification, frequency response analysis, island detection, variable energy resource integration, and more. SPP further states that its choice to place the PMU equipment at the high-side of the generator step-up transformer also helps to reduce costs by limiting the number of connections necessary to transfer PMU data to SPP.28

26 Id. at 3.

27 Id.

28 Id. at 4.
18. Commission staff requested that SPP explain whether SPP believes the benefits of PMUs installed on the transmission owner’s side of the point of interconnection accrue to the transmission owner or the interconnection customer, and explain how such benefits inform SPP’s proposal to have the interconnection customer bear the fixed cost of PMU installation. In its response, SPP states that for a new generator being connected to SPP along with PMU equipment, the initial beneficiary is the generator/interconnection customer. SPP states that PMUs facilitate more accurate on-line model validation, regardless of whether the PMU equipment is on the transmission-side of the point of interconnection, or the generator-side. SPP further states that because generators are the primary cause of the forced oscillations monitored by PMU equipment, it is appropriate that the cost of installing such equipment at new generator sites be assigned to the interconnection customers themselves.\textsuperscript{29} SPP explains that by placing the PMU equipment at the high-side of the generator step-up transformer, the number of connections necessary to stream PMU data to SPP is reduced, which, in turn, reduces required capital and administrative costs. Similarly, SPP states that its proposal to have the transmission owner, rather than the interconnection customer, transmit PMU data to SPP requires fewer network paths across the SPP footprint, thereby reducing costs and sparing interconnection customers the cost and responsibility of maintaining the additional communication paths that would otherwise be required.\textsuperscript{30}

C. Use of Real-Time PMU Data

19. Commission staff requested SPP to explain the extent to which SPP will monitor the PMU data in real-time. In its response, SPP states that although the current system is an information-only system used by engineers and not intended for use in making real-time reliability decisions, SPP envisions a future PMU project that creates a NERC Critical Infrastructure Protection compliant PMU system and adds real-time reliability operator procedures once SPP’s PMU coverages increases. SPP states that the larger PMU coverage and a Critical Infrastructure Protection compliant PMU system will allow for continuous, real-time recording of phase angle differences in order to evaluate transmission system stress and perform more effective and timely voltage stability assessments.\textsuperscript{31}

D. Cost of Equipment and Cost Allocation

20. Commission staff requested an estimate of the cost of PMU equipment from SPP, and asked whether the cost would be greater for remote areas that lack strong

\textsuperscript{29} Id. at 5.

\textsuperscript{30} Id.

\textsuperscript{31} Id. at 5-6.
communication links. SPP responds that it assessed the cost of a new standalone PMU relay to be less than $10,000, and also considered Department of Energy estimates of the average overall costs per PMU that ranged from $40,000 to $180,000. SPP acknowledges that PMU-related costs vary depending on the site and nature of equipment to be installed, particularly if the installation requires additional communications beyond those already required in the GIA process. However, SPP asserts that these costs are nonetheless relatively minor compared to the overall cost of an interconnection buildout.\textsuperscript{32}

21. Commission staff additionally sought from SPP an explanation of its choice of 50 MW as the threshold above which interconnection customers would be required to install PMUs. In its response, SPP explains that the proposed 50 MW threshold was the product of stakeholder discussions and adapted from NERC’s suggested 100 MVA threshold for PMU placement. SPP continues that in light of the large number of wind resources across its footprint, along with the potential for significant growth in solar resources, setting the PMU deployment threshold at 50 MW bolsters system reliability by capturing a greater percentage of new wind and solar resources.\textsuperscript{33}

22. Commission staff further requested that SPP explain the criteria that a transmission owner would use in determining whether to exercise its discretion to fund PMU installations. Commission staff also inquired as to if this aspect of SPP’s proposal would result in unduly discriminatory behavior if a transmission owner chooses to only exercise its discretion to fund PMU installations for affiliated interconnection customers and not for unaffiliated interconnection customers. In response, SPP states that the Commission has approved comparable funding optionality in similar contexts. SPP states that, for example, under the PJM tariff, the interconnection customer has the option of paying for the necessary metering equipment associated with its interconnection, but if it does not exercise this option, the transmission owner has the option, but not the responsibility, to fund the equipment.\textsuperscript{34} SPP adds that its existing Tariff includes the same optionality for funding of metering and related communications equipment.\textsuperscript{35} SPP states that it merely seeks to provide transmission owners with the option to fund PMU installations in situations where the transmission owner judges that such an option is warranted. SPP continues that providing this option does not pose any threat of

\textsuperscript{32} Id. at 6-7.

\textsuperscript{33} Id. at 7-8.

\textsuperscript{34} Id. at 8 (citing PJM, Open Access Transmission Tariff, Attachment O, Appendix 2 § 8.1).

\textsuperscript{35} Id. at 9 (citing SPP, Tariff, Attachment V, Appendix 6, Article 8.2).
economic discrimination to any generator or interconnection customers. Finally, SPP states that it is indifferent as to the source of PMU installation funding, that its assessment of PMU deployment costs does not depend on whether an interconnection customer is affiliated with a transmission owner, and that it does not have any ability to second-guess a transmission owner’s decision to fund PMU costs.\(^{36}\)

**E. Other Issues**

23. Commission staff requested that SPP clarify how ongoing communication and maintenance costs would be allocated under its proposal. SPP states that the interconnection customer will be responsible for ongoing PMU operation and maintenance expenses, as well as for communication costs from the PMU to the transmission owner’s phasor data concentrator. SPP states that once a fully Critical Infrastructure Protection compliant PMU system is established at SPP, SPP will assume the costs of ongoing communication and maintenance from the transmission owner to SPP.\(^{37}\)

24. In response to Commission staff’s inquiry about the applicability of the proposed Tariff revisions to interconnection customers already in the interconnection queue, SPP clarifies that the proposed Tariff revisions would apply to any GIA executed after the approved effective date.\(^{38}\) Commission staff also requested that SPP explain the extent to which new interconnection customers could satisfy SPP’s proposed requirements for the installation of PMUs with existing equipment. SPP states that transmission owners may elect to use existing equipment based on their judgment of how best to comply with NERC standards and interconnection requirements, noting that existing digital relays must be Critical Infrastructure Protection compliant.\(^{39}\) Finally, Commission staff requested that SPP explain how long PMU data would have to be stored locally. SPP states that it does not propose any such requirement.\(^{40}\)

36 Id. at 9.

37 Id.

38 Id.

39 Id. at 10.

40 Id.
V. Discussion

A. Procedural Matters

25. Pursuant to Rule 214 of the Commission’s Rules of Practice and Procedure, 18 C.F.R. § 385.214 (2017), the timely, unopposed motions to intervene serve to make the entities that filed them parties to this proceeding. Pursuant to Rule 214(d) of the Commission’s Rules of Practice and Procedure, 18 C.F.R. § 385.214(d) (2017), the Commission grants AWEA’s late-filed motion to intervene given its interest in the proceeding, the early stage of the proceeding, and the absence of undue prejudice or delay.

B. Commission Determination

26. We reject the proposed Tariff revisions without prejudice to SPP submitting a revised proposal in the future. We find that the language in the proposed Tariff revisions regarding funding for the installation of PMUs is unclear and may be unjust and unreasonable, and unduly discriminatory or preferential.

27. Specifically, SPP has not shown that its proposal to give the transmission owner the option of funding the installation is just and reasonable and not unduly discriminatory or preferential. A transmission owner’s decision to exercise its discretion to fund PMU installations only when its affiliate is the interconnection customer could result in affiliated interconnection customers having lower costs than non-affiliated interconnection customers, which could give the affiliates an undue competitive advantage.

28. In addition, SPP has not addressed how transmission owners would account for the costs of PMU installations that they incur for their own generators or for generators of affiliated interconnection customers, and how such costs would be treated under the transmission owners’ transmission formula rates in order to prevent unreasonable and/or unduly discriminatory transmission rates (i.e., where unaffiliated interconnection customers could fund PMU installations for their own generators and also be made to pay for PMU installations for generators owned by the transmission owner and/or its affiliates through the transmission owner’s embedded cost transmission rates).\footnote{For example, in Order No. 2003 the Commission required all transmission owners to remove from their transmission rates the costs of interconnection facilities (e.g., generator step-up transformers) constructed for the transmission owner’s own generating facilities, in order to ensure that the transmission owner’s own generators and those of its competitors are treated comparably. See Standardization of Generator Interconnection Agreements and Procedures, Order No. 2003, FERC Stats. & Regs.}
29. We are also not persuaded by SPP’s assertion that its proposal is consistent with other tariff provisions previously accepted by the Commission, such as Attachment V, Appendix 6, Article 8.2 of SPP’s Tariff, which governs the installation of remote terminal units. Article 8.2 does not provide the transmission owner with the option to fund remote terminal unit installations, as SPP claims. Rather, Article 8.2 provides for remote terminal unit installation solely at the expense of the interconnection customer: “a Remote Terminal Unit … shall be installed by Interconnection Customer, or by Transmission Owner at Interconnection Customer’s expense.”\(^{42}\) Similarly, the PJM tariff provision that SPP cites only allows for metering equipment to be installed at the interconnection customer’s expense, not the transmission owner’s expense.\(^{43}\)

30. Moreover, we find that SPP’s proposed Tariff language does not include certain details that could affect the costs of PMUs and who bears those costs. Specifically, SPP’s proposed Tariff revisions fail to specify who will be responsible for ongoing PMU communication and operation and maintenance expenses. While SPP explains who will be responsible for such costs in its Deficiency Response, this information is not included in the proposed Tariff revisions.\(^{44}\) Additionally, while SPP’s Deficiency Response explains that existing equipment, such as relays or fault recorders, could potentially satisfy the proposed PMU requirements,\(^{45}\) SPP’s proposed Tariff revisions do not include such language.

31. Our rejection of SPP’s Tariff revisions is without prejudice to SPP refiling its PMU proposal without the proposed language permitting transmission owners to fund PMU installations at their discretion, which, as discussed above, may be unduly discriminatory or preferential. In addition, any subsequent proposal should be clear in explaining how transmission owners will treat PMU installation costs in order to avoid including them in transmission rates, because doing so could effectively result in non-

\(^{42}\) SPP, Tariff, Attachment V, Appendix 6, Article 8.2 (9.0.0) (emphasis added).

\(^{43}\) PJM, Open Access Transmission Tariff, Attachment O, Appendix 2, § 8.1 (0.0.0).

\(^{44}\) See supra P 23.

\(^{45}\) See supra P 24.
affiliate customers subsidizing PMU installations for generators belonging to transmission owners and/or their affiliated interconnection customers.\textsuperscript{46} Also, any subsequent proposal should include Tariff language regarding responsibility for ongoing PMU communication and operation and maintenance expenses.\textsuperscript{47} Finally, any subsequent proposal should include Tariff language clarifying the extent to which the interconnection customer can utilize existing equipment, such as relays or digital fault recorders with phasor measurement capabilities, or provide data from PMUs already deployed by the interconnection customer and/or sited on the generator side of the point of interconnection.\textsuperscript{48}

**The Commission orders:**

SPP’s proposed Tariff revisions are hereby rejected without prejudice, as discussed in the body of this order.

By the Commission.

( S E A L )

Kimberly D. Bose, 
Secretary.

\textsuperscript{46} For example, SPP transmission owners could address these concerns through classification of PMU costs to generator plant accounts and/or revisions to their transmission formula rates to exclude such costs from calculation of their transmission rates.

\textsuperscript{47} For example, PJM’s tariff states that the interconnection customer is required to maintain, at its expense, communication equipment capable of carrying PMU data to a local data concentrator, and that the transmission owner will provide for the ongoing support and maintenance of network communications linking the data concentrator to the transmission owner. PJM, Open Access Transmission Tariff, Attachment O, Appendix 2, § 8.5.3 (1.0.0).

\textsuperscript{48} For example, PJM’s tariff states that interconnection customers could satisfy the PMU requirement by installing “similar quality equipment, such as relays or digital fault recorders, that can collect data at least at the same rate as PMUs and which data is synchronized via a high-accuracy satellite clock.” PJM, Open Access Transmission Tariff, Attachment O, Appendix 2, § 8.5.3 (1.0.0).