170 FERC ¶ 61,100
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Neil Chatterjee, Chairman;
Richard Glick and Bernard L. McNamee.

Southwest Power Pool, Inc. Docket Nos. ER19-2845-000
ER19-2845-001

ORDER ACCEPTING TARIFF REVISIONS

(Issued February 14, 2020)

1. On September 20, 2019, Southwest Power Pool, Inc. (SPP) submitted, pursuant to section 205 of the Federal Power Act (FPA)[1] and Part 35 of the Commission's regulations,[2] proposed revisions to Attachment V[3] of its Open Access Transmission Tarff (Tariff) to require the installation of Phasor Measurement Units (PMU) at new generator interconnections. As discussed below, we accept SPP's proposed Tariff revisions, effective November 20, 2019.

I. Background

2. On March 14, 2018, SPP submitted proposed Tariff revisions in Docket No. ER18-1078 (March 2018 Filing) to require the installation of PMUs at new generator interconnections. On August 6, 2018, the Commission rejected without prejudice the March 2018 Filing.[4] The Commission noted that any future refiling

[1] 16 U.S.C. § 824d (2018).

[2] 18 C.F.R. pt. 35 (2019).

[3] Attachment V contains SPP's *pro forma* Generator Interconnection Agreements (GIAs). Specifically, as relevant to the instant filing, Appendices 13 and 14 of 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.

[4] *Sw. Power Pool, Inc.*, 164 FERC ¶ 61,087 (2018) (August 2018 Order).

should: (1) ensure that transmission owners are not permitted to fund PMU installations at their discretion; (2) explain how transmission owners will treat PMU installation costs in order to avoid including them in transmission rates; (3) clarify responsibility for ongoing PMU communication and operation and maintenance expenses; and (4) clarify 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.[5]

II. Filing

3. SPP proposes to add a new article titled "Phasor Measurement Unit (PMU) Recording Equipment" to Appendices 6,[6] 8,[7] 13,[8] and 14[9] of Attachment V of its Tariff. SPP's proposed Tariff revisions require that, prior to the Initial Synchronization Date[10] 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 change of ownership. The proposed Tariff revisions further state that the PMU equipment shall become part of the transmission owner's interconnection facilities and will be funded by the interconnection customer.

4. The proposed Tariff revisions require the PMUs to be capable of gathering phasor measurements as specified in the SPP PMU Communications Handbook,[11] be capable of streaming data to SPP in IEEE C37.118 or equivalent format, and at least be sufficient to determine (1) positive-sequence voltage magnitude and angle; (2) positive-sequence current magnitude and angle; (3) frequency; and (4) rate of change of frequency. The

[5] *Id.* P 31.

[6] SPP Tariff, attach. V, app. 6, art. 8.5.

[7] *Id.* attach. V, app. 8, art. 8.4.

[8] *Id.* attach. V, app. 13, art. 8.5.

[9] *Id.* attach. V, app. 14, art. 8.4.

[10] 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." *Id.* attach. V, § 1 (4.0.0).

[11] The SPP PMU Communications Handbook is posted at: https://www.spp.org/documents/55158/spp%20pmu%20communication%20handbook%20v1.0.pdf.

proposed Tariff revisions also require that this data be transmitted over the data circuits specified in Article 8.1. SPP proposes that to the extent similar quality equipment is being added or already exists, 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, such equipment can be utilized to satisfy this requirement if the equipment is located on the transmission owner's side of the point of change of ownership and if mutually agreed to by the interconnection customer and transmission owner.

5. SPP requests an effective date of November 20, 2019 for its proposed Tariff revisions.

III. Notice and Responsive Pleadings

6. Notice of SPP's filing was published in the *Federal Register*, 84 Fed. Reg. 51,532 (2019), with interventions and protests due on or before October 11, 2019. Timely motions to intervene were filed by American Electric Power Service Corporation, GridLiance High Plains LLC, Mid-Kansas Electric Company, Inc., and Sunflower Electric Power Corporation. ITC Great Plains, LLC filed a motion to intervene out of time. EDP Renewable North America, LLC and RWE Renewables Americas, LLC (jointly, SPP Generation Developers) filed timely motions to intervene and a protest.

7. On November 5, 2019, SPP filed an answer to SPP Generation Developers' protest (SPP Answer). On December 16, 2019, SPP responded (Deficiency Response) to a letter issued by the Commission staff informing SPP that its filing was deficient and requesting additional information. Notice of SPP's Deficiency Response was published in the *Federal Register*, 84 Fed. Reg. 72,354 (2019), with interventions and protests due on or before January 6, 2020. None was filed.

IV. Comments

8. SPP Generation Developers state that they generally support PMUs and do not oppose bearing PMU installation costs as a condition of interconnection service.[12] However, SPP Generation Developers assert that SPP has not justified its proposal to assign PMU communications and operation and maintenance expenses to the interconnection customer. SPP Generation Developers contend that SPP has not supported its proposal to characterize PMUs as transmission owner interconnection facilities, and that PMUs should instead be considered network upgrades because they generally benefit all transmission system users. SPP Generation Developers aver that classifying PMUs in this manner is consistent with the SPP Tariff's definition of network

[12] SPP Generation Developers Protest at 2.

upgrades.[13] SPP Generation Developers also note that assigning ongoing PMU communications and operations and maintenance expense to transmission customers is consistent with the current practice in PJM Interconnection, L.L.C. (PJM).[14] According to SPP Generation Developers, the various system-wide operational benefits of PMUs cited by SPP in its proposal are further evidence that ongoing PMU communications and operations and maintenance expenses should be considered network upgrades. SPP Generation Developers insist that these costs should be borne generally even if the Commission does not find that PMUs should be classified as network upgrades because of the Commission's "beneficiary pays" principle, and regardless of SPP's proposed PMU placement on the interconnection customer side of the point of interconnection rather than the transmission owner side.[15]

9. SPP Generation Developers assert that SPP provides no information about PMU communications costs, which can be significant in parts of SPP that lack strong communications links.[16] In addition, SPP Generation Developers state that to their knowledge SPP only has the tools to perform *ex post* assessments with PMU data. SPP Generation Developers argue that it is unreasonable for SPP to require streaming of PMU data until it has processes in place to use PMU data in real-time in order to optimize transmission system capacity to the benefit of interconnection customers.[17] Further, SPP Generation Developers contend that SPP's proposed 50 MW threshold constitutes a disproportionate burden for smaller generation projects. SPP Generation Developers assert that the 100 MW threshold in PJM, or potentially the 75 MVA North American Electric Reliability Corporation (NERC) registration requirement threshold, are more reasonable.[18]

10. In its answer, SPP argues that assigning to the interconnection customer the costs of PMU installation and associated communications equipment necessary to send PMU data to the transmission owner's phasor data concentrator is consistent with cost causation principles because the PMU equipment will monitor and detect oscillations at

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[13] *Id.* at 3.

[14] *Id.* (citing *PJM Interconnection, L.L.C.*, 145 FERC ¶ 61,280, at P 7 (2013)).

[15] *Id.* at 4-5.

[16] *Id.* at 5.

[17] *Id.* at 6-7.

[18] *Id.* at 7-8.

substations, which tend to increase with the interconnection of a new generator.[19] SPP states that such cost responsibility is consistent with articles 7 and 8 of SPP's GIA, which require that the interconnection customer be responsible for the costs of metering and communication equipment.[20] SPP states that the proposed requirement for the interconnection customer to be responsible for the ongoing PMU operation and maintenance costs similarly aligns with existing provisions in the GIA.[21] SPP notes that interconnection customers will benefit from the ability to analyze PMU data recorded while the generating facility was running rather than having to take the generating facility offline to perform studies. SPP also states that interconnection customers may benefit from PMUs by using their data to comply with NERC reliability standards such as MOD-026 and MOD-027.[22] SPP states that interconnection customers also benefit from reduced or shortened system oscillations.[23] SPP states that it is currently using real-time PMU data to monitor oscillations, and reiterates that the 50 MW threshold is appropriate due to the high number of wind resources in the SPP footprint, and the potential for significant growth in solar and electric storage resources.[24] SPP explains that these types of inverter-based generators can cause greater oscillations than more conventional, non-variable resources and, for that reason, require more rigorous monitoring.[25]

11. SPP argues that designation of PMU equipment as transmission owner interconnection facilities is appropriate because placement of the equipment on the transmission side of the generator step-up transformer by definition requires designation of the PMU as transmission owner interconnection facilities.[26] SPP explains that its proposed placement of the PMU equipment is consistent with NERC guidelines.[27] Furthermore, SPP states that PMUs are sole use facilities because they would not be

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[19] SPP Answer at 4.

[20] *Id.* at 3 (citing SPP Tariff, attach. V, app. 6 §§ 7.1, 8.1).

[21] *Id.* (citing SPP Tariff, attach. V, app. 6 §§ 7.1, 10.5).

[22] *Id.* at 7-8.

[23] *Id.* at 8.

[24] *Id.* at 8-11.

[25] *Id*. at 9.

[26] *Id.* at 4-5 (citing SPP Tariff, attach. V, § 1).

[27] *Id.* at 6.

needed but for the interconnection of the generating facility, due to the unique way a generating facility can impact the transmission system. Thus, SPP argues, PMUs meet the "sole use" aspect of transmission owner interconnection facilities as defined in the SPP Tariff.[28] SPP contends that PMUs are not network upgrades (which would not meet the definition of transmission owner interconnection facilities), because the Commission previously found that the "but for" test that applies to network upgrades did not apply to PMUs.[29]

12. Regarding communication equipment, SPP notes that interconnection customers in both SPP and PJM have similar cost responsibility for PMU communication equipment.[30] SPP states that its proposal aims to further reduce total costs by leveraging the existing communication equipment between SPP and the transmission owner's data centers rather than requiring additional communication links between SPP and each new interconnection customer.[31]

V. Deficiency Letter and Response

A. Rate Treatment of PMU Installation Costs

13. Commission staff requested that SPP explain how its proposal ensures transmission owners will not include PMU installation costs in transmission rates in cases where the transmission owner installs PMUs on behalf of its own generation. In response, SPP states that when a transmission owner installs PMUs for a generation interconnection customer, the PMU costs will be directly assigned to that customer under its GIA. SPP asserts that transmission owners may only recover costs for facilities in transmission rates if they are transmission facilities under Attachment AI of the Tariff. SPP notes that direct assignment facilities are listed in Attachment AI as excluded facilities that are not transmission facilities. SPP states that, as with other excluded facilities, transmission owners are responsible for correctly classifying PMU costs to

[28] *Id.* at 5 (citing SPP Tariff, attach. V, § 1).

[29] *Id.* (citing *PJM Interconnection, L.L.C.*, 145 FERC ¶ 61,280 at P 16).

[30] *Id.* at 7.

[31] *Id.*

ensure they are not included in transmission rates. SPP explains that it does not dictate how those exclusions are to be accomplished, and that transmission owners handle them through methods such as booking the costs in non-transmission accounts or excluding the costs from their formula rate templates.[32]

B. Ongoing PMU Operations and Maintenance Expenses

14. Commission staff requested that SPP describe the key components of PMU communications and operations and maintenance costs that would be assigned to the interconnection customer, provide cost estimates, and explain how the costs may vary based on geographic location and other relevant factors. In response, SPP estimates one-time communications costs associated with installing a PMU will range from $0 to $50,000, based on the increase in bandwidth the interconnection customer needs to be able to transfer PMU data. SPP explains that ongoing operations and maintenance costs, including network charges, are difficult to predict because they vary greatly based on substation location and the type of communication used. However, SPP states that its stakeholders and working groups determined that these costs are relatively minor compared to other interconnection costs in the millions of dollars.[33]

15. Commission staff also requested that SPP explain whether it proposes to require PMU installations be capable of fully Critical Infrastructure Protection (CIP)-compliant real-time data streaming, real-time data streaming solely for system monitoring and situational awareness purposes, or data streaming at some other frequency. In response, SPP explains that the proposed data transfer requirements were created[34] with the intent of reducing the amount of data required to be transferred (and thereby reducing the cost of implementing PMU technology) while still allowing the use of PMU data in system

[32] Deficiency Response at 3-4.

[33] *Id.* at 5-6.

[34] SPP states that, consistent with Critical Infrastructure Protection (CIP) standards, the transmission owner is responsible for assessing how the standards apply to the installation of the PMUs. SPP states that it does not propose to require that PMU installations be compliant with CIP standards at this time, but encourages PMU installations to take into account the potential need for future compliance because SPP's long-term vision is to use real-time PMU data for real-time decision-making applications. However, SPP states that it has no specific timeline, in part because there are not currently enough PMU devices installed on SPP's system to support real-time applications. *Id.* at 6-7.

oscillation detection and other applications. Moreover, SPP states that it does not propose to require local storage, which reduces storage costs and makes data retrieval more efficient and less costly.[35]

16. Commission staff requested that SPP describe the proposed roles and responsibilities of the interconnection customer, transmission owners, and SPP in the streaming of PMU data from the interconnection customer to SPP. In response, SPP states that the interconnection customer has no role in streaming the PMU data to SPP. SPP explains that the transmission owner installs, owns, and maintains the PMU and communications equipment used to transfer the PMU data from the substation to the transmission owner control center. SPP states that it has a private communications network to transfer data from the transmission owner control center to the SPP control center, and that the SPP PMU system include servers and applications to receive, store, and process PMU data.[36]

VI. Discussion

A. Procedural Matters

17. Pursuant to Rule 214 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.214 (2019), 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), we grant ITC Great Plains, LLC'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.

18. Rule 213(a)(2) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.213(a)(2) (2019), prohibits an answer to a protest unless otherwise ordered by the decisional authority. We accept the SPP Answer because it has provided information that assisted us in our decision-making process.

B. Commission Determination

19. We accept SPP's proposed Tariff revisions, effective November 20, 2019, as requested. We find that SPP's proposal to require the installation of PMUs at new generator interconnections has been shown to be just and reasonable. As SPP explains, the PMUs will provide data to SPP that it can use to improve system reliability and system model validation, and that may assist with compliance with current or future

[35] *Id.* at 6-8.

[36] *Id.* at 8.

NERC requirements.[37] For example, as SPP explains, PMUs with streaming data will enhance SPP's ability to detect and respond to forced oscillations at substations, which can cause localized stability problems or more widespread reliability issues such as the tripping of generators.[38] We expect that PMUs will also enhance SPP's phase angle monitoring, voltage stability assessments, wide-area situational awareness, and post-grid event analysis.[39]

20. We also find that SPP's proposed Tariff revisions remedy the deficiencies identified by the Commission in the August 2018 Order.[40] SPP's proposed revisions do not give the transmission owner the option to fund PMU installations. Additionally, SPP explains that because PMUs are direct assignment facilities excluded from transmission rates under the Tariff, transmission owners will be responsible for classifying the PMUs in non-transmission accounts or otherwise excluding such costs from transmission rates, similar to current practice with respect to generator step-up transformers and generator leads.[41] Further, SPP explains that existing language in the GIA provides that the interconnection customer will be responsible for PMU communication and operations and maintenance expenses.[42] SPP's proposed Tariff revisions also permit the use of existing equipment to meet the PMU installation requirement.

21. We are not persuaded by SPP Generation Developers' argument that PMUs should be considered network upgrades and that ongoing PMU communications and operations and maintenance costs should be borne by transmission customers rather than the interconnection customer because PMUs benefit the transmission system generally.[43] We find that SPP reasonably designated PMUs as transmission owner interconnection

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[37] SPP Transmittal at 4-6.

[38] *Id.* at 5.

[39] *Id.* at 4-5.

[40] August 2018 Order, 164 FERC ¶ 61,087 at PP 27-28, 30.

[41] Deficiency Response at 3-4.

[42] SPP Transmittal at 3 (stating that article 8.1 of the GIA requires the interconnection customer to maintain communications with the transmission owner, and that article 10.5 of the GIA provides that the interconnection customer is responsible for operation and maintenance expenses associated with transmission owner interconnection facilities).

[43] SPP Generation Developers Protest at 2-5.

facilities because the PMUs are equipment owned, controlled or operated by the transmission owner between the point of change of ownership to the point of interconnection.[44] With regard to the beneficiaries of PMUs, the Commission has stated that PMU data "benefits both the system and the generators."[45] However, although PMUs in the aggregate should provide benefits to the entire SPP system,[46] the benefit of an individual PMU accrues to the interconnection customer because the PMU provides data specific to an individual generator's interaction with the grid that supports the generator's reliable operation. In particular, PMU data will enable interconnection customers to demonstrate compliance with NERC reliability standards by performing online verification instead of taking the generator offline for testing of model parameters, which can be costly and time-consuming.[47] Accordingly, we find that it is reasonable for the interconnection customer to bear ongoing PMU communications and operations and maintenance costs.

22. We disagree with SPP Generation Developers' assertion that SPP's proposal to require PMU data streaming is premature based on SPP's current planned use cases for the data. Although SPP currently has no planned real-time use cases for PMU data streamed from CIP-compliant PMU installations, we find the proposed streaming requirement strikes a reasonable balance of supporting currently available system oscillation detection and other *ex post* PMU-based applications while also potentially enabling future real-time use cases at minimal incremental cost to the interconnection customer. SPP proposes to require streaming rather than local storage, streaming of single-phase rather than three-phase data, and streams of only 30 samples per second rather than the maximum 120 samples per second. SPP also proposes to use its private communication network to transfer data from the transmission owner's control center to

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[44] *See pro forma* Large Generator Interconnection Agreement art. 1 (Definitions) ("Transmission Provider's Interconnection Facilities shall mean all facilities and equipment owned, controlled or operated by the Transmission Provider from the Point of Change of Ownership to the Point of Interconnection").

[45] *PJM Interconnection, L.L.C.*, 145 FERC ¶ 61,280 at P 17.

[46] SPP Transmittal at 4 (stating that PMUs and the associated data will be used by SPP 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 system stress from a wide area overview; and (4) perform model validation for operations and planning system stability studies).

[47] *Id.* at 7.

SPP's control center.[48] In light of these factors, we find that it is reasonable to assign to the interconnection customer the ongoing cost of streaming PMU data from the substation to the transmission owner control center.

23. We disagree with SPP Generation Developers' contention that SPP has not justified its proposed 50 MW threshold for PMU installations. We find that SPP's proposed 50 MW threshold strikes a reasonable balance between encouraging the proliferation of technology that provides reliability and other benefits while not burdening smaller generators with the proportionally larger costs associated with PMUs. As explained by SPP, the Department of Energy estimates the costs of new PMU equipment to be between $40,000 and $180,000,[49] which is relatively minor compared to the millions of dollars of capital costs of new generation resources. SPP also explains that there are a large number of wind resources in SPP, that there is the potential for significant growth in solar and electric storage resources, and that these types of resources can cause more forced oscillations and require more rigorous monitoring.[50] Given this rationale, along with the estimates of costs, we find that the 50 MW threshold reasonably balances SPP's need to monitor forced oscillations with the cost burdens on new generators.

The Commission orders:

SPP's proposed Tariff revisions are hereby accepted, effective November 20, 2019, as discussed in the body of this order.

By the Commission.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.

[48] Deficiency Response at 7-8.

[49] *Id.* at 5.

[50] SPP Answer at 9.