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Utah Public Service Commission
Heber M. Wells Building
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RE: Docket No. 23-R312-01
Investigation into Possible Amendment of Utah Admin. Code R746-312, Electrical Interconnection
Comments of Western Resource Advocates

INTRODUCTION

Western Resource Advocates ("WRA") appreciates the Commission's inquiry into whether to update Rule 746-312 of the Utah Administrative Code to reflect the updated IEEE 1547-2018 interconnection standard for distributed energy resources ("DERs").[1] WRA strongly supports updating Utah Code regarding electrical interconnection and incorporating aspects of IEEE 1547-2018. We agree with the Commission's justification for this inquiry that significant development has occurred around smart grid technologies necessitating interconnection rule updates. In these comments, we provide recommendations on procedure, timing, and scope, and we encourage the Commission to consult recently published guides on interconnection best practices. We further recommend soliciting technical assistance, convening technical conferences or working groups to reach consensus regarding the aspects of IEEE 1547-2018 that should be incorporated, followed by a formal rulemaking procedure to update Utah's interconnection standards.

DERs coupled with smart inverters are critical components of a clean, reliable, and smart electricity grid. The power system in Utah is experiencing unprecedented transformation from centralized generation with unidirectional power flows to a modern grid capable of hosting non-emitting DERs with automated load management and bidirectional power flows. Interconnection rules incorporating IEEE 1547-2018 are necessary to safely interconnect the anticipated penetration of distributed generation and energy storage on the distribution grid. Updated interconnection rules also provide cost and procedural transparency to developers and consumers. Importantly, the interconnection rules should also be revised to ensure the large amount of new DERs can be operated to fully utilize their capabilities to provide grid support and reliability benefits. An updated interconnection standard must facilitate greater grid benefits

[1] In this document, DERs refer to any customer-sited energy generation or energy storage system utilizing inverters and connected at the distribution voltage level. The most common DERs in this context are distributed solar photovoltaic ("PV") systems, standalone battery energy storage systems ("BESS"), or collocated solar PV and BESS.

from DERs to maximize the public interest that can be derived from these clean, modular, multi-functional and flexible resources.

Incorporating IEEE 1547-2018 while penetration of these resources in Utah remains relatively low would avoid legacy installations of DERs that cannot provide grid support services. DERs using smart inverters provide significant grid and ratepayer benefits that accrue to all customers--even to customers without solar or storage installations.

BACKGROUND

Utah's current rules governing interconnection of distributed resources took effect in 2010.[2] The current rules were based on FERC's Small Generator Interconnection Procedures ("SGIP") established in FERC Order 2006 (issued May 2005)[3] with modifications to conform to Utah's rules. Although the current Utah Code references "IEEE 1547, as amended",[4] Utah's interconnection rules have not undergone major revision since 2010 and do not reference default settings or safety protocols for smart inverters, specifically. Besides a minor update in 2016 align definitions of "inverter" and "switchgear" in Rule R746-312 with other sections of Utah Code and with amendments to IEEE 1547 Sections 4.1.1, 4.2.3, and 4.2.4,[5] Utah's interconnection rules have not been revisited in earnest.

When considering the capabilities of smart inverters available today, Utah's interconnection rules are now outdated. Utah's current interconnection rules were codified before smart inverters could safely and reliably manage grid disturbances; therefore, certain aspects of the current interconnection rules may be artificially limiting both the capacity and grid support potential of DERs integrated to the distribution grid.

IEEE 1547-2018 UPDATE

Substantial innovation has occurred in smart inverter technology since 2010 necessitating the major 2018 update to IEEE 1547. Smart inverter requirements from IEEE 1547-2018 enable more coordinated operation of DERs under normal and abnormal grid conditions, improved safety protocols, and new mandatory communications protocols. One valuable grid support function mandated for smart inverters in the IEEE standard is voltage regulation – or the ability to supply or absorb reactive power. If voltage and current are unsynchronized, some of the power flowing through a circuit cannot be used by connected devices, decreasing efficiency. Smart inverters can supply or absorb reactive power to resynchronize voltage and current and increase the "real" power usable by various connected loads. IEEE 1547-2018 also includes ride-through requirements for smart inverters. Inverters conforming to older standards, like IEEE 1547-2003, were more susceptible to voltage drops, meaning large amounts of DERs could trip offline simultaneously, potentially exacerbating reliability events on the bulk power system. IEEE 1547-2018 mandates that smart inverters can "ride-through" short or long-term disruptions in voltage or frequency, enabling DERs to stay online and provide system reliability benefits

[2] See Docket No. 09-R312-01, https://psc.utah.gov/2016/07/11/docket-no-09-r312-01/
[3] See FERC Order 2006.
[4] Utah Code 54-15-102(9)(b)
[5] See DAR File No. 40900, https://rules.utah.gov/publicat/bulletin/2016/20161115/40900.htm

even amid bulk power system disruptions. The standard also requires specific communications protocols for smart inverters referred to as interoperability requirements, that enable remote, coordinated control of DERs, utility or third-party aggregation, and fault data collection.

Even though IEEE 1547-2018 mandates minimum requirements for smart inverters such as grid support features, voltage regulation, and interoperability requirements, the standard is not prescriptive in nature. In other words, while the requirements specified in the IEEE 1547-2018 standard are mandatory for new equipment, default settings and utilization of these features is at the discretion of the utility, regulator, or customer – subject to prevailing interconnection rules. IEEE 1547-2018 does not prescribe recommendations on the adoption or utilization of smart grids or utility controls. IEEE 1547-2018 ensures that DERs can provide system and consumer benefits as the grid evolves. The standard provides a set of choices from which utilities, regulators, and stakeholders can select the settings that best fit their service territory's needs. Thus, adoption of IEEE 1547-2018 requires active participation from these parties to agree upon technical requirements and subsequent implementation of rules.

MARKET TRENDS, EQUIPMENT AVAILABILITY, AND TIMING RECOMMENDATIONS

Similar to the evolving technical capabilities of smart inverters, the policy and market landscape affecting the adoption and utilization of DERs with smart inverters has progressed. The Inflation Reduction Act ("IRA") extended tax credits available to DERs like distributed solar and energy storage (both standalone and PV-coupled). The Utah Office of Energy Development ("OED") submitted a Notice of Intent letter to compete for funding from the $7 billion Solar for All program. Nearly two dozen Utah communities adopted resolutions to achieve 100% net renewable electricity through the Utah Renewable Communities program. Rocky Mountain Power's Wattsmart Battery program has had measurable success as a grid management tool since its inception. As of February 2022, customers in PacifiCorp's Utah service territory installed nearly 452 MW-AC of private generation and are expected to install roughly 1,733 MW of additional private generation over the next two decades.[6] Overall, the market for customer-owned DERs in Utah has grown rapidly and will continue to grow.

WRA believes that the timing of this rulemaking inquiry is ideal to effectively incorporate current federal and utility incentives, investments in grid modernization, updated projections for DER adoption, and market availability of DERs conforming to IEEE 1547-2018. While IEEE released its major update to IEEE 1547 in 2018, challenges remained regarding the certification and market availability of smart inverters that met the 2018 standard. In May of 2020, IEEE published a companion document, IEEE 1547.1-2020, which outlined conformance specifications for equipment based on the requirements of IEEE 1547-2018.[7] Supply chain and labor challenges persisted following the release of IEEE 1547.1-2020 causing delays in the testing and market availability of DERs conforming to IEEE 1547-2018. The

[6] DNV, "Private Generation Forecast: Behind-The-Meter Resource Assessment-PacifiCorp," February 2, 2023. https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2023-irp/2023-irp-support-studies/PacifiCorp_Private_Generation_Resource_Assessment.pdf at p1, p24.
[7] IEEE Standards Coordinating Committee, "IEEE Standard 1547.1-2020 (Revision of IEEE Standard 1547.1-2005," https://sagroups.ieee.org/scc21/standards/standards-1547-1/

final step in the process relied on certification of equipment defined by UL 1741.[8] The latest edition of UL 1741, Edition 3, was released in September of 2021 and is the definitive certification standard for smart inverters that comply with the requirements in IEEE 1547-2018. Once this process was in place, Nationally Recognized Testing Laboratories ("NTRLs") were finally able to begin certification and listing of conforming equipment.

States that began interconnection rulemakings to incorporate IEEE 1547-2018 requirements faced challenges and delays with implementation, in part due to limited market availability of certified smart inverters. As of September 2023, IREC released independent research[9] on the market availability of smart inverters, indicating that the rate of actual certifications of smart inverters was finally catching up to the expected rate. With equipment now commercially available, WRA strongly recommends beginning the process of formally adopting IEEE 1547-2018 and modernizing the State's interconnection rules.

PROCEDURAL RECOMMENDATIONS

WRA recommends that the Commission, in conjunction with utilities and stakeholders, start the proceeding by clarifying its internal motivations for updating interconnection rules. As a first step, we recommend the Commission convene a technical conference or series of technical workshops on topics related to the interconnection process and IEEE 1547-2018. In Utah, there has already been considerable interest in smart inverters and IEEE 1547-2018; we firmly believe the Commission and stakeholders would benefit from revisiting technical assistance regarding smart inverters provided in Docket No. 21-035-16 ("Grid Modernization Collaborative").[10] or soliciting additional technical assistance. As noted in our comments in Docket No. 21-035-16 regarding grid modernization topics and smart inverters, the information presented by experts from IREC, EPRI, GridLab, and NREL was highly technical in nature and in hindsight, may have been more beneficial if disseminated through technical conferences or workshops attended by Commissioners and Commission Staff.[11] WRA also believes that PacifiCorp could lend valuable expertise to such a technical process, as it has been an active participant in Oregon's formal interconnection rulemaking[12] and is a member of the Storage Interconnection Committee within the BATRIES project which focuses on developing solutions to critical barriers affecting energy storage interconnection on the distribution system.[13]

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[8] Underwriters Laboratory, "Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources – UL Standard 1741, Edition 3," https://www.shopulstandards.com/ProductDetail.aspx?productId=UL1741

[9] IREC, "New Research Sheds Light on When Key Smart Inverters Will Be Available," September 12, 2023. https://www.irecusa.org/blog/regulatory-engagement/new-research-sheds-light-on-when-key-smart-inverters-will-be-available/

[10] See Utah PSC Docket No. 21-035-16, Collaborative Stakeholder Process for Rocky Mountain Power's Grid Modernization and Rate Design. https://psc.utah.gov/2021/03/17/docket-no-21-035-16/

[11] Comments of Western Resource Advocates and Utah Clean Energy at 2. https://pscdocs.utah.gov/electric/21docs/2103516/329415WRAUCECmnts8-28-2023.pdf

[12] See OPUC Docket Nos. UM 2111 and AR 659.

[13] More about the BATRIES project here: https://energystorageinterconnection.org/

While not easily segregated, WRA emphasizes that the establishment of technical settings in IEEE 1547-2018 and the formal adoption of those technical requirements are distinct steps and should be treated as such by the Commission. We note that the Commission has wide latitude to decide whether to address technical requirements simultaneously within a formal interconnection rulemaking or whether to guide utilities and stakeholders to develop consensus on technical aspects of IEEE 1547-2018 in one or more technical working groups. With only one regulated utility, the latter approach may be appropriate to reach consensus on technical requirements and reduce the administrative burden on the Commission. Prior to opening a formal docket, some states have first convened technical working groups to produce Technical Interconnection and Interoperability Requirements (TIIRs)[14] before proceeding to formal rulemaking and adoption.

Following this process, we recommend the Commission initiate a formal rulemaking docket for the express purpose of updating the Utah Code to integrate recommendations from the technical working group(s) and address any remaining issues related to implementation. A procedural schedule should be established within a formal docket to allow sufficient time for stakeholder identification, discussion, and resolution of issues.

In their publication titled "Updating Distributed Energy Resource Interconnection Rules: A Guide for Local Authorities",[15] The National Renewable Energy Laboratory ("NREL") outlines a three-step process. The first step, *Determining the Context*, recommends identifying goals and expectations of stakeholders as well as conducting process engineering to avoid bottlenecks and misunderstandings. The second step, *Developing the DER Interconnection Rule*, involves identifying the specific technical considerations contained in IEEE 1547-2018 that are relevant to the jurisdiction, and understanding how these aspects relate to policy, planning, and technical requirements. The third step, *Maintaining and Revising the Interconnection Rule*, explains the importance of data collection and process analysis following rule implementation to revisit changing motivations and stakeholder needs. The Commission could use these steps to guide their rulemaking in both process and scope.

SCOPING RECOMMENDATIONS

WRA believes that providing detailed recommendations regarding technical interconnection topics is outside of the immediate scope of the Commission's inquiry. However, we appreciate the opportunity to provide a non-exhaustive list of topics that could be explored further within facilitated technical conferences or workgroups:

- Normal and abnormal performance categories
- Voltage regulation functions
- Interoperability, controls, and communication protocols

[14] TIIRs, which are typically subject to Commission approval and public comment, specify default settings for smart inverters and scenario-based settings to support the stability of the grid. See IREC, *Model Interconnection Procedures, 2023 Edition – Attachment 9, Technical Interconnection and Interoperability Requirements (TIIR) Template*, https://irecusa.org/wp-content/uploads/2023/08/IREC-Model-Interconnection-Procedures-2023-FINAL-8.23.23.pdf

[15] NREL, *A Guide to Updating Interconnection Rules and Incorporating IEEE Standard 1547,* 2021. https://www.nrel.gov/docs/fy22osti/75290.pdf.

- Power quality and overvoltage
- Hosting capacity, interconnection screening, and review
- Treatment of energy storage, especially limited-export, and non-export systems
- DER impacts on reliability and the bulk power system
- Environmental benefits and emission reductions

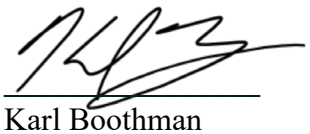
To help the Commission make decisions related to both process and scope, we would like to direct the Commission to extensive resources the Commission may find helpful such as:

- *A Guide to Updating Interconnection Rules and Incorporating IEEE Standard 1547* (NREL).[16]
- *Making the Grid Smarter – Primer on Adopting the New IEEE 1547-2018 Standard for Distributed Energy Resources* (IREC).[17]
- *Decision Options Matrix for IEEE 1547-2018 Adoption* (IREC).[18]
- *Model Interconnection Procedures – 2023 Edition* (IREC).[19]

CONCLUSION

WRA strongly supports incorporating IEEE 1547-2018 into Utah's interconnection rules. We recommend the Commission solicit technical assistance, hold technical conferences, and/or establish technical working groups for the purpose of clarifying the process and scope of interconnection rule updates. WRA looks forward to being an active participant in this process.

Sincerely,



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[16] NREL, *A Guide to Updating Interconnection Rules and Incorporating IEEE Std 1547-2018*, October 2021. https://www.nrel.gov/docs/fy22osti/75290.pdf
[17] IREC, *Making the Grid Smarter: Primer on Adopting the New IEEE Standard 1547-2018,* January 2019. https://irecusa.org/resources/making-the-grid-smarter-primer-on-adopting-the-new-ieee-standard-1547-2018/.
[18] IREC, *Decision Options Matrix for IEEE 1547-2018 Adoption*, 2022. https://irecusa.org/wp-content/uploads/2022/10/Decision-Options-Matrix-for-IEEE-1547-2018-Adoption.pdf.
[19] IREC, *Model Interconnection Procedures – 2023 Edition,* August 2023. https://irecusa.org/wp-content/uploads/2023/08/IREC-Model-Interconnection-Procedures-2023-FINAL-8.23.23.pdf.