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**COMMENTS OF PORTLAND GENERAL ELECTRIC
ON THE U.S. DEPARTMENT OF ENERGY'S ENERGY CONSERVATION
PROGRAM: ENERGY CONSERVATION STANDARDS FOR
DISTRIBUTION TRANSFORMERS**

EERE-2019-BT-STD-0018

March 27, 2023

Portland General Electric (“PGE”) appreciates the opportunity to submit comments on the U.S. Department of Energy’s (DOE’s) *Energy Conservation Program: Energy Conservation Standards for Distribution Transformers*, 88 Fed. Reg. 1,722 (Jan. 11, 2023). DOE proposes a new federal minimum efficiency standard, trial standard level (TSL) 4, for both single- and three-phased liquid-immersed distribution transformers. This effectively requires that, starting on January 1, 2027, new liquid-immersed distribution transformers use amorphous core steel. Most transformers presently do not meet this requirement. PGE is greatly concerned by this proposal, given the current severe challenge of securing transformers and the additional burden that a shift to a new type of transformer will place on the supply chain. Access to the new types of transformers that would comply will be constrained, as the shift in production has yet to occur, making an already serious situation worse. While PGE supports energy efficiency broadly, improved transformer efficiency cannot come at the expense of reliability. Transformers are critical equipment that are needed both for the clean energy transition and continuing to deliver reliable power to meet customers' growing needs.

PGE is Oregon’s largest electric utility. Our fully integrated utility is based in Portland, Oregon. We serve roughly half of all Oregonians and more than two-thirds of Oregon’s commercial and industrial activity occurs in PGE service area. PGE’s vision for a clean, reliable, affordable energy future is shared by the customers and communities we serve. Oregon’s 100% clean electricity law, enacted in 2021 with PGE support, requires electric companies to reduce greenhouse gas emissions associated with serving Oregon retail electricity customers compared to the companies’ baseline emissions level by 80% by 2030 and 100% by 2040. Advancements in policy, regulation, and technology are needed to meet these ambitious emission reductions, while maintaining reliable service at a reasonable cost to customers. It will also require significant investments in building out clean energy resources and facilities, all of which will depend on obtaining essential grid equipment and critical supplies.

PGE is largely aligned with the comments filed in this docket by the Edison Electric Institute (“EEI”), the trade association for investor-owned utilities of which PGE is a member.

Current Transformer Supply Constraints Are Causing Significant Challenges

A nationwide shortage of certain transformers is negatively impacting PGE’s ability to provide commercial and industrial customers with the transformers necessary for the completion of their projects. Supply chain disruptions, labor constraints, shipping and transportation issues, as well as increased demand related to growth within service areas and extreme weather events are all exacerbating factors. The American Public Power Association notes that wait times to secure critical materials jumped 429% between 2020 and 2022, from two to three months to about a year. Further, there are no clear signals from the industry that lead times will improve in the next few years.

The potential impacts are forecast to be most restrictive for specialty, 3 phase submersible, Factory Mutual/Bio Temp, and 3 phase pad mount transformers. While PGE has limited quantities on hand, resupply may be significantly delayed and could affect projects that include multi-family and affordable housing, as well as light industrial and commercial development.

Since the beginning of 2022, the lead time to order 3-phase transformers for commercial/industrial purposes has increased more than sevenfold, from 20 weeks to 142 weeks, with a 27-week increase between just September and October. Our calculation of the wait times is as follows:

- Nov 2021 13-20 weeks
- Jan 2022 20-30 weeks
- Jun 2022 40-50 weeks
- Aug 2022 86 weeks
- Sep 2022 115 weeks
- Oct 2022 142 weeks
- Feb 2023 142 weeks

Given the types of shortages, it is taking PGE just as long to obtain the type of transformer needed to complete a multi-family housing unit as it takes to get the kind used in equipping a substation.

These serious supply chain challenges make the near- and mid-term forecasts bleak. PGE is seeing direct impacts to projects that entered the development queue in 2021. For 2023, we’re already seeing the potential impact to customer developments. Suppliers are now urging us to begin ordering for 2025. In addition, some manufacturers are restricting the number of units that utilities can purchase in a given year – allocating only a certain number. Making matters worse, as utilities clamor for more transformers, prices are spiking. Utilities are in a precarious position as they try to balance the expectation that they will have transformers available by committing dollars to buying and storing more transformers than may actually be needed. As regulated industries, investor-owned utilities must prove to regulators that investments or expenditures were prudent in order to recover those expenditures in rates.

PGE's team has made changes to help reduce the impact of these shortages to PGE customers. These include delaying non-critical, non-customer jobs to make available as many transformers as possible for customer-driven projects. We are urging developers to contact us as soon as possible to help get their projects into the queue. We are also exploring new sources, including offshore manufacturers, refurbished transformers and other solutions. In parallel, we are working with EEI and other industry groups to help elevate the issue with policymakers to help expedite solutions. However, it is unclear this will be enough to address the challenges and we are currently seeking additional assistance from the federal government to step in and assist in resolving this worsening crisis.

Impact of Current Shortage in DOE's Analysis

The proposal for new energy efficiency standards cannot be viewed in a vacuum. Rather, it must be viewed against the backdrop of the current supply chain crisis. DOE is required to consider specific information when prescribing new or amended standards under the Energy Policy and Conservation Act (EPCA). The availability of covered products, as well as the practicability of manufacturing, installing and servicing them, is to be included in this consideration. Each of these raises significant concerns. Requiring manufacturers to shift to a new type of transformer that currently has minimal production, at a time when supplies are already severely constrained, creates a serious risk to the electric grid and the transition to clean energy.

Technical Considerations

There are a number of technical challenges that a shift to amorphous core transformers would trigger. From a practical standpoint, every distribution transformer from every manufacturer we use would need to be redesigned, requiring submittal and approval drawings, and create further delays with supplies. This issue would be replicated sector-wide.

The larger profile of the amorphous core and windings compared to a grain-oriented steel core will also require a larger tank, more winding copper/aluminum wire, more oil, and more labor to produce, resulting in higher up-front procurement costs. We estimate an average of approximately 15%-20% more than grain-oriented steel core. An example for size comparison is that a 25KVA pole mounted amorphous core transformer is roughly the size of a 50KVA steel core transformer. This illustrates how much larger the new amorphous core transformers would need to be.

Amorphous core transformers are also more prone to accelerated degradation during overloading conditions as compared to grain-oriented steel. Current PGE design practices allow for peak loads of up to 150% of the transformer nameplate rating in residential and single shift commercial applications with grain-oriented steel transformers. PGE would need to revise these design criteria, which would lead to an overall increase in transformer size for units that would be serving identical applications. This will further exacerbate size and weight issues as well as increase cost overall.

Further Factors

PGE would like to underscore a few other important considerations. Further detail on these is provided in EEI's comments.

As noted above, the amorphous core transformers will be significantly heavier. This triggers a host of related issues that utilities would need to address. It is anticipated that these heavier transformers would require a replacement of the wood poles that hold them as well as other infrastructure that supports the transformers. This exacerbates our challenges with implementing these requirements, as there is already a supply chain issue with wood poles, as well as other related infrastructure. The required change is also expected to trigger a need for different equipment, which utilities would all need to procure. Additionally, the heavier weight of the transformers triggers transportation considerations and challenges. They would likely require flatbed trucks and cranes to install. Weight and access restrictions for roads and certain areas, especially in rural places, may create further challenges for replacements of transformers.

The shift to a new type of transformer is expected to require transformer manufacturers to retool and redesign production lines to switch from the GOES-based-transformers to the use of amorphous core steel. This will result in significant downtime when those lines will not be producing distribution transformers the industry can deploy. Manufacturers have already noted that would require significant time to make this transition. A lack of active transformer production capacity while existing stockpiles already are low creates a very serious risk to the electric sector and can lead to an even more widespread lack of availability. The long lead times we are already facing may not just be compounded by this rule but could also increase the risk that the industry will not have distribution transformers needed to respond to natural disasters or other destructive events. This comes on top of our efforts to undertake infrastructure investment, as needed to realize the full benefits of the Bipartisan Infrastructure Law, and build and expand a clean, reliable, and resilient grid.

The sector is already experiencing challenges maintaining adequate supplies of transformers in stock. If supplies tighten further, it could become harder and harder for utilities to keep adequate stock of transformers, creating real risks for ongoing work, transformational sector change and recovery following outage events (storms, fires, etc.).

Finally, given the wide array of changes that will like result from this proposed rule, we anticipate significant challenges meeting the timeline proposed by this rule. Indeed, we question if it can be met.

Recommendation

DOE should either make a "no new standard" final determination or finalize a standard at a level that allows multiple higher efficiency models of GOES and amorphous steel core transformers to be available to electric companies. DOE could modify either decision when it next revisits efficiency standards. It's possible that at that point supply chains could be in a better position to

support broader use of amorphous steel core transformers without putting the reliability, security and resilience of the U.S. electric grid at risk. We urge you to defer action now in recognition of the significant reliability concerns inherent in constrained access to distribution transformers.

Conclusion

PGE reiterates our concern with this energy efficiency proposal, which we consider unwarranted and likely to worsen an already very serious situation around transformer availability.

Transformers are critical electric grid components, whose availability is essential to grid resiliency and utilities' transition to a clean energy future. This is particularly so as significant additional transmission and energy projects will be needed for this transition. But transformer shortages also impact utilities' ability to provide reliable service to customers and restoration of service after disasters. Delivery delays in transformers and other critical grid components may also jeopardize the success of some of the programs that received funding in the Bipartisan Infrastructure Law, as utilities may not be able to complete projects in the timelines required under these programs.

We thank you for your consideration of these comments. Please don't hesitate to reach out with any further questions.