Appliance Standards Awareness Project
American Council for an Energy-Efficient Economy
Natural Resources Defense Council

July 9, 2019

Mr. Jeremy Dommu
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Program, EE-5B
1000 Independence Avenue SW
Washington, DC 20585-0121

RE: Docket number EERE-2017-BT-TP-0055; Test Procedure for Distribution Transformers; Notice of proposed rulemaking and request for comment

Dear Mr. Dommu:

This document constitutes the comments of the American Council for an Energy-Efficient Economy (ACEEE), the Appliance Standards Awareness Project (ASAP), and the Natural Resources Defense Council (NRDC) with respect to the Notice of Proposed Rulemaking (NOPR) regarding the test procedures for distribution transformer (84 FR 20704). Several of our organizations were involved in the development of the original efficiency standards legislation for transformers and the subsequent standards rulemaking docket (EERE-2010-BT-STD-0048), including the negotiated rulemaking. ACEEE and ASAP also submitted comments on the RFI issued under this docket in 2017. We appreciate the opportunity to provide input as DOE considers revisions to the test procedures.

DOE should use the best available data on transformer loading to establish test procedure PUL rating points

Since 2017, electric utility adoption of Advanced Metering Infrastructure (AMI) technology has generated new data on the actual average per-unit loads (PUL) for distribution transformers that are relevant to this docket. The IEEE Transformer Committee reviewed AMI data provided by Dominion, Duke Energy, Consolidated Edison, and Toronto Hydro for liquid-immersed distribution transformers and developed the PUL estimates shown in Table 1.

Table 1. Peak of distribution for average PUL estimates – medium voltage, liquid filled transformers

Utility	PUL
Dominion	10%
Duke Energy	15%
ConEd	26%
Toronto Hydro	24%

Estimates based on actual transformer loading data from over 100,000 units.
Source: Mahesh Sampat, IEEE Transformer Committee
https://www.transformerscommittee.org/subcommittees/distributiontransfsc/

The empirical data shown in Table 1 suggests that liquid-immersed distribution transformers, at least at four major North American electric utilities, typically operate at lower PULs than the single test PUL of 50% chosen by DOE.

For liquid-immersed distribution transformers, DOE should consider ratings based on a weighted-average of multiple loads

ACEEE and ASAP submitted the above comment to the 2017 RFI. In the NOPR DOE responded as follows: "Lastly, available data describing this PUL variation is largely anecdotal and insufficient to show that a multiple-PUL weighted-average efficiency metric is more representative of in-service PUL than the existing metric. Specifically, a lack of information is available to determine which PULs would be appropriate as part of a multiple-PUL weighted efficiency metric, and how those PULs should be weighted. Given the drawbacks cited and the lack of evidence at this time to show a weighted-average metric is more representative than the existing metric, DOE is not proposing a multiple-PUL weighted-average efficiency metric."

We recommend that DOE request IEEE's Transformer Committee to provide the AMI data described above and analyze it to determine whether empirical data describing PUL variation are now sufficient to support a weighted-average PUL efficiency metric. We request that DOE also consider a multiple PUL efficiency metric.

If DOE decides to use a single PUL rating point for liquid-immersed transformers, IEEE and other data suggest 35% of full load as a maximum appropriate single value

In the 2017 RFI DOE estimated that the initial PUL for liquid-immersed transformers was 34% and 40% for single- and three-phase equipment, respectively, and then assumed an 1% annual increase over the life of the transformer to account for growth in connected load.

The IEEE data summarized in the table above actually suggest a PUL rating point of around 25%. We also believe that the assumption of a 1% average annual increase in distribution transformer loads cannot be supported. Although electricity generation and retail sales hit new highs in 2018[1] this was the first significant increase since 2010. 2018 electricity consumption seems to have been a weather-driven anomaly,[2] following a decade of flat growth in the US. Retail electricity sales have remained essentially

[1] 4,177810 GWh, EIA Electric Power Monthly March 2019.
[2] "The increased demand for electricity in 2018—including record demand in the commercial and residential sectors—is largely attributable to cold winters and a hot summer." Ibid

flat since 2007 despite an unusually long period of economic expansion and the continued electrification of the US economy. Electricity consumption is falling for some major end-uses, like lighting, propelled by federal efficiency standards implemented from 2010-2017. Photovoltaic generation already depresses daytime electricity peak demand in California and other states and will continue to show strong growth. The EIA projects that future growth in electricity sales will be driven by population growth, which tends to cause grid expansion and the installation of new transformers, rather than to increase loads on existing transformers.

The impending electrification of transportation raises the prospect of significant new electricity consumption on existing feeders, but even if electric vehicles (EVs) start to claim a significant share of new car sales, the impact on peak electricity demand and transformer loads may be small. It is in the electric utility industry's economic interest to take commonsense actions that encourage off-peak EV charging. A recent article in the *IEEE Electrification Magazine* found that "At a macro scale, EVs appear to pose only a modest burden on the electric grid".[3]

In the 2017 RFI for this docket, ACEEE and ASAP commented that DOE's assertion that the record supports a 50% PUL for liquid-immersed transformer ratings appeared to be erroneous. DOE did not respond to our comment in the NOPR. The lifecycle cost (LCC) spreadsheets in the docket contain the initial loads referenced in the RFI, but not the RFI's claimed load growth or lifetime average PULs. The RFI says that PUL estimates from a previous standards docket were subject to, "a one percent annual increase over the life of the transformer to account for connected load growth" (82 FR 44349). Our comments noted that the rate of load growth would need to be more than 2% annually to reach the lifetime average PULs asserted in the RFI. As discussed above, we believe that the data do not support an assumption of even a 1% average annual increase in distribution transformer loads.

For all these reasons, DOE's estimated PUL value of 34% should be considered the maximum appropriate single PUL rating point. We thank DOE for the responses to our other comments and request that the agency investigate this apparent error and adjust the proposed PUL accordingly.

For low-voltage and medium-voltage dry-type transformers, DOE should adopt loads of 25% and 38%, respectively

ACEEE and ASAP submitted this comment to the 2017 RFI and in the NOPR DOE responded as follows: "DOE considered updating the test PUL requirements to an alternative single test PUL if it were to better reflect how distribution transformers operate in service. As discussed in sections III.E and III.E.1, however, DOE has tentatively determined that the range of in-service PULs is large, and that the available information describing in-service PUL is inconclusive, which leaves DOE unable at this time to show that an alternate single test PUL is more representative of in-service PUL than the existing single test PUL."

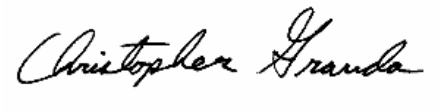
We recommend that DOE request additional utility AMI data and perform a loading analysis on low-voltage and medium-voltage dry-type transformer like the one performed by the IEEE's Transformer Committee as discussed above to determine whether the available information now allows a determination. However, if DOE is not able to perform such an analysis, we recommend that DOE use

[3] *Will Electric Vehicles Drive Distribution Grid Upgrades?*, IEEE Electrification Magazine, June 2019 and *Electric Vehicles as Distributed Energy Resources*, Rocky Mountain Institute, 2017

the estimates from the April 2013 distribution transformer standards final rule of 25% and 38% for industrial low-voltage and medium-voltage dry-type transformers respectively. Again, experience over the last decade, and projected electrification in the foreseeable future, does not support assumptions of increased transformer loads over time.

Thank you for considering these comments.

Sincerely,



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