



TO: Office of Energy Efficiency and Renewable Energy, Department of Energy
FROM: Michael A. Anthony, P.E

March 27, 2023

RE: EERE-2019-BT-STD-0018 – Proposed Energy Conservation Standards for Distribution Transformers

Thank you for the opportunity to comment upon the proposed regulation. We have reviewed many of the 50+ comments and believe that our history of advocating energy efficiencies in electrical codes and standards should be known to your office. For more technical details on the recommendations summarized in this letter please use the link below:

<https://standardsmichigan.com/eere-2019-bt-std-0018-0065/>

At an annual clip of \$100 billion the education industry (K-12 schools, colleges and university-affiliated healthcare systems) is the largest non-residential building construction market in the United States. Large campuses such as the University of Michigan are ideal study units for cities of the future. In light of this, and from our 30+year experience with the Institute of Electrical and Electronic Engineers, the National Fire Protection Association and the United States Army Corp of Engineers, we have two recommendations – one energy-related, the other reliability-related.

1. Gather electrical loading data to inform National Electrical Code committees writing the rules for building branch circuit and feeder power chains.

Transformers are the most important element in a building power chain and most of them are significantly unloaded (i.e. too large in terms of kVA) because of the fire safety requirements in the National Electrical Code (NEC). The link above explains how the IEEE Education & Healthcare Facilities Committee collaborated with several other universities in the recent past to persuade technical committees writing the NEC to permit designers to downsize interior building power chains because of lower lighting power densities. Result: less waste heat and lower circuit construction cost; transformers included..

More can be done; especially in hospitals where oversized interior power chains result in oversized everything – electrical rooms, switchgear, transformers, cooling motor fans, ceiling plenum sheet metal systems that carry heat away, and backup generators. Underloaded hospital backup generators are less reliable than hospital backup generators that are “right-sized”.

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2. Remove all obstacles to manufacturers that choose to innovate very inexpensive transformers for the purpose of preventing civil unrest during major regional contingencies (MRC).

We visualize a new product class. Very inexpensive transformers, coupled with mobile generators, portable switchgear and a well-trained staff, can contribute to mitigating the unthinkable. Manufacturers and utilities will need to co-innovate. We imagine an expanded fleet of these MRC transformers in the 150 - 1500 kVA range that can be wheeled around to inject power at medium to the most common 2, 3 and 4 wire customer service points.

Our reading of other commenting letters reveal that transformers are not necessarily a stabilized technology. Engineers must take into account a range of practical considerations, such as the availability of materials, manufacturing processes, and cost constraints, that cannot always be fully captured by classical lumped parameter models. While we hope that the United States never needs MRC transformers we should be prepared and manufacturers should be incentivized.

We estimate that cost of gathering data for a statistically significant data set for Recommendation #1 will run a total of \$500,000 to \$5,000,000 for about two years. This number is based on the experience of my IEEE colleague, Robert G. Arno, who has directed similar large scale data gathering projects for the *US Army Corps of Engineers Homeland Power Reliability Enhancement Program*.

To summarize: we think EERE should shift its focus to the power chain of the entire building – not just one component of that power chain. As a nation we have made significant progress lowering energy requirements of end use equipment but have made very little progress with a commensurate downsizing of building power chains because of the fire safety priority of the NEC where transformer manufacturers also have a voice. Because the National Electrical Code is revised every three years, it is possible to accrue meaningful results relatively quickly with the funding and the changes we propose.

Thank you for your consideration of our comments



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