



IEEE PES Transformers Committee
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U.S. Department of Energy NOPR for Distribution Transformers

— Technical Presentation —
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and Alan Traut**

1. Abstract

On December 29, 2022, the U.S. Department of Energy (DOE) issued a Notice of Proposed Rulemaking (NOPR) for Energy Efficiency for Distribution Transformers intended for 2027 implementation. The proposed rules would mandate that all distribution transformers within the proposed scope reduce total losses at 35% load for low voltage dry-type transformers and 50% load for both liquid-filled and dry-type medium voltage transformers. The proposed scope would cover the range from 10 kVA to 1500 kVA for single-phase units and from 15 kVA to 5000 kVA for three-phase units

This presentation examines the impacts on materials, designs and users. You will see that significant changes will need to be made if this is implemented.

2. Learning Objectives

This tutorial provides opportunities to gain an understanding of the following:

- DOE NOPR
- Design implications
- Materials impacts, including core steel and conductors
- Impact on manufacturers and users
- Shortcomings of DOE analysis
- How to submit comments to the DOE

4. Presenters' Biographies

Philip J Hopkinson is an IEEE Life Fellow and transformer engineer, leader, technologist, Professional Engineer (PE) in North Carolina and technical advisor to the U.S. National Committee for IEC TC 14 Power Transformers since 1996. From 1966 to 1992, Phil held numerous design, development and engineering management positions with GE, Cooper and Schneider in liquid-filled, dry-type and cast resin systems at all power and voltage classes. He holds 15 U.S. patents. Phil earned his BSEE from Worcester Polytechnical Institute in Worcester, Massachusetts. He is a graduate of the General Electric Company's four-year A-B-C Course and received his MS in System Science from Brooklyn Polytechnical Institute in Brooklyn, New York.

Colby Lovins is an electrical engineer with over 20 years of experience and 17 years in the design, development, manufacture and application of dry-type distribution transformers and medium voltage switchgear. Colby has held various positions in design engineering, project management and engineering management with Federal Pacific, General Electric and others. He is an active member of the IEEE Transformers Committee and is presently working group chair for Determination of Hottest-Spot Temperature in Dry-Type Distribution and Power Transformers. Colby received his degree in electrical engineering from Old Dominion University.

Bryan Marquardt is an engineer with 11 years of experience in electrical steel research and applications. He has worked in various positions in applications engineering and steel product research management for Cleveland-Cliffs and its predecessor company where he works with transformer manufacturers globally. Bryan received his BS in Electrical and Computer Engineering from Ohio State.

Aaron Meyers has worked in the three-phase liquid-immersed distribution transformer business of Cooper Power Systems and Eaton Corporation for the past 15 years. Aaron has a long history of involvement with the DOE's distribution transformer efficiency standards. He led the effort to bring Cooper into compliance with the initial DOE regulations, served as a member of the negotiated rulemaking committee in 2011 and 2012, supervised and guided the project manager responsible for Eaton's compliance with the 2016 standard and is actively helping to guide Eaton through the current regulatory amendment efforts. Aaron also led Eaton's product development effort to launch three-phase, amorphous core transformers in 2016 and, shortly thereafter, consulted on the effort to launch single-phase amorphous core transformers. Aaron earned his BSEE from the University of Illinois Urbana-Champaign.

Dan Mulkey has over 43 years of experience in utility distribution and transmission system design and operation, including over 30 years as Pacific Gas & Electric's (PG&E) system expert for various types of electrical equipment, including distribution transformers. Retired from PG&E since 2015, he now does consultation and provides expert witness testimony as the Vice President of Mulkey Engineering, Inc. Dan is an IEEE Life Senior Member and has been active in the IEEE Transformers Committee since 1990, currently serving as Chair of the Enclosure Integrity Working Group. He received his BSEE from Fresno State University, California, and is a registered Professional Engineer in California.

Alan Traut is a transformer engineer with over 40 years of experience in the design, development, manufacture and application of liquid-filled distribution transformers. Al has held numerous positions in engineering and engineering management with Cooper Power Systems, General Electric, Kuhlman Electric, Power Partners and Howard Industries. He is an active member of the IEEE Transformers Committee and is presently working group Chair for Overhead Pole-Mounted Transformers. Al received his BS in Electrical Engineering from Northwestern University and is a registered Professional Engineer in Wisconsin.

Joe Tedesco has over 10 years of experience in the dry-type transformer industry. Prior to joining ABB (now Hitachi Energy) in 2013, he held positions at the U.S. Naval Research Laboratory and National Institute of Standards and Technology. Within Hitachi, Joe has held roles involving product development and third-party certification, and he is the dry-type standards engineer for North America as well as being a member of Hitachi's global standards team. Joe is an active member of the IEEE Transformers Committee and Dry-Type Transformers Subcommittee, and he is currently the working group Chair for Sealed Dry-Type Distribution and Power Transformers. He received his BS in Physics from the University of Virginia and his MS and PhD in Physics from North Carolina State University.