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DOE energy standards for distribution transformers

Background

The U.S. Department of Energy (DOE) settled a lawsuit that challenged their 2010 rule on efficiency standards for distribution transformers. As part of the settlement, a negotiated rulemaking working group (WG) of interested stakeholders was formed consisting of transformer manufacturers, steel manufacturers, utilities, environmental interest groups, and consultants. As a result of this work, the DOE published a Notice of Proposed Rulemaking (NOPR) on February 10, 2012.

The NOPR puts forward a standard of Efficiency Level 1 (EL1) for most liquid-filled distribution transformers. The current DOE efficiency standards implemented on January 1, 2010, were considered EL0. The WG essentially divided into three groups with distinct proposals:

- Group 1 proposed efficiency levels ranging from EL0 to EL0.5 for the various product classes under consideration. This group's message to the DOE was that the standard currently in effect is a good standard and it should not be changed
- Group 2 agreed to support EL1 in an attempt to gain consensus within the WG
- Group 3 proposed EL3 for all liquid-filled product types under consideration. They claimed that this efficiency level could be economically justified based on the efficiency gains regardless of the long payback period for the investment in the new transformers

Page 7 of the proposed ruling has a statement that may inspire interested parties to vocally support maintaining current standards or confirming agreement with the EL1 standard as proposed:

Based on consideration of the public comments DOE receives in response to this notice and related information collected and analyzed during the course of this rulemaking effort, DOE may adopt energy efficiency levels presented in this notice that are either higher or lower than the proposed standards.

Environmental groups began issuing press releases immediately after the ruling, arguing that significantly higher standards are needed and that the DOE is losing the opportunity to save enough electricity to shut down dozens of coal-fired power plants.

Cooper Power Systems
by EATON

Key issues

At EL2 and EL3, most transformer design configurations are not achievable with conventional core steels and will require amorphous core steel for most applications. Amorphous metal transformers are larger and heavier than conventional units of the same kVA rating. The handling of the transformers by the utility will likely be impacted, including the potential need to reinforce or replace utility poles due to the added weight.

Amorphous core transformers are able to save energy and have lower losses during periods of low loading, mainly at night; however, during peak loading conditions, or any time loading levels exceed 50%, conventional core transformers are more efficient. These high loading conditions coincide with the periods when the cost of energy is highest.

According to the DOE's calculations, adopting EL1 would result in an average price increase of 21% over the base price of a 2010 DOE-compliant transformer across the various liquid-filled transformer designs considered. Higher efficiency levels would be even more expensive due to:

- Increased weight
- Increased amorphous demand, which will likely result in higher prices for the metal because the North American market is served by only one manufacturer headquartered in Japan
- Increased capital equipment costs as amorphous metal requires different core making and assembly equipment for the transformer manufacturers

Conclusion

Eaton's Cooper Power Systems supports the proposed EL1 efficiency standard rather than any of the higher efficiency levels. The EL1 levels will allow manufacturers to compete on a price/performance basis, using both conventional and amorphous core transformers. Raising transformer efficiency requirements beyond the proposed EL1 levels is not economically justifiable, and will negatively impact utilities and unnecessarily burden consumers with higher utility rates as a result.

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