

**Comments on the Department of Energy's Preliminary Technical
Support Document for Distribution Transformers
(Docket Number EE-2010-BT-STD-0048/ RIN 1904-AC04)**

***Submitted by:* Appliance Standards Awareness Project • American Council for an
Energy-Efficient Economy • Natural Resource Defense Council**

April 18, 2011

We respectfully submit these comments in response to the Preliminary Technical Support Document (PTSD) for distribution transformers announced in the Federal Register on March 2, 2011. 76 Federal Register 11396. In general, we believe the Department of Energy (DOE) has done a very thorough job in analyzing a complex product and industry. Distribution transformers are a key part of the electrical system and, as such, improved standards have the potential to provide large benefits for the economy, consumers and the environment. DOE's analysis demonstrates that large potential national energy and economic savings are achievable with improved standards for each class of distribution transformers.

In order to assist DOE in advancing this important rulemaking, we have the following comments:

1. DOE should adjust selling price estimates: In all cases, the calculated selling price of the product seems much **higher** than the market prices in 2010. We have done a cursory search on the web and have found several bid results that were awarded for the purchase of distribution transformers in 2010. Almost all of these were posted by small to medium-sized municipalities. We have attached one such example from the Electric Power Board of Chattanooga, TN, a medium-sized municipal utility. As you can see, the quantity purchased is low and the purchase was through a distributor, factors which would typically lead to a relatively high price. However, on this bid, winning bid prices are some 40-60% lower than those calculated by the Department in the rulemaking analysis. For a large utility, the prices would be even lower due to higher quantities purchased and buying direct from the manufacturer.

We also checked with a number of utility representatives and other industry experts. The consensus among those we checked with is that the DOE prices are too high.

Therefore, we strongly encourage the Department to more thoroughly research market prices and adjust its estimates accordingly. We suggest that the Department obtain real-world price estimates through independent research of public bids and by seeking inputs from users (utilities) and/or suppliers and/or their trade associations.

Some factors contributing to DOE's too-high estimates could be:

- a. Material price assumptions. These estimates appear to be higher than actual prices in 2010. DOE should validate these estimates by checking with suppliers.
- b. Material and labor costs. DOE has calculated mark ups which appear higher than actual prices suggest. For example;
 - i. Factory overhead is generally applied to labor cost *only*, not to entire product cost (including material).
 - ii. Most large utilities purchase liquid-filled transformers directly from the manufacturers. For those cases, manufacturer representatives' commission is already in the price of the transformer, it is not added (No mark-up) to manufacturers' prices. Only smaller utilities that prefer to buy through distributors will experience distributor mark-up.

If DOE cannot determine precisely why its price estimates are higher than observed market prices, DOE should apply an adjustment factor to bring price estimates in line with observed prices. In other words, actual observations of market prices should provide the primary basis for DOE analysis rather than modeled prices.

Finally, we note that observed prices for low-voltage dry-type transformers may be more difficult for DOE to locate. DOE should seek these prices from manufacturers. If DOE cannot locate market price data, DOE should consider applying an adjustment factor from the liquid immersed analysis to the dry-type analysis because the underlying methods for modeling prices are very similar.

2. DOE overestimates the impact of weight and size changes on

installation costs: DOE assumes significant additional costs for transformers over 1,000 lbs. It appears that the cost function applied to design line 2 (DL 2) assumes that 25% of installations would result in a required pole change-out at the cost of \$2,000 per occurrence when the weight of the transformer exceeds 1,000 lbs. (We presume that DOE does not include situations where the base case transformer also exceeds 1,000 lbs.) DOE also includes a transformer pole support cost of \$0.12/lb to account for a sturdier pole replacement pole (Section 6.3.1).

Based on conversations with utility company representatives and industry literature, we believe that this additional cost is entirely erroneous and should be eliminated. The primary determining factor in selecting pole size is the horizontal load it is likely to experience and not the vertical load. Transformer weight results in vertical load.

Bulletin 1724E-150 of Rural Utilities Services of the U.S. Department of Agriculture describes how to determine "Unguyed Distribution Poles – Strength

Requirements.” Section 3.2 of this document provides the calculation on the loading on the pole and it is shown below.

3.2 Combined Loading Equation: All of the loads that can be expected to be applied to a pole have to be considered in order to determine the pole’s strength requirements to sustain the loads. Loads are simultaneously applied to poles in both the horizontal and vertical directions. Poles need to have sufficient strength such that the following relationship is satisfied:

$$\frac{M_{applied}}{S} + \frac{P_{applied}}{A} \leq MOR \quad \text{EQ 3.1}$$

Where,

- $M_{applied}$ = Moments induced in the pole (in-lb)
- $P_{applied}$ = Vertical loads on the pole (lbs)
- S = Section of modulus (in³)
- A = Cross section area of pole (in²)
- MOR = Modulus of rupture (lb/in²)

Usually the P/A portion of Equation 3.1 is negligible in comparison with the M/S portion of the equation and thus is ignored in the distribution pole strength calculations of this bulletin.

Please note the last paragraph. It clearly says that the size of the pole is essentially determined by the horizontal load and vertical load can be “ignored”. In other words the impact of transformer weight (vertical load) is negligible compared to horizontal load considerations. Thus, **increased weight due to higher efficiency will not result in pole change-outs. We strongly recommend that the cost function applied to DL 2 be dropped.**

3. DOE should consider “wound core” technology for low-voltage & medium-voltage dry-type transformers: We observed that the Department has not considered wound core technology for low-voltage & medium-voltage dry-type transformers. We realize that wound core traditionally is not used for these product lines. However, wound core construction offers a higher level of efficiency than either butt-lap or mitered joint. We recommend that the Department add wound core made from conventional steel (GOSS) as a design option for at least the low-voltage dry-type product line. Low voltage products are made in sufficient volume to potentially justify the additional equipment and tooling costs associated with wound core construction.

4. DOE should consider supplemental designs in the main analysis. The supplemental designs using aluminum conductors evaluated by DOE for the PTSD (section 5.3.19) are viable options for manufacturers. We recommend that the Department complete this design option for *all* product lines and include these in the subsequent stages of the analysis. We note that the supplemental designs tend to make improved efficiency more cost effective than designs considered in the main analysis to date.

5. DOE should survey users to better assess the baseline practice: Many utilities which “evaluate” transformers still purchase lowest first-cost transformers. Some utilities apply very low A and B factors. Furthermore, “band of equivalence” methods tend to override evaluations that might otherwise lead to purchase of a transformer above minimum standards. For example, a 10% band of equivalence would tend strongly to lead to a lowest first cost purchase, even with relatively high A and B factors. We confirmed with a large utility that they typically purchase lowest first cost transformers despite performing evaluations, in part due to application of a band of equivalence.

Therefore, we recommend that the Department survey sufficient users and suppliers to develop a better estimate of the percentage of units that were purchased in 2010 that had significantly higher efficiency than the minimum standard. In the interest of reducing effort in gathering such information, we suggest that this survey be limited to liquid-filled units. Alternatively such data can be sought from trade groups (EET and/or NEMA).

6. DOE should consider advanced standards for a portion of the market: Amorphous metal and Amorphous Metal Distribution Transformer (AMDT) were invented and commercialized in the U.S. in the early 1980s. From the mid-1980s to the mid-1990s, some 500,000 units were installed in the U.S. and have been in operation since then with a very satisfactory performance record. Globally, by 1998, 1.25 million units were installed. Currently, utilities in China and India are the major buyers of these types of transformers. China has already installed over 70 million kVA and is installing at the rate of 20 million kVA/year. There are 100+ manufacturers qualified to make AMDT in China. (EcoTransformer - Final Report – January 2011 www.ecotransformer.org/docs/EuP_Lot%202_Transformers_Final%20Report.pdf).

The Department’s current study shows that AMDT designs offer the lowest lifecycle cost for the vast majority of the equipment classes. Thus, performance standards based on this type of technology is in the best interest of the country in the long term. However, we recognize that since this technology is currently not used widely in this country, requiring it in the short term across all or most product classes may not be desirable. Therefore, we would like to suggest that DOE consider proposing performance standards for a portion of the market that would cause the *least disruption*. For example, DOE should start by considering a performance standard which might effectively require AMDT for **liquid-filled, small, pad mounted transformers (DL 1 & DL 4)**. **Per the DOE analysis, a minimum lifecycle cost standard for these design lines would most cost-effectively be achieved by** AMDT designs. Since most current manufacturers of these particular design lines have produced AMDTs in the past, they have the know-how. Three out of the six manufacturers of these design lines currently

offer AMDT commercially. Most of the smaller transformer manufacturers are not active in the DL 1 and DL 4 markets.

In addition, pad mounted transformers sit on the ground so there is no over weight issue. As the size of these types of units are dictated by its front cabinet which are generally larger than core & coil, increased core/coil size will not result in increased transformer size.

DOE may be able to identify other design lines where selecting a standard most likely only achievable by AMDT makes sense. By focusing on the design lines where manufacturer impacts are most manageable, DOE could establish standards that pave the way forward for this efficient design without risking disruptions to the market. This initial limited scope could be expanded in future rulemakings as the supply of material increases and technology spreads further.

7. DOE should complete new standards for low-voltage dry-type transformers. As described in the PTSD, DOE is obligated to review standards for liquid-immersed and medium-voltage dry-type transformers per a legal settlement. For the reasons described in the comments of Earthjustice to this docket, we believe that DOE is also obligated to review and, if justified, amend standards for low-voltage dry-type distribution transformers. Therefore, we strongly encourage DOE to complete new standards for low-voltage dry-type distribution transformers on the same schedule as the other transformers included in the PTSD.

Please do not hesitate to contact Andrew deLaski at (617) 363-9470 or adelaski@standardsASAP.org if you have any questions regarding these comments. Thank you for your consideration.

Sincerely,



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About the signatories:

The Appliance Standards Awareness Project (ASAP) is a not-for-profit organizations dedicated to increasing awareness of and support for appliance and equipment efficiency standards. Founded in 1999 by the American Council for an Energy-Efficient Economy (ACEEE), the Alliance to Save Energy, the Energy Foundation, and the Natural Resources Defense Council, ASAP is led by a steering committee that includes representatives from the environmental community, consumer groups, utilities and state government. ASAP provides advice and technical support to parties interested in advancing state standards. ASAP is located at 16 Cohasset St., Boston, MA 02131.

The American Council for an Energy-Efficient Economy (ACEEE) is a nonprofit organization dedicated to advancing energy efficiency as a means of promoting both economic prosperity and environmental protection. ACEEE fulfills its mission by conducting in-depth technical and policy assessments; advising policymakers and program managers; working collaboratively with businesses, public interest groups, and other organizations; publishing books, conference proceedings, and reports; organizing conferences and workshops; and educating consumers and businesses. ACEEE was involved in the legislation establishing federal efficiency standards, and has been active in all rulemakings since then. ACEEE is located at 529 14th Street N.W., Suite 600 Washington, D.C. 20045-1000.

The Natural Resources Defense Council (NRDC) is a national environmental advocacy organization with over 555,000 members. NRDC has spent decades working to build and improve DOE's federal appliance standards programs because of the important energy, environmental, consumer and reliability benefits of appliance efficiency standards. NRDC participated in the enactment of the first federal legislation establishing efficiency standards, and has been active in all significant rulemakings since then. NRDC is based in New York City at 40 W. 20th Street, NY, NY 10011; phone 212-727-2700.

Attachment