

ENERGY STAR Distribution Transformers Draft 2 Stakeholder Comment Summary and Response

The U.S. Environmental Protection Agency (EPA) thanks all stakeholders for their participation in the development of the ENERGY STAR specification for medium-voltage, liquid-immersed distribution transformers. In consideration of compelling stakeholder feedback, EPA has decided not to finalize the specification at this time, and instead will pilot it as part of buying guidance and web resources designed to connect utilities with manufacturers offering more efficient transformers.

Topic	Subtopic	Stakeholder Comment	EPA Response
General		Two stakeholders noted that they support EPA's efforts to launch an ENERGY STAR program for medium-voltage, liquid-immersed distribution transformers to promote efficiency levels over the DOE Federal Standard. One of these stakeholders welcomed the endorsement of a Total Ownership Cost (TOC) approach and noted that TOC based purchases have been displaced by most utilities today, which purchase based on the DOE required minimum efficiencies. Another stakeholder stated that customers are familiar with the TOC practice and readily apply the approach to their purchasing process. This stakeholder did not support an ENERGY STAR program for distribution transformers, stating that customers would not need ENERGY STAR in order to use a TOC method for purchasing. The stakeholder noted that purchasers already know about more efficient transformers and do not require the label in order to be identified.	EPA recognizes the benefits of employing a TOC approach to purchasing medium-voltage liquid-immersed distribution transformers in delivering both cost and energy savings. Given varied stakeholder feedback on the use of a TOC approach in transformer purchases, EPA seeks to encourage more widespread adoption by including a recommended TOC approach within the ENERGY STAR specification.
General	EPA Consultant	A stakeholder noted their concern regarding EPA's consultant who they stated is a consultant for a raw material supplier, who would become a financial beneficiary of the program. They stated that this is a conflict of interest.	EPA reviews the qualifications and status of all of its consultants prior to working with them. No conflict of interest has existed throughout the development of this specification.
Definitions		A stakeholder noted their understanding for EPA's intention to harmonize as closely as possible with the DOE definitions, but stated that some of the definitions should be adjusted to reflect current technology without materially changing the definitions but only making them more accurate.	EPA intent is to harmonize with the DOE definitions. With this Final Draft, EPA has made minor modifications to some of the definitions (as noted below) to reflect current technology trends without materially changing their meaning.
Definitions	Transformers	A stakeholder requested that EPA change the definition to remove any limitation for manufacturer's choice of conductor to insulated wire only, so it would read "insulated conductor" instead.	EPA has modified the definition to mention "insulated conductor" instead of "insulated wire" to reflect different technologies available for conductor choice.
Definitions	No Load Loss	A stakeholder noted that since losses vary depending on the voltage applied, they recommend that EPA modify the No Load Loss definition to specify "at rated voltage".	EPA has modified the definition to include "at rated voltage" for clarity.
Scope	Exclusions	<p>A stakeholder requested that EPA change the scope to include only distribution transformers operating between 1 and 34.5 kV, with a size rating of 10-500kVA for single phase units and 15-2500kVA for three-phase units. This suggestion would remove units larger than 500 kVA for single-phase units because utilities already face serious challenges using DOE compliant pole-type transformers with their current infrastructure due to size and weight increases.</p> <p>This stakeholder also suggested that three-phase transformers that are designed for vault applications should be excluded given the restrictive dimensional requirements that need to be met.</p> <p>In addition, this commenter requested that EPA only include transformers with a BIL under 150 kV given the challenges that are already an issue with the DOE standard. They mentioned that even more stringent levels for ENERGY STAR would not be practical or useful.</p> <p>They noted that the volume of all of the above mentioned products would also be very small.</p> <p>Finally, to avoid ambiguity with the application of transformers with multiple kVA ratings listed on the nameplate, a stakeholder recommended that EPA exclude them from scope. In addition, they requested that EPA specify that each portion of a duplex transformers will need to meet the requirements at the given ratings.</p>	<p>EPA has excluded single-phase transformers larger than 500 kVA, three-phase vault transformers, and all transformers with a BIL greater than 150 kV due to a lack of data on appropriate efficiency criteria. In its call for data from stakeholders, EPA did not receive any data on products that would be able to meet efficiency criteria beyond the DOE specification. Since these types of transformers represent a low market share, excluding them will likely not significantly impact energy savings potential. EPA will continue to monitor the market to determine the feasibility of and energy savings opportunity for including these types of products within the scope of the specification in a future revision.</p> <p>EPA has issued a clarification to the specification that transformers with multiple ratings and duplex transformers must have each portion of the unit meet the criteria applicable to the portion's kVA rating.</p>
IEEE Standards		A stakeholder suggested that EPA include a requirement that all ENERGY STAR distribution transformers must meet the IEEE National Standards. They noted that EPA cites a standard that is still under development (IEEE PC57.120/D13) and that this is subject to change which introduces unnecessary uncertainty.	EPA is referencing the IEEE standard in specification to assist in calculating the TOC approach and the PC57.120/D16.1 Loss Evaluation Guide for Distribution Transformers and Reactors was finalized last month (October 2016). To note, EPA is referencing the DOE test method to test and measure the energy savings of a transformer to harmonize with how products are tested to the federal standard.

ENERGY STAR Distribution Transformers Draft 2 Stakeholder Comment Summary and Response

Topic	Subtopic	Stakeholder Comment	EPA Response
Data Analysis	Core Material Types	A stakeholder stated that EPA should not include DR80, ZDMH, and MOH core materials in the analysis because they are available in low volumes and are generally only used in special circumstances.	EPA understands that materials such as DR80, ZDMH, and MOH are globally available and that the currently proposed criteria can be met with domestically available (M) steels.
Data Analysis		A stakeholder requested that EPA include a feasibility analysis on design cost for having competing standards: ENERGY STAR and the DOE Federal Standard. Specifically they noted the interplay and necessity of three factors: 1. The final application must be the correct use (i.e., experience the same loading) for which it was certified, 2. The transformer must meet the DOE Federal Standard while being maximized for the above loading factor, and 3. The transformer must be practical and cost-effective	ENERGY STAR is a voluntary program, and not all manufacturers are capable of participating in the program and maintaining desired levels of profitability. All companies have unique abilities, business models and cost structures. It is impossible to determine whether the marginal investment of bringing an ENERGY STAR product to market will be profitable for a specific company. Making the business case to manufacture products that meet the ENERGY STAR criteria can only be made by that company. That said, many companies' existing product lines have products that could currently meet ENERGY STAR levels. In addition, EPA is adapting the method that manufacturers already use to comply with the DOE Federal Standard to certify to ENERGY STAR, thus reducing the investment that will need to be made by manufacturers to certify products to ENERGY STAR.
Role of Total Ownership Cost (TOC)		A stakeholder stated that the use of TOC is only indirectly encouraged and noted that it would be preferable if EPA continued to instead use the previous methodology used for the old ENERGY STAR program to allow utilities to partner with ENERGY STAR if they use TOC. Another stakeholder indicated that the technical feasibility presented in the data analysis for Draft 2 is insufficient in accounting for the purchase price of exotic materials. They stated that citing the DOE analysis without taking into account costs and higher purchase price will not yield realistic results and the TOC calculation is inaccurate and misleading.	With this specification, EPA seeks to ensure that energy savings occur in a cost effective manner. Thus, EPA has developed energy savings criteria that also accounts for products that would deliver cost savings when employing a TOC approach. EPA found that employing a TOC only approach, in some instances, does not necessarily deliver energy savings over the DOE-minimum compliant design. EPA understands that the price of materials may vary and affect the overall purchase price. EPA has twice requested data from stakeholders on the cost of materials since EPA launched this specification in 2015. As such, EPA has not received any data from stakeholders to factor material cost into its analysis. Prior to finalizing the specification following this Final Draft, EPA welcomes any data that could inform the cost effectiveness of more energy efficient transformers.
Load Factors		A stakeholder requested a simplification to Equation 2 such that you are comparing the energy performance against the DOE minimum because as written, it may yield inconsistent results between manufacturers. Two stakeholders stated that setting specific load factors (i.e. 15%, 35%, 65%), instead of using the proposed load factor bins, would reduce administrative burden substantially. One commenter requested clarification on how distribution transformers with a range of load factors will enable buyers to compare features, savings, and optimize purchasing, noting that using ranges, instead of fixed integers will result in confusion in any list of products and inhibit a comparison to be made across products. Another stakeholder noted that there is an IEEE Transformers Committee that established a taskforce to collect loading data to publish publicly since loading information is unavailable at this time. In the preliminary findings, the utility data shows a 49% loading factor as typical for residential loads. This stakeholder requested that EPA wait to establish load factors until this study has been completed. They noted that as proposed, the load factor bins may bias transformer designs toward higher coil losses and lower core losses compared to a minimum DOE compliant design, which could lead to lower efficiency at load factors above 50%. In addition they noted the complexities with the concept of an average loading and believed that the three load bins could diminish the realization of national savings potential. They suggested that EPA set upper limits for total losses to supplement the minimum efficiency requirement at 50%. Another stakeholder agreed with this as well and noted that DOE used 50% because a customer base served by a single transformer will grow over time, resulting in the optimization of that transformer for a specific load to be irrelevant over time. Another stakeholder believed that the load factors favor lower load conditions and thus will encourage the use of amorphous core materials. They noted that DOE states that smaller capacity single-phase liquid immersed transformers were loaded between 20 to 60%.	EPA updated Equation 2 with the assumption that the minimum DOE designs will have a core loss equal to load loss at the 50% load factor. This approach will reduce burden for manufacturers by keeping the performance of the DOE model a constant for a given capacity for all manufacturers, rather than a variable that would need to be modeled for each TOC-optimized design. EPA has maintained the requirements for the load factor ranges that were presented in Draft 2. In addition to the load ranges previously seen, divided the high load factor bin into two: > 40–55% and > 55% (in Draft 2, the highest bin included all load factors > 40%). This was based on stakeholder feedback requesting a specific load bin greater than 40%, and EPA found that having a higher load bin will also generate more energy savings. EPA received feedback that optimizing transformers at each utility-provided load factor within a bin would be burdensome for manufacturers. Therefore, EPA has provided specific load factors in the midpoint of each bin at which the requirement shall be met. The midpoint was chosen by reviewing the RMS load distribution for DL 1 previously developed by DOE. This should simplify the process of providing ENERGY STAR designs in response to a customer request. A manufacturer will be able to provide just a single ENERGY STAR design that is acceptable across the entire load factor bin, rather than ensuring that its designs meet the requirements each time a utility purchaser provides a load factor. EPA does not expect this to decrease savings significantly.
Percent Energy Savings		A stakeholder stated that the EPA approach would require manufacturers to design a base model (or minimum DOE compliant design) in order to design a model with the given percentage energy savings over that baseline model, which would lead to double the amount of administrative costs and processing time for ENERGY STAR listing.	EPA updated Equation 2 with the assumption that the minimum DOE designs will have a core loss equal to load loss at the 50% load factor. This approach will reduce burden for manufacturers by keeping the DOE model a constant for a given transformer that would be the same for all manufacturers, rather than a variable that would need to be modeled for each TOC-optimized design.

ENERGY STAR Distribution Transformers Draft 2 Stakeholder Comment Summary and Response

Topic	Subtopic	Stakeholder Comment	EPA Response
Energy Savings		A stakeholder stated that the current structure of the specification will not ensure that energy savings are realized and that EPA did not provide a market analysis showing the demand for ENERGY STAR Distribution Transformers. This stakeholder believed that two of the three national utility representatives indicated that there was little interest in the proposed program. They also noted that because of this, EPA's estimate that 100% or 50% of the market will be ENERGY STAR products over a 30 year time period, is inaccurate. They requested that EPA use a more accurate percentage, like 10% or 20% and in addition, that EPA poll potential customers to demonstrate that there is sufficient demand to justify the cost for manufacturers.	The current structure of the specification encourages a TOC approach to purchasing and transformer optimization to an estimated load factor, which EPA believes will result in energy savings, especially in those cases where utilities are not using any TOC approach before purchasing a minimum-cost DOE compliant design. If there is a 20% stock replacement of ENERGY STAR certified transformers over 32 years, the savings are still estimated to be around 1.4 TWh, which is still quite significant. In addition, after a specification is finalized, EPA begins to market ENERGY STAR certified distribution transformers through various strategies, depending on the industry (e.g., promotion through the website and Product Finder tool, developing educational and promotional materials for purchasers, the use of the ENERGY STAR mark and graphics in manufacturer materials).
Limiting Product Availability		Several stakeholders noted that there appears to be a very limited number of models that can meet the requirements for certain conditions (e.g., 50 and 1500 kVA with A value of \$7 and B value of \$2.80). They expressed concern that the current levels eliminate well over 90% of the products on the market, and that the recovery of any additional upfront costs will not be recovered within a reasonable amount of time.	EPA believes that there are a number of models that can meet the requirements for the given conditions. For the situation pointed out by this stakeholder, EPA did not use A/B values of \$7/\$2.80, but rather these specific values were used for the high load factor analysis only.
Weight/Size Consideration		Two stakeholders noted that ENERGY STAR designs may unreasonably increase the weight of transformers, making them unusable at many common utility installation points without infrastructure upgrades. One of these stakeholders requested that EPA examine the feasibility of the resulting ENERGY STAR designs. They noted that DOE assumed that increasing transformer weight over 15% would require a pole change.	In response to stakeholder concerns regarding the potential increase in the weight of more energy efficient transformers requiring infrastructure upgrades, EPA performed an analysis comparing the size/weight of a minimum DOE-compliant model with that of the lowest-first-cost model that 1) provides positive Total Ownership Cost over a minimum DOE-compliant model while 2) also providing energy savings as specified in Table 1 of Draft 2. In analyzing the effects of increasing the efficiency requirements as proposed in Draft 2 for models in Design Lines 2 and 3, where weight is particularly critical, EPA found that the weight of certain core materials can be kept within 5% of the weight of the minimum DOE-compliant model. Per their published Technical Support Document, DOE assumes that a pole change-out may be necessary only if the weight is increased by more than 15% for pole-mounted transformers. In some cases, EPA found that using DR80 core steel can result in lighter units than the minimum DOE-compliant model and some amorphous core steels (indicated as SA1 in the table) result in a weight increase of 10% or less. EPA's analysis is posted to the ENERGY STAR Distribution Transformers product development page: https://www.energystar.gov/sites/default/files/Distribution%20Transformers%20Draft%20Data%20Analysis%20Memo.pdf
Material Availability		A stakeholder noted that amorphous core materials are only available from two global sources and that relying on this one type of material treads close to an issue of sole-source availability. They also stated that there are periodic gaps in availability of high-performance grain oriented steels. They believed that amorphous metal is the only practical low-load factor efficiency option based on the ENERGY STAR proposal.	ENERGY STAR requirements do not depend on the use of amorphous core material for compliance. They can be met using Grain Oriented Silicon Steel (GOSS) products.
Purchasing Process		A stakeholder stated that manufacturers do not offer products by catalogue number or model number, but instead they are custom products, with efficiency being one feature. They recommended that EPA illustrate how it's program administration practices will accommodate the needs of custom-made products.	For purposes of ENERGY STAR third-party certification, since distribution transformers are custom-built products, transformer manufacturers will be allowed to follow the same laboratory testing procedures they use when reporting their product performance to DOE. As such, manufacturers will be able to use both the same actual test results submitted to DOE as well as modeled results from the same alternative efficiency determination method (AEDM) they currently use to demonstrate DOE compliance, allowing for more timely response to potential customers regarding ENERGY STAR status of design options.

ENERGY STAR Distribution Transformers Draft 2 Stakeholder Comment Summary and Response

Topic	Subtopic	Stakeholder Comment	EPA Response
Certification		<p>Several stakeholders expressed their concerns regarding the 3rd Party Certification process. These commenters noted that the expense associated with certification will add significant costs to transformers which would make them less likely to be purchased with or without the use of TOC. One of these stakeholders suggested that EPA work with manufacturers to ensure that the cost increases are minimized.</p> <p>Another stakeholder stated that the process would be burdensome, especially with the load factor bins, and does not take into account the nature of transformer purchasing which will discourage manufacturer participation. This stakeholder noted support for using the AEDM method.</p> <p>Stakeholders indicated that there are not 'off the shelf' products like in other product categories, but rather the customer specifies the performance parameters for specific applications, a process which involves a dialogue between customers and manufacturers. Thus, the base model concept cannot easily be applied to this industry as well as the idea of "desk reviews". One stakeholder noted that the process would not add any value and would disincentive manufacturers from participating. Finally, they appreciated the proposal to allow manufacturers to use their existing DOE testing and AEDM procedure for ENERGYSSTAR, requiring compliance with Certification Bodies and a Supervised Manufacturer Testing Lab will be too burdensome.</p>	<p>To address manufacturer burden from certification, once a specification is finalized, EPA will allow transformer manufacturers to follow the same laboratory testing procedures when certifying a product to ENERGY STAR as they do when reporting their product performance to DOE. As such, manufacturers will be able to use both the same actual test results submitted to DOE as well as modeled results from the same alternative efficiency determination method (AEDM) they currently use to demonstrate DOE compliance, allowing for more timely response to potential customers regarding ENERGY STAR status of design options.</p>