Setting Standards for Excellence

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President and Chief Executive Officer

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The Honorable Steven Chu
Secretary of Energy
U.S. Department of Energy
1000 Independence Ave., SW
Washington, D.C. 20585

Subject: NEMA Recommendations Regarding Department of Energy Negotiated Rulemaking for Distribution Transformers

Dear Mr. Secretary:

I would personally like to thank you and the Department staff for providing NEMA and other stakeholders the opportunity to collaborate on a consensus position on energy conservation standards for distribution transformers through the innovative negotiated rulemaking procedure.

From NEMA's perspective, this process has been extremely valuable in helping all the stakeholders understand the interests and concerns of the other stakeholders. In addition, it provided an opportunity for transformer manufacturers to explain existing technologies and markets, and for the Department's consultants to refine the various models and input assumptions used in the analysis.

NEMA and its members are committed to distribution transformer energy efficiency. Through NEMA, the industry developed the first specification for transformer energy efficiency, NEMA TP1-1996, and a voluntary NEMA Premium Efficiency Transformer program. During the negotiated rulemaking process, we advocated proposals to increase distribution transformer efficiency above the current federal minimums, which are already quite high, ranging from 97 percent to 99.49 percent.

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We share with other stakeholders the objective of increasing energy efficiency, but we must balance that objective with the critical needs of maintaining a competitive domestic transformer manufacturing base in the U.S. and maintaining U.S. jobs, both of which are important values that that the *Energy Policy and Conservation Act* requires the Department to incorporate in developing a Final Rule.

We have consistently maintained the following three principles in our analysis and recommendations:

1. NEMA supports developing new transformer energy efficiency standards, provided that those standards are justified from a cost effectiveness perspective. For several years, NEMA has developed and has promoted a voluntary NEMA Premium® program that offers low voltage dry-type transformers with 30 percent less loss than existing federal requirements.

2. NEMA believes it is important to support and maintain a healthy transformer industry in the U.S. and will guard against efficiency regulations that would lead to uncompetitive market constraints and conditions. We are speaking of the market for important transformer inputs as well as the markets for transformers themselves. These markets will break down if a Final Rule locks manufacturers into one particular grade of steel, one particular type of core material, one particular supplier, or one design approach. In manufacturing transformers, design flexibility, and materials substitution are critical to the viability of the industry as well as the feasibility of delivering customized products. Recognition of this flexibility was a key element in the Department's 2007 Transformer Final Rule, and it must continue to be given considerable weight. Some specifics of why this is important are noted in the attachment to this letter.

3. NEMA believes it is important that all stakeholders understand the potential negative impacts on small manufacturing facilities if significantly higher efficiency standards are adopted. Putting undue pressures on small manufacturing facilities and potentially eliminating U.S. jobs should be avoided if possible.

NEMA has used these three principles, together with the analysis performed by Navigant Consulting and Lawrence Berkeley National Laboratory (LBNL), to develop our recommendations to the other stakeholders during the negotiated rulemaking. The NEMA-recommended efficiency levels for each of the three distribution transformer classes—medium voltage liquid-filled (LF), medium voltage dry-type (MVDT), and low voltage dry-type (LVDT)—are outlined in an attachment to this letter, but here we state a few general points that impact all three classes of transformers.

a. A disconnect exists between the dollars-per-watt-saved analysis used by the utilities and the manufacturers in practice, and the models used by Navigant and LBNL. Significantly different interpretations ensue from the two different ways of looking at the cost of increasing efficiency. NEMA relies on the real world experiences of the manufacturers who design and build distribution transformers to their customers' needs every day over the projections of the models. This led NEMA to make recommendations for efficiency levels that fall between the levels that would be justified based on the dollars-per-watt methodology used by the utilities and the models employed by Navigant and LBNL. NEMA and its members believe our approach is the right one for the country.

b. In the existing distribution transformer regulations, single-phase and three-phase efficiency standards are normalized to one another. However, there are distinct differences between them. In general, it is more difficult to increase the efficiency of the three-phase MVLF than the single-phase. The reverse is true for MVDT and LVDT – it is more difficult to increase the efficiency of the single-phase than the three-phase. These differences should be reflected in the standard.

c. It is also more difficult to increase efficiencies on higher basic impulse level (BIL) transformers (above 95 BIL) than lower BIL transformers. These higher BIL transformers should be required to comply with efficiency levels that are not as high as lower BIL units.

d. In general, as transformer efficiencies increase, the first-cost of the transformers also increases. Higher first-costs will make it more likely that utilities will refurbish old, less efficient transformers instead of buying new high efficient transformers, a trend we are already witnessing. These refurbished transformers will most likely have efficiencies *lower* than even the current standards. This reality needs to be factored into the analysis. If DOE wants to reconsider its position on regulating rebuilt transformers, NEMA would be prepared to support DOE.

e. NEMA is very concerned with the possibility that higher efficiency standards will negatively impact small manufacturing facilities and may actually drive some small companies out of business. These issues were discussed, but we think that they were not weighted properly in the LBNL analysis. The statute compels that the Department consider the impact of an amended energy conservation standard on competition.

f. In order for all newly manufactured units to meet the stringent Compliance, Certification and Enforcement requirements,

manufacturers actually "over design" the efficiency of the units by five percent or more. This fact needs to be given weight in setting energy conservation standards for distribution transformer standards, especially as we approach maximum technological feasibility.

g. We are dealing with a group of products that is already very efficient. Existing energy conservation standards are all above 97 percent, with the highest standard being 99.49 percent. The potential incremental gains in efficiency under consideration are measured in just tenths of one percent. NEMA believes that some increase can be justified—and we made such bold proposals to the stakeholders. We are in an area where moving too many tenths of one percent would have serious implications: steelmakers could no longer supply materials to transformer manufacturers, the number of core materials suppliers would be fewer, competition in providing inputs would be reduced, utility customers would see a significant cost impact, manufacturer flexibility in designing transformers would be diminished, and smaller transformer manufacturers will likely exit the business.

NEMA thanks you for the opportunity to submit these comments. The above recommendations consistently apply the three basic principles we noted at the beginning of this letter. We request that you consider these recommendations seriously. We believe that adopting energy efficiency standards higher than our recommendations has the potential to negatively impact the U.S. transformer industry.

NEMA and its manufacturers stand ready to provide any further information as the process continues. Our transformer-specific views are attached.

Respectfully,

Evan R. Gaddis
President and CEO

Enclosure

Cc: The Honorable Henry Kelly
Dan Cohen
John Cymbalsky

NEMA RECOMMENDATIONS BY SPECIFIC TRANSFORMER CLASSES

LIQUID-FILLED TRANSFORMERS

1. There is a disconnect between the simple dollars-per-watt-saved estimates performed by the utilities and the manufacturers, and the cost effectiveness calculated by Lawrence Berkley National Laboratory (LBNL). The dollars-per-watt saved calculation performed on the new energy efficiency levels indicates that it is *not* cost effective to increase the efficiency levels for liquid-filled transformers beyond the 2010 levels established in the October 2007 Final Rule.

   The LBNL lifecycle cost analysis indicates that higher efficiency levels are warranted. Although we do not believe that LBNL's analysis has been properly validated to correspond with real-world experience, NEMA and the manufacturers are willing to consider efficiency levels up to the cross-over point between amorphous metal and M-3 silicon steel, where core material substitution preserves the interests of both the raw materials suppliers and the manufacturers in the availability of alternative material inputs and design flexibility. In Design Lines (DL) 1-5 this crossover point is roughly at efficiency level 1 (EL1), except for DL2. Specifically, NEMA recommends:

   a. DL1 at EL1
   b. DL2 at EL0
   c. DL3 at EL1
   d. DL4 at EL1
   e. DL5 at EL1

   This recommendation is derived from our fundamental principal of keeping efficiency levels within a range that allows for open competition between various core materials. We do not support efficiency levels above this point because:

   a. Once there becomes a cost differential where amorphous designs are significantly less than M-3 steel designs, then either amorphous will dominate the market and hurt the U.S steel industry, or the amorphous manufacturer will significantly increase prices to match M-3 steel, invalidating the LBNL life cycle cost analysis.
   b. As noted several times during the negotiated rulemaking discussions, all transformer manufacturers reported that the slope of the delta-price vs. delta-efficiency curve actually increases more steeply than reported in the Navigant analysis.
   c. Beyond EL1, we project that the refurbishment market will increase and undermine the primary objective of reducing transformer

energy consumption. Several utility representatives have indicated that the refurbishment market is already growing as a result of the efficiency rule that became effective on 1/1/2010.

d. The NEMA transformer manufacturers have reported that they can not generate a sustainable economic mix of core materials at EL2 and higher, and at least one small manufacturer reported that the company can not stay in business at levels higher than EL1.

2. NEMA recommends different treatment for network/vault transformers than other liquid-filled transformers because of size limitations in existing vaults. In many cases, higher efficiency transformers (larger transformers) cannot fit into existing vaults and still maintain required safety and maintenance clearances. The manufacturers are willing to provide a proposal on the treatment of these transformers.

3. The Basic Impulse Level (BIL) rating of a transformer has a significant impact on the losses of the product. This is because the clearance between the windings and the core must increase as the BIL increases, resulting in a greater volume of core materials and thus a greater amount of no-load losses.

   This impact was recognized by the Department for the Medium Voltage Dry-Type (MVDT) efficiency standards established in 2010. However the Department did not recognize this impact with the Medium Voltage Liquid-Filled (MVLF) standards. The MVLF efficiency standards cover a range of BIL ratings up to and including 200 KV. But the standard was written independent of the BIL rating, which meant that it had to be applicable to all ratings (including up to 200 BIL). In light of this, NEMA recommends that the efficiency level for MVLF transformers with 150 BIL and higher be maintained at the existing EL0.

MEDIUM VOLTAGE DRY-TYPE TRANSFORMERS

1. NEMA continues to be concerned with the projected transformer price estimates provided by Navigant. Although the price estimates for the lower efficiency levels seem reasonable, we are not confident in the results presented for the higher levels. Specifically, ABB continues to report that the slope of the data points in the technical analysis (scatter graph) do *not* correlate to the slope of the actual transformer sold by ABB.

   The analysis performed by our member companies indicated that the following efficiency levels are cost effective. These recommendations are in agreement with the efficiency levels recommended by the Appliance Standards Awareness Project and other energy efficiency advocates for

DL11 and DL12. The advocates did not address other DLs in this category, but offered to work with NEMA on the details.

a. DL9 at EL 1.5
b. DL10 at EL 2
c. DL11 at EL 2
d. DL12 at EL 3
e. DL13 (new modified level)

2. NEMA also recommends the following adjustments in this category:
   a. For DL13, we recommend that the efficiency level allow for 10% more loss than DL12. The DL13 products are the high BIL transformers noted in item c. of the general comments.
   b. For single phase transformers, we recommend that the single phase efficiency be less than the three phase efficiency by a maximum of 30% higher losses not to exceed the 2010 standard.
   c. For small transformers (less than 300 kVA), we recommend EL1. In large kVA transformers, coil size predominantly dictates the overall core size. In small kVA transformers, voltage clearance dictates the core size and hence the no-load losses and efficiency. For units less than 300 kVA, an efficiency level higher than EL1 is extremely difficult to achieve with commercially available silicon steel.
   d. For MVDT transformers used in high-rise buildings, NEMA recommends different treatment because of size and weight limitations in existing installations. In many cases, higher efficiency transformers (larger transformers) cannot fit into existing locations and still maintain required safety and maintenance clearances. The manufacturers are willing to provide a proposal on the treatment of these transformers.

LOW VOLTAGE DRY-TYPE TRANSFORMERS

1. NEMA continues to be concerned that high efficiency standards will hurt small U.S. manufacturers that currently produce LVDT transformers. The impact to small manufacturing facilities needs to be factored into this rulemaking process. NEMA requested that the Department's consultant interview some of these small manufacturers to better estimate the impact at various energy efficiency levels.

2. NEMA recommends that the efficiency levels for the LVDT transformers be increased to EL2 for both DL7 and DL8. These efficiencies track closely to the NEMA Premium Program and are at the upper limit of what the small manufacturers can tolerate. DL6 has a very small potential for energy savings because of the small quantity of sales. We recommend

retaining the existing EL0 level for DL6. NEMA recommends EL2 for both DL7 and DL8 because:

a. There is significant uncertainty in the analysis and the EL2 level already represents a 25% to 35% increase in prices over the EL0 level.
b. The Navigant analysis continues to show a flatter price vs. efficiency curve than the actual data collected by the manufacturers.
c. The NEMA Premium design is still in the early stages of development and only a small number of units have been sold. This indicates that the existing cost effectiveness is less than that reported by LBNL.
d. Manufacturers will need to "over design" transformers to ensure that all units meet required efficiency levels. Some manufacturers have reported that this over design can improve energy saving by over five percent over required level.

3. NEMA does not yet have a proposal for the treatment of datacenter transformers. Datacenter transformers have different requirements and are designed differently than typical distribution transformers, but we have not yet resolved how to effectively define this application so as to eliminate "gaming the system." A work group was established to define this class of transformers and propose appropriate efficiency levels. We will reconsider our position on datacenter transformers once we receive a report from the work group.