Setting Standards for Excellence

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October 4, 2016

VIA EMAIL TO: BatteryChargersUPS2016STD0022@ee.doe.gov

Mr. Jeremy Dommu
US Department of Energy
Buildings Technologies Office EE–5B
1000 Independence Avenue SW
Washington, DC
20585–0121

Re: NEMA & ITI Comments on Energy Conservation Program: Minimum Energy Conservation Standards for Uninterruptible Power Supplies

Docket Number: EERE-2016-BT-STD-0022
Regulatory Information Number: 1904-AD69

Dear Mr. Dommu,

As the leading trade association representing the manufacturers of electrical and medical imaging equipment, the National Electrical Manufacturers Association (NEMA) provides the attached comments on the Department of Energy Proposed Minimum Energy Conservation Standards for Uninterruptible Power Supplies. These comments are submitted on behalf of NEMA Power Electronics Section Member companies. The Information Technology Industry Council, the global voice of the tech sector, joins us in these comments.

NEMA, founded in 1926 and headquartered in Arlington, Virginia, represents nearly 400 electrical and medical imaging manufacturers. Our combined industries account for more than 350,000 American jobs and more than 6,500 facilities across the U.S. Domestic production exceeds $117 billion per year.

The Information Technology Industry Council (ITI) is the global voice of the tech sector, celebrating its 100th year in 2016 as the premier advocacy and policy organization for the world's leading innovation companies. In both the U.S. and in countries around the world, ITI navigates the relationships between policymakers, companies, and non-governmental organizations, providing creative solutions that advance the development and use of technology around the world.

Please find our detailed comments attached.

Our Member companies count on your careful consideration and we look forward to an outcome that meets their expectations. If you have any questions on these comments, please contact Alex Boesenberg of NEMA at 703-841-3268 or alex.boesenberg@nema.org or Alexandria McBride of ITI at 202-626-5753.

Sincerely,

Kyle Pitsor
Vice President, Government Relations
National Electrical Manufacturers Association

Alexandria McBride
Director, Environment and Sustainability
Information Technology Industry Council

NEMA & ITI ("Industry") Comments on Energy Conservation Program: Minimum Energy Conservation Standards for Uninterruptible Power Supplies

General Comments:

> Although the DOE has determined to regulate Uninterruptible Power Supplies (UPS) within the umbrella of Battery Charger Minimum Energy Conservations Standards, we importantly note --- from the critical perspective of the UPS system customer --- the fact that a UPS system is never purchased for its incidental function as a battery charger. The primary intended use of a UPS system is to filter, shape, and monitor mains power to a critical load. In the event mains power fails, the energy backup component of the UPS provides temporary power to the load using power stored in a battery either to sustain power through the power loss event or allow an orderly shutdown of the critical load. A secondary, arguably tertiary, operating mode of the UPS is to maintain and replenish energy in a storage battery. In general the UPS system spends an insignificant amount of time and energy charging the backup energy storage system. The significance of this fact is the following: The primary function of delivering power to a load(s) must be respected. Thus the UPS device must be provided sufficient power to perform all intended function(s) and utilities as designed so as to meet the consumers' primary purpose of installing it. Consequently DOE is obligated to impose only energy efficiency standards that in no way limit the effectiveness of the UPS across the range of its primary purpose on behalf of the customer. This is especially so because the architectures and performance features are selected because of specific customer requirements. Slightly lower efficiency UPS systems serve an important role in the marketplace because that particular architecture delivers performance and features valued by the customer.

By seeking to regulate UPS efficiency by type of basic design, the DOE appears to partly understand the fact that different UPS designs can have very different consumer utility. We agree with this approach, but we advocate strongly that it be improved upon. Besides the overall design approach, output wattage and secondary features are just as important to consumer needs. These differences in output and features have corresponding demand and price trends that we believe the DOE has inadequately examined.

To review, the three basic designs of UPS are: (1) Voltage and Frequency Dependent (VFD), (2) Voltage Independent (VI), and (3) Voltage and Frequency Independent (VFI). VFD designs are the most popular by units sold and provide simple backup power without continuous power regulation or power conditioning. VI designs offer voltage regulation but pass noise and other fluctuations in mains power to the load. VFI products provide full power conditioning and true AC output, reducing noise and providing "clean" power to the load. As performance features increase in complexity, price also increases.

With respect to features vs. price, we request the DOE more thoroughly examine performance features unrelated to battery charging and their relationship and effects on UPS efficiency and price. These "secondary" features include services such as power conditioning, USB charging ports, wired and wireless connectivity, integrated on-board data displays, self-diagnostics, communications capabilities and other functions. By only looking at price vs. electrical efficiency, and strongly favoring those devices advertised or tested as "most" efficient, the DOE

risks eliminating very important consumer demanded utilities from UPS product, which would be a violation of EPCA clause 325(o)(4)[1].

We note with disappointment the DOE's admission in the public meeting of September 16, 2016 that the analytical conclusions in the NOPR were based almost exclusively on ENERGY STAR UPS product performance data, yet this data was not measured using the newly proposed DOE UPS test procedure. In our view, this is not in conformity with and contrary to the intent of Section 7 of DOE's Process Improvement Rule, 10 CFR 430 Appendix A to Subpart C. It follows that any analytical "conclusion" seeking to establish the impact of the proposed efficiency requirements can only be guesswork. Our members estimate the negative impact of the proposed UPS test procedure to be a reduction of between 0.2% and 0.4% in measured efficiency. Given that the bulk of the market (VFD and VI) products) are already over 97% efficient, a few tenths of a percent adds up quickly against compliance with an energy conservation standard. If the DOE persists on pursuing very strict efficiency levels (and the NOPR levels is very strict), it follows that DOE is obliged, 1) to either mathematically determine the impacts of the proposed new UPS test procedure of devices by type and wattage range, and adjust the ENERGY STAR data accordingly for its analysis, 2) or to undertake an extensive amount of additional physical testing and base the standard on these new data.

With respect to scope and maintaining a consumer focus in this rulemaking, we note the DOE's public comments on September 16, 2016 which indicated DOE's intent to consider restricting the scope of products to wall plug appliances using NEMA plugs 1-15P and 5-15P[2]. We agree wholeheartedly with this clarification to scope and urge the DOE to formalize it and apply it to this rulemaking analysis. Further, we note that this clarification should also be applied to the UPS test procedure rule.

Additionally, with respect to the scope of this rulemaking and any proposed rule, we note that there are UPS products in the sub-300W range that are not adequately represented in the DOE's data sets. These products are sold to satisfy small backup needs from products such as Voice Over Internet Protocol (VOIP) and similar services. These small UPS products are more significantly impacted by fixed core losses than higher wattage products, and none of the known member products can pass today's ENERGY STAR performance levels. From the market's perspective, this did not matter because ENERGY STAR is a voluntary program and there was no demand for ENERGY STAR qualified UPSs in the 50W range. Since DOE's standards are mandatory, small UPS products must be analyzed and accommodated by any proposed rule. Our members have been encouraged to send the DOE performance data for small wattage UPS below 300W to aid in their analysis. We submit proposed revisions to efficiency levels and product wattage ranges in our response to item 3.

Issues on Which DOE Seeks Comment

[1] "The Secretary may not prescribe an amended or new standard under this section if the Secretary finds . . . that interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States in any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities and volumes that are substantially the same as those generally available in the United States at the time of the Secretary's finding."

[2] https://en.wikipedia.org/wiki/NEMA_connector

Although comments are welcome on all aspects of this proposed rulemaking, DOE is particularly interested in comments on the following issues.

(1) DOE requests comments on the potential technology options identified for improving the efficiency of UPSs. See section IV.A.2 for further detail.

Industry Comment:

1. Regarding the use of Stendust for a core material and Litz wire: Using these technologies for inductor construction are expensive undertakings and at best worth only 0.5% in efficiency improvements. More to the point, however, these technology options are specific to designs that use transformer-less topologies and VFI designs (the type of UPS least available in the market-place). Such designs are not being pursued *due to patent issues*. It would be important for the DOE to consult with the Department of Justice, if DOE continues to consider these technology options in the rulemaking, to ensure that competition is not adversely impacted by DOE regulation in view of the patent landscape.

2. Regarding wide band gap semiconductors such as silicon carbide and gallium arsenide: Wide band gap semiconductors are only just now becoming commercially viable and the cost of those components compared to the standard insulated-gate bipolar transistor (IGBT) is approximately a 3x cost increase. It is not clear whether economies of scale in the limited market of UPS will cause any significant reduction in cost of IGBT components. Our best estimate of the efficiency improvement moving to a wide band gap semiconductor without additional topology design is a 0.25% improvement. These wide band gap devices only best serve the VFI designs and they do nothing for VFD designs (the most prevalent in the market-place). They only marginally serve VI designs.

3. Regarding the potential use of low equivalent series resistance (ESR) capacitors: Since most, if not all, capacitors in a UPS are used as a filtering element, the move to a low ESR type capacitor will not serve to increase efficiency as the energy lost into this filtering element is still lost regardless of the equivalent series resistance of the capacitor. As a result, this suggested technology option is not an efficiency improvement and should be removed from the list of viable options.

4. Regarding high copper content Printed Circuit Boards (PCBs): High copper content in PCB traces can lower the I^2R losses on the PCBs; however the efficiency gain is on the order of < 0.25%. The highest commercially viable option of high copper content PCBs is 4 oz. boards. This technology option can be used in all three design types of UPS units.

5. Regarding variable speed fan controls: We agree that a variable speed fan control can, at lighter loads, save on energy delivered to the fan(s). However, this will only serve to help the VFI type products because VFI products are the only type of UPS that have fans constantly operating, while VFD and VI types do not typically have constantly rotating fans.

6. Even if DOE were to ignore the foregoing important comments about the applicability and feasibility of these options, the above listed options taken at their optimum performance potential still result in less than one percent potential efficiency

improvement. This is clear evidence that the DOE has pushed the proposed efficiency limits too far in terms of feasibility, especially for product types where DOE has proposed an efficiency level in excess of tested and cataloged efficiency (see analysis of VI products 300-700W in item 3). Furthermore, as we note in item 10, this attempt to greatly improve the already high efficiency levels is an exercise in creative analysis more than it is a true physical improvement. Efficiencies of the bulk of the market are in the high 90's. The burden of redesign and testing to improve overall product efficiency a sub-percent is not justified, as our following comments will further illustrate.

(2) DOE requests comment on its screening analysis used to select the most viable options for consideration in setting this proposed standards. See section IV.B.2 for further detail.

Industry Comment: The screening analysis demonstrates a limited understanding of how UPS equipment is designed, and a limited awareness of the tradeoffs involved in the power switching devices used in UPS equipment. For example, in item 1 we note the discontinuity between the screened-in technology options and UPS topologies and construction. This clear lack of knowledge about UPS design and operation evidences the need for the DOE's proposed efficiencies to restrict themselves to levels that, do not eliminate most of the product on the market in anticipation of future technology improvements (see item 3 re: VI designs). A more temperate approach is required that impacts only a smaller subset of the products on the market.

Today's UPS market reflects the success of the ENERGY STAR UPS program, which has *already accomplished its goal of market transformation*. As a result, energy savings in the market can only be accomplished through elimination of SKUs, rather than by improving the class as a whole (see item 8). Put another way, once designs are optimized and mature, further improvements can only happen through culling. The DOE's wishful thinking that sub-percent energy efficiency improvements can be effectively and affordably made will instead be offset by increased component costs, slacking UPS sales (see item 6), and the loss of 0.2-0.4% in tested efficiency due to the changes to the UPS Test Procedure from those already established in the market-place.

(3) DOE requests comment on the ELs selected for each product class for its analysis. See section IV.C.2 for further detail.

Industry Comment: With the proposal to "regulate by curve" instead of by setting discrete efficiency levels, the DOE will disrupt the well-established market practice of the ENERGY STAR UPS program and impair or eliminate consumer utility. Furthermore, the proposed energy efficiency levels will severely deplete product availability in some sectors and may force customers to different capacities or power technologies, for sake of availability and price.

We also disagree with the DOE's underlying assumption that consumers will continue to purchase specific topologies, VFD, VI, VFI regardless of price impacts in specific sectors of those products. Consumers of UPS are very price-conscious, yet the DOE has assumed that consumers will continue to buy the same products forever, despite the potentially significant price impacts proposed. This assumption is very shortsighted and fails to respect the tremendous potential impact of the proposed standards. We speak to this point more in item 6.

For all products, we disagree with the DOE's attempt to use a curve-based approach to establishing energy conservation standards. This proposal does not respect differences in design stemming from consumer demanded performance features (see General Comments).

The DOE offers no proof of why a curve makes more sense, or why it offers sufficient improvement over the well-established ENERGY STAR approach that industry uses to good effect today. The DOE has not justified the market disruption of efficiency curves sufficiently to carry them through. Instead the DOE should respect existing practices and use a flat bar method. When "raising the bar," we propose to the DOE that a stair-stepped approach which respects common core designs by wattage range will be the most effective approach in terms of understanding, feasibility and energy savings.

Voltage and Frequency Dependent (VFD) products:
The proposed minimum efficiency curve for VFD products, as displayed in Figures 1 and 2 below, does not conform to any reasonable explanation for its shape, except that DOE sought to apply anything other than a straight line to the scattered plot of product efficiencies. The "cluster", using this term loosely, of products tested above 96% efficiency as shown in Figure 1 would seem to be the visual encouragement which led DOE analysts to a curve-based proposal. However, this mistaken trend is illusory: if the greater data set of ENERGY STAR UPS efficiencies is added to the display, as shown in Figure 2, whatever basis the DOE had for selecting a curve disappears.

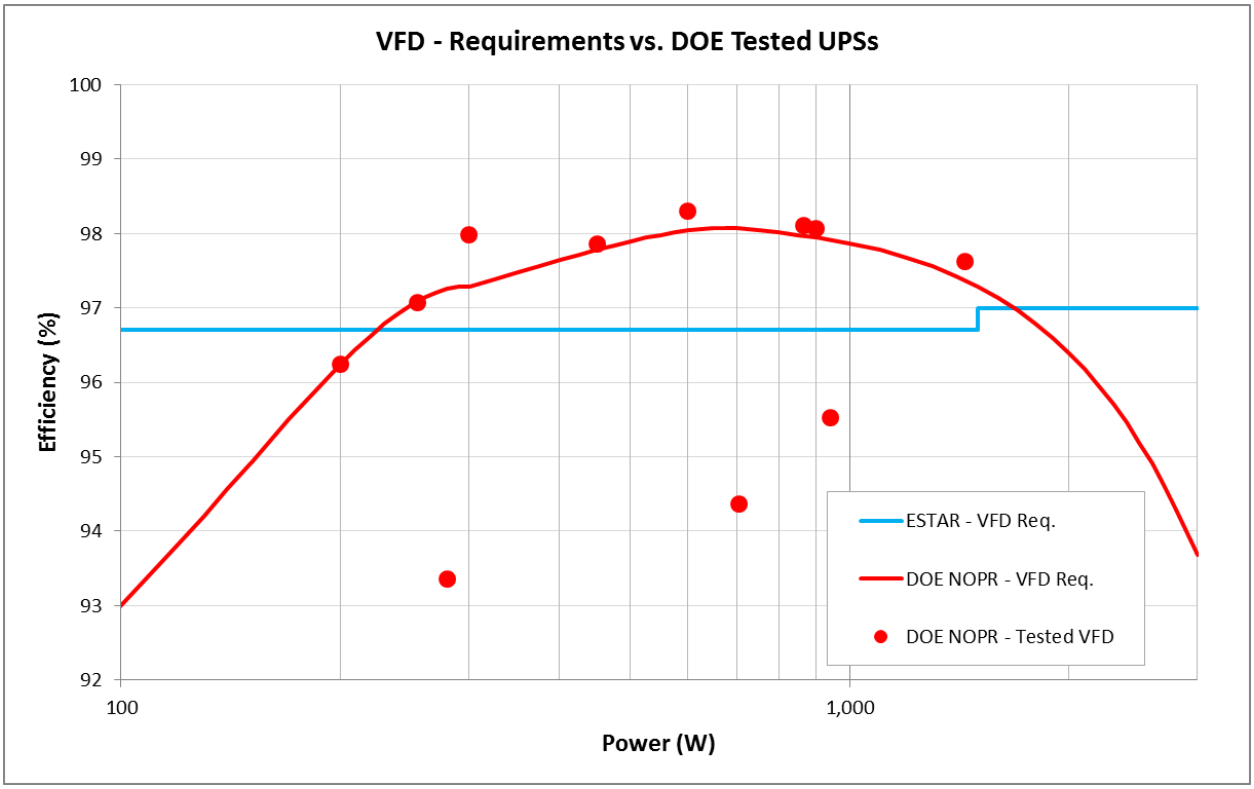

Figure 1: DOE Tested VFD Efficiencies and the DOE Proposed Curve

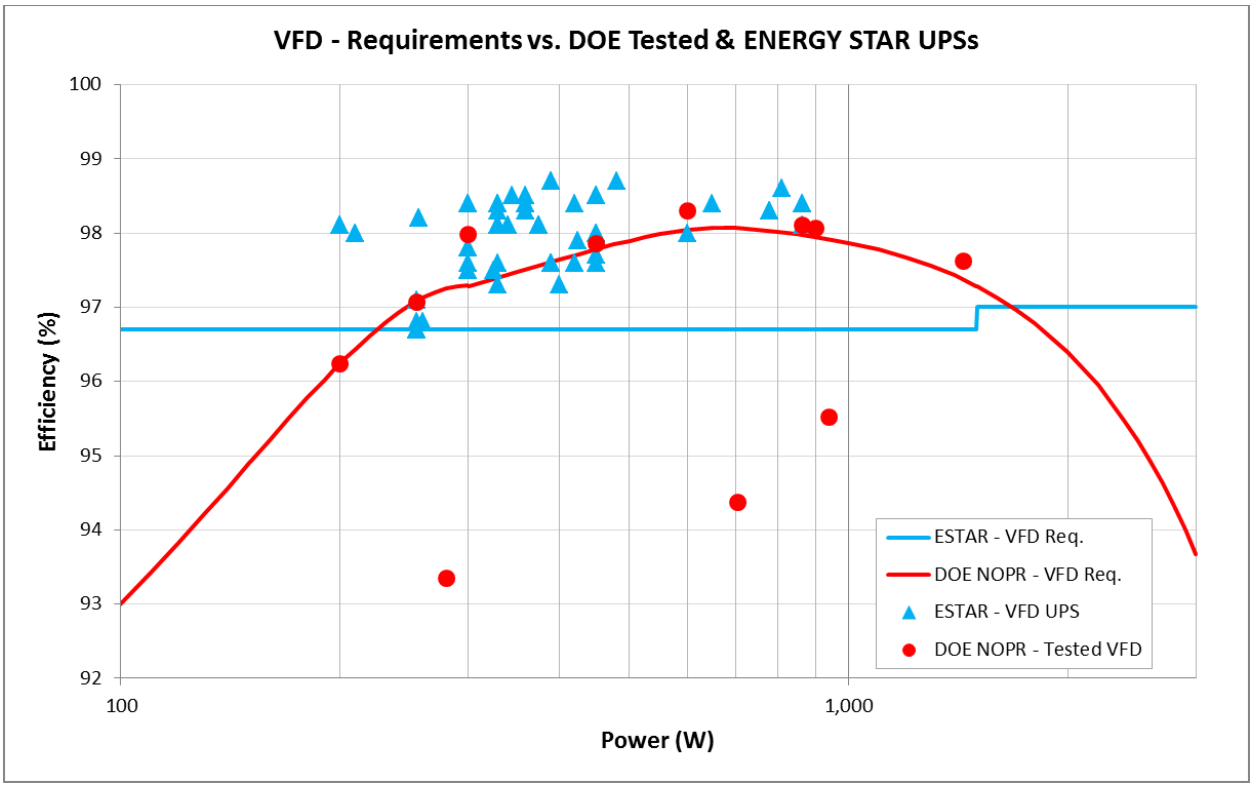

Figure 2: ENERGY STAR VFD Product Efficiencies vs. DOE Proposed Curve

An unexamined factor that influences the scatter of plotted efficiencies is this: neither the DOE's test results nor the ENERGY STAR efficiency reporting account for the *variety of secondary product performance features in these devices*. While "core" UPS efficiency may vary, since the market has transformed (see item 8 below), secondary impacts on efficiency can be credited to either cost-cutting or the addition of product performance features (see General Comments above). A curve-based approach unfairly prejudices products that have a slightly lower efficiency because they are satisfying consumer demanded secondary functions like USB charge ports, wireless connectivity and so on. Also, as product wattage capacity increases, efficiency can rise as fixed losses in the core of the UPS are offset by other efficiencies in power delivery to the load. A flat line, respecting wattage ranges (i.e. common central circuitry), is the only fair way to regulate UPS products. We also believe a fixed efficiency requirement will encourage innovation by manufacturers who want to fill consumer demand for increased amounts of secondary features. Lastly, since technology options are limited in their effectiveness (see comment to item 1 above) it follows that DOE should use a simple stair-step approach to regulate VFD, the most popular product category, in a manner that can be economically justified and does not impair and eliminate consumer utilities.

We propose the following efficiency levels for VFD products to replace the DOE's (see figure 3 below):

1. For VFD UPS <150W: establish a level of 95.56% efficiency. These products have the highest amount of fixed losses by wattage, and are already at peak efficiency.
2. For VFD UPS ≥150W - ≤700W: raise the minimum efficiency from 96.6% to 97.3%.
3. For VFD UPS >700W: raise the minimum efficiency from 96.6% to 97.7%.

The above proposed changes will likely eliminate approximately 42% of current VFD product offerings from the market.

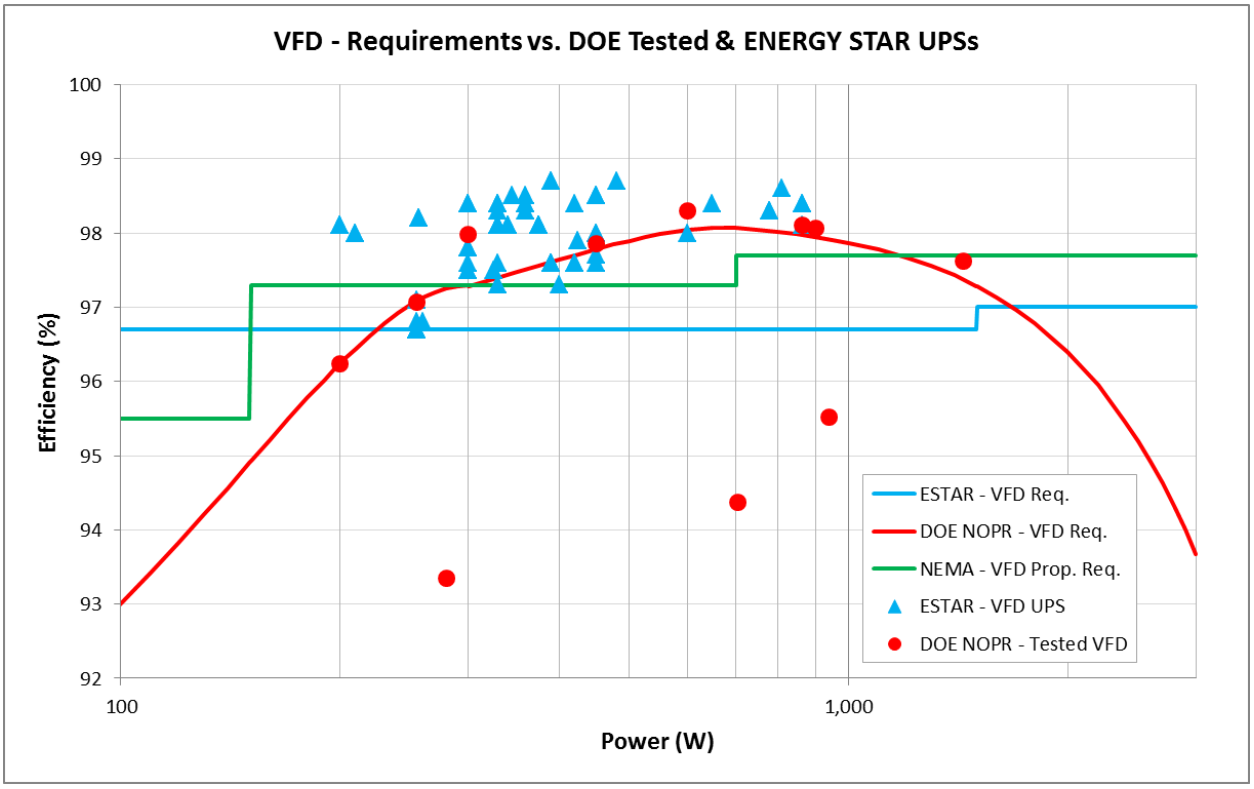

Figure 3: Industry Counterproposal for VFD UPS Efficiencies

Voltage Independent (VI) products:
Having incorrectly concluded that a curve-based approach is the best way to regulate VFD products, the DOE carried this flawed reasoning over to VI and VFI products. By far, the worst feature of the Efficiency Levels proposed in the NOPR is the impact on VI products in the 0-1000 watt range. The DOE's proposal, when represented graphically in figure 4 below, will effectively eliminate all products in this capacity range. As we note above in item 1, the remaining efficiency gain potential from technology options is insufficient assurance that efficiency gains can overcome the too-aggressive energy efficiency proposal coupled with the "loss" in efficiency due to test procedure changes. We note that, oddly, the DOE evidences the impact of its own strict proposal in the physical testing results for the VI class, where in figure 4 none of the DOE-tested units would pass the proposed EL.

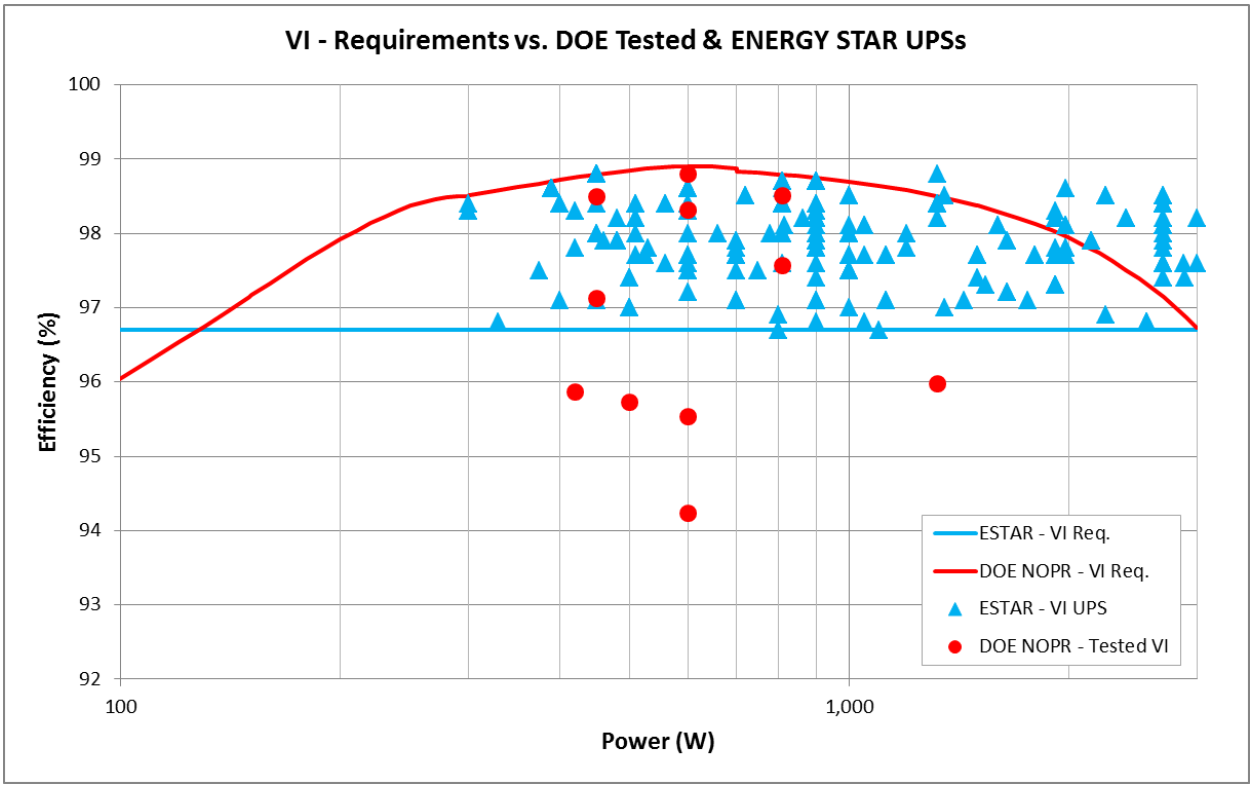

Figure 4: ENERGY STAR and DOE Tested VI UPS Efficiencies vs. the DOE Proposed Curve

The DOE cannot in good faith maintain their proposal for minimum efficiency requirements for VI products as written. As we conclude in item 1, the remaining technology options are not sufficient to overcome the combined negative impacts of the test procedure change and extremely strict efficiency requirements. As a result, VI UPS customers will either have to buy larger capacity products to get past the knee of the curve, buy different classes of products at greater cost (VFI), or accept reduced performance (VFD). Consumers who purchase solely based on price already buy the more popular, and less expensive, VFD devices. Educated consumers who know they need voltage regulation or full power conditioning and isolation from mains power must buy larger wattage VI and VFI devices, respectively.

The DOE acknowledges some consumers' willingness to pay more for specific services as quoted in our comment to item 4, so the DOE must respect that these customers will continue to buy VI or VFI products in some cases. In these cases, if there are no products available in lower wattages, consumers will buy more load capacity (and associated energy consumption) than they need to gain the features demanded.

These educated consumers have historically demanded specific product performance features and that demand is now supplied by VI and VFI products. Stated another way; voltage regulation and full power regulation are consumer-demanded product utilities, in accordance with EPCA clause 325(o)(4) (see footnote 1). It follows that the DOE must also preserve these product performance features in a full range of wattages (i.e. capacities) because capacity is a consumer-demanded product utility.

The DOE may NOT eliminate VI products in the sub-1000W range. The DOE's analysis does not prove that technology options will conclusively yield sufficient improvements to VI UPS

designs to overcome the overly-strict proposed efficiency levels combined with the negative 0.2-0.4% tested efficiency impact of the changed test procedure. A person of sound logical thinking can only conclude that the proposed efficiency levels for 0-1000W VI UPS are erroneous and must be changed. We propose a revised approach below which we believe properly accounts for market demand, efficiency potential and consumer product utility.

Because the efficiencies of VFD and VI products are similar, particularly after culling lesser-performing units, We propose DOE set the same requirements for VI that we have proposed for VFD. This will improve compliance because it will reduce confusion. By our estimates, this will eliminate roughly 39% of current products from the market. See figure 5.

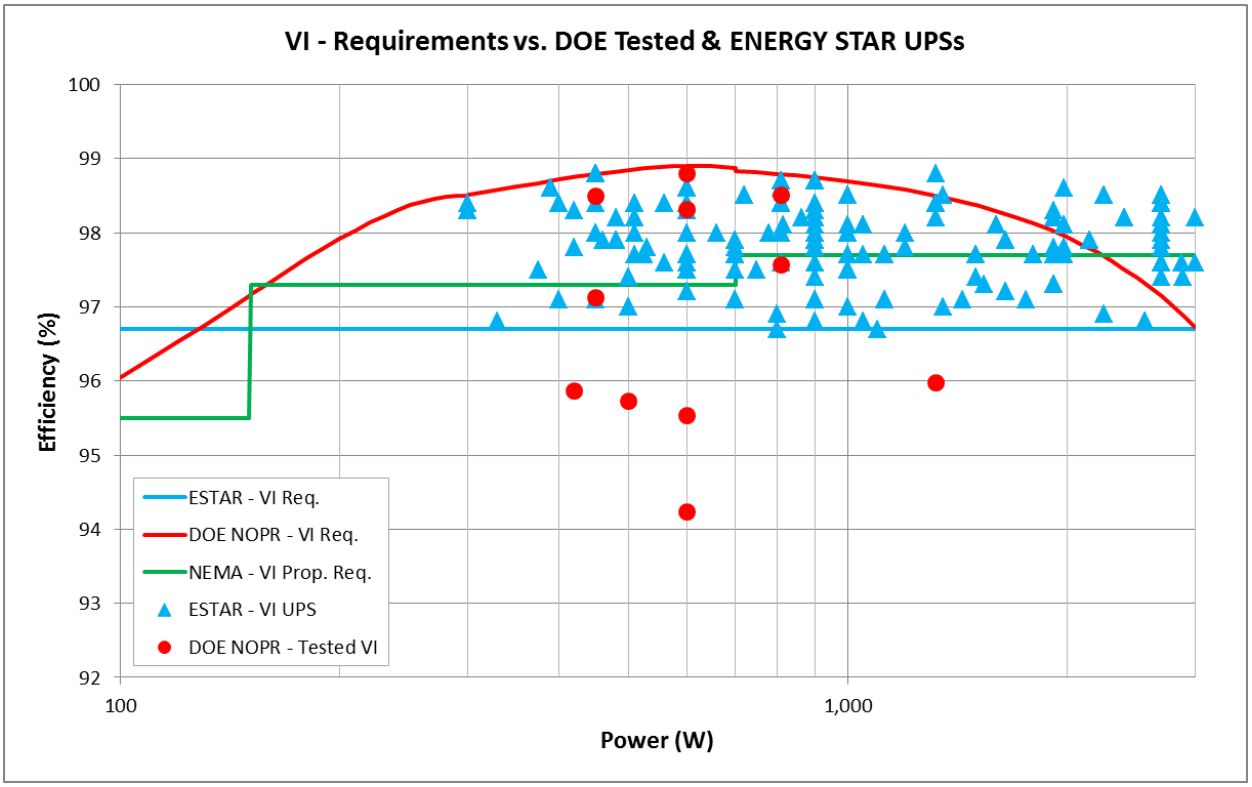

Figure 5: Industry Counterproposal for VI UPS Efficiency

Voltage and Frequency Independent (VFI) products:
As before, the DOE proposal for VFI products unfairly prejudices lower-wattage units and does not offer sufficient leeway to maintain these consumer demanded capacities. There is no evidence in the DOE TSD or in the ENERGY STAR database that any products in the market will pass the proposed efficiency requirements for 700W capacity and below. The DOE is prohibited from eliminating this consumer demanded capacity range (footnote 1). Furthermore, there is no visual or mathematical reason why a curve-based approach fits this product class, given the available efficiency data. Again, the curve approach is apparently carried over from VFD products, despite its poor fit. See figure 6 for a graphic representation.

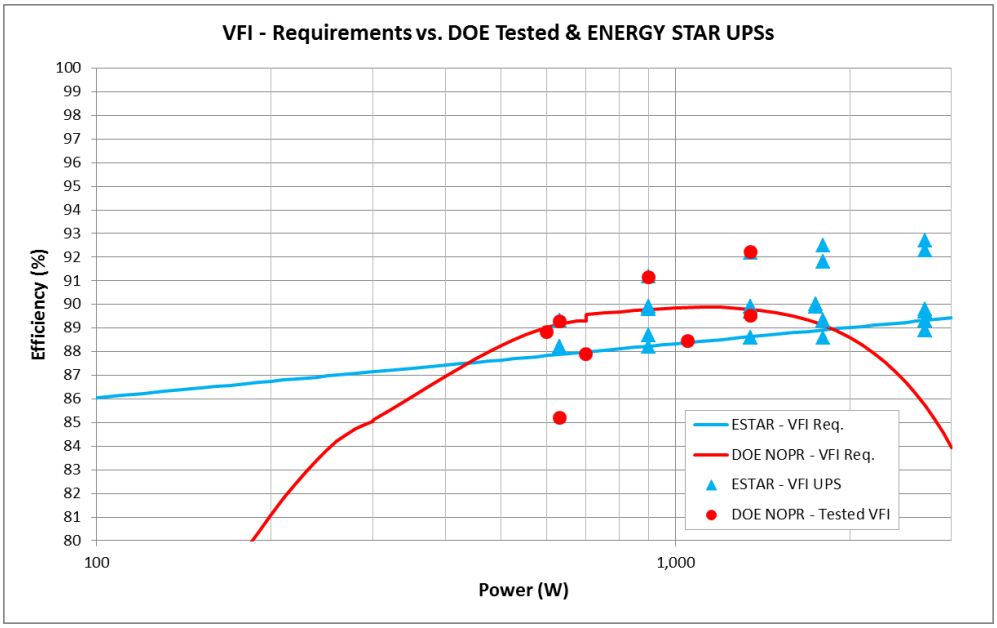

Figure 6: ENERGY STAR and DOE Tested VFI UPS Efficiencies vs. DOE Proposed Curve

Rather than eliminate all the lower capacities of VFI products, the DOE should preserve the option of lower wattages by using a straight line approach to establishing minimum energy conservation standards for VFI products. The DOE proposal for VFI products would eliminate roughly 45% of products on the market today. We propose a sloped line that raises the ENERGY STAR efficiency level by 1%. This will likely eliminate approximately 65% of products on the market today; a significant improvement over the DOE's proposal. See figure 7.

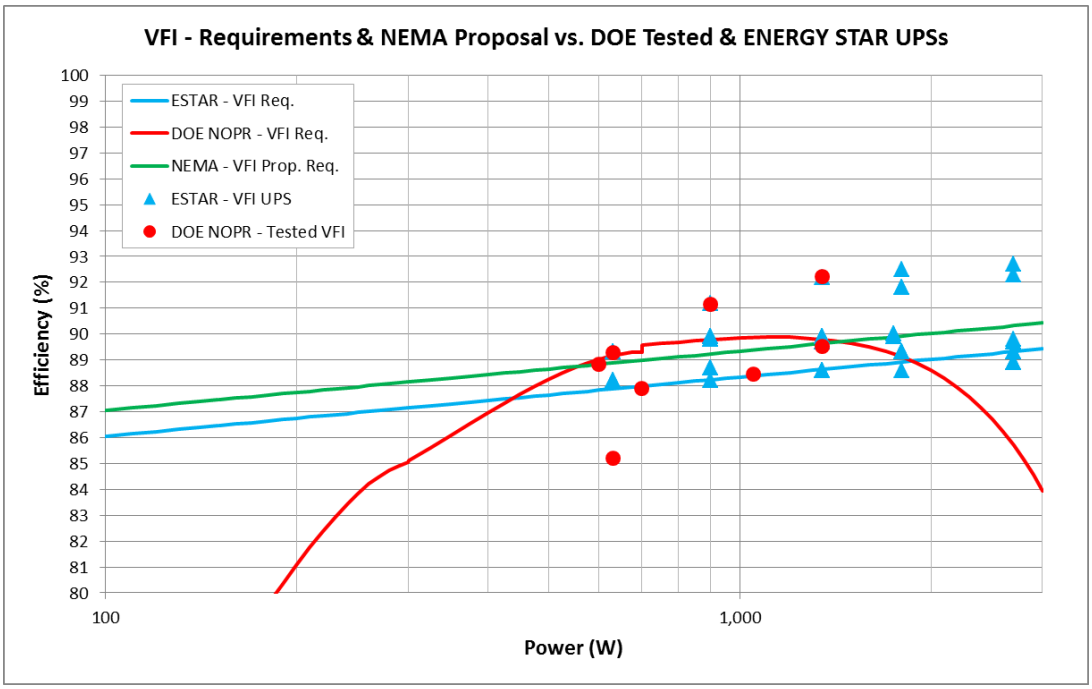

Figure 7: Industry Counterproposal for VFI UPS Efficiency

(4) DOE requests comment on its understanding of why less efficient UPSs continue to exist in the market place at a price higher than more efficient units. See section IV.C.3 for further detail.

Industry Comment: In the NOPR the DOE states, “For the VFD UPSs in scope of this rulemaking, DOE believes consumers may typically be more concerned with the reliability of the protection the product provides, than its energy efficiency.” We agree that this is one aspect of consumer decision-making that the DOE should bear in mind. Furthermore, not analyzed by the DOE in the TSD is the high likelihood that these products include other features such as USB charging ports, wired and wireless connectivity, integrated on-board data displays, or other performance features. Taken in this context, the DOE’s statement can be followed to a logical conclusion that consumers will accept slightly lower efficiency and higher cost for greater functionality and utility. From the consumer’s perspective, increased functionality, even when accompanied by slightly higher costs, makes clear sense. The DOE should not pursue ultra-efficiency while compromising and eliminating important secondary functionality sought by consumers.

(5) DOE requests further comment on the average loading conditions for UPS product classes. See section IV.E for further detail.

Industry Comment: We agree with the DOE’s assumptions for average loading. The proposed average loading conditions are consistent with the ENERGY STAR UPS program, which was developed in close coordination with Industry.

(6) DOE requests additional information on UPS shipment volumes and projections. See section IV.G for further detail.

Industry Comment: We note that the EPA ENERGY STAR UPS program for the last two years indicates an 18% reduction in UPS sales[3]. Specifically, for 2015 EPA reported 3,121,000 units and 3,790,000 units sold in 2014. This is a decline in the market of 18%. This is in stark contrast and disagreement with DOE’s optimistic estimates showing continued increase in shipments in the NOPR and TSD. This is inconsistent with forecasts for computing equipment to which shipments of UPS correlated. The primary cause of DOE’s manifest error is that the DOE’s shipment data includes figures dating back to the early days of the Battery Chargers rulemaking, before the sales of personal computers and other wall-plug consumer IT products began to fall behind increased sales of portable products like laptops and tablets. It follows that DOE must re-examine the current UPS market trends, conduct more manufacturer interviews and data gathering, and accept that consumer IT devices are increasingly wireless and battery-operated and therefore have internal batteries which render a UPS unnecessary. The noticeable reduction in ENERGY STAR UPS sales uses data that is more current than the DOE’s and clearly conflicts with the increases predicted by DOE’s outdated information. When correct data is applied to the analysis, it will certainly diminish predicted energy savings for UPS and make it more difficult to economically justify the proposed standard.

We refer the DOE to this Statista forecast for shipments of laptops, desktop PCs and tablets worldwide from 2010 to 2019 https://www.statista.com/statistics/272595/global-shipments-forecast-for-tablets-laptops-and-desktop-pcs/ as another source of information on declining sales in products which in turn influence UPS sales proportionally.

[3] 2015 EPA UPS Program Unit Shipment Data: https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2015_USD_Summary_Report.pdf

(7) DOE requests comment on commercial and residential price elasticity data for UPS product classes. See section IV.G for further detail.

Industry Comment: Within the NOPR is the following statement: "To DOE's knowledge, price elasticity estimates are not readily available in existing literature for UPSs, and hence DOE assumed a price elasticity of demand of zero." No one can possibly and reasonably make this assumption. It is contrary to all facts to posit perfect inelasticity for UPS. As computers have become mobile with built-in batteries, the need for backup power devices has diminished. Thus the price elasticity of demand for UPS devices has declined in proportion to the increase in computing devices with built-in batteries. The price elasticity is most certainly not zero because a consumer at some point could replace a desktop computer with a comparable laptop if the price of the UPS device used to protect the desktop increased excessively. The advent of cloud computing services has also added a layer of back-up security for computers as an indirect substitute for UPS devices. The only reasonable conclusion is that DOE did not conduct enough data gathering and analysis on price impacts. This must be corrected.

(8) DOE requests comment or data that may inform historical or forecasted efficiency trends for UPSs. See section IV.H for further detail.

Industry Comment: There is little relevant historic efficiency trend information because the UPS market *has already been transformed* by the ENERGY STAR UPS program. We refer to the DOE to verbal testimony[4] from ICF International at the September 16, 2016 DOE public meeting which notes that ENERGY STAR UPS sales data represents 78% of the domestic UPS market. Given that ENERGY STAR aims to be the top 20% of any given market, and chose their version 1.0 specification requirements consistent with that aim, one must conclude that the market has been transformed and economically justifiable efficiency improvement is marginal.

It makes the most sense for DOE to simply set the national minimum at the current ENERGY STAR level and lock in the transformation. However, one cannot miss the clear intent of the DOE to elevate efficiencies even higher than ENERGY STAR and we refer the DOE to our more feasible counter-proposals in item 3 above.

(9) DOE seeks comment on its use of 6.1 percent as a discount rate for UPS manufacturers. See section IV.J.2 for further detail.

Industry Comment: We refer the DOE to Office of Management and Budget Circulars A4 and A94 which contain information about discount rates. We do not understand why the DOE chose to use a discount rate of 6.1% versus the 3% and 7% discount rates recommended in OMB Circular A4. This 6.1% discount rate is very close to the 7% discount rate recommended in OMB Circular A94, as the 7% is meant to reflect a discount rate average before tax rate of return to private capital in the U.S. economy. In addition OMB Circular A94 defines general principles for net present value measures including the discount rate. With the costs concentrated in the early part of the rulemaking the investment will occur shortly after the rule is released and the benefits will follow later, and in the case of the model much later and with a high discount rate (6.1%) the net present value of future cash flow is reduced significantly. DOE has not indicated clearly why the 6.1% discount rate was used. The DOE should use the 3% and 7% discount rates

[4] Page 24 line 17 https://www.regulations.gov/contentStreamer?documentId=EERE-2016-BT-STD-0022-0014&attachmentNumber=1&disposition=attachment&contentType=pdf

recommended by OMB. This will keep analysis consistent with previous rulemakings, and more accurately analyze net present value for the investments industry will be making to conform to the Final Rule.

(10) DOE seeks comment on its determination that product redesigns necessary to meet the ELs required by the proposed standard would not require investments in equipment and tooling, and on its determination that the majority of product design cycles would either take place before or coincide with the compliance period of the potential standards for UPSs. See section IV.J.2.a for further detail.

Industry Comment: We disagree with the DOE's determination that product redesign is not necessary with the addition of the technology options listed in item 1. Only those products already compliant, i.e. "above the curve", will require no redesign. Other products will require additional development and testing to apply and confirm improved efficiency, if they are redesigned at all. The very narrow margin of potential efficiency improvement, coupled with patent protection of some technologies, will encourage most manufacturers to simply obsolete designs rather than improve them. One of the large investments in tooling would be for higher accuracy current transformers (CTs) and power analyzers for the final test of products. As the efficiency of the products increase the margin of error due to measurement equipment becomes more important. The higher efficiency levels that the DOE has proposed will require a capital expenditure in more accurate factory measuring equipment. The DOE must include this capital cost in the manufacturing impact analysis. Alternatively, if the DOE accepts the Industry counterproposal for UPS efficiencies, no additional capital expenditure is anticipated.

(11) DOE seeks comment on its methodology used to calculate product conversion costs, including the assumption of no capital conversion costs or stranded assets for UPS manufacturers at analyzed ELs. See section IV.J.2.a for further detail.

Industry Comment: See our comment under item 10 above.

(12) DOE seeks comment on its methodology used to calculate manufacturer markups, its use of different manufacturer markups for each product class, and the specific manufacturer markups DOE estimated for each UPS product class. See section IV.J.2.d for further detail.

Industry Comment: We refer the DOE to individual member company responses to this item.

(13) DOE seeks comment on its determination that all UPS manufacturing takes place abroad. Additionally, DOE seeks comment on the presence of any domestic UPS manufacturing beyond assembly, R&D, testing, and certification, and if there are any potential negative impacts to domestic employment that could arise due to energy conservation standards on UPSs that are not fully captured by the direct employment impact analysis. See section V.B.2.b for further detail.

Industry Comment: Not all UPS manufacturing is taking place abroad. While some sub-assemblies and parts for the products may be made outside of the country there still is assembly taking place in the U.S. This U.S. based manufacturing may be in jeopardy as product prices increase with added technology options and companies counterbalance increased product cost by moving assembly to locations outside the U.S. to areas with lower labor costs. Our members are aware of two significant U.S.-based manufacturing and testing locations, one in Raleigh, NC and the other in Columbus, OH as well as some other smaller companies who have not participated in these proceedings. The fact that small companies lack

the personnel and funds to participate and attend DOE rulemakings does not absolve the DOE from determining the rule's impact on these companies. To help identify more U.S.-based UPS manufacturers we refer the DOE to the Online Certifications Directory[5] from Underwriter's Laboratories. In the field for UL Category Code enter "YEDU" which is the code for UPS. This will yield over 100 companies which the DOE can reach out to who may have domestic employment impact risks. The DOE should revise its domestic employment impact determination according to the aforementioned U.S.-based manufacturers and recalculate the effects of the rule's efficiency levels.

(14) DOE seeks comment on any potential UPS component manufacturer capacity constraints caused by the proposed standards in this NOPR. See section V.B.2.c for further detail.

Industry Comment: We refer the DOE to individual member company responses to this item.

(15) DOE seeks comment on any other manufacturer subgroups that DOE should analyze and/or types of UPS manufacturers for the manufacturer subgroup analysis, including the identification of UPS manufacturer subgroups that should be analyzed separately. See section V.B.2.d for further detail.

Industry Comment: We have no comment on this item.

(16) DOE seeks comment on the compliance costs that UPS manufacturers must make for any other regulations, especially if compliance with those regulations is required within three years before or after the estimated compliance year of this proposed standard (2019). See section V.B.2.e for further detail.

Industry Comment: We refer the DOE to individual member comments on the subject of cost.

(17) DOE seeks comment on its tentative conclusion that the proposed standard will not have a significant impact on a substantial number of small entities. See section VI.B.3 for further detail.

Industry Comment: We disagree and refer the DOE to our comments to item 13.

(18) DOE invites comment from the public regarding the competitive impacts that are likely to result from this proposed rule. In addition, stakeholders may also provide comments separately to DOJ regarding these potential impacts.

Industry Comment: As we note above it item 1, some of the DOE's proposed technology options couple with too-high proposed efficiency levels will tread heavily into patent-protected areas, potentially lessening competition. Therefore, the DOE is obliged to consult with the Department of Justice to take into account competition effects and marketplace issues with the DOE proposal.

[5] http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.html