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Mr. Robert Meyers
ENERGY STAR Product Development
U.S. Environmental Protection Agency
Energy Star for Office Equipment
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Energy Star Large Network Equipment Specification Version 1.0.

Dear Mr. Meyers:

The Telecommunications Industry Association (TIA) hereby submits its comments on the proposed scope and testing methodology for the draft ENERGY STAR Large Network Equipment (LNE) Specification Version 1.0.[1]

I. INTRODUCTION

TIA represents the global information and communications technology industry through standards development, advocacy, tradeshows, business opportunities and market intelligence. TIA's hundreds of member companies' products and services empower communications in every industry and market, including healthcare, education, security, public safety, transportation, energy, government, the military and entertainment. Our members work through TIA's voluntary, consensus-based standards process to enhance the business environment for telecommunications, broadband, mobile wireless, information technology, networks, cable, satellite, unified communications, emergency communications and the sustainability of technology. TIA is standards development organization accredited by the American National Standards Institute (ANSI).

[1] Energy Star Large Network Equipment Version 1.0, *available at* https://www.energystar.gov/products/specs/node/413 .

Many TIA members produce equipment implicated by the proposed ENERGY STAR Large Network Equipment (LNE) specification. TIA members have long been supporters of the ENERGY STAR program in a variety of product categories and commend the program as a successful partnership between the EPA, DOE and industry to recognize innovation in energy efficiency. TIA's members greatly value the ENERGY STAR certification, and rely on this certification to market their products to retailers and consumers. ENERGY STAR has played a critical role in providing incentives and to reward the production of energy efficient technologies.

Large network equipment represents a significant first for the ENERGY STAR program. The unique challenges inherent in the nature of large network equipment will require an incremental approach to advance an effective ENERGY STAR specification. Unlike many other products covered by the ENERGY STAR program, the energy use of network equipment varies considerably based on the configuration and use by the end user, which is often customized for performance for enterprise and other users based on specific criteria. In addition to being used in the enterprise space, some of the network equipment product categories listed in the discussion document are also utilized outside of the enterprise, such as in datacenter and carrier networks. The complex, highly configured and customized nature of large network equipment creates significant challenges in identification of criteria and specifications that can be used to establish a suitable energy efficiency threshold for ENERGY STAR. Additionally, an ENERGY STAR specification for large network equipment could face difficulties keeping pace with the rapid technology development taking place with network equipment as the ICT industry innovates to keep pace with accelerated demands on the network. Some categories of network equipment are integrating increased functionality, consolidating security, network management and other

features into the product further complicating the development of a suitable threshold or test procedure. In short, the unique challenges with large network equipment would make the development of an ENERGY STAR specification daunting if the EPA attempts to develop a specification for all network equipment under consideration at once.

TIA provides the following recommendations responsive to the EPA's request for information to take into consideration in making the determination on how to move forward with development of a specification for large network equipment. Because of the complexity and multiplicity of use case scenarios impacting the energy use profile of network equipment, TIA recommends that the initial specification start with a narrow scope focused on routers and switches where existing voluntary industry standards exist and defer other more complex scenarios to future revisions. TIA also recommends that ENERGY STAR heavily rely and reference existing voluntary industry standards and test procedures for network equipment as opposed to creating new standards or test procedures.

As with other ENERGY STAR products, TIA believes that the certification criteria for large network equipment should cultivate a competitive environment for manufacturers as well as further the EPA's ENERGY STAR program's efforts through the implementation of practicable and reasonable qualification efficiency requirements. Maximum consumer benefit will occur if the ENERGY STAR program continues to implement realistic and achievable standards that enable recognition of and the associated awards for innovation through certification.

II. DISCUSSION

1. TIA recommends that the scope of the specification for LNE be limited to routers and switches.

The discussion document states that EPA is currently considering routers, switches, security appliances and access point controllers for inclusion under the LNE specification. TIA recommends that the initial specification focus specifically on routers and switches, which account for a large share of energy use of the discussed product categories, deferring the other product categories to future revisions. A significant difference between routers/switches and security appliances is the minimum service level to be tested, as security appliances are expected to do more than traffic forwarding. Because of the inherent difference in the product categories as well as the lack of industry consensus on a suitable test methodology or framework for security appliances, TIA strongly recommends that the initial specification should be limited to routers and switches, deferring specification development of other product categories to future revisions. TIA also agrees with EPA that wireless and wireline access including optical transport should be excluded from the scope of the specification altogether.

2. TIA recommends that the EPA consider distinguishing between Large Network Equipment (LNE) and Small Network Equipment (SNE) based on performance rather than number of ports.

It appears that the EPA intends to draw the line between LNE and SNE without a gap, using the number of ports (11) as the criteria. A distinction based on the number of ports leads to classifying equipment in some cases contrary to how it is used in the real world. For example, a switch with 10x100 GE ports is a 2-terabit device and clearly could not be categorized as an SNE product. A more rational approach would be to observe why LNE metrics are different from SNE allowances. SNE normally consists of multifunctional devices without an explicit lead modality. For SNE, features are generally rated over performance. LNE are products with one leading modality (performance), which allows for productivity-based metrics such as TEER.

TIA recommends that LNE as a category include performance-oriented products and that the EPA more clearly define the scope of equipment for SNE and LNE.

3. TIA recommends that the EPA and DOE rely on existing voluntary, consensus-based industry standards and test procedures where feasible rather than develop new procedures.

Industry has already made significant progress in advancing development of definitions, metrics and test procedures with LNE products. TIA recommends that the EPA rely on existing voluntary industry standards and test procedures for the initial specification where feasible rather than develop new procedures. The voluntary standards development process followed by industry is a transparent, inclusive process that brings together multiple stakeholders. EPA should rely on and reference existing voluntary industry standards in moving forward with the development of a specification and test procedures.

4. To address modular vs. fixed subcategories of LNE, TIA recommends that the initial specification defer more complex modularity scenarios until future revisions.

The discussion document includes modular vs. fixed as categories of LNE and asks what impact these categories may have on product capabilities and energy consumption. The complications with modularity arise only when mixing cards of dissimilar types, for example, with ports or functions other than belonging to 1 or 2 uplink/downlink groups. When a Unit Under Test (UUT) is homogenously equipped, there is no difference with respect to the test procedure to fixed equipment. In fact, most TEER ratings published today are for modular products. TIA recommends including homogenously equipped modular products in version 1, but EPA should defer the more complex modularity scenarios until future revisions.

5. TIA does not believe that managed versus unmanaged categories of network equipment will significantly impact energy consumption.

The discussion document includes managed versus unmanaged as additional categories of LNE and asks what impact these categories may have on product capabilities and energy consumption. TIA does not believe that the management status of LNE, which is performance-oriented, will significantly impact energy performance.

6. TIA recommends tailoring LNE PPDS disclosure requirements to items relevant to LNE.

The discussion document lists publication of power and performance data in the standard EPA PPDS to provide more detailed information on product energy performance for customers of enterprise equipment. The standard EPA PPDS is used for a range of products including servers, UPS, and storage, and the discussion document states that EPA anticipates using the same PPDS for LNE. Much of the information currently listed in the EPA PPDS recommendation for servers is not applicable for LNE equipment. Most importantly, LNE devices are not built around commodity components or architectures, making the listing of individual ASIC, FPGA and memory bus efficiencies impossible. Furthermore, the recommended TEER test procedure uses only 3 measurement points and aggregates them into a single metric, with intention to simplify the procurement process and eliminate confusion. TIA recommends reducing the LNE PPDS requirement to a disclosure of model number/card list, software version and metric(s).

7. TIA recommends that the LNE specification focus on total energy efficiency rather than the various features of LNE.

The discussion document provides a list of approaches that the EPA seeks to evaluate as part of the LNE specification including port shutdowns, remote administration, variable speed

fans, dynamic power scaling, Energy Efficient Ethernet, and higher operating temperature capabilities.

However, LNE draft 1.0 employs a system efficiency metric that automatically encompasses energy performance of all subcomponents. For example, two otherwise identical switches with PS subsystems of different efficiency will patently diverge in their TEER energy rating. Evaluation of detailed subsystem properties, such as port shutdowns and variable speed cooling fans (particularly without reference to their time-domain attributes), will overlap rather than complement with the TEER definition of real-time energy rating. For example, consider the following two cases:

a) A system may scale performance according to load with granularity of nanoseconds in real-time, resulting in its behavior always being load-proportional.
b) A system may scale performance on the order of minutes, shutting down or bringing up cards. This system would be load proportional, but only under predictable conditions, such as day/night in the enterprise and may perform sub-optimally otherwise.

The first case will be detected by a variable-load test, such as ATIS TEER. Generally speaking, variable-load technologies are expensive to design and implement. The second case permits a system to achieve some degree of energy proportionality at low cost and while passing the risk to the end-user. Since sets of capabilities in cases (a) and (b) are not the same, they would require two different tests and metrics.

We recommend that EPA consider designing LNE program requirements that are orthogonal (complementary) rather than overlapping:

-variable-load metric (typical)

-extended-idle metric (optional)

-energy and performance monitoring (typical)

8. TIA recommends that the EPA consider putting Power over Ethernet (PoE) in a separate class from LNE.

The discussion document asks if PoE mid-span devices should be classified as network equipment of external power supplies. PoE equipment may justify its own class with separate requirements because it shares many attributes with external power supplies. If PoE is included in the LNE specification, it should be treated as its own category.

9. TIA recommends that EPA accept the TEER metric definition in the most recent format.

We recommend looking into the latest TEER definition found in the most recent ITU-T and ATIS publications. The proposed test methodology produces three measurement points for different load levels - Lmax (P100), Lmid (Pmid) and Lidle (P0), where the mid-point is either 0.1 or 0.3 of Lmax. Please note that P.TEER = Lmax/P100 (Gbps/W) is the peak system efficiency - the highest possible energy performance than can be practically achieved. If a UUT in the field is run for A units of time at load Lmax, for B units at Lmid and for C units at Lidle, its total throughput for the time (A+B+C) will be (A*Lmax + B*Lmid) because Lidle=0. Likewise, its measured energy consumption in the same cycle will be (A*P100+B*Pmid+C*Pidle).

Thus, the final efficiency becomes:

TEER = (A*Lmax + B*Lmid) / (A*P100 + B*Pmid + C*Pidle) (W/Gbps)

This is the form of formula present in ITU-T L.1310, ETSI R&S and also submitted as amendment to ATIS.2009 standard.

The legacy ATIS.2009 draft used a different formula:

2009.TEER = Lmax / (A*P100 + B*Pmid + C*Pidle)

When using the 2009.TEER formula, it is possible to rank products from best to worst. However, it can be confusing if treated as an indication of expected energy performance because it does not correspond to energy performance achievable in the field and in fact provides a rating above the maximum possible peak value (Lmax/P100). We suggest accepting the TEER metric definition in a modern, updated format.

III. CONCLUSION

TIA appreciates the opportunity to provide input to the EPA and DOE regarding Version 1.0 of the LNE specification for Energy Star, and looks forward to continuing to work with the EPA, DOE and other stakeholders moving forward.

Respectfully submitted,

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