



ENERGY STAR Large Network Equipment Discussion Document October 2012

Please send comments to largenetwork@energystar.gov
no later than **November 21, 2012**

Introduction

The U.S. Environmental Protection Agency (EPA) is developing a new ENERGY STAR® specification for Large Network Equipment (LNE). The U.S. Department of Energy (DOE) will develop the LNE test method as part of the specification development process. The launch of this effort is closely aligned with other ENERGY STAR work on IT and consumer electronics specifications and will bring significant savings to users of these products. Capabilities present in LNE may also enable more efficient operation of other IT equipment. An energy efficiency specification for LNE presents a clear opportunity for reducing national building energy use due to the large installed base of these products and their always-on status. In 2008, network equipment in the USA consumed 18 TWh—nearly 1% of building electricity—and was expected to grow at 6% per year to 23 TWh in 2012¹. It is possible to reduce overall network equipment energy consumption by 20% to 50% with sufficient market penetration of efficient technologies¹.

The ENERGY STAR program has also been actively developing a Small Network Equipment (SNE). The ENERGY STAR SNE specification covers products that represent nearly 30% of all network equipment energy consumption nationwide¹. EPA intends for the LNE specification to pick up where the SNE specification leaves off, with the scope covering as much of the remaining 70% of network equipment energy consumption as possible, including switches and enterprise routers and possibly extending to security appliances and access point controllers.

This discussion document proposes a basic definition for LNE, identifies specific product types that could be covered by the Version 1.0 ENERGY STAR LNE specification, provides an overview of energy efficiency considerations, a sketch of the proposed specification's focus, and presents questions for discussion. EPA is providing the document to spur discussion and thoughtful commentary on the scope and structure of the LNE specification.

Stakeholders are encouraged to provide feedback on the concepts and definitions presented in this document, as well as to share their knowledge of topics not addressed here that they believe important to the development of this specification. Communication between EPA, DOE, and industry stakeholders is critical to the success of the ENERGY STAR program. To that end, EPA and DOE are sharing this discussion¹ document and hosting a web meeting on October 24th, 2012 to discuss the questions outlined in this document (access details to be provided separately). EPA will consider stakeholder input on all aspects of this document as the Agency drafts a Draft 1 Specification. ENERGY STAR representatives are available for additional technical discussions with interested parties at any time during the specification development process.

For questions on the specification, please email largenetwork@energystar.gov. The EPA contact for specification development is Robert Meyers, available at Meyers.Robert@epa.gov or 202-343-9923. The DOE contact for test method development is Bryan Berringer, available at Bryan.Berringer@ee.doe.gov or 202-586-0371.

¹ Lanzisera, Steven, Nordman, Bruce, Brown, Richard E. (2012). Data network equipment energy use and savings potential in buildings. [Energy Efficiency](#), Volume 5, Issue 2, p. 149 - 162.

In each section below, EPA has developed questions for discussion and appreciates any additional information, studies, or data to supplement any answers provided.

Definition and Eligible Product Types

The ENERGY STAR specification for Small Network Equipment (SNE) contains the following definition:

Large Network Equipment (LNE): Network Equipment that is rack-mounted, intended for use in standard equipment racks, or contains more than eleven (11) ports for wired network.

At this time, EPA is considering the following types of LNE products for inclusion in Version 1.0:

- Routers
- Switches
- Security Appliances
- Access Point Controllers

Apart from the above basic product types, LNE may be further categorized:

- Modular vs. Fixed. A modular product contains a chassis which can accept a variety of functional units to enable services. A fixed product consists of hardware which is mostly a single functional unit.
- Managed vs. Unmanaged. Managed products allow more precise control over ports or groups of ports, while unmanaged simply pass data through

Questions:

- a. Are there alternate definitions for LNE that should be reviewed and considered by EPA?
- b. Are there any LNE product types not addressed above that should be added to the list of products under consideration for Version 1.0? Are there any products that should be explicitly excluded?
- c. Are there any product categories not included above that EPA should be aware of, beyond modular vs. fixed or managed vs. unmanaged? What impact do these categories have on product capabilities and energy consumption?
- d. What is the size of the blade switch market? EPA appreciates any information on blade switches, their typical features, deployments, and power consumption.

Proposed Focus of Version 1.0

A major challenge for developing the LNE specification will be covering a variety of products with hardware ranging from relatively fixed to highly configurable and with features that have varying effects on overall energy consumption and performance. However, other ENERGY STAR IT specifications have faced similar challenges, and lessons learned from their development may be brought to bear on LNE.

EPA proposes that Version 1.0 focus primarily on fixed equipment. This category of devices is best suited as a target for the LNE specification since it consumes most of the energy in the LNE category, is sold into a large and diverse market for deployment in a large number of installations, features excellent savings opportunities, and is relatively easy to measure and evaluate.

EPA is also considering modular LNE products for inclusion in Version 1.0 but recognizes that these products are typically more complex and that the testing methodology and eligibility requirements for them may be different from that used for fixed products. Lessons from the ENERGY STAR Storage specification may be helpful here, as that product category also contains highly configurable and complex systems. In particular, that specification contains a method for combining individually tested subsystems into larger products and a way to substitute roughly equivalent components without requiring retesting of the whole system. The Storage specification also places a strong emphasis on reporting and publishing product test results. While the particular solutions found in the Storage specification may not directly apply to modular LNE, they could be adapted or serve as starting points for the development of

approaches that appropriately address LNE.

Requirements under Consideration for Version 1.0

Requirements that EPA is considering for Version 1.0 include:

- Measured energy efficiency of products while handling traffic.
- Minimum power supply efficiency requirement, when applicable.
- Standard methods for reporting product energy use and system performance via network communication protocols.
- Inclusion of specific energy efficiency features or capabilities, many of which are listed above.
- Publication of test results via the Power and Performance Data Sheet (PPDS).

Questions:

- e. What is the state of power supply efficiency levels in LNE? Would power supply efficiency requirements be applicable to all product types? Are power supply efficiency levels similar across the various product types listed above?
- f. What energy and product characteristic data is most relevant to end users trying to understand their product's energy consumption? This information goes beyond just having an ENERGY STAR label and would be presented in the PPDS.
- g. Are there additional requirements or incentives appropriate to LNE that EPA should consider?
- h. The preliminary approach document for testing LNE uses the Telecommunications Energy Efficiency Ratio (TEER) to calculate efficiency. Are there any other power, energy, and/or power performance metrics that EPA and DOE should consider?

Energy Efficiency Considerations

Due to the nature of how LNE devices use energy and the number of ways they are purchased and deployed, there are a variety of possible approaches to evaluating their energy efficiency. EPA and DOE have, in other related specifications such as servers and UPSs, used two or all three of these approaches in a complimentary manner:

- Quantitative evaluations of energy use and/or performance via the test method.
- Detection and recognition of specific energy-related features and capabilities via the test method and specification.
- Publication of power and performance data. EPA has developed a standard PPDS to provide more detailed information on product energy performance for customers of enterprise equipment. The PPDS is used for products such as servers, UPS, and storage, and EPA anticipates using it with LNE too.

EPA seeks to ensure that energy efficiency features can be evaluated when present in LNE. EPA has developed a preliminary list of approaches that deliver energy efficiency:

- Ability to power off unused switch ports to reduce power consumption.
- Remote administration of power on a per-port basis, which allows flexibility in designing how the switch fits into the network so data center managers can effectively manage power consumption.
- Use of variable speed cooling fans.
- Designs that scale power dynamically with changes in the level of utilization.
- Implementation of Energy Efficient Ethernet (IEEE 802.3az).
- Reporting of system energy use over the network via standard protocols.
- Ability to perform well at higher operating temperatures to reduce cooling requirements.

Questions:

- i. Are there any product features not listed above that EPA should be aware of that provide energy saving opportunities? What are the energy and performance impacts of these features as they currently exist? What about in the near future?

- j. Are the savings from the more efficient Power over Ethernet (PoE) large enough to include in this specification? Should PoE mid-span devices be considered to be network equipment or external power supplies?
- k. What are some strategies that can be promoted by ENERGY STAR to improve power management and data availability in LNE products?