ENERGY STAR® Product Specification for Large Network Equipment

Eligibility Criteria
Draft 1 Version 1.0

Following is the Version 1.0 ENERGY STAR product specification for Large Network Equipment. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

Note: This draft specification builds upon the previously distributed Framework Document. EPA received substantial written feedback from stakeholders on the Framework Document, and has since conducted a series of individual and group meetings to further develop the EPA perspective on Large Network Equipment efficiency opportunities. EPA welcomes feedback and additional data from all interested stakeholders to support this specification development effort.

1 DEFINITIONS

A) Product Classifications:

1) Network Equipment: A device whose primary function is to pass Internet Protocol traffic among various network interfaces/ports.

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

A. Fixed Product: An LNE product in which greater than half of the total number of available physical network ports in the product are not swappable or interchangeable.

B. Modular Product: An LNE product in which half or more of the total number of available physical network ports in the product are swappable or interchangeable.

Note: EPA received stakeholder requests to provide further clarity on the delineation between fixed and modular LNE products. Suggestions were provided to create three types of modularity. Due to a lack of data to support the suggested modularity types at this time, EPA is proposing to separate fixed and modular products by whichever port type is more prevalent in the product. EPA welcomes feedback on this proposal.

Additionally, EPA welcomes stakeholder feedback on alternative means to delineate between Small (SNE) and Large Network Equipment. The current approach of using port count was created during the development of the SNE V1.0 specification. Should an alternate approach that more effectively delineates be identified, EPA anticipates applying the approach to both product specifications.

B) Product Types:

1) Router: A network device that routes network packets from one logical network to another, along a predefined or dynamically discovered path, based on network layer information embedded in the Network packet header (OSI layer #3).

2) Switch: A network device that delivers packet data frames to specific physical ports on the device, based on the destination address of each frame from the Data Link (OSI layer #2), within a logical network.

3) Security Appliance: A stand-alone network device whose primary function is to protect the network from unwanted traffic (e.g. secure tunnel and firewall appliances).

4) Access Point Controller: A network device whose primary function is to manage wireless local

area network (WLAN) traffic through one or more wireless access point devices.

Note: EPA proposes a Switch definition that makes clear that some devices can perform both native data link layer switching and also encapsulate data frames in network packets for intra and extra network routing at multiple link layers (e.g. 2, 3 & 4). These devices are considered switches in this document.

EPA also received stakeholder feedback on whether virtual private network (VPN) servers were included in the definition of security appliances. EPA proposes that appliances whose primary function is to provide VPN and firewall services are included in the Security Appliance definition.

C) Product Characteristics:

1) Processor Managed Product: An LNE product whose management is handled through a distinct co-management processor within the product itself that has independent control over the LNE product.

2) Network Managed Product: An LNE product that is not Processor Managed, where management of the product is handled through processing power provided by a separate device within the network it is connected to.

3) Stackable Product: A product, which supports the ability to join multiple discrete products of similar type to form a single larger autonomous functioning unit.

4) Core Product: A product which commonly has all physical ports active and operates at a typical load of 20% or greater compared to its maximum capability.

5) Edge Product: A product which typically only has a portion of its physical ports active and operates at a typical load of less than 20% compared to its maximum capability.

Note: EPA received stakeholder feedback on the Framework Document stating that an unmanaged LNE product is not an applicablecharacteristic. Rather, the managed product characteristic should be divided by whether the management of the product is occurring internally through the use of a management processor, or externally over the network. EPA welcomes feedback on this proposal.

EPA also received stakeholder feedback concerning the treatment of stackable products (typically stackable switches) in the energy efficiency criteria section. While EPA is evaluating treatment of these products, the Agency seeks stakeholder feedback on the proposed definition

Finally, EPA is proposing Core and Edge definitions to separate LNE products which are often not fully loaded or connected from products which face routinely higher loads and are typically fully connected. This distinction is reflected in the accompanying Draft 2 Test Method in sections 6.1 and 6.2. If adopted, it will inform future development of active state energy efficiency criteria. EPA is proposing to allow manufacturers to choose which of these descriptions more accurately reflects their product or product family, and that is the designation that will be referenced for all specification and test method purposes related to that product or product family.

D) LNE Components:

1) Power Supply Unit (PSU): A device that converts ac or dc input power to one or more dc power outputs for the purpose of powering an LNE product. An LNE product's PSU must be self-contained and physically separable from the motherboard and must connect to the system via a removable or hard-wired electrical connection.

A. Ac-Dc Power Supply: A PSU that converts line-voltage ac input power into one or more dc power outputs for the purpose of powering an LNE product.

B. Dc-Dc Power Supply: A PSU that converts line-voltage dc input power to one or more dc outputs for the purpose of powering an LNE product. For purposes of this specification, a dc-dc converter (also known as a voltage regulator) that is internal to an LNE product and is used to convert a low voltage dc (e.g., 12 V dc) into other dc power outputs for use by the LNE product's components is not considered a dc-dc power supply.

C. Single-output Power Supply: A PSU that is designed to deliver the majority of its rated output power to one primary dc output for the purpose of powering an LNE product. Single-output PSUs may offer one or more standby outputs that remain active whenever connected to an input power source. For purposes of this specification, the total rated power output from any additional PSU outputs that are not primary and standby outputs shall be no greater than 20 watts. PSUs that offer multiple outputs at the same voltage as the primary output are considered single-output PSUs unless those outputs (1) are generated from separate converters or have separate output rectification stages, or (2) have independent current limits.

D. Multi-output Power Supply: A PSU that is designed to deliver the majority of its rated output power to more than one primary dc output for the purpose of powering an LNE product. Multi-output PSUs may offer one or more standby outputs that remain active whenever connected to an input power source. For purposes of this specification, the total rated power output from any additional PSU outputs that are not primary and standby outputs is greater than or equal to 20 watts.

2) Standard Equipment Rack: An equipment enclosure commonly seen in data centers or managed facilities and intended to house a variety of information technology equipment. Front panel width is typically 19 inches (482.6 mm). Standard equipment racks are defined by EIA-310, IEC 60297, or DIN 41494.

3) Modular Chassis: An equipment enclosure used in a modular LNE product that houses all the components of the product together in one place (e.g. PSUs, backplane, line cards).

4) Backplane: A circuit board within the chassis of a modular LNE product into which line cards or modules are inserted to allow communication between the various connected modules.

5) Line Card: A pluggable module that can be inserted into the backplane of a modular LNE product to provide various forms of connectivity to edge products connected to the network.

6) Processor: The logic circuitry that responds to and processes the basic instructions that drive an LNE product. For purposes of this specification, a processor is a central processing unit (CPU) which can be used to provide basic function and/or management function.

Note: EPA is proposing new definitions for the primary components inherent in LNE products and welcomes feedback on them. Stakeholders are also encouraged to identify additional terms and definitions that further delineate this product type from other IT equipment and drive LNE energy performance.

E) Other Enterprise and Datacenter Information Technology Equipment:

1) Small Network Equipment (SNE): Network Equipment that is intended to serve users in either small networks or a subset of a large network. SNE includes a) all Network Equipment with integral wireless capability and b) other Network Equipment meeting all of the following criteria:

i) Designed for stationary operation

ii) Contains no more than eleven (11) wired Physical Network Ports; and

iii) Primary configuration for operation outside of standard equipment racks.

2) Computer Server: A computer that provides services and manages networked resources for client devices (e.g., desktop computers, notebook computers, thin clients, wireless devices, PDAs, IP telephones, other computer servers and other network devices). A computer server is sold through enterprise channels for use in data centers and office/corporate environments. A computer server is primarily accessed via network connections, versus directly-connected user input devices such as a keyboard or mouse. For purposes of this specification, a product must meet all of the following criteria to be considered a computer server:

i) is marketed and sold as a Computer Server;

ii) is designed for and listed as supporting computer server operating systems (OS) and/or hypervisors;

iii) is targeted to run user-installed applications typically, but not exclusively, enterprise in nature;

iv) provides support for error-correcting code (ECC) and/or buffered memory (including both buffered DIMMs and buffered on board (BOB) configurations)

v) is packaged and sold with one or more ac-dc or dc-dc power supplies; and

vi) is designed such that all processors have access to shared system memory and are visible to a single OS or hypervisor.

3) Storage Product: A fully-functional storage system that supplies data storage services to clients and devices attached directly or through a network. Components and subsystems that are an integral part of the storage product architecture (e.g., to provide internal communications between controllers and disks) are considered to be part of the storage product. In contrast, components that are normally associated with a storage environment at the data center level (e.g., devices required for operation of an external SAN) are not considered to be part of the storage product. A storage product may be composed of integrated storage controllers, storage devices, embedded network elements, software, and other devices. While storage products may contain one or more embedded processors, these processors do not execute user-supplied software applications but may execute data-specific applications (e.g., data replication, backup utilities, data compression, install agents).

4) Storage Networking Products: Products whose primary purpose is the transfer of data between computers systems and storage products. This includes products that use typical storage networking protocols (e.g. Fibre Channel), as well as those that support IP based storage traffic such as iSCSI capable networking products.

5) Uninterruptible Power Supply (UPS): Combination of convertors, switches, and energy storage devices (such as batteries) constituting a power system for maintaining continuity of load power in case of input power failure.

6) Digital Subscriber Line Access Multiplexer (DSLAM): A network device that connects multiple digital subscriber line (DSL) interfaces to a backbone network that in turn connects to a larger service provider network.

7) Cable Modem Termination System (CMTS): A network device that connects multiple cable television (CATV) interfaces to a backbone network that in turn connects to a larger service provider network. Note that CATV connections are often also used to transfer IP traffic.

8) Network Caching Device: A network device connected to a network that caches content from a remote source that allows connected devices on the downstream network faster subsequent access by later serving the cached content to the downstream devices rather than content accessed directly from the original source.

9) Load Balancing Device: A network device connected to a network that distributes network traffic across several downstream devices. These products allow increased capacity and reliability of data transfer over the network.

Note: EPA has added IT equipment definitions to describe the equipment proposed to be out of scope of Version 1.0. The following definitions are fully harmonized with other ENERGY STAR specifications and should not require revision: computer server, storage product, uninterruptable power supply. EPA welcomes stakeholder feedback on the proposed definitions in Section 1) I) "Other Enterprise and Datacenter Information Technology Equipment".

F) Operational Power States:

1) Active State: The operating state where the product is carrying out work in response to prior or concurrent external requests.

2) Idle State: The operating state where the product is capable of carrying out work, but is not actively transferring data.

Note: EPA received several comments to focus on the two states specified above. However, several stakeholders suggest that EPA include a new Low Power State that is an optional state available in some LNE products. EPA is requesting additional information on the functionality of Low Power States and how prevalent they are in LNE products.

G) Additional Terms:

1) Physical Network Port: An integrated physical connection point primarily intended to accept IP or similar traffic via a cable. Fiber-optic connections are **not** considered Physical Network Ports for the purposes of this specification.

a) Uplink Port: A port designated for transferring consolidated data traffic from multiple devices or downstream networks attached to the downlink ports to an upstream network or device.

b) Downlink Port: A port designated for distributing data from the consolidated uplink port to a single device or downstream network.

Note: EPA has clarified that fiber-optic connections are not considered Physical Network Ports in this document.

EPA is proposing definitions for uplink and downlink ports as they are referenced in the Draft 2 test method. EPA welcomes stakeholder feedback on these definitions.

2) Energy Efficient Ethernet (EEE): A technology which enables reduced power consumption of Ethernet interfaces during times of low data throughput. Defined in Clause 78 of IEEE 802.3 (originally specified in IEEE 802.3az).

Note: EPA received stakeholder feedback to update the IEEE reference to EEE, and has revised the definition accordingly.

3) Power over Ethernet (PoE): A technology which enables transfer of electrical power, along with data, to network end point devices through an Ethernet cable. PoE is defined in Clause 33 of IEEE 802.3 (originally specified in IEEE 802.3af and IEEE 802.3at). The PoE specification defines two types of equipment:

a) Type 1: Powered devices may require up to 13.0 watts

b) Type 2: Powered devices may require up to 25.5 watts

Note: EPA received stakeholder feedback to update the IEEE references to PoE, and has revised the definition accordingly.

H) Product Family: **[TBD]**

Table 1: Product Family Requirements

Base Components	Same Part Number Required?	Same Technical Specifications Required?	Same Quantity Required?	Notes
TBD	TBD	TBD	TBD	TBD
TBD	TBD	TBD	TBD	TBD

1) Maximum Configuration: A product configuration that includes the combination of base

components that generates the maximum possible energy consumption with a product family [TBD].

2) Minimum Configuration: A product configuration that includes the combination of base components that generates the least possible energy consumption within a product family [TBD].

3) Typical Configuration: A product configuration that lies between the minimum and maximum configurations that is representatives of a product with high volume sales. [TBD]

Note: EPA is proposing a placeholder for "Product Family" in this draft, which resembles the original approach taken in both computer servers and data center storage. EPA will further develop the product family concept in later draft specifications.

2 SCOPE

2.1 Included Products

2.1.1 Products that meet the definition of Large Network Equipment in Section 1 of this document are eligible for ENERGY STAR certification under this specification. Products explicitly excluded from Version 1.0 are identified in Section 2.2.

2.2 Excluded Products

2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible for certification under this specification. The list of specifications currently in effect can be found at www.energystar.gov/specifications.

2.2.2 The following products are not eligible for certification under this specification:

i. Small Network Equipment;

ii. Computer Servers, including blade switches sold within a Blade Server configuration;

iii. Storage Products, including Blade Storage;

iv. Storage Networking Products;

v. Security Appliances;

vi. Access Point Controllers;

vii. DSLAM/CMTS equipment;

viii. Network Caching Devices; and

ix. Load Balancing Devices.

Note: EPA is proposing to exclude items i-iii as they are already covered by other ENERGY STAR specifications. EPA received stakeholder requests to exclude items iv-ix and agrees with the rationale in removing them from scope in Version 1.0. EPA welcomes stakeholder feedback on this exclusion list.

3 CERTIFICATION CRITERIA

3.1 Significant Digits and Rounding

3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

3.1.2 Unless otherwise specified in this specification, compliance with specification limits shall be evaluated using directly measured or calculated values without any benefit from rounding.

3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

3.2 Power Supply Requirements

3.2.1 Power supply test data and test reports from testing entities recognized by EPA to perform power supply testing shall be accepted for the purpose of certifying the ENERGY STAR product.

3.2.2 Power Supply Efficiency Criteria: Power Supplies used in products eligible under this specification must meet the following requirements when tested using the Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.6 (available at www.efficientpowersupplies.org). Power Supply data generated using Rev. 6.4.2, 6.4.3, or 6.5 are acceptable provided the test was conducted prior to the effective date of Version 1.0 of this specification.

i. Fixed LNE Products: To certify for ENERGY STAR, a fixed LNE product must be configured with **only** PSUs that meet or exceed the applicable efficiency requirements specified in Table 2 **prior to shipment**.

ii. Modular LNE Products: To certify for ENERGY STAR, a modular LNE product shipped with a chassis must be configured such that **all** PSUs supplying power to the chassis meet or exceed the applicable efficiency requirements specified in Table 2 **prior to shipment**.

Table 2: Efficiency Requirements for PSUs

Power Supply Type	Rated Output Power	10% Load	20% Load	50% Load	100% Load
Multi-output	All Output Levels	N/A	85%	88%	85%
Single-output	All Output Levels	80%	88%	92%	88%

Note: EPA is proposing to use 80Plus Gold PSU levels, with an additional 80% efficiency requirement for the 10% load. EPA believes the 10% load requirement is vital to assess the performance of PSUs in products that supply PoE power or which may be bought with an overcapacity PSU to facilitate future expansion by the end user.

These requirements (including the 10% load requirement) match those found in the current Version 2.0 ENERGY STAR Computer Servers Eligibility Criteria. EPA received stakeholder feedback stating that many LNE products share hardware similar to that of Computer Servers, and even that there is a growing trend to replace switches/routers with generic computer servers running software to mimic the aforementioned devices. As a result of this feedback, EPA feels that setting levels at 80Plus Gold for LNE products is appropriate and welcomes additional PSU test data from LNE manufacturers.

3.2.3 Power Supply Power Factor Criteria: Power Supplies used in products eligible under this specification must meet the following requirements when tested using the Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.6 (available at www.efficientpowersupplies.org). Power Supply data generated using Rev. 6.4.2, 6.4.3, or 6.5 are acceptable provided the test was conducted prior to the effective date of Version 1.0.

i. Fixed LNE Products: To certify for ENERGY STAR, a fixed LNE product must be configured with **only** PSUs that meet or exceed the applicable power factor requirements specified in Table 3 **prior to shipment**, under all loading conditions for which output power is greater than or equal to 75 watts. Partners are required to measure and report PSU power factor under loading conditions of less than 75 watts, though no minimum power factor requirements apply.

ii. Modular LNE Products: To certify for ENERGY STAR, a modular LNE product shipped with a chassis must be configured such that **all** PSUs supplying power to the chassis meet or exceed the applicable power factor requirements specified in Table 3 **prior to shipment**, under all loading conditions for which output power is greater than or equal to 75 watts. Partners are required to measure and report PSU power factor under loading conditions of less than 75 watts, though no minimum power factor requirements apply.

Table 3: Power Factor Requirements for PSUs

Power Supply Type	Rated Output Power	10% Load	20% Load	50% Load	100% Load
Multi-output	All Output Ratings	N/A	0.80	0.90	0.95
Single-output	Output Rating ≤ 500 W	N/A	0.80	0.90	0.95
	Output Rating > 500 W and Output Rating ≤ 1,000 W	0.65	0.80	0.90	0.95
	Output Rating > 1,000 watts	0.80	0.90	0.90	0.95

Note: EPA is proposing power factor requirements in line with those required in both the ENERGY STAR Version 2.0 Computer Servers and Version 1.0 Data Center Storage Eligibility Criteria. EPA welcomes stakeholder data to better inform these requirements.

3.3 Energy Efficiency Feature Requirements

3.3.1 To certify for ENERGY STAR, an LNE product must have the following features enabled in its as-shipped configuration, implemented as specified:

i. Port Power Down: An LNE product must have the ability to power down unused physical network ports in an automated fashion, which does not require input from the end-user.

ii. Remote Port Administration: An LNE product must provide the end-user with the ability to conduct remote administration of individual physical network ports.

iii. Adaptive Active Cooling: Primary components of an LNE product must utilize adaptive cooling technologies that reduce the energy consumed by the cooling technology in proportion to the current cooling needs to the LNE product. (e.g., reduction of variable speed fan or blower speeds at lower ambient air temperature). This requirement is not applicable to devices that employ passive cooling.

iv. Energy Efficient Ethernet: All physical network ports in an LNE product must be compliant with IEEE 802.3 Clause 78.

Note: EPA received feedback from stakeholders on the Framework Document that the proposed energy efficiency features above were reasonable and achievable by LNE products already on the market.

Several stakeholders stated that the ability to scale power dynamically with the level of product utilization was an industry goal, but that it would require multiple generations of product development before it is reached. Similar comments were made with regard to operation at higher temperature levels.

EPA understands that these capabilities are not yet common in the market, but is interested in further discussion on how to potentially incentivize and accelerate the adoption of these features.

3.4 Active State Efficiency Criteria for Fixed Products

3.4.1 Active State Data Reporting: To certify for ENERGY STAR, an LNE product or LNE Product Family must be submitted for certification with the following information disclosed in full and in the context of the complete Active State efficiency rating test report:

i. [TBD]

3.4.2 Active State Efficiency: To certify for ENERGY STAR, an LNE product must meet the following l active criteria [TBD].

Note: Active state efficiency requirements will be developed in more detail in subsequent draft specifications, following the gathering of additional product data to support level setting. One of EPA's goals in creating this Version 1.0 specification is to develop a simple, easy-to-understand energy performance assessment for LNE products, which can be fairly and consistently applied to products and which can provide end users with an apples to apples product comparison. To that end, the ongoing gathering of data will ideally result in one or more measurements that are applicable across all LNE products within each product category.

3.5 Active State Efficiency Criteria for Modular Products

3.5.1 Active State Data Reporting: To certify for ENERGY STAR, an LNE product or LNE Product Family must be submitted for certification with the following information disclosed in full and in the context of the complete Active State efficiency rating test report:

i. [TBD]

Note: Active state power and performance data will be reported for all modular products as a requirement to gain ENERGY STAR certification, but no active state efficiency criteria will be proposed for modular products in Version 1.0. EPA welcomes additional stakeholder feedback on the most appropriate boundaries and configuration guidance that can be provided with the intention of creating a standardized approach to configuring modular products for certification testing. EPA's goal is to ensure that the data generated in this process strikes an acceptable balance between test burden and providing data, which is meaningful and beneficial for the end-user.

4 STANDARD INFORMATION REPORTING REQUIREMENTS

4.1 Data Reporting Requirements

4.1.1 All required data fields in the ENERGY STAR Version 1.0 LNE Qualified Product Exchange form shall be submitted to EPA for each ENERGY STAR certified LNE product or LNE Product Family.

4.1.2 The following data will be displayed on the ENERGY STAR website through the product finder tool:

i. model name and number, identifying SKU and/or configuration ID;

ii. product characteristics (utilization type, modular vs. fixed, power specifications, etc.);

iii. product type (management scheme, stackable, etc.);

iv. tested system configuration(s);

v. energy consumption and performance data from required Active State Efficiency Criteria testing;

vi. PoE capability (number of PoE ports supported, maximum PoE class supported, maximum total PoE power supported, etc.);

vii. available and enabled power saving features (e.g., power management);

viii. for product family certifications, a list of certified configurations with qualified SKUs or configuration IDs; and

ix. for a modular LNE products, a list of compatible chassis that meet ENERGY STAR qualification criteria.

4.1.3 EPA may periodically revise this list, as necessary, and will notify and invite stakeholder engagement in such a revision process.

Note: EPA has proposed an initial list of information that it intends to collect and display as part of the certification process for Version 1.0. EPA welcomes stakeholder feedback on additional information that should be displayed on the ENERGY STAR website.

5 STANDARD PERFORMANCE DATA MEASUREMENT AND OUTPUT REQUIREMENTS

5.1 Data Elements

5.1.1 Data Elements: Core LNE products shall be capable of measuring and reporting the following data elements at the LNE product level:

i. Input Power, in watts. Input power measurements must be reported with accuracy within ±5% of the actual value for measurements greater than 200 W, through the full range of operation. For measurements less than or equal to 200 W, the accuracy must be less than or equal to 10 W multiplied by the number of installed PSUs; and

ii. Inlet Air Temperature, in degrees Celsius, with accuracy of ± 2°C.

5.1.2 Reporting Implementation:

i. Data shall be made available in a published or user-accessible format that is readable by third-party, non-proprietary management systems;

ii. Data shall be made available to end users and third-party management systems over a standard network connection;

iii. Data shall be made available via embedded components or add-in devices that are packaged with the LNE product (e.g., a service processor, embedded power or thermal meter or other out-of-band technology, iPDU, or pre-installed OS);

5.1.3 Sampling Requirements:

i. *Input power*: Input power measurements must be sampled internally to the LNE product at a rate of greater than or equal to 1 measurement per contiguous 10-second period.

ii. *Inlet air temperature (optional)*: Inlet air temperature measurements must be sampled internally to the LNE product at a rate of greater than or equal to 1 measurement every 10 seconds.

iii. *Timestamping*: Systems that implement time stamping of environmental data shall sample internally to the LNE product data at a rate of greater than or equal to 1 measurement every 30 seconds.

iv. *Management Software*: All sampled measurements shall be made available to external management software either via an on-demand pull method, or via a coordinated push method. In either case the system's management software is responsible for establishing the data delivery time scale while the LNE product is responsible to assuring data delivered meets the above sampling and currency requirements.

5.1.4 Documentation Requirements: The following information shall be included in the data submission:

i. Guaranteed accuracy levels for power and optional temperature measurements, and

ii. The time period used for data averaging (if present).

5.1.5 Use of iPDUs: Section 5.1 may be satisfied using iPDUs. In order to satisfy the Data Elements requirement, an iPDU must:

i. Meet all requirements for accuracy, sampling, and data reporting;

ii. Be made available for sale and delivery with certified ENERGY STAR LNE products by appearing on the manufacturer's website and/or in marketing material where information on the LNE product is displayed.

Note: EPA received stakeholder feedback stating that most LNE products are currently able to measure many variables including power, throughput, latency, and utilization in real or near-real time through vehicles including the Management Information Base (MIB) and Simple Network Management Protocol (SNMP). Stakeholders did indicate that there is generally some work to be done on the software side to make all of this data available to other devices on the network. EPA believes that this hurdle may largely be addressed for Core products with typically high-utilization (e.g. data center applications) during the development of the Version 1.0 specification and is proposing to include the reporting of power and temperature at this time. Note that EPA is not proposing to apply these requirements to Edge products in Version 1.0.

6 TESTING

6.1 Test Methods

6.1.1 Test methods identified in Table 2 shall be used to determine certification for ENERGY STAR.

Table 2: Test Methods for ENERGY STAR Certification

Product Type	Test Method
All	ENERGY STAR Test Method for Large Network Equipment (Rev. August-2014)
All	Alliance for Telecommunications Industry Solutions (ATIS) – 0600015.03.2013 Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting for Router and Ethernet Switch Products

6.2 Number of Units Required for Testing

Note: In this section, EPA typically defines product families and describes how products are certified as a family. EPA welcomes discussions with stakeholders on this topic.

6.3 International Market Certification

6.3.1 Products shall be tested for certification at the relevant input voltage/frequency combination for each market in which they will be sold and promoted as ENERGY STAR.

7 EFFECTIVE DATE

7.1.1 Effective Date: The Version 1.0 ENERGY STAR Large Network Equipment specification shall take effect on **TBD**. To certify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the model's date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

Note: New specifications are generally effective immediately upon completion.

7.1.2 Future Specification Revisions: EPA reserves the right to change this specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through stakeholder discussions. In the event of a specification revision, please note that the ENERGY STAR certification is not automatically granted for the life of a product model.

8 CONSIDERATIONS FOR FUTURE REVISIONS

8.1.1 **TBD**