# ENERGY STAR® Product Specification for Large Network Equipment

## Eligibility Criteria
## Draft 2 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.

# 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 mountable in a Standard Equipment Rack, supports network management protocols (e.g. SNMP) and contains one of the following features:

a) contains more than eleven (11) Physical Network Ports.

b) Total aggregate port throughput of the product is greater than 12 Gb/s

3) Modular Product: An LNE product that accepts Modules, as defined below in 1.(D)(5), modifying the capability of the device.

4) Fixed Product: An LNE product that cannot accept Modules that modify the capability of the device.

**Note:** EPA received stakeholder requests to improve the existing separation of SNE and LNE products by making minor revisions to the proposed definition of LNE. In response, EPA is proposing that a product will qualify as an LNE product if it has either more than 11 ports or total aggregate port throughput greater than 12 Gb/s. This is intended to cover products such as smaller switches and routers with very high speed (10Gb/s) ports that cannot be addressed appropriately in the SNE specification, and that are typically used in enterprise and data center applications.

**Example**: A switch with twelve 1Gb/s downlink ports and one 1Gb/s uplink port is an LNE product because it has greater than eleven ports and its total aggregate port throughput is 13Gb/s.

Additionally, in response to stakeholder feedback, EPA has simplified the definitions of fixed and modular products, and added a new definition for Module in the LNE Components subsection (D) below. EPA welcomes feedback on these proposed changes.

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). This includes products whose primary function is to provide virtual private network (VPN) services.

**Note:** EPA has clarified that security appliances include products whose primary function is to provide virtual private network (VPN) services. EPA welcomes stakeholder feedback on whether there is a need to further clarify the degree of VPN functionality provided by the product to categorize it as a security appliance, or if this definition is sufficiently clear.

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.

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.

**Note**: EPA received feedback that core and edge are locations in the network, and that use of ports in an LNE product is a function of the product's location in the network as well. While EPA's original intent of the Core Product and Edge Product definitions, present in Draft 1 and proposed for removal in Draft 2, was to separate out products commonly found in a core environment versus an edge environment, the sum of the proposed changes in Draft 2 eliminate the need to distinguish this characteristic in Version 1.0. Therefore, EPA is proposing to remove the definitions of Core Product and Edge Product found in the Draft 1 document. EPA welcomes stakeholder feedback on this change.

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, modules).

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) Module: A plug in device, not used alone, which can add/change the type of network connections, increase/decrease the number of ports, and add/remove additional functionality for a product. Modules include but are not limited to line cards, port adapters, and network adapters. Modules do not include pluggable transceivers (e.g. SFP, SFP+, XFP) or modular power supplies.

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 to replace the previous line card definition with a more broad Module definition above, which includes line cards as well as port adapters and network adapters. EPA chose to remove the line card definition as its previous contents were found to be redundant when considering the new definition for Module.

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.

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.

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 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 now considered Physical Network Ports in this document. This results in the inclusion of some products with fiber-optic port connectivity in the scope of Version 1.0. More details on scope regarding fiber-optic ports can be found in Section 2 below.

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).

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 up to 13.0 watts

b) Type 2: Powered devices up to 25.5 watts

H) Product Family: A group of models/configurations that share a set of common attributes that are variations on a basic design.

1) Common Product Family Attributes for Modular Products: A set of features common to all models/configurations within a modular product family. All models/configurations within a modular product family must share the following:

a) Be from the same model line or machine type; and

b) Share the same mechanical and electrical designs in the chassis with only superficial mechanical differences to enable a design to support a variety of module options.

2) Product Family Tested Product Configurations:

a) Minimum Power Configuration: The product configuration that includes the combination of components including modules, power supplies, and other associated processing and power support hardware that generates the least possible energy consumption within a product family.

b) Maximum Power Configuration: The product configuration that includes the combination of components including modules, power supplies, and other associated processing and power support hardware that generates the greatest possible energy consumption within a product family.

c) Typical Configuration: A product configuration that lies between the minimum and maximum configurations that is representative of a product with high volumes sales. Product families containing a single product shall be represented by that configuration.

**Note:** EPA is proposing a product family structure for modular products that defines common attributes that allow for a wide range of modules to be considered within a defined family, particularly in heterogeneous module configurations.

EPA is proposing that three modular configurations are tested for any family; minimum and maximum power configurations, as well as a manufacturer selected typical configuration which is representative of a product with high volume sales. This variation will capture the range of performance and power that an end-user can expect within a particular family, along with a typical configuration that will provide some insight into the scaling of those values within the family.

If possible, EPA would like to include a product family structure for fixed products prior to the finalization of Version 1.0 to potentially reduce testing burden while still collecting a sufficient level of data to educate end-users on the variations in energy efficiency performance within a model line as a whole. At this time, stakeholder feedback has been mixed on whether a product family structure for fixed products is possible. EPA requests additional stakeholder feedback on the specific areas that separate products in fixed model lines, and if any of these variables can be streamlined to reduce the number of models tested (e.g. only test the highest energy consuming PoE model if a product that is otherwise the same has multiple PoE total power options.) The variables EPA is considering as part of the fixed product family structure are shown below:

a) Be from the same model line or machine type

b) Speed, count, and type (e.g. copper, fiber-optic) of Uplink Ports;

c) Speed, count, and type (e.g. copper, fiber-optic) of Downlink Ports;

d) Presence of Power over Ethernet (PoE), and the maximum available power provided by the product's PoE capability if present; and

e) Power supplies.

EPA welcomes feedback on the proposed modular product family structure and again looks forward to working with stakeholders to streamline the common attributes of fixed product families, if possible, to better make use of the product family structure for fixed products.

# 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.

**Note:** With the inclusion of fiber-optic ports in the definition of Physical Network Ports above, products with fiber-optic connectivity are now implicitly covered in scope of Version 1.0. EPA is including LNE products with fiber-optic ports in scope as requested by several stakeholders because they are commonly found on the edge of a network and can provide similar functionality compared to copper based products depending on a product's specific port configuration.

## 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 Products that contain Physical Network Ports that have 40Gb/s or higher link rate capability.

**Note:** EPA is proposing to exclude products with very high speed physical network ports (40Gb/s or greater) as they typically operate at higher utilizations, exist in core data center and telecommunications environments, and are extremely difficult and challenging to test. Additionally, there is a comparatively small number of models offered compared to the 1Gb/s and 10Gb/s offerings found closer to the edge of the network. EPA welcomes stakeholder feedback on the desire to focus on products closer to the edge of the network where a majority of network equipment energy use is observed, by excluding these high speed core products.

2.2.3 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.

# 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 received stakeholder feedback that 80Plus Gold certification is not applicable for DC input products, and therefore the PSU requirements should not be included in Version 1.0. EPA would like to clarify that the PSU requirements is to meet the efficiencies reflected in Table 2 above and Table 3 below rather than to certify to the 80Plus program.

3.2.3 Power Supply Power Factor Criteria: Ac-Dc 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 Ac-Dc** 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** Ac-Dc 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 Ac-Dc 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 has clarified in Section 3.2.3 and Table 3 that power factor requirements only apply to ac input power supplies.

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

ii. 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.

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

**Note:** EPA has removed the Port Power Down requirement proposed in Draft 1 as it was determined to be aligned closely enough with Energy Efficient Ethernet that it is considered redundant.

### 3.4 Active State Efficiency Criteria for all LNE Products

**Note: EPA will not include active state efficiency criteria in the Version 1.0 of this specification,** rather the Agency is making use of an approach that will drive efficiency now and generate data that will support setting active levels in Version2.0 of this specification. This approach mirrors the approach to active power taken in Version 1.0 of the ENERGY STAR Computer Server specification and the Version 1.0 ENERGY STAR Data Center Storage specification.

The proposed approach requires (1) that an LNE product be evaluated using the ENERGY STAR LNE Test Method, with results to be publically disclosed via the ENERGY STAR program through the third party certification process, and (2) that the LNE product also provide an energy-efficient platform by meeting or exceeding pass/fail levels and requirements in other areas such as power supply efficiency, energy efficient features, and data measurement and output requirements.

3.4.1 EPA is pursuing this approach to active state evaluation to encourage further testing of the energy efficiency of LNE products. EPA will evaluate this data when considering active state efficiency levels in Version 2.0 of the specification. Efficiency data will be measured and disclosed in a consistent manner and is provided along with the hardware and software characteristics of each system. Thus, this reporting approach will assist manufacturers in differentiating the efficiency of their products and purchasers interested in buying efficient products. 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. Full power and performance shall be measured and reported, both in certification materials and as required in Section 4 for each applicable configuration within the product family as defined in Section 1.H)4) above.

3.4.2 The testing of modular Large Network Equipment for compliance with Section 3.4.1 shall be carried out with the following additional considerations:

i. Power and performance values shall be measured and reported using a fully-populated chassis

ii. Heterogeneous module configurations are permitted.

**Note:** EPA has consolidated all Active State Efficiency Criteria for Large Network Equipment into Section 3.4, and subsequently have removed Section 3.5 which was previously found in Draft 1.

# 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), including port counts, port speeds, number of modules supported, types of ports supported, etc.;

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 provided more detail for the types of variables intended for collection for each testing system configuration. EPA welcomes additional stakeholder feedback on information that should be collected through the certification process.

# 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.

# 6 TESTING

## 6.1 Test Methods

6.1.1 Test methods identified in Table 1 shall be used to determine certification for ENERGY STAR.

**Table 1: Test Methods for ENERGY STAR Certification**

| Product Type | Test Method |
|---|---|
| All | ENERGY STAR Test Method for Large Network Equipment (Rev. June-2015) |
| 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

6.2.1 Representative Models shall be selected for testing per the following requirements:

i. For certification of an individual product configuration, the unique configuration that is intended to be marketed and labeled as ENERGY STAR is considered the Representative Model.

ii. For certification of a product family of all product types, one product configuration for each of the required configurations defined in Section 1.H)4) within the family are considered Representative Models. All such representative models shall have the same Common Product Family Attributes as defined in 1.H).

**Note:** EPA has updated Section 6.2 bringing it in line with the approach to Representative Models used in most other ENERGY STAR consumer electric and information technology product specifications, including Computer Servers and Data Center Storage specifications.

## 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.

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**