ENERGY STAR® Program Requirements for Set-top Boxes

Partner Commitments

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacture and labeling of ENERGY STAR qualified products. The ENERGY STAR Partner must adhere to the following partner commitments:

Qualifying Products

1. **Comply with current ENERGY STAR Eligibility Criteria**, which define performance requirements and test procedures for Set-top Boxes (STBs). A list of eligible products and their corresponding Eligibility Criteria can be found at www.energystar.gov/specifications.
2. **Prior to associating the ENERGY STAR name or mark with any product,** obtain written certification of ENERGY STAR qualification from a Certification Body recognized by EPA for Set-top Boxes prior to associating the ENERGY STAR name or mark with any product. As part of this certification process, products must be tested in a laboratory recognized by EPA to perform Set-top Box testing. A list of EPA-recognized laboratories and certification bodies can be found at www.energystar.gov/testingandverification.
3. **Ensure that any model associated with the ENERGY STAR name or mark** meets the following standards:

   3.1. Product material requirements as defined in restriction of hazardous substances (RoHS) regulations, as generally accepted. This includes exemptions in force at the date of product manufacture, where the maximum concentration values tolerated by weight in homogeneous materials are: lead (0.1%), mercury (0.1%), cadmium (0.01%), hexavalent chromium (0.1%), polybrominated biphenyls (PBB) (0.1%), or polybrominated diphenyl ethers (PBDE) (0.1%). Batteries are exempt.

   Notes:

   - The explicit intention is to harmonize with EU RoHS.
   - For purposes of ENERGY STAR third-party certification, these requirements shall not be reviewed when products are initially qualified nor during subsequent verification testing. Rather, EPA reserves the right to request supporting documentation at any time.

Using the ENERGY STAR Name and Marks

4. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Identity Guidelines are available at www.energystar.gov/logouse.
5. Use the ENERGY STAR name and marks only in association with qualified products. Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is qualified and offered for sale in the U.S. and/or ENERGY STAR partner countries.
6. Provide clear and consistent labeling of ENERGY STAR qualified Set-top Boxes, per the following:

   6.1. Partner shall adhere to the following product-specific commitments regarding use of the ENERGY STAR certification mark on qualified products:

      6.1.1. Partner must use the ENERGY STAR mark in one of the following ways:

1) Via permanent or temporary label on the top or front of the product. All temporary labeling must be affixed to the product with an adhesive or cling-type application; or

2) Via electronic labeling. Electronic labeling must meet the following requirements:

a. The ENERGY STAR mark in cyan, black, or white must appear at least once per day when the product is in use, and must display for a minimum of 5 seconds;

b. The ENERGY STAR mark must be at least 10% of the screen by area, must not be smaller than 76 pixels x 78 pixels, and must be legible.

6.1.2. Partner must also use the ENERGY STAR mark in all of the following ways:

1) In product literature (e.g., user manuals, specification sheets);

2) On product packaging/boxes for products sold at retail; and

3) On the Partner's website where information about ENERGY STAR qualified products is displayed. Partner must comply with the ENERGY STAR Web Linking Policy, which can be found at www.energystar.gov/partners.

6.2. For all qualified products sold to Service Providers that are ENERGY STAR Partners, the Manufacturing Partner may provide labeling on behalf of the Service Provider Partner. All product labeling must meet the requirements specified herein for electronic notification or physical labeling.

6.3. For all products sold to Service Providers that are not an ENERGY STAR Partner, the Manufacturing Partner may qualify and label the product if it meets ENERGY STAR eligibility criteria in all possible hardware and software configurations, and under all potential operating scenarios.

Verifying Ongoing Product Qualification

7. Participate in third-party verification testing through a Certification Body recognized by EPA for Set-top Boxes, providing full cooperation and timely responses. EPA/DOE may also, at its discretion, conduct tests on products that are referred to as ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily supplied by Partner at the government's request.

Providing Information to EPA

8. Provide unit shipment data or other market indicators to EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:

8.1. Partner must submit the total number of ENERGY STAR qualified Set-top Boxes shipped in the calendar year or an equivalent measurement as agreed to in advance by EPA and Partner. Partner shall exclude shipments to organizations that rebrand and resell the shipments (unaffiliated private labelers).

8.2. Partner must provide unit shipment data segmented by meaningful product characteristics (e.g., type, capacity, presence of additional functions) as prescribed by EPA.

8.3. Partner must submit unit shipment data for each calendar year to EPA or an EPA-authorized third party, preferably in electronic format, no later than March 1 of the following year.

Submitted unit shipment data will be used by EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner.

9. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.

10. Notify EPA of a change in the designated responsible party or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at www.energystar.gov/mesa.

Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures, and should keep EPA informed on the progress of these efforts:

- Provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and its message.
- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.
- Purchase ENERGY STAR qualified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product information to employees for use when purchasing products for their homes.
- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), EPA may provide links where appropriate to the Partner website.
- Ensure the power management feature is enabled on all ENERGY STAR qualified displays and computers in use in company facilities, particularly upon installation and after service is performed.
- Provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR qualified products.
- Provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, communicate, and/or promote Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event.
- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway.
- Join EPA's Green Power Partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities. For more information on Green Power, visit www.epa.gov/greenpower.

ENERGY STAR® Product Specification for Set-top Boxes

Eligibility Criteria Version 5.1

Following is the Version 5.1 ENERGY STAR product specification for Set-top Boxes (STBs). A product shall meet all of the identified criteria to earn the ENERGY STAR.

1 DEFINITIONS

A) Set-top Box (STB): A device with the primary purpose of receiving digital television services from a coaxial, hybrid fiber coaxial, or fiber-to-the-home distribution system, from satellites, or encapsulated in IP packets from managed IP distribution networks; decrypting or descrambling these signals; and decoding/decompressing for delivery to residential consumer displays and/or recording devices, and/or one or more other Set-Top Boxes, including Thin Clients, in a residential multi-room architecture. STBs that incorporate common LAN functionality as a secondary function are considered STBs for this specification.

<table>
<tr><td colspan="2" rowspan="3"></td><td colspan="3">Primary purpose is receiving television services?</td></tr>
<tr><td colspan="2">Yes</td><td rowspan="2">No</td></tr>
<tr><td colspan="2">Local Video Connection?</td></tr>
<tr><td colspan="2"></td><td>Yes</td><td>No</td><td></td></tr>
<tr><td rowspan="2">Direct Service Provider or Streaming Video Provider Source Input?</td><td>Yes</td><td colspan="2">Non- Thin Client STB</td><td>Small Network Equipment (covered in separate ENERGY STAR Specification)</td></tr>
<tr><td>No</td><td>Thin Client/ Remote STB</td><td colspan="2">Excluded from Scope</td></tr>
</table>

B) Product Type (Base Type): The means of access to video content for a STB.

1) Cable: A STB that can receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system with Conditional Access (CA) or a STB capable of receiving cable service after installation of a CableCARD or other type of Conditional Access system.

2) Satellite: A STB that can receive and decode video content as delivered from a MVPD satellite network.

3) Cable Digital Transport Adapter (DTA): A minimally configured Cable STB that can receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system.

4) Internet Protocol (IP): A STB that can receive television/video signals encapsulated in IP packets.

i) Over-the-top (OTT) Internet Protocol (IP): An IP STB that cannot receive signals from a Multichannel Video Programming Distributor (MVPD) as defined in Title 47 U.S. Code § 522.

ii) Multichannel Video Programming Distributor (MVPD) Internet Protocol (IP): An IP STB that can receive signals from a MVPD.

5) Thin-client / Remote: A STB that can receive content over an HNI from another STB, but is unable to interface directly to the MVPD network.

C) Additional Functionality:

1) CableCARD: The capability to decrypt premium audio/video content and services and provide other network control functions via a plug-in Conditional Access module that complies with the ANSI/SCTE 28 HOST-POD Interface Standard[1].

2) Digital Video Recorder (DVR): A feature that records television signals on a hard disk drive (HDD) or other non-volatile storage device integrated into the STB for playback at an arbitrary time. A DVR includes features such as: Play, Record, Pause, Fast Forward (FF), and Fast Rewind (FR). STBs that only support buffering or a Service Provider network-based "DVR" service are not considered DVR STBs for purposes of this specification. The presence of DVR functionality does not mean the device is defined to be a STB.

3) DOCSIS®: The capability to distribute data and audio/video content over cable television infrastructure in accordance with the CableLabs® Data Over Cable Service Interface Specification[2].

4) Home Network Interface (HNI): An interface with external devices over a local area network (example: Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wireless-Fidelity or Wi-Fi), Multimedia over Coax Alliance (MoCA), HomePNA alliance (HPNA), IEEE 802.3, HomePlug AV) that is capable of transmitting or receiving video content.

   i) Multi-Input Multi-Output (MIMO) Wireless HNI: IEEE 802.11n/ac and related MIMO enabled Wi-Fi functionality that supports more than one spatial stream in both send and receive. When using the notation MIMO AxB: A is considered the number of spatial streams while B is the number of antennas supported. A spatial stream is an independent and separately encoded data signal.

5) Multi-room: The capability to provide independent live audio/video content to two or more Clients or support pause/time-shifting capability for otherwise standalone IP or Thin-client STBs within a single family living unit. This definition does not include the capability to manage gateway services for multi-subscriber scenarios.

6) Multi-stream: A STB feature that allows the device to receive multiple independent streams of video content for use with one or more Clients, one or more directly connected Display Devices, or a DVR, picture-in-picture, etc. This definition does not include the capability to manage gateway services for multi-subscriber scenarios.

7) Ultra HD (4k) Resolution: The capability to transmit or display video signals with a minimum output resolution of 3840×2160 pixels in progressive scan mode at minimum frame rate of 24 fps (abbreviated 2160p24).

8) High Efficiency Video Processing (HEVP): Video decoding providing compression efficiency significantly higher than H.264/AVC, for example HEVC (H.265).

9) Three-dimensional (3D) Capability: The capability to transmit or display video signals with 3D depth information for stereoscopic display.

10) Access Point: The capability to provide wireless network connectivity to multiple clients. For the purposes of this specification, Access Point functionality includes only IEEE 802.11 (Wi-Fi) connectivity.

1 http://www.scte.org/standards/
2 http://www.cablelabs.com/specs/

11) Router: The capability to determine the optimal path along which network traffic should be forwarded. Routers forward packets from one network to another based on network layer information. Router functionality includes Access Point and Mesh Networking functionality.

12) Mesh Networking**:** The capability to extend the Wireless Access Network (WAN) throughout a customer's premises through a decentralized, point-to-point network.

13) Telephony: The ability to support analog telephones through one or more RJ11 or RJ14 jacks.

14) Transcoding: Additional capability to translate (e.g., MPEG2 to H.264), transrate (e.g., HD bitrate to Mobile bitrate), transcale (e.g., HD resolution to Mobile resolution), transcrypt (e.g., CAS to DRM), or perform audio format conversions (e.g., AC-3 to AAC) in real-time.

D) Auto Power Down (APD): A STB feature that monitors parameters correlated with user activity or viewing. If the parameters collectively indicate that no user activity or viewing is occurring, the APD feature enables the STB to transition to Sleep Mode.

E) Principal Function: Functions necessary for selecting (via electronic program guide), receiving, decoding, decompressing, or delivering live or recorded audio/video content to a Display Device, local/remote recording device, or Client. Monitoring for user or network requests is not considered a Principal Function for STBs.

F) Operational Modes:

1) On Mode: The STB is connected to a power source. At least one Principal Function is activated and all Principal Functions are provisioned for use. The power draw in On Mode may vary based on specific use and configuration.

2) Sleep Mode: A range of reduced power states where the STB is connected to a power source and is not providing any Principal Function. The STB may transition to On Mode due to user action, internal signal, or external signal. The power drawn in this mode may vary based on specific use or configuration. If any Principal Function is activated while operating in this mode, the STB is assumed to transition to On Mode. Monitoring for user or network requests is not considered a Principal Function. The STB shall be able to transition from this mode to On Mode within 15 seconds (independent of any television recovery time) to be considered in Sleep Mode.

3) Deep Sleep State: A power state within Sleep Mode characterized by power draw less than or equal to 1 W. The STB shall be able to transition from this mode to On Mode within 15 seconds (independent of any television recovery time) to be considered in Deep Sleep State.

4) Scheduled Sleep Mode: A power state characterized by a power draw of less than or equal to 15% of On Mode Power or 3 W, whichever is greater. This mode may be delivered through a schedule or special button press, and allows a transition time to On Mode greater than 15 seconds.

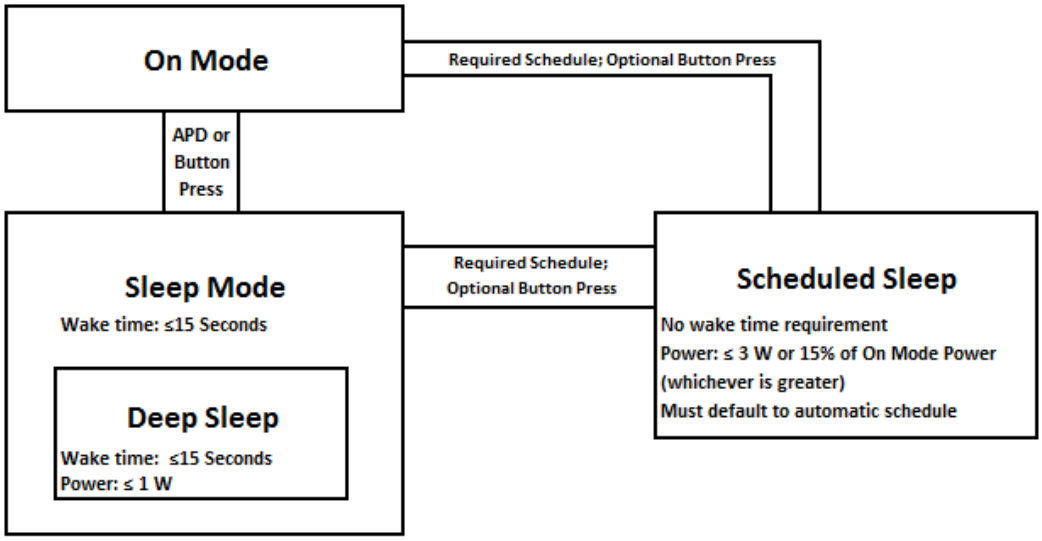

Figure 1: Illustration of the Relationships Between Modes

G) Other Definitions

1) Display Device (DD): A device (e.g., TV, Computer Monitor, or Portable TV) that receives its content directly from a STB through a video interface (example: High-Definition Multimedia Interface (HDMI), Component Video, Composite Video, or S-Video), not through a HNI, and displays it for viewing.

2) Client: A device (e.g., STB, Thin-Client STB, Smart TV, Mobile Phone, Tablet, PC, etc.) that can receive content over a HNI from another STB.

3) External Power Supply (EPS): Also referred to as External Power Adapter. An external power supply circuit that is used to convert household electric current into dc current or lower-voltage ac current to operate a consumer product.

4) Standard dc: A method for transmitting dc power defined by a well-known technology standard, enabling plug-and-play interoperability.

   Note: Common examples are Universal Serial Bus (USB) and Mobile High-definition Link (MHL). Usually Standard dc includes both power and communications over the same cable but that is not required.

5) Service Provider: A business entity that provides video content, a delivery network, and associated installation or support services to subscribers with whom it has an ongoing contractual relationship.

6) Multichannel Video Program Distributors (MVPD): An organization such as a cable operator, a multichannel multipoint distribution service, a direct broadcast satellite service, or a television receive-only satellite program distributor, who makes available for purchase, by subscribers or customers, multiple channels of video programming. This FCC definition does not currently include OTT service providers.

7) Conditional Access: The encryption, decryption, and authorization techniques employed to protect content from unauthorized viewing. CableCARD and Downloadable Conditional Access System (DCAS) are examples of Conditional Access technology.

8) Typical Energy Consumption (TEC): A means for evaluating energy efficiency through a calculation of expected energy consumption for a typical household over a one-year period, expressed in units of kWh/year.

9) Unit Under Test (UUT): The STB being tested.

H) Product Family: A group of product models that are (1) made by the same manufacturer, (2) subject to the same ENERGY STAR certification criteria, and (3) of a common basic design. Product models within a family differ from each other according to one or more characteristics or features that either (1) have no impact on product performance with regard to ENERGY STAR qualification criteria, or (2) are specified herein as acceptable variations within a product family. For Set-top Boxes, acceptable variations within a product family include:

1) Aesthetic housing changes that do not affect the thermal characteristics of the device (e.g., color, labeling, or other cosmetic modifications); and

2) Software configuration.

2 SCOPE

2.1 Included Products

2.1.1 Products that meet the definition of Set-top Box and a Set-top Box Base Type as specified herein are eligible for ENERGY STAR certification, with the exception of products listed in Section 2.2.

2.2 Excluded Products

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

3 QUALIFICATION 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, 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 General Qualification Criteria

3.2.1 External Power Supply (EPS): Single- and Multiple-voltage EPSs shall meet the Level VI or higher performance requirements under the International Efficiency Marking Protocol when tested according to the Uniform Test Method for Measuring the Energy Consumption of External Power Supplies, Appendix Z to 10 CFR Part 430.

i. Single- and Multiple-voltage EPSs shall include the Level VI or higher marking.

ii. Additional information on the Marking Protocol is available at http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218

3.2.2 Maintenance Activities:

i. Products may automatically exit Sleep Mode and/or Scheduled Sleep Mode on a regular schedule to download content, scan for program and schedule information, and perform maintenance activities. The total time spent performing maintenance activities shall not

exceed an average of two hours in any 24-hour period, exclusive of activities scheduled by the end-user (e.g., video recording of a regularly scheduled program). Video downloads that are not user-requested (e.g., "speculative recording", or "push") shall be counted against the two hour average per day requirement.

ii. Products that have exited Sleep Mode or Scheduled Sleep Mode and completed maintenance or other user-requested activities shall automatically return to Sleep Mode or Scheduled Sleep Mode in less than 15 minutes.

iii. Products that provide a speculative recording function shall provide a user-accessible menu option to permit users to disable the functionality. Instructions for disabling speculative recording shall be included in printed and/or electronic product manuals.

3.2.3 Auto Power Down (APD): To apply "YES" in Table 1 Operational Mode Durations for Column 1 "APD Enabled by Default," products shall meet the following requirements:

i. STBs shall be deployed with APD enabled by default, with APD timing set to engage after a period of less than or equal to 4 hours from last user activity. User activity is defined as any activity in which the user interacted with the UUT. The Emergency Alert System (EAS) system can wake the box and should be considered user activity for the purposes of this requirement.

ii. APD default settings shall persist until an end-user chooses to manually either (1) disable or (2) modify the default APD settings.

3.2.4 Scheduled Sleep Mode: To apply "YES" in Table 1 Operational Mode Durations for Column 2 "Automatic Scheduled Sleep," products shall meet the following requirements:

i. STBs shall be deployed with Scheduled Sleep enabled by default.

ii. STBs may include clearly marked button(s) or switch(es) on the remote control that shall enable modification to the schedule for Scheduled Sleep within 2 seconds of being pressed and within two button presses.

iii. Additionally, STBs that qualify with Scheduled Sleep must include a user-controllable timer that provides a schedule for each day of the week or respond to a network stimulus. Alternative button configurations or methods of modifying Scheduled Sleep will be acceptable with written approval from EPA.

iv. Scheduled Sleep functionality shall not prevent a device from performing a user-scheduled DVR recording or other function.

v. Conversely, a user-scheduled DVR recording or other function shall not prevent a device from entering and remaining in Scheduled Sleep, except during the time required to perform the DVR recording or other function, and 15 minutes before and after the time required.

vi. An override function may be provided to allow the end-user to disable Scheduled Sleep functionality; however, users shall first be offered an explanation of the Scheduled Sleep feature and provided the opportunity to change the schedule to better suit their needs.

vii. After the end of Scheduled Sleep time, the STB must resume Sleep Mode functionality including the ability to transition to On Mode in 15 seconds or less.

viii. Scheduled Sleep default settings shall persist until an end-user chooses to manually either (1) disable or (2) modify the default Scheduled Sleep settings.

3.3 Typical Energy Consumption (TEC) Requirements

3.3.1 TEC as determined per the test procedure, shall be less than or equal to the Maximum TEC Specification Requirement (TEC_{MAX}), as illustrated in Equation 1.

Equation 1: TEC Requirement for STBs

$$TEC \leq TEC_{MAX} = \left(TEC_{BASE} + \sum_{1}^{n} TEC_{ADDL\_i} \right) \times \text{eff}_{ac-dc},$$

Where:

- *TEC is the Typical Energy Consumption, as calculated in Equation 2;*
- *TEC_{MAX} is the maximum TEC Specification Requirement—the level for ENERGY STAR certification;*
- *TEC_{BASE} is the topmost applicable Base Type TEC Allowance (kWh), as specified in Table 2;*
- *TEC_{ADDL_i} is each applicable Additional Functionality TEC Allowance (kWh), as specified in Table 3, applied once per functionality unless indicated otherwise with the word "Additional", and subject to the requirements in Section 3.3.2, below; and*
- *$eff_{ac\text{-}dc}$ is the standard adjustment for ac-dc power conversion losses that occur at the device powering the STB, and is 1.0 for Ac-powered STBs and 0.85 for STBs with Standard dc.*

Equation 2: TEC Calculation

$$TEC = 0.365\left[\left(T_{WATCH\_TV} \times P_{WATCH\_TV}\right) + \left(T_{SLEEP} \times P_{SLEEP}\right) + \left(T_{APD} \times P_{APD}\right) + \left(T_{SCHED\ SLEEP} \times P_{SCHED\ SLEEP}\right)\right]$$

Where:

- *T_{WATCH_TV} is the time in On Mode, as determined per Table 1 (h);*
- *P_{WATCH_TV} is the measured power in On Mode (W);*
- *T_{SLEEP} is the time in Sleep Mode, as determined per Table 1 (h);*
- *P_{SLEEP} is the measured power in Sleep Mode, including Deep Sleep (W);*
- *T_{APD} is the time coefficient for APD, as determined per Table 1 (h);*
- *P_{APD} is the measured power after an APD timeout (W);*
- *T_{SCHED_SLEEP} is the time operating in an automatic Scheduled Sleep Mode (maximum of 4 h); and*
- *P_{SCHED_SLEEP} is the measured power in an automatic Scheduled Sleep Mode (W).*

Table 1: Operational Mode Durations

Sleep Mode APD Enabled by Default*	Auto-matic Sche-duled Sleep	T_{WATCH_TV} *Where,* $T_{APD\ TIMEOUT}$ *is the time from last user activity to Auto Power Down*	T_{SLEEP}	T_{APD}	T_{SCHED_SLEEP}
NO	NO	14	10	0	0
NO	YES	14	$10 - T_{SCHED\ SLEEP}$	0	$T_{SCHED\ SLEEP}$ deployed duration
YES	NO	$7 - \frac{4 - T_{APD\ TIMEOUT}}{2}$	10	$7 + \frac{4 - T_{APD\ TIMEOUT}}{2}$	0
YES	YES	$7 - \frac{4 - T_{APD\ TIMEOUT}}{2}$	$10 - T_{SCHED\ SLEEP}$	$7 + \frac{4 - T_{APD\ TIMEOUT}}{2}$	$T_{SCHED\ SLEEP}$ deployed duration

* APD to include APD to Deep Sleep.

Table 2: Base Type TEC Allowance (TEC_{BASE})

Base Type (Use Topmost if Multiple Apply)	Allowance (kWh/year)
1. Cable DTA	37
2. Cable	50
3. Satellite	50
4. Multichannel Video Programming Distributor (MVPD) Internet Protocol (IP)	40
5. Thin-client / Remote	7 (Applicable after January 1, 2018)
6. Over the top (OTT) Internet Protocol (IP)	7

3.3.2 Additional Functionality TEC Allowances (TEC_{ADDL_i}) shall be as specified in Table 3, subject to the following requirements:

i. No additional functionality allowances may be applied to STBs with CABLE DTA base functionality.

ii. The HOME NETWORK INTERFACE, MIMO Wi-Fi HNI, MULTI-STREAM, ROUTER, Ultra HD Resolution, and HEVP-TC allowances are the only additional functionality allowances that may be applied to STBs with THIN CLIENT / REMOTE base functionality.

iii. The CableCARD allowance may not be applied more than twice per STB.

iv. The DOCSIS 2 and DOCSIS 3.0 allowances may only be applied to STBs that are installed in a Service Provider network with DOCSIS capability.

v. Either the DOCSIS 2 or the DOCSIS 3.0 allowance may be applied, but not both.

vi. The MULTI-ROOM allowance may only be applied once per STB, regardless of the number of remote outputs served by the STB.

vii. The MULTI-ROOM allowance may only be applied to STBs that can provide live audio/video content to multiple devices (2 or more Clients) or support pause/time-shifting capability for otherwise standalone IP or Thin-client STBs.

viii. The MULTI-ROOM allowance may not be combined with the HOME NETWORK INTERFACE allowance on a single STB.

ix. The MIMO Wi-Fi HNI allowance can only be combined with HOME NETWORK INTERFACE or MULTI-ROOM allowance and only when the device is tested with Wi-Fi as the HOME NETWORK INTERFACE providing the primary video transport from the MULTI-ROOM STB to the device. It cannot be used at any other time and must be used in conjunction with the HOME NETWORK INTERFACE or MULTI-ROOM allowance.

x. The MULTI-STREAM allowances may only be applied once per STB, regardless of the number of simultaneous streams supported by the STB.

xi. Either the ROUTER or ACCESS POINT allowance may be applied once per STB, and must be combined with the HOME NETWORK INTERFACE or MULTI-ROOM allowance.

xii. The HEVP and HEVP-TC allowances may not be applied to STBs without a local display.

Table 3: Additional Functionality TEC Allowance (TEC_{ADDL_i})

Additional Functionality	Allowance (kWh/year)
Advanced Video Processing	0
Advanced Video Processing – Additional	0
CableCARD	15
CableCARD – Max One Additional	15
Digital Video Recorder (DVR)	35
DOCSIS 2	25
DOCSIS 3.0 (May be also applied to DOCSIS 3.1 devices)	45
HD	0
High Efficiency Video Processing (HEVP)	10
High Efficiency Video Processing for Thin Clients (HEVP-TC)	10
Home Network Interface (HNI)	15
MIMO Wi-Fi HNI (MIMO) 802.11n Low Power (< 200 mW conducted output power) Base (Initial 2x2 Streams)	9
MIMO 802.11ac Low Power Base (initial 2x2 Streams)	18
MIMO Wi-Fi Low Power – Each Additional Stream Beyond 2x2	3

Additional Functionality	Allowance (kWh/year)
MIMO 802.11n High Power (≥ 200 mW conducted output power) Base (Initial 2x2 Streams)	11
MIMO 802.11ac High Power Base (initial 2x2 Streams)	22
MIMO Wi-Fi High Power – Each Additional Stream Beyond 2x2	4
Multi-room	21
Multi-stream – Cable/Satellite	18
Multi-stream – IP	18
Multi-stream – Additional	0
Transcoding	13
Transcoding – Additional	5
Ultra HD Resolution	5
Access Point	8
Router	15
Telephony	4

Note: Products intended for sale in the US market are subject to minimum toxicity requirements. Please see ENERGY STAR Program Requirements for Set-top Boxes: Partner Commitments for details.

4 TESTING

4.1 Test Methods

4.1.1 Test methods identified in Table 4 shall be used to determine energy consumption.

Table 4: Test Methods for ENERGY STAR Qualification and Additional Incentives

Product Type	Test Method
STBs	ENERGY STAR Test Method for Set-top Boxes (Rev. May-2016)

4.2 Certification Options

4.2.1 ENERGY STAR requirements must be met in a Set-top Box's as-deployed configuration, connected to the specific service provider's network or a simulated live network specific to the certifying service provider. ENERGY STAR Partner must report the most consumptive results for the model. The reported value may exceed the tested value.

4.2.2 If a Partner wishes to certify configurations of a model for which non-ENERGY STAR certified alternative configurations or operating scenarios exist, the Partner must assign the certified configurations an identifier in the model name/number that is unique to ENERGY STAR certified configurations. This identifier must be used consistently in association with the certified configurations in marketing/sales materials and on the ENERGY STAR list of certified products (e.g., model A1234 for baseline configurations and A1234-ES for ENERGY STAR certified configurations).

5 USER INTERFACE

5.1.1 Partners are encouraged to design products in accordance with the user interface standard IEEE P1621: Standard for User Interface Elements in Power Control of Electronic Devices Employed in Office/Consumer Environments. For details, see http://energy.lbl.gov/controls/.

6 EFFECTIVE DATE

6.1.1 Effective Date: The Version 5.1 ENERGY STAR Set-top Box specification shall take effect on **January 1, 2017 for all products with the exception of Thin Clients. Thin Clients must meet these requirements on January 1, 2018.** To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on its 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.

6.1.2 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 qualification is not automatically granted for the life of a product model.

7 FUTURE SPECIFICATION REVISIONS

7.1.1 EPA will include the following topics in the next revision of the STB specification by 2019:

i. TEC requirements for all STB types that require the use of Deep Sleep or Scheduled Sleep.

Appendix A:
Explanation of Parameters

I. Table 5, below, maps parameters used by ENERGY STAR to parameters used in CTA-2043, August 2013.

Table 5: ENERGY STAR to CTA-2043 Parameter Map

ENERGY STAR V5.1	ENERGY STAR V4.1	CTA-2043	Explanation	Explanation for deviation from CTA-2043
P_{WATCH_TV}	P_{WATCH_TV}	$P_{WATCH\ TV\_N}$	Measured power in On Mode (W)	Simplified definition.
T_{WATCH_TV}	T_{WATCH_TV}	T_{ON*}	Time in On Mode (h)	Deviates from CTA-2043 to enable the power and time term subscripts to match.
P_{SLEEP}	P_{SLEEP}	P_{SLEEP}	Measured power in Sleep Mode, including Deep Sleep (W)	
T_{SLEEP}	T_{SLEEP}	T_{SLEEP*}	Time in Sleep Mode as a result of manual power down (h)	
P_{SCHED_SLEEP}	$P_{SLEEP\_SP\_2}$	$P_{SLEEP\_SP\_N}$	Measured power in an automatic Scheduled Sleep Mode (W)	More descriptive definition.
T_{SCHED_SLEEP}	T_{DEEP_SLEEP}	T_{SLEEP*}	Time operating in an automatic Scheduled Sleep Mode (maximum of 4h)	Distinguishes between different types of T_{SLEEP}, and distinguishes between scheduled and deep sleep.
P_{APD}	$P_{APD\_ON\_TO\_SLEEP}$	$P_{APD\_ON\_TO\_SLEEP}$	Measured power after an APD timeout (W)	Modified to enable the power and time term subscripts to match.
T_{APD}	T_{APD}	Not defined	Time in Sleep Mode as a result of APD (h)	CTA-2043 provides no guidance.
$T_{APD\_TIMEOUT}$	$T_{APD\_ON\_TO\_SLEEP}$	$T_{APD\_ON\_TO\_SLEEP}$	Time from last user activity to Auto Power Down (h)	More descriptive definition.

* Note in CTA-2043: “Should be provided by the entity specifying the use of CTA-2043”

ENERGY STAR® Program Requirements Product Specification for Set-Top Boxes

Test Method Rev. May-2016

1 OVERVIEW

The following test method shall be used for determining product compliance with requirements in the ENERGY STAR Specification for Set-top Boxes.

2 APPLICABILITY

The following test method is applicable to all products eligible for qualification under the ENERGY STAR Specification for Set-top Boxes.

3 DEFINITIONS

Unless otherwise specified, all terms used in this document are consistent with the definitions in the ENERGY STAR Specification for Set-top Boxes.

4 TEST SETUP

4.1 Test Setup and Instrumentation

A) Unless otherwise specified within this Test Method, the test setup and instrumentation for all portions of this method shall be in accordance with Section 7 of the Consumer Technology Association (CTA) standard, CTA-2043, "Set-top Box (STB) Power Measurement", Rev. Aug-2013 (CTA-2043).

B) Ac Input Power: Products shall be tested for qualification at the relevant input voltage/frequency combination for each market in which they will be sold and promoted as ENERGY STAR, as specified in Table 1.

Table 1: Ac Input Power Requirements

Market	Voltage	Voltage Tolerance	Maximum Total Harmonic Distortion	Frequency	Frequency Tolerance
North America, Taiwan	115 V ac	+/- 1.0 %	2.0%	60 Hz	+/- 1.0 %
Europe, Australia, New Zealand	230 V ac	+/- 1.0 %	2.0%	50 Hz	+/- 1.0 %
Japan	100 V ac	+/- 1.0 %	2.0%	50 Hz or 60 Hz	+/- 1.0 %

C) Dc Input Power:

1) Products may be tested with a dc source (e.g., via network or data connection) only if dc is the only available source of power for the product (i.e., no ac plug or External Power Supply (EPS) is shipped with the product).

2) Dc-powered products shall be installed and powered as directed by the manufacturer, using a port with the full specifications recommended for the STB (e.g., Universal Serial Bus (USB) 3.1 if applicable, even if backwards-compatible with USB 2.0).

3) The power measurement shall be made between the dc source (e.g., Host Machine) and the cable shipped with the product, including the losses introduced by the shipped cable. If no cable is shipped with the product, any cable between 2 and 6 feet long may be used in its place. The resistance of the cable used to connect the UUT to the point of measurement shall be measured and reported.

   Note: The measured resistance of dc power cables includes the sum of resistances of both the dc supply voltage wire and the ground wire.

4) A spliced cable may be used between the shipped cable and dc source in order to connect the power meter. If this method is used, the following requirements must be met:

   a) The spliced cable shall be used in addition to the shipped cable described in Section 4.1C)3).

   b) The spliced cable shall be connected between the dc source and the shipped cable.

   c) The spliced cable shall be no longer than 1 foot.

   d) For measuring voltage, the total amount of wiring used between the voltage measurement and the shipped cable shall be less than 50 milli-ohms of resistance. This only applies to the wiring that is carrying load current.

      Note: Voltage and current need not necessarily be measured at the same location, so long as the voltage is measured within 50 milli-ohms of the shipped cable.

   e) The current measurement can be made either on the ground wire or the dc supply voltage wire.

   f) Figure 1 depicts an example spliced cable setup using a USB 2.0-powered UUT connected to the Host Machine.

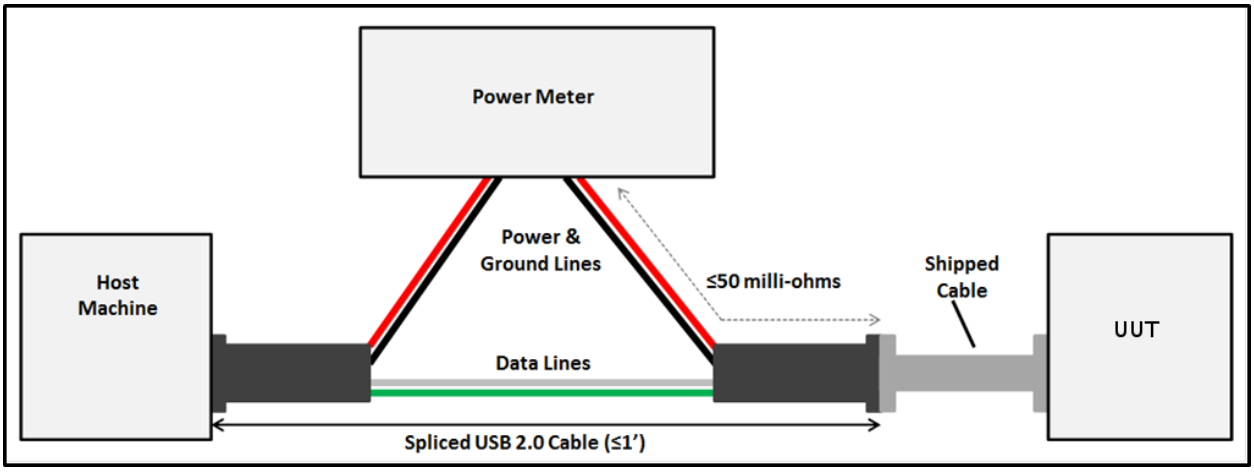

Figure 1: Example Spliced USB 2.0 Cable Arrangement

4.2 UUT Connections

A) The UUT shall be connected to the first applicable input connection specified in Table 2.

Table 2: Input Connections

Connection (Protocol)
1. Coax (QAM/DOCSIS)
2. Coax (Satellite/MoCA)
3. Coax (QAM/MoCA)
4. Wi-Fi
5. Coax (HPNA)
6. Ethernet (802.3)
7. Other

B) If the UUT is intended for operation on a Home Network or with Clients or Multi-room STBs and the input connection specified in Section 4.2A), above, is insufficient to permit this operation, the UUT shall be further connected to the Home Network, Clients, or Multi-room STB through a second connection specified in Table 3.

Table 3: Network Connections

Connection (Protocol)
1. MIMO Wi-Fi HNI
2. Wi-Fi
3. Coax (MoCA)
4. Coax (HPNA)
5. HomePlug AV
6. Ethernet (802.3)
7. Other

C) STBs offering concurrent operation of integrated HNIs at time of installation must be tested with the HNIs providing video content.

D) STBs and Clients that are connected using a wireless connection shall be placed within 10 feet of each other during testing. Ensure that there are no walls or other obstructions between the STB and Client.

E) If the UUT supports connection to a Display Device, it shall be connected to a Display Device with the first applicable output connection specified in Table 4.

Table 4: Output Connections

Connection (Protocol)
1. HDMI/DVI
2. Component
3. S-Video
4. Composite
5. Coax
6. Other

4.3 Voice and Data Setup

Unlike as specified in CTA-2043, the UUT shall be provisioned to provide data and/or voice services where applicable.

A) Voice: UUTs with Public Switched Telephone Network (PSTN) technology shall be configured and provisioned for VOIP services to allow incoming and outgoing calls. Connect an analog single-line telephone to the UUT via the RJ-14 jack on the unit using a 1.8 meter, 4 wire telephone extension with RJ-14 connectors.

B) Data: Configure and provision data services such that there is a live, usable connection to the head end and a live, usable local area network via either MoCA, Ethernet, or Wi-Fi interfaces on the UUT, following the precedence list in Table 2 above. Follow the configuration directives in the ENERGY STAR Version 1.0 Small Network Equipment (SNE) Specification in Sections 6.3 through 6.4.7) of the SNE Test Procedure. Ignore the WAN portion of Section 6.4.

C) In the case of an Ethernet network, a switch capable of the same maximum link speed as the UUT shall be connected via a 1 meter Ethernet Cat 5a or Cat 6 cable.

D) In the case of MoCA, a compatible MoCA bridge shall be connected via the appropriate COAX/Cat5e (or better) cable and provisioned for data services.

E) Additional devices shall not otherwise be connected to the local area network unless the connected Clients utilize this network for video transmission.

5 TEST CONDUCT

5.1 Implementation of CTA-2043 for STB Testing

The Test Conduct shall be carried out according to the requirements in CTA-2043 reference with the following guidance.

A) Required Test Results

1) Tests shall be performed using a live or simulated Service Provider or streaming video provider environment per Section 8.1.11 of CTA-2043.

2) The minimum required CTA-2043 tests test parameters, and reported results are specified in Table 5. Parameters used in this section are defined in Appendix A of the ENERGY STAR Specification for Set-top Boxes or CTA-2043.

3) Scheduled Sleep test is not required if the STB does not support this mode.

4) As specified in section 8.1.3 of CTA-2043, all tests shall use source test streams that match the output capability of the UUT. However, UltraHD output capable STBs shall use an UltraHD Test Stream only if claiming the UltraHD adder. Otherwise, they shall use an HD Test Stream. The output resolution from the UUT shall be the same as the input resolution (e.g. 720p or 1080i for an HD STB).

B) Special Function Configuration

1) If at any time during setup or on mode operation a message prompt is displayed requesting the configuration of special functions, such as automatic power down (APD), deep sleep, or scheduled sleep, select the configuration(s) as noted below:

a) If the message prompt has an option(s) that would cause a saved change to the STB setup, test the STB in the most power consumptive configuration for that mode. A saved change to the STB setup is one that is retained on subsequent use, that is, after the STB has been turned off in the current session and restarted for a new viewing session.

Message prompts may contain information on how to make a saved change or give the user the option to go to a specific setting menu to make a saved change. In this case, the setting shall be left unchanged and the STB should remain in its default configuration.

Example: during on mode operation, the STB displays a prompt to verify the user is not watching so it can go into sleep mode. If the prompt has an option to directly disable APD for future scenarios, then this is considered a saved change and the most power consumptive configuration (i.e. APD disabled) for that mode shall be selected.

b) If the message prompt options would cause a change just for the current viewing session, test the STB in the as-deployed option for that setting. For APD or schedule sleep, choose the message prompt option that puts the STB in the mode that is being tested as follows:

   i. Choose the option that will keep the STB in on mode, for the on mode power measurement.

   ii. Choose the option that will allow the STB to transition to APD or scheduled sleep mode, for the power measurement in each of these modes. Note: to allow the STB to transition to ADP or scheduled sleep, it often does not require any prompt to be selected.

   Example: during on mode operation, the STB displays a prompt to verify the user is not watching so it can go into sleep mode. If the prompt only has options that verify whether or not the user is watching or an option to go to a specific setting menu, this is not considered a saved change and the appropriate option may be selected to maintain the STB in on mode or allow it to transition via APD (i.e. don't select any option and allow the STB to transition to sleep mode).

c) If a scheduled sleep prompt is displayed that asks for the scheduled sleep duration (i.e. start time and end time), input the duration as specified in section 5.3B).

Table 5: CTA-2043 Required Tests and Test Parameters

CTA-2043 (Test Number: Test Name)	**Test Parameters**	**Reported Result**
ON Mode		
8.2.2.1 ON (Watch TV)*	$T_{WATCH\_TV} \geq 5$ min	P_{WATCH_TV}
SLEEP Mode		
8.3.4 SLEEP**	$T_{SLEEP} \geq 1$ h (Use CTA-2043 Section 8.3.2 (a) for SLEEP determination method***)	P_{SLEEP}
SCHEDULED SLEEP Mode		
8.3.4 SLEEP (for SCHEDULED SLEEP mode)	$T_{SCHED\_SLEEP} \geq 1$ h $T_{SLEEP\_WAIT} = 5$ min	P_{SCHED_SLEEP} T_{SCHED_SLEEP}
Power Mode Transitions		
8.5.1 APD initiated ON to SLEEP	$T_{SLEEP\_MAX} = 4.25$ h	P_{APD} $T_{APD\_TIMEOUT}$
8.5.3 Reenter SLEEP after RECORD	$T_{SLEEP\_MAX} = 20$ min	$T_{REC\_to\_SLEEP}$
8.5.4 Reenter SLEEP after MAINT	$T_{SLEEP\_MAX} = 20$ min	$T_{MAINT\_to\_SLEEP}$
8.5.5 SLEEP to ON	$T_{SLEEP\_to\_ON\_WAIT} = 1$ min	$T_{SLEEP\_to\_ON}$

* CTA-2043 ON Mode test may be tested in the configurations specified above and without the requirement, as seen in CTA-2043 Section 8.2.2.1 to measure and record each iteration of adding another Display Device until the maximum supported is connected. Only the power draw of the specified number of Display Devices and Client configurations need be reported.

** Assure no SCHEDULED SLEEP is scheduled over the entire duration of the SLEEP test. The STB may enter DEEP SLEEP over the duration of the SLEEP test.

*** SLEEP determination method from CTA-2043 Section 8.3.2 (a) is “No channel viewing or recording is supported on a UUT or Client”.

5.2 Implementation of CTA-2043 for Multi-room STB Testing

A) Multi-room STB Test Set-Up: Multi-room STBs that support connection to a Display Device shall be set up per Figure 2 using the connections specified in Section 4.2. Multi-room STBs that do not support connection to a Display Device shall be set up per Figure 3 using the connections specified in Section 4.2. Additionally, all STBs shall be subject to the following requirements.

1) The Clients connected to the Multi-room STB shall be configured per CTA-2043.
2) STBs claiming the Multi-Room (MR) allowance must be tested with three (3) live video streams with two Clients (receiving live video) and a locally connected Display Devices, if supported. If a locally connected Display Device is not supported, the STB must be tested with three Clients (receiving live video). If three live streams are not supported the MR allowance may not be used.
3) All other testing conditions shall be taken from the sections above.

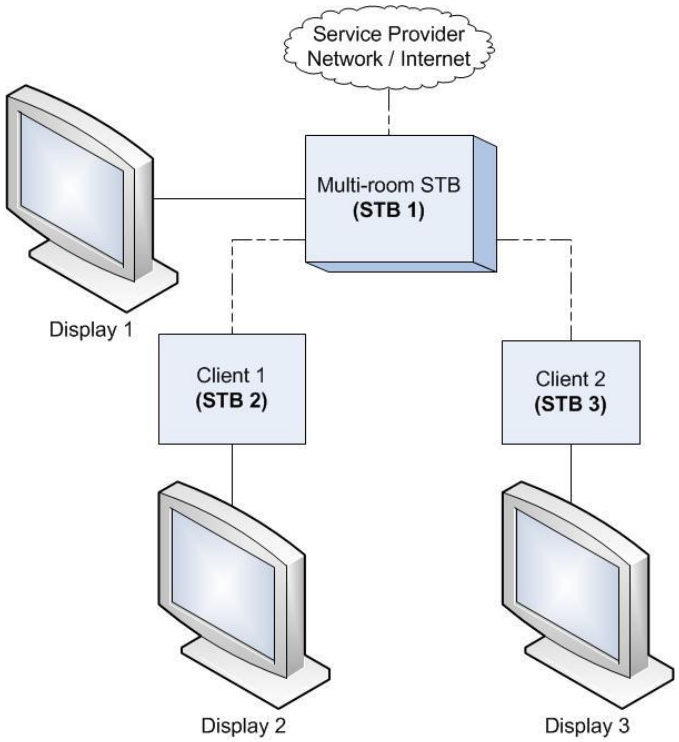

Figure 2: Multi-room STB Configuration for STBs that Support Connection to a Display Device

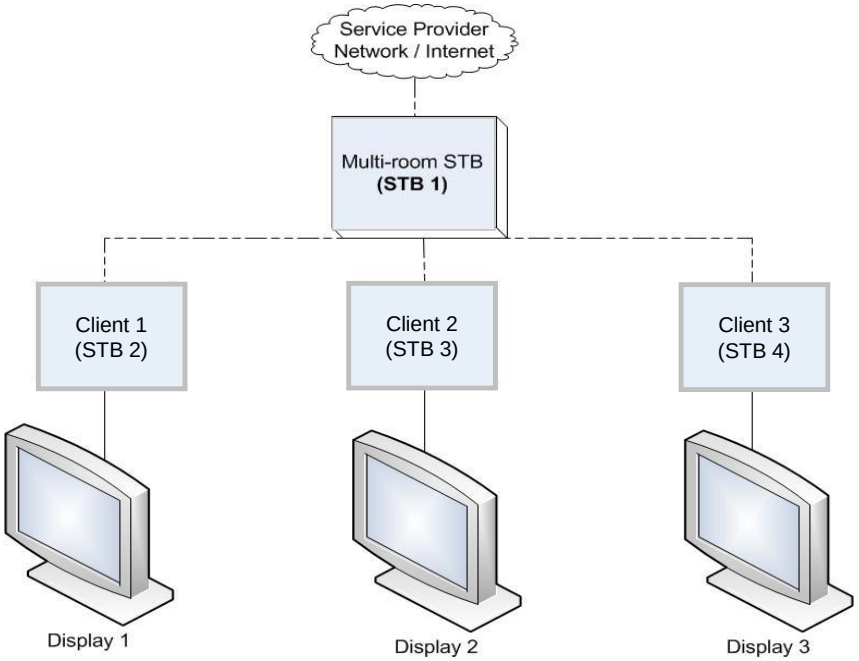

Figure 3: Multi-room STB Configuration for STBs that do not Support Connection to a Display Device

B) Multi-Room STB On Mode Test Conduct: The following instructions describe the measurement of On Mode for Multi-Room STBs for the purposes of calculating TEC.

1) The Multi-Room STB under test and the connected Clients shall be running the CTA-2043 tests specified in Table 6 concurrently, with the Thin Client/Remote STBs serving as a background condition for the testing of the Multi-Room STB.

2) When testing On Mode for Multi-Room STBs, video traffic shall be sent to all connected Clients. Regardless of the internal state of the Multi-Room STBs, this configuration shall be considered the On Mode for the STB.

Table 6: On Mode Test Setup for Multi-Room STBs

Device in Figure 2 or Figure 3	CTA-2043 Test	Result	Notes
STB 1 (UUT)	8.2.2.1: ON (Watch TV)	P_{WATCH_TV}	Multi-Room STB in On Mode
STB 2	8.2.2.1: ON (Watch TV)	Not Measured	Thin Client/Remote STB in On Mode over a home network
STB 3	8.2.2.1: ON (Watch TV)	Not Measured	Thin Client/Remote STB in On Mode over a home network
STB 4	8.2.2.1: ON (Watch TV)	Not Measured	Thin Client/Remote STB in On Mode over a home network

C) Multi-Room STB Sleep Mode Test Conduct: The following instructions describe the measurement of Sleep Mode for Multi-Room STBs for the purposes of calculating TEC.

1) The Multi-Room STB under test and the connected Clients shall be running the CTA-2043 tests specified in Table 7 concurrently, with the Thin-client/Remote STBs serving as a background condition for the testing of the Multi-Room STB.

2) When testing Sleep Mode for Multi-Room STBs, no video traffic shall be sent to the Clients. Regardless of the internal state of the Multi-Room STB, this configuration shall be considered the Sleep Mode for the STB.

Table 7: Sleep Mode Test Setup for Multi-Room STBs

Device in Figure 2 or Figure 3	CTA-2043 Test	Result	Notes
STB 1 (UUT)	8.3.4 SLEEP	P_{SLEEP}	Multi-Room STB in Sleep Mode
STB 2	8.3.4 SLEEP	Not Measured	Thin Client/Remote STB in Sleep Mode
STB 3	8.3.4 SLEEP	Not Measured	Thin Client/Remote STB in Sleep Mode
STB 4	8.3.4 SLEEP	Not Measured	Thin Client/Remote STB in Sleep Mode

5.3 Implementation of CTA-2043 for Scheduled Sleep Mode

A) Test Setup: Units for test shall be set up per the following requirements.

1) All devices shall be configured per CTA-2043.

2) The number of Clients, Display Devices, or Recording Devices connected to the UUT is unspecified; however, all devices shall be in Sleep Mode.

B) Test Conduct:

1) All requirements in section 8.3.1 of CTA-2043 shall be followed.

2) The time period for the test, T_{SCHED_SLEEP}, shall be equal to the duration of the default sleep schedule or 4 hours, whichever is smaller. If there is no default scheduled sleep time, then input the start and end time such that the total scheduled sleep duration (T_{SCHED_SLEEP}) is exactly 4 hours (e.g. scheduled sleep hours are set to be 1:00 am to 5:00 am).

a) 30 minutes before the beginning of the scheduled sleep time, place the STB in the On (Watch TV) configuration.

b) Do not use (or move) the STB remote control.

c) Place all connected client devices into Sleep Mode.

d) Ensure the STB is in On Mode before scheduled sleep time begins.

e) Begin power draw measurement at the start of the scheduled sleep time. Record the average power drawn as P_{SCHED_SLEEP} and the duration of the test as T_{SCHED_SLEEP}.

5.4 Implementation of CTA-2043 for Sleep to On Mode Transition

A) Units for test shall be configured per section 8.5.5 of CTA-2043.

B) Before turning on the STB, turn on the display device (either connected directly to the UUT or connected to a Client that is connected to the UUT).

C) The display device must be on and waiting for input from the UUT. Ensure that the latency and settings of the connected display device do not affect the UUT's sleep to on mode transition time measurement.

D) For thin-client UUTs, turn on the server STB before performing the test.

E) Turn on the UUT as specified in section 8.5.5 of CTA-2043 and record the sleep to on mode transition time. For UUTs that are not directly connected to a display device (i.e. server STBs), turn on the UUT as well as the intermediary Client at the same time and record the sleep to on mode transition time.

5.5 Verifying No Network Initiated Actions

A) According to section 8.3.1(c) of CTA-2043, no network initiated actions shall occur during the Sleep Mode or Scheduled Sleep Mode tests. If a network initiated action cannot be prevented, or if it is unclear whether network initiated actions are occurring during the tests, then use the following steps:

1) Repeat the Sleep Mode test 2 more times on the same unit.

2) Use the median value of all 3 tests as the Sleep Mode power measurement.

6 TEST PROCEDURES FOR ALL PRODUCTS

6.1 UUT and Test Preparation

UUT and test preparation shall be performed according to Section 8.1.1 to Section 8.1.12 of CTA-2043, with additional guidance from Section 5 of this document and the ENERGY STAR Specification for Set-top Boxes.

6.2 On Mode Testing

On Mode power shall be measured according to Section 8.2.1 of CTA-2043, with additional guidance from Section 5 of this document.

6.3 Sleep Mode Testing

Sleep Mode power shall be measured according to Section 8.3.1 of CTA-2043, with additional guidance from Section 5 of this document.

6.4 Scheduled Sleep Mode Testing

Scheduled Sleep power shall be measured according to Section 8.3.1 of CTA-2043, with additional guidance from Section 5 of this document.

6.5 Power Mode Transitions

A) APD Initiated On to Sleep: APD initiated on to sleep mode power and transition time shall be measured according to Section 8.5.1 of CTA-2043, with additional guidance from Section 5 of this document.

B) Reenter Sleep after Record Event: The transition time to reenter Sleep Mode after a recording event shall be measured according to Section 8.5.3 of CTA-2043, with additional guidance from Section 5 of this document.

C) Reenter Sleep after Maintenance Event: The transition time to reenter Sleep Mode after a maintenance event shall be measured according to Section 8.5.4 of CTA-2043, with additional guidance from Section 5 of this document.

D) Sleep to On Mode Transition: The Sleep to On Mode transition time shall be measured according to Section 8.5.5 of CTA-2043, with additional guidance from Section 5 of this document.

7 REFERENCES

A) CTA-2043, Set-top Box (STB) Power Measurement, Rev. August 2013.