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. Obtain 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.

Using the ENERGY STAR Name and Marks

3. 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.
4. 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.
5. Provide clear and consistent labeling of ENERGY STAR qualified set-top boxes, per the following:

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

    5.1.1. 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.

    5.1.2. 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;

5.2. 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.

5.3. 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

6. Participate in third-party verification testing through a Certification Body recognized by EPA for set-top boxes.

7. Comply with tests that EPA/DOE may conduct at its discretion 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. Any information used will be masked by EPA so as to protect the confidentiality of the Partner;

9. Report to EPA any attempts by 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® Program Requirements
Product Specification for Set-top Boxes

Eligibility Criteria
Version 3.0

Following is the Version 3.0 ENERGY STAR Product Specification for Set-top Boxes (STB). A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

1. DEFINITIONS

A) Product Type (Base Type): The primary means of access to video content for a STB. All base types may be configured as a simple STB that provides a single primary function, or as part of a complex STB that provides a primary function and one or more additional functionalities.

1) Cable: A STB whose primary function is to receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system with conditional access (CA) and deliver them to a consumer display, thin-client/remote STB, and/or recording device.

2) Satellite: A STB whose primary function is to receive television signals from satellites and deliver them to a consumer display, thin-client/remote STB, and/or recording device.

3) Cable Digital Transport Adapter (DTA): A minimally-configured STB whose primary function is to receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system and deliver them to a consumer display and/or recording device.

4) Internet Protocol (IP): A STB whose primary function is to receive television/video signals encapsulated in IP packets and deliver them to a consumer display, thin-client/remote STB, and/or recording device.

5) Terrestrial: A STB whose primary function is to receive television signals over the air (OTA) or via community cable distribution system without conditional access (CA) and deliver them to a consumer display, thin-client/remote STB, and/or recording device.

6) Thin-client / Remote: A STB that (1) is designed to interface between a Multi-room STB and a TV (or other output device), (2) has no ability to directly interface with a Service Provider, and (3) relies solely on a Multi-room STB for content. Any STB that meets the definition of a cable, satellite, IP, or terrestrial STB is not a thin-client/remote STB.

B) Product Features:

1) Base Functionality: The primary functionality that defines the ENERGY STAR criteria applicable to a particular STB. Base Functionality is one of the following: Cable, Satellite, IP, Terrestrial or Thin-Client/Remote.

2) Additional Functionality:

i) Advanced Video Processing: The capability to encode, decode, and/or transcode audio/video signals in accordance with standards H.264/MPEG 4 or SMPTE 421M.

ii) 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].

1 http://www.scte.org/standards/

iii) Digital Video Recorder (DVR): The capability to store video in a digital format to a rewritable disk drive or other non-volatile storage device integrated into a STB. This definition excludes video capture software for personal computers or server-based DVR capabilities.

iv) 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].

v) High Definition (HD) Resolution: The capability to transmit or display video signals with resolution greater than or equal to 720p.

vi) Home Network Interface: The capability to interface with external devices over a high bandwidth network (e.g., IEEE 802.11 (WiFi), MoCA, HPNA). For purposes of this specification, IEEE 802.3 wired Ethernet is not considered a Home Network Interface.

vii) Multi-room: The capability to provide independent audio/video content to multiple devices within a single family dwelling. This definition does not include the capability to manage gateway services for multi-subscriber scenarios.

viii) Multi-stream: The capability to deliver two or more simultaneous audio/video streams to a consumer display, thin-client/remote STB, or recording device. The simultaneous streams may be delivered via a physically separate input or via the primary input. This definition does not include out-of-band tuners.

ix) Removable Media Player: The capability to decode digitized audio/video signals on DVD or Blu-ray Disc optical media.

x) Removable Media Player / Recorder: The capability to decode and record digitized audio/video signals on DVD or Blu-ray Disc optical media.

C) Automatic Power Down (APD): The capability of a device to switch itself from On mode to Sleep mode after a predetermined period of time (APD timing) has elapsed. APD timing begins when the following criteria have been met:

1) The device has ceased performance of all primary functions; or

2) The last user input has been received (e.g., remote control signal, volume adjustment).

D) Primary Function:

1) Delivery of live or recorded audio/video content to a thin-client/remote STB or local/remote recording device is considered a primary function;

2) Delivery of live or recorded audio/video content to a consumer display within 4 hours of last user interaction/input is considered a primary function;

3) Continuous device functions (e.g., clocks, status displays, indicator lamps) are NOT considered primary functions.

E) Operational Modes:

1) On Mode: Where the product is connected to a mains power source, has been activated and may be providing one or more primary functions. The common terms “active”, “in-use” and “normal operation” also describe this mode.

2) Sleep Mode: Where the product is connected to a mains power source, is not providing a primary function, and offers one or more of the following user oriented or protective functions which may persist for an indefinite time:

i) To facilitate the activation of other modes (including activation or deactivation of On mode) by remote switch (including remote control), internal sensor, timer;

2 http://www.cablelabs.com/specifications/

ii) Continuous function: information or status displays including clocks;

iii) Continuous function: sensor-based functions.

3) Deep Sleep State: A power state within Sleep Mode characterized by reduced power consumption and increased time required to return to full On Mode functionality.

F) Other Definitions:

1) Service Provider: A business entity that provides audio/video content to subscribers with whom it has an ongoing contractual relationship. A Service Provider distributes ENERGY STAR qualified STBs to end users under a lease or rental arrangement.

2) 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.

3) Digital Television Adapter (DTA): A device that receives terrestrial (over the air) digital signals and converts them to an analog output suitable for analog TVs. DTAs do not provide digital signal output. This definition does not include converters for satellite or cable digital signals or devices that perform multiple functions (e.g., DVD players with DTA capability).

4) Game Console: A stand-alone device whose primary function is to process video game content. The primary inputs for game consoles are special hand-held controllers rather than the mouse and keyboard used by a conventional computer. Game consoles are equipped with audio/video outputs for use with televisions as the primary display, rather than an external monitor or integrated display. Game consoles typically do not use a conventional general-purpose operating system, but often perform a variety of multimedia functions such as: DVD/CD playback, digital picture viewing, and digital music playback.

5) Out-of-band Tuner: A tuner compliant with standards ANSI/SCTE 55-1 2002, ANSI/SCTE 55-2 2002, or similar, that is used to gain access to data channels outside of the primary audio/video source signal. These tuners may facilitate two-way communication to allow a STB to exchange data (e.g., diagnostics) with the Service Provider, and may enable access to Pay-Per-View or other rich-media interactive content.

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

7) Unit Under Test (UUT): The device being tested.

G) Product Family: A group of product models that are (1) made by the same manufacturer, (2) subject to the same ENERGY STAR qualification 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 aesthetic housing changes that do not affect the thermal characteristics of the device (e.g., color, labeling, or other cosmetic modifications).

2. SCOPE

2.1 Included Products

2.1.1 Products that meet the definition of a Set-top Box Base Type as specified herein are eligible for ENERGY STAR qualification, 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/products.

3. QUALIFICATION CRITERIA

3.1 Significant Digits and Rounding

3.1.1 All calculations shall be performed with actual measured or observed values. Only the final result of a calculation shall be rounded. Calculated results shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using exact values without any benefit from rounding.

3.2 General Qualification Criteria

3.2.1 External Power Supply: If a product is shipped with an EPS, the EPS shall meet the level V performance requirements under the International Efficiency Marking Protocol and include the level V marking. Additional information on the Marking Protocol is available at www.energystar.gov/powersupplies.

3.2.2 Maintenance Activities:

i. Products may automatically exit Sleep Mode and/or Deep Sleep State 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 Deep Sleep State and completed maintenance or other user-requested activities shall automatically return to Sleep Mode or Deep Sleep State 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): Products that offer an APD feature shall meet the following requirements:

i. Products shall be shipped from the manufacturer with APD enabled by default, with APD timing set to engage after a period of inactivity less than or equal to 4 hours.

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

3.2.4 Deep Sleep:

i. For a power state to qualify as a Deep Sleep, measured power consumption (P_{DEEP_SLEEP}) shall be less than or equal to 15% of the power consumption in On Mode (as measured per the ENERGY STAR test procedure for "Watching Live TV" [P_{TV}]), or 3.0 watts, whichever is greater.

ii. For STBs with a user interface, a means of manually activating Deep Sleep shall be accessible to the end user via a clearly marked button or switch on the remote control and/or the front face of the STB. Alternative button configurations will be acceptable with written approval from EPA.

iii. For STBs with no user interface (e.g., "set-back boxes") and for STBs that can switch between power states only via external network stimuli (e.g., thin client remote STBs) to qualify for ENERGY STAR Deep Sleep benefits; Deep Sleep functionality shall be enabled by default upon shipment to the end user, and shall be initiated automatically via timer or other means not requiring direct end user manipulation of the device (e.g., detecting demand of a downstream device via HDMI link, network message). Alternate means of detection/communication must be broadly applicable and not limited to a specific brand of TV or downstream device.

iv. If Deep Sleep capability is enabled in the as-shipped default product configuration, an override function may be provided to allow the end-user to disable Deep Sleep functionality.

3.3 Typical Energy Consumption (TEC) Requirements

3.3.1 Combined TEC ($TEC_{COMBINED}$), as determined in Section 3.3.2 shall be less than or equal to the Maximum TEC Requirement (TEC_{MAX}), as determined in Section 3.3.3.

3.3.2 Combined TEC shall be calculated per Equation 1.

Equation 1: Calculation of Combined TEC ($TEC_{COMBINED}$)

$$TEC_{COMBINED} = TEC_{PRIMARY} + TEC_{PLAY/REC}$$

Where:

- *$TEC_{PRIMARY}$ is the Primary TEC calculated per Equation 2; and*
- *$TEC_{PLAY/REC}$ is the Playback/Record TEC calculated per Equation 3.*

i. Primary TEC ($TEC_{PRIMARY}$) shall be calculated per Equation 2.

Equation 2: Calculation of Primary TEC ($TEC_{PRIMARY}$)

$$TEC_{PRIMARY} = 0.365 \times \left((T_{TV} \times P_{TV}) + (T_{SLEEP} \times P_{SLEEP}) + (T_{APD} \times P_{APD}) + (T_{DEEP_SLEEP} \times P_{\mathrm{DEEP_SLEEP}}) \right)$$

Where:

- *T_{TV} is the time coefficient for On Mode, as determined per Table 1;*
- *P_{TV} is the measured power in On Mode (W);*
- *T_{SLEEP} is the time coefficient for Sleep Mode, as determined per Table 1;*
- *P_{SLEEP} is the measured power in Sleep Mode (W);*
- *T_{APD} is the time coefficient for APD, as determined per Table 1;*
- *P_{APD} is the measured power after APD (W);*
- *T_{DEEP_SLEEP} is the time coefficient for Deep Sleep State, as determined per Table 1; and*
- *P_{DEEP_SLEEP} is the measured power in Deep Sleep State (W).*

Table 1: Primary TEC Equation Time Coefficients

APD to Sleep Enabled by Default	APD to Deep Sleep Enabled by Default	T_{TV}	T_{SLEEP}	T_{APD}	T_{DEEP_SLEEP}
NO	NO	14	10	0	0
NO	YES	14	6	0	4
YES	NO	7	10	7	0
YES	YES	7	6	7	4

ii. For products with DVR, Removable Media Playback, or Removable Media Playback / Record capabilities, Playback/Record TEC ($TEC_{PLAY/REC}$) shall be calculated per Equation 3, with weightings for Playback and Record mode as specified in Table 2. Only one playback/record function may be selected per product. For all other products, Playback/Record TEC ($TEC_{PLAY/REC}$) shall be equal to zero.

Equation 3: Calculation of Playback/Record TEC ($TEC_{PLAY/REC}$) For Products with DVR or Removable Media Player

$$TEC_{PLAY/REC} = 0.365 \times \left[\left(\left(P_{PLAYBACK} - P_{TV} \right) \times H_{PLAYBACK} \right) + \left(\left(P_{RECORD} - P_{TV} \right) \times H_{RECORD} \right) \right],$$

Where:

- $P_{PLAYBACK}$ *is the measured power during recorded video playback (W);*
- P_{RECORD} *is the measured power during video recording (W); and*
- $H_{PLAYBACK}$ *and* H_{RECORD} *are weightings for time spent in playback and record, as specified in Table 3.*

Table 2: Weightings for Playback/Record TEC Calculation

Function	DVR	Removable Media Playback	Removable Media Playback w/ Record
Playback Duration ($H_{PLAYBACK}$)	2.0 hrs/day	2.0 hrs/day	2.0 hrs/day
Record Duration (H_{RECORD})	3.0 hrs/day	0	1.0 hrs/day

3.3.3 The Maximum TEC Requirement (TEC_{MAX}) shall be calculated per Equation 4.

Equation 4: Calculation of Maximum TEC Requirement (TEC_{MAX})

$$TEC_{MAX} = TEC_{BASE_MAX} + \sum_{i-1}^{n} TEC_{ADDL_i}$$

Where:

- TEC_{BASE_MAX} *is the Base Type TEC Allowance (kWh); and*
- TEC_{ADDL_i} *is each applicable Additional Functionality TEC Allowance (kWh).*

i. The Base Type TEC Allowance (TEC_{BASE_MAX}) shall be as specified in Table 3, subject to the following requirements:

a. If the STB meets the definition of Cable DTA base type, the Base Functionality shall be CABLE DTA.

b. If the STB meets the definition of Cable STB base type, and/or the STB is capable of

receiving cable service after installation of a CableCARD or other type of conditional access system, the Base Functionality shall be CABLE.

c. If the STB Base Functionality is not CABLE, and the STB meets the base type definition of Satellite STB, the Base Functionality shall be SATELLITE.

d. If the STB Base Functionality is not CABLE, SATELLITE, or CABLE DTA, and the STB meets the base type definition of IP STB, the Base Functionality shall be IP.

e. If the STB Base Functionality is not CABLE, SATELLITE, CABLE DTA, or IP, and the STB meets the base type definition of Terrestrial STB, the Base Functionality shall be TERRESTRIAL.

f. If the STB Base Functionality is not CABLE, SATELLITE, CABLE DTA, IP, or TERRESTRIAL, and the STB otherwise meets the base type definition of Thin-Client/Remote, the Base Functionality shall be THIN-CLIENT / REMOTE.

Table 3: Base Type TEC Allowance ($TEC_{BASE\ MAX}$)

Base Functionality	Version 3.0 Allowance (kWh/year)
Cable	60
Satellite	70
Cable DTA	35
Internet Protocol (IP)	50
Terrestrial	22
Thin-client / Remote	35

ii. Additional Functionality TEC Allowances (TEC_{ADDL_i}) shall be as specified in Table 4, subject to the following requirements:

a. The HIGH DEFINITION allowance is the only additional functionality allowance that may be applied to STBs with CABLE DTA base functionality.

b. The ADVANCED VIDEO PROCESSING, HOME NETWORK INTERFACE, HIGH DEFINITION, REMOVABLE MEDIA PLAYER, and REMOVABLE MEDIA PLAYER/RECORDER allowances are the only additional functionality allowances that may be applied to STBs with THIN CLIENT / REMOTE base functionality.

c. The ADVANCED VIDEO PROCESSING allowance may only be applied once per STB, regardless of the number of advanced video processing options offered by the device.

d. The CableCARD allowance may only be applied once per STB, regardless of the number of CableCARDs installed in the STB.

e. The DOCSIS allowance may only be applied to STBs that are installed in a Service Provider network with DOCSIS capability.

f. The HIGH DEFINITION (HD) allowance shall not be applied to STBs with TERRESTRIAL base functionality.

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

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

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

Table 4: Additional Functionality TEC Allowance ($TEC_{ADDL\ i}$)

Additional Functionality	Version 3.0 Allowance (kWh/year)
Advanced Video Processing	12
CableCARD	15
Digital Video Recorder (DVR)	45
DOCSIS®	20
High Definition (HD)	25
Home Network Interface	10
Multi-room	40
Multi-stream – Cable/Satellite	16
Multi-stream – Terrestrial/IP	8
Removable Media Player	8
Removable Media Player / Recorder	10

3.4 Products with Multi-room Capability:

3.4.1 Products with Multi-room capability shall be evaluated for ENERGY STAR qualification per the following requirements:

i. If the Combined TEC for the product as tested in single-output configuration is less than or equal to the Maximum TEC Requirement minus the Multi-room additional functionality allowance, the product may be qualified for ENERGY STAR for use in any configuration (e.g., single-TV installations or multi-room installations).

ii. For products that can support a second N/ATSC display output over standard RF cabling without the need for a Thin Client, if the Combined TEC for the product as tested in dual-output configuration is less than or equal to the Maximum TEC Requirement plus one half (50%) of the Thin Client / Remote base functionality allowance, the product may be qualified for ENERGY STAR in a Multi-room configuration. Partner shall clearly indicate in product literature that the product qualifies for ENERGY STAR only when providing content to more than one TV.

iii. For products that can support a second display output via a Thin Client, if the Combined TEC for the product as tested in dual-output configuration is less than or equal to the Maximum TEC Requirement, the product may be qualified for ENERGY STAR in a Multi-room configuration. Partner shall clearly indicate in product literature that the product qualifies for ENERGY STAR only when providing content to more than one TV.

4. TEST REQUIREMENTS

4.1 Test Methods

4.1.1 When testing Set-top Box products, the test methods identified in Table 5 shall be used to determine ENERGY STAR qualification.

Table 5: Test Methods for ENERGY STAR Qualification

Product Type	Test Method
All Products	ENERGY STAR Test Method for Set-top Boxes, Rev. Aug-2011

4.2 Number of Units Required for Testing

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

i. For qualification of an individual product model, a product configuration equivalent to that which is intended to be marketed and labeled as ENERGY STAR is considered the Representative Model;

ii. For qualification of a product family, any product configuration within a family may be considered the Representative Model.

4.2.2 A single unit of each Representative Model shall be selected for testing. If test results for any operational mode power measurement are within 5% of ENERGY STAR requirements, two additional units of the same Representative Model with an identical configuration shall be tested.

4.2.3 All tested units shall meet ENERGY STAR qualification requirements.

4.3 International Market Qualification

4.3.1 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.

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://eetd.LBL.gov/Controls.

6. EFFECTIVE DATE

6.1.1 Effective Date: The Version 3.0 ENERGY STAR Set-top Box specification shall take effect on the dates specified in Table 6. 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 (e.g., month and year) 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.

Table 6: Specification Effective Dates

Product Type	Version 3.0 Effective Date
All Products	September 1, 2011

7. FUTURE SPECIFICATION REVISIONS

7.1.1 EPA intends to investigate the following topics during the next revision of the STB specification:

i. Delete the removable media playback/record options from the TEC assessment due to lack of relevance to the STB market.

ii. Implement a mandatory Deep Sleep requirement for all qualifying STBs.

iii. Address potential new STB base types such as "Gateway STBs."

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

Test Method
Rev. Aug-2011

1 OVERVIEW

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

2 APPLICABILITY

The test procedures herein are applicable to all Set-top Box products under the ENERGY STAR program. The test procedures in Section 7 are intended to be performed in the sequence that is presented in this document, as applicable, except for products with Multi-room capability, which can begin with Section 7.9.

- Test procedures in Section 7.1 and 7.6 are applicable to all products.
- Test procedures in Section 7.2 and 7.3 are applicable to products with DVR capability.
- Test procedures in Section 7.4 and 7.5 are applicable to products with Removable Media Player capability.
- Test procedures in Section 7.7 are applicable to products with APD functionality.
- Test procedures in Section 7.8 are applicable to products with Deep Sleep functionality.
- Test procedures in Section 7.9 are applicable to products with Multi-room capability.

3 DEFINITIONS

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

4 TEST SETUP

A) Test Setup and Instrumentation: Test setup and instrumentation for all portions of this procedure shall be in accordance with the requirements in Canadian Standards Association (CSA) C380-08, Section 4, unless otherwise noted in this document. In the event of conflicting requirements, the ENERGY STAR test method shall take precedence.

B) Input Power: Input power shall be as specified in Table 1.

Table 1: Input Power Requirements

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

C) Ambient Temperature: Ambient temperature shall be from 18 °C to 28 °C.

D) Relative Humidity: Relative humidity shall be from 10% to 80%.

E) Power Meter: Power meters shall possess the following attributes[1]:

1) Crest Factor: Capability to measure the current waveform without clipping.

i) The peak of the current waveform measured during Sleep Mode and On Mode shall determine the crest factor rating requirement and the appropriate current range setting.

ii) The full-scale value of the selected current range multiplied by the crest factor for that range shall be at least 15% greater than the peak current.

2) Bandwidth: Minimum bandwidth as determined by an analysis of current and voltage to determine the highest frequency component (harmonic) with a magnitude greater than 1% of the fundamental frequency under the test conditions.

3) Minimum Frequency Response: 3.0 kHz;

4) Minimum Sampling Frequency: 60 Hz;

5) Minimum Resolution:

i) 0.01 W for measurement values less than 10 W;

ii) 0.1 W for measurement values from 10 W to 100 W; and

iii) 1.0 W for measurement values greater than 100 W.

F) Measurement Accuracy:

1) Power measurements with a value greater than or equal to 0.5 W shall be made with an uncertainty of less than or equal to 2% at the 95% confidence level.

2) Power measurements with a value less than 0.5 W shall be made with an uncertainty of less than or equal to 0.01 W at the 95% confidence level.

G) Power Measurement Location: All power measurements shall be taken at a point between the AC mains power source and the UUT.

H) Source Signals: The following Reference Channels shall be used for testing. For STBs without conventional tuners (e.g., IP STBs), equivalent video content, from a source representative of typical consumer usage, shall be substituted for each channel described below.

1) Reference Channel A: Network television channel, standard definition (SD) format, minimum 480i resolution.

[1] Characteristics of approved meters derived from IEC 62301 Ed 1.0.

2) Reference Channel B: Live or recorded sports channel;

   i) If the STB is HD-capable, this channel shall be in HD format, minimum 720p resolution.

   ii) If the STB is not HD-capable, this channel shall be in SD format, minimum 480i resolution.

3) Reference Channel C: 24-hour news channel, standard definition (SD) format, minimum 480i resolution.

5 TEST CONDUCT

A) UUT Settings: The UUT shall be tested in its "as-shipped" configuration. For products that offer a choice of user-configurable options, all options shall be set to their default condition.

B) UUT Control: The UUT shall be controlled with the factory-supplied remote control (I/R or RF) to the extent possible. For units that do not ship with a remote control, or for functions that cannot be exercised with the supplied remote control, control interfaces on the face or body of the UUT may be used.

C) Tuning: Tuning to a broadcast video source shall entail the following:

   1) Acquisition of an encrypted digital video service by one tuner; and

   2) Rendering of the acquired video service on all analog audio/video outputs (e.g., RF modulated, S-Video, composite, and component) and on all S/PDIF audio outputs, as applicable.

D) Satellite Low Noise Block (LNB): Incremental power required to operate LNBs shall be supplied from an independent source. If LNB power must be drawn from the STB, the power consumed by the LNB may be subtracted from the total power measurement. It is preferable that all LNB power be supplied independently of the STB.

E) Head-end System Interaction:

   1) STBs with POD/CableCARD-encrypted content shall decrypt by POD/CableCARD.

   2) Cable STBs shall interact with Conditional Access (CA) system data via DOCSIS Set-top Gateway (DSG) or SCTE-55.

   3) Telcocom QAM/IP STBs shall interact with CA system data via SCTE-55 and/or via an applicable LAN technology (e.g., MoCA).

   4) IP STBs shall interact with CA system data via applicable LAN technology (e.g., IEEE-802.3, MoCA).

   5) Satellite STBs shall interact with CA system via LNB and POTS modem or applicable Home Network Interface as defined in the ENERGY STAR specification.

   6) Terrestrial STBs shall interact with an ATSC signal from a live source.

F) Secondary Device Functions: The following UUT functions shall be tested in their "as-shipped" configuration (i.e., if the functions are enabled by default upon shipment, they must be enabled for testing):

   1) WiFi, unless video streaming over WiFi is the primary means of content delivery;

   2) Voice Over IP (VOIP); and

   3) Data services that are made available to the end-user (e.g., broadband services).

G) Conditional Access: If the UUT uses POD or CableCARD for CA system control, conditional access hardware shall be installed in the UUT prior to applying power.

H) Battery Powered Devices: For products designed to operate using batteries when not connected to the mains, the battery shall be fully charged before beginning the test and left in place for the test.

I) A/V Interconnections: If the UUT offers several audio and video interconnection options, select and configure the system with one of the following interconnections, in order of preference: HDMI, component, S-video, and composite.

J) Untested Features: Any features not identified in this test procedure shall be configured in their "as-shipped" configuration.

K) Power Management: Any power management capability that reduces the power consumption of inactive features may be enabled as it would be when deployed to an end-user under the same conditions.

L) Home Network Interface: If the UUT supports more than one type of home network interface, one interface link shall be connected and available for data transfer during testing. For multi-room devices, the selected link type shall be able to support multiple client device access. STBs sold at retail shall be tested in the default as-shipped configuration. For leased or multi-room STBs, the interface shall be selected in the following order of precedence:

1) MoCA
2) HPNA
3) WiFi
4) Other

6 UUT PRE-TEST INITIALIZATION

A) Prior to the start of testing, the UUT shall be initialized as follows:

1) Set up the UUT per the instructions in the supplied operating manual.
2) Connect the UUT to a display device via an A/V Interconnection as specified above (e.g., HDMI).
3) Connect the power meter to the power source and connect the UUT to the power outlet on the power meter.
4) Power on the UUT with the remote control and perform initial system configuration, as applicable. Ensure that UUT features and functions are in their as-shipped configuration.
5) Connect the UUT to the signal source.
6) Let the UUT sit for at least 15 minutes, or until the unit has completed initialization and is ready for use.
7) Measure and record the AC mains input voltage and frequency.
8) Measure and record the test room ambient temperature.

7 TEST PROCEDURES

7.1 Watching Live TV (P_{TV})

1) Verify that the UUT is turned on and tuned to a live television channel.

   i) If the UUT base type is IP, and the UUT does not have the capability to play back live, streaming video content (i.e., the UUT is a "download-only" device), the Live TV portion of the test procedure shall be performed while video content is simultaneously being played back and downloaded.

ii) If the UUT offers DVR functionality, the Live TV portion of the test procedure shall be performed with the primary video stream paused for 5%, in fast forward for 10% and in rewind for 10% of the total test time, while raw video input is simultaneously being buffered. This requirement does not increase the total test duration.

2) Tune to Reference Channel A.

3) Measure and record the average power over a 5-minute period.

4) Tune to Reference Channel B (if the UUT is HD capable, Reference Channel B should be in HD format).

5) Measure and record the average power over a 10-minute period.

6) Tune to Reference Channel C.

   i) If the UUT has the ability to handle multiple simultaneous video streams, set a second tuner to Reference Channel A and render it simultaneously in a second window embedded in the primary display window (i.e., Picture-in-Picture).

   ii) The second window shall be as near to 25% of the total display screen area as possible.

   iii) If no picture-in-picture capability exists, the second channel shall be recorded in the background.

7) Measure and record the average power over a 5-minute period.

8) Calculate and record the average power (P_{TV}) over the three measurement periods.

9) If the UUT offers place-shifting capability, repeat the Live TV test with the place-shifting feature turned on. Record the individual power measurement results from the place shifting test

7.2 Recording Live TV to DVR (P_{RECORD})

1) This portion of the test procedure shall be performed with a second tuner engaged and recording at all times. It is permissible to create a series of pre-programmed back-to-back recording sessions for these tests to avoid menu prompts.

2) Verify that the UUT is turned on and tuned to a live television channel.

3) Tune to Reference Channel A.

4) Measure and record the average power over a 5-minute period.

5) Tune to Reference Channel B (if the UUT is HD capable, Reference Channel B should be in HD format).

6) Measure and record the average power over a 10-minute period.

7) Tune to Reference Channel C.

8) Measure and record the average power over a 5-minute period.

9) Calculate and record the average power (P_{RECORD}) over the three measurement periods.

10) Save the recordings for the Playback test.

7.3 Playing Back Recorded TV from DVR ($P_{PLAYBACK}$)

1) Verify that the UUT is turned on and tuned to a live television channel.

   i) If the UUT base type is IP, and the UUT does not have the capability to play back live, streaming video content (i.e., the UUT is a “download-only” device), this portion of the test procedure shall be performed with video playback from disk storage and no simultaneous file download.

ii) If the UUT offers DVR functionality, this portion of the test procedure shall be performed with the primary video stream paused for 5%, in fast forward for 10%, and in rewind for 10% of the total test time, while raw video input is simultaneously being buffered. In addition, this portion of the test procedure shall be performed with a second tuner engaged and recording at all times.

2) Use the remote control to begin playback of the recording of Reference Channel A.
3) Measure and record the average power over the playback period.
4) When playback is complete, delete the recording. If automatically prompted to delete, select the affirmative prompt.
5) Use the remote control to begin playback of the recording of Reference Channel B.
6) Measure and record the average power over the playback period.
7) When playback is complete, delete the recording. If automatically prompted to delete, select the affirmative prompt.
8) Use the remote control to begin playback of the recording of Reference Channel C.
9) Measure and record the average power over the playback period.
10) When playback is complete, delete the recording. If automatically prompted to delete, select the affirmative prompt.
11) Calculate and record the average power consumption ($P_{PLAYBACK}$) over the three measurement periods.

7.4 Recording Live TV to Removable Media (P_{RECORD})

1) Verify that the UUT is turned on and tuned to Reference Channel A.
2) Begin the power measurement.
3) Use the remote control to activate the UUT's removable media recording function.
4) Insert the removable media. Open and close the disc tray, as necessary.
5) Use the remote control to begin recording to the removable media.
6) Record the video content for 20 minutes.
7) Use the remote control to stop recording and eject the removable media.
8) Measure and record the average power consumption (P_{RECORD}) for the full duration of the test.
9) If the UUT is capable of recording HD content, repeat the test with an HD video stream that meets the requirements of Reference Channel B. Calculate and record the average power (P_{RECORD}) over the two measurement periods.

7.5 Playing Back Recorded TV from Removable Media ($P_{PLAYBACK}$)

1) Verify that the UUT is turned on and tuned to Reference Channel A.
2) Begin the power measurement.
3) Use the remote control to activate the UUT's removable media playback function. Note that if this function is automatically activated when the removable media door is actuated, or when a disc is inserted, this step of the test procedure may be omitted.
4) Insert the removable media. Open and close the disc tray, as necessary.
5) Use the remote control to begin playback of removable media video content. Note that if playback begins automatically upon insertion of removable media, this step of the test procedure may be omitted.

6) Play the recording for 20 minutes.

7) Use the remote control to stop playback and eject the removable media.

8) Measure and record the average power consumption ($P_{PLAYBACK}$) over the full duration of the test.

9) If the UUT is capable of playing back HD content, repeat the test with an HD video stream that meets the requirements of Reference Channel B. Calculate and record the average power ($P_{PLAYBACK}$) over the two measurement periods.

7.6 Sleep Mode (P_{SLEEP})

1) Verify that the UUT is turned on and tuned to Reference Channel A. Ensure that at least the "Watching Live TV" tests have been completed immediately prior to the start of this portion of the test procedure.

2) Use the remote control to place the system into Sleep Mode.

3) Begin the power measurement.

4) Measure and record the average power consumption (P_{SLEEP}) over a 5-minute period.

7.7 Auto Power Down (P_{APD})

1) Verify that the UUT is turned on and tuned to Reference Channel A.

2) Allow the UUT to automatically power down to Sleep Mode.

3) Verify that the UUT is in the expected Sleep Mode.

4) Begin the power measurement.

5) Measure and record the average power consumption (P_{APD}) over a 5-minute period.

7.8 Deep Sleep State (P_{DEEP_SLEEP})

1) Verify that the UUT is turned on and tuned to Reference Channel A.

2) Allow the UUT to automatically power down to Sleep Mode and transition to Deep Sleep State, or manually initiate Deep Sleep State.

3) Verify that the UUT is in the expected Deep Sleep State.

4) Begin the power measurement.

5) Measure and record the average power consumption (P_{DEEP_SLEEP}) over a 5-minute period.

7.9 Multi-room and Client STB

A) If a multi-room-capable UUT can qualify without a multi-room additional functionality allowance, the UUT shall only be tested in a single-display configuration, per Sections 7.1 through 7.8. Otherwise, the UUT shall be tested in a multi-room configuration. A client STB, if required by the multi-room STB, shall also be tested in a multi-room configuration, as follows:

1) Attach a single remote STB (or client device such as a television) to the server STB in a standard multi-room configuration.

2) Tune the server STB to Reference Channel A, and ensure that Reference Channel A is displaying on the primary local video output of the server STB.

3) Begin recording Reference Channel A on the server STB, and allow recording to continue for the duration of testing.

4) Test the remote STB according to sections 7.1 through 7.8 of this test procedure, as applicable.

5) Measure and record power consumption of both the server STB and the remote STB, as applicable, for all tests that are performed.