



ENERGY STAR® Product Specification for Set-top Boxes

Eligibility Criteria Final Draft Version 5.0

1 Following is the Version 5.0 ENERGY STAR product specification for Set-top Boxes (STBs). A product
2 shall meet all of the identified criteria to earn the ENERGY STAR.

3 **1 DEFINITIONS**

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

		Primary purpose is receiving television services?		
		Yes		No
		Local Video Connection?		
		Yes	No	
Direct Service Provider or Streaming Video Provider Source Input?	Yes	Non- Thin Client STB		Small Network Equipment (covered in separate ENERGY STAR Specification)
	No	Thin Client/ Remote STB	Excluded from Scope	

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

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

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

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

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

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

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

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

28 C) Additional Functionality:

29 1) CableCARD: The capability to decrypt premium audio/video content and services and provide
30 other network control functions via a plug-in Conditional Access module that complies with the
31 ANSI/SCTE 28 HOST-POD Interface Standard¹.

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

38 3) DOCSIS®: The capability to distribute data and audio/video content over cable television
39 infrastructure in accordance with the CableLabs® Data Over Cable Service Interface
40 Specification².

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

45 **Note:** EPA has clarified the HNI definition to make clear that it applies to STBs that are capable of
46 transmitting or receiving video content. This was the original intention of the definition (e.g., Thin Clients
47 were expected to use the HNI allowance, while multi-room servers were expected to use the Multi-room
48 allowance), but one stakeholder requested clarification.

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

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

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

62 7) Ultra HD (4k) Resolution: The capability to transmit or display video signals with a minimum
63 output resolution of 3840x2160 pixels in progressive scan mode at minimum frame rate of 24 fps
64 (abbreviated 2160p24).

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

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

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

2 <http://www.cablelabs.com/specs/>

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

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

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

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

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

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

86 F) Operational Modes:

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

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

97 3) Deep Sleep State: A power state within Sleep Mode characterized by power draw less than or
98 equal to 1 W. The STB shall be able to transition from this mode to On Mode within 15 seconds to
99 be considered in Deep Sleep State.

100 **Note:** EPA has revised the definition of Sleep Mode and Deep Sleep State to require a wake time within
101 15 seconds, to better fit with consumer expectations of electronic products on the market, such as TVs.
102 Furthermore, the vast majority of ENERGY STAR-certified STBs (48/56) can already transition in 15
103 seconds or less. Applying this shorter wake time to Deep Sleep as well will make it less likely to be
104 disabled by users, which should result in additional savings.

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106 4) Scheduled Sleep Mode: A power state characterized by a power draw of less than or equal to
107 15% of On Mode Power or 3 W, whichever is greater. This mode may be delivered through a
108 schedule or special button press, and allows a transition time to On Mode greater than 15
109 seconds.

110 **Note:** EPA has revised the definition of Scheduled Sleep to clarify that wake times greater than 15
111 seconds are allowed for additional hardware flexibility. EPA has also included additional power draw
112 requirements into Scheduled Sleep to better differentiate it from Sleep Mode and Deep Sleep.

113 G) Other Definitions

114 1) Display Device (DD): A device (e.g., TV, Computer Monitor, or Portable TV) that receives its
115 content directly from a STB through a video interface (example: High-Definition Multimedia

- 116 Interface (HDMI), Component Video, Composite Video, or S-Video), not through a HNI, and
117 displays it for viewing.
- 118 2) Client: A device (e.g., STB, Thin-Client STB, Smart TV, Mobile Phone, Tablet, PC, etc.) that can
119 receive content over a HNI from another STB.
- 120 3) External Power Supply (EPS): Also referred to as External Power Adapter. An external power
121 supply circuit that is used to convert household electric current into dc current or lower-voltage ac
122 current to operate a consumer product.
- 123 4) Standard dc: A method for transmitting dc power defined by a well-known technology standard,
124 enabling plug-and-play interoperability.
- 125 Note: Common examples are Universal Serial Bus (USB) and Mobile High-definition Link (MHL).
126 Usually Standard dc includes both power and communications over the same cable but that is
127 not required.
- 128 5) Service Provider: A business entity that provides video content, a delivery network, and
129 associated installation or support services to subscribers with whom it has an ongoing contractual
130 relationship.
- 131 6) Multichannel Video Program Distributors (MVPD): An organization such as a cable operator, a
132 multichannel multipoint distribution service, a direct broadcast satellite service, or a television
133 receive-only satellite program distributor, who makes available for purchase, by subscribers or
134 customers, multiple channels of video programming. This FCC definition does not currently
135 include OTT service providers.
- 136 7) Conditional Access: The encryption, decryption, and authorization techniques employed to
137 protect content from unauthorized viewing. CableCARD and Downloadable Conditional Access
138 System (DCAS) are examples of Conditional Access technology.
- 139 8) Typical Energy Consumption (TEC): A means for evaluating energy efficiency through a
140 calculation of expected energy consumption for a typical household over a one-year period,
141 expressed in units of kWh/year.
- 142 9) Unit Under Test (UUT): The STB being tested.
- 143 H) Product Family: A group of product models that are (1) made by the same manufacturer, (2) subject
144 to the same ENERGY STAR certification criteria, and (3) of a common basic design. Product models
145 within a family differ from each other according to one or more characteristics or features that either
146 (1) have no impact on product performance with regard to ENERGY STAR qualification criteria, or (2)
147 are specified herein as acceptable variations within a product family. For Set-top Boxes, acceptable
148 variations within a product family include:
- 149 1) Aesthetic housing changes that do not affect the thermal characteristics of the device (e.g., color,
150 labeling, or other cosmetic modifications); and
- 151 2) Software configuration.

152 **2 SCOPE**

153 **2.1 Included Products**

- 154 2.1.1 Products that meet the definition of Set-top Box and a Set-top Box Base Type as specified herein
155 are eligible for ENERGY STAR certification, with the exception of products listed in Section 2.2.

156 **2.2 Excluded Products**

- 157 2.2.1 Products that are covered under existing ENERGY STAR product specifications are not eligible
158 for qualification under the STB specification. The list of specifications currently in effect can be
159 found at www.energystar.gov/specifications.

160 **3 QUALIFICATION CRITERIA**

161 **3.1 Significant Digits and Rounding**

- 162 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.
- 163 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using directly
164 measured or calculated values without any benefit from rounding.
- 165 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
166 website shall be rounded to the nearest significant digit as expressed in the corresponding
167 specification limit.

168 **3.2 General Qualification Criteria**

- 169 3.2.1 External Power Supply (EPS): Single- and Multiple-voltage EPSs shall meet the Level VI or
170 higher performance requirements under the International Efficiency Marking Protocol when tested
171 according to the Uniform Test Method for Measuring the Energy Consumption of External Power
172 Supplies, Appendix Z to 10 CFR Part 430.
- 173 i. Single- and Multiple-voltage EPSs shall include the Level VI or higher marking.
- 174 ii. Additional information on the Marking Protocol is available
175 at <http://www.regulations.gov/#!documentDetail;D=EERE-2008-BT-STD-0005-0218>
- 176 3.2.2 Maintenance Activities:
- 177 i. Products may automatically exit Sleep Mode and/or Deep Sleep State on a regular schedule
178 to download content, scan for program and schedule information, and perform maintenance
179 activities. The total time spent performing maintenance activities shall not exceed an average
180 of two hours in any 24-hour period, exclusive of activities scheduled by the end-user (e.g.,
181 video recording of a regularly scheduled program). Video downloads that are not user-
182 requested (e.g., “speculative recording”, or “push”) shall be counted against the two hour
183 average per day requirement.
- 184 ii. Products that have exited Sleep Mode or Deep Sleep State and completed maintenance or
185 other user-requested activities shall automatically return to Sleep Mode or Deep Sleep State
186 in less than 15 minutes.
- 187 iii. Products that provide a speculative recording function shall provide a user-accessible menu
188 option to permit users to disable the functionality. Instructions for disabling speculative
189 recording shall be included in printed and/or electronic product manuals.
- 190 3.2.3 Auto Power Down (APD): To apply “YES” in Table 1 Operational Mode Durations for Column 1
191 “APD Enabled by Default,” products shall meet the following requirements:
- 192 i. STBs shall be deployed with APD enabled by default, with APD timing set to engage after a
193 period of less than or equal to 4 hours from last user activity. User activity is defined as any
194 activity in which the user interacted with the UUT. The Emergency Alert System (EAS)
195 system can wake the box and should be considered user activity for the purposes of this
196 requirement.
- 197 ii. All energy-related default settings shall persist until an end-user chooses to manually either
198 (1) disable APD, or (2) modify the default settings.
- 199 iii. In addition to disabling APD, users shall have the option to increase the APD timing to 12
200 hours.

201 **Note:** EPA added a requirement that end users should be notified that they can adjust the timeout of APD
202 in addition to disabling it, to enable further energy savings for STBs in commercial establishments.

- 203 3.2.4 Scheduled Sleep Mode: To apply “YES” in Table 1 Operational Mode Durations for Column 2

- 204 “Automatic Scheduled Sleep,” products shall meet the following requirements:
- 205 i. STBs shall be deployed with Scheduled Sleep enabled by default.
- 206 ii. A means of activating Scheduled Sleep shall be present and may include clearly marked
 207 button(s) or switch (es) on the remote control that shall begin activation of Scheduled Sleep
 208 within 2 seconds of being pressed and within two button presses. Additionally, Scheduled
 209 Sleep shall be activated via a user-controllable timer or network stimulus. Alternative button
 210 configurations or methods of reaching Scheduled Sleep will be acceptable with written
 211 approval from EPA.
- 212 iii. Scheduled Sleep functionality shall not prevent a device from performing a user-scheduled
 213 DVR recording or other function.
- 214 iv. Conversely, a user-scheduled DVR recording or other function shall not prevent a device
 215 from entering and remaining in Scheduled Sleep, except during the time required to perform
 216 the DVR recording or other function, and 15 minutes before and after the time required.
- 217 v. An override function may be provided to allow the end-user to disable Scheduled Sleep
 218 functionality; however, users shall first be offered an explanation of the Scheduled Sleep
 219 feature and provided the opportunity to change the schedule to better suit their needs.
- 220 vi. After the end of Scheduled Sleep time, the STB must resume Sleep Mode functionality
 221 including the ability to transition to On Mode in 15 seconds or less.

222 **Note:** EPA revised the above requirement to reflect the shorter transition time to On Mode being
 223 proposed for Sleep Mode.

224 **3.3 Typical Energy Consumption (TEC) Requirements**

225 3.3.1 TEC as determined per the test procedure, shall be less than or equal to the Maximum TEC
 226 Specification Requirement (TEC_{MAX}), as illustrated in Equation 1.

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228 **Equation 1: TEC Requirement for STBs**

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$$TEC \leq TEC_{MAX} = \left(TEC_{BASE} + \sum_1^n TEC_{ADDL_i} \right) \times \text{eff}_{ac-dc}$$

230 *Where:*

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

243 **Note:** EPA has removed the Client Incentive from Section 3.3.1 and the TEC equation, in line with the
 244 proposed removal of the allowance from Section 3.3.3.

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246 **Equation 2: TEC Calculation**

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$$TEC = 0.365[(T_{WATCH-TV} \times P_{WATCH-TV}) + (T_{SLEEP} \times P_{SLEEP}) + (T_{APD} \times P_{APD}) + (T_{SCHED\ SLEEP} \times P_{SCHED\ SLEEP})]$$

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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).

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Table 1: Operational Mode Durations

Sleep Mode APD Enabled by Default*	Auto-matic Scheduled Sleep	T_{WATCH_TV}	T_{SLEEP}	T_{APD}	T_{SCHED_SLEEP}
		Where, T_{APD} TIMEOUT is the time from last user activity to Auto Power Down			
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

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* APD to include APD to Deep Sleep.

Note: EPA has updated some of the above terminology for readability based on stakeholder input and provided a parameter map to CTA-2043 in Appendix A. EPA has reviewed these terminology changes with an author of CTA-2043 who is aligned with the approach and plans to consider these term changes for inclusion in CTA-2043 during an upcoming revision process.

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

Base Type (Use Topmost if Multiple Apply)	Allowance (kWh/year)
1. Cable DTA	37
2. Cable	50
3. Satellite	50

Base Type (Use Topmost if Multiple Apply)	Allowance (kWh/year)
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

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Note: Despite stakeholder requests to relax the requirement for Thin Clients, EPA has maintained the originally proposed TEC level as low power sleep states, used for purposes of calculating TEC limits, are being achieved by other consumer products today, including TVs supporting RVU, which perform the same functions as Thin Clients.

EPA also received OTT IP STB test data from a stakeholder, and has included it in the Final Draft dataset. Following review of this expanded dataset; EPA has confirmed that the proposed levels for OTT IP STBs are appropriate. EPA also notes that the functionality offered by these products is similar to the functionality provided by Thin Clients. As such, EPA proposes to maintain the same TEC base levels for these product types.

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

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

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ii. The HOME NETWORK INTERFACE, MIMO Wi-Fi HNI, MULTI-STREAM, 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.

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

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iv. The DOCSIS 2 and DOCSIS 3.X allowances may only be applied to STBs that are installed in a Service Provider network with DOCSIS capability.

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v. Either the DOCSIS 2 or the DOCSIS 3.X allowance may be applied, but not both.

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

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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.

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

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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.

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

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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.

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xii. The HEVP and HEVP-TC allowances may only be applied to STBs that provide an UltraHD

308 output through decoding an UltraHD stream or upscaling an HD stream per the Test Method.
 309 They may not be applied to STBs without a local display.

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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.X	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 Base (Initial 2x2 Streams)	9
MIMO 802.11ac Base (initial 2x2 Streams)	18
MIMO Wi-Fi Additional Streams Beyond 2x2	3
Multi-room	21
Multi-stream – Cable/Satellite	18
Multi-stream – IP	18
Multi-stream – Additional	0
Transcoding	13
Transcoding – Additional	5
UltraHD Resolution	5
Access Point	8
Router	15
Telephony	4

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313 **Note:** EPA received relatively few comments on the Draft 2 adder levels. One stakeholder did comment
 314 that some HD STBs perform High Efficiency Video Processing (HEVP), so the HEVP adder should be
 315 given to an STB regardless of the presence of UHD, as the additional HEVP processing power would
 316 require additional electronic components. EPA considered this comment but concluded that when HEVP
 317 is used solely in the background with no UHD content delivered, the consumer receives the energy cost
 318 but no benefit. As such, EPA maintains that the adder only be available when UHD capability is present.
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320 Another stakeholder commented that high-power MIMO products (i.e., Multi-room servers) will not

321 exercise the high-power function when tested only 10 feet from the client as required by the test method.
322 DOE cannot amend the test method to extend the distance between the two devices without significantly
323 increasing test burden; therefore, EPA has removed the high-power MIMO allowances, and offers all
324 MIMO products one set of allowances based on the lower power allowances in the US Industry Voluntary
325 Agreement for Small Network Equipment. This approach will also provide an incentive for manufacturers
326 to power-scale with distance to the client. Further comments and the Agency's responses are included in
327 the comment-response document posted to the ENERGY STAR website.

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329 3.3.3 Client Only Incentive:

330 **Note:** A stakeholder recommended that EPA remove the client-only incentive for STBs to simplify the
331 specification because there has not been a significant need to use the incentive and that the increasing
332 trend to DVGs would further reduce the use of client only boxes. The stakeholder added that eliminating
333 the adder would have the added benefit of making more transparent TEC calculations and easier
334 comparisons between the STB products. EPA agrees with these comments and has removed the Client
335 Only Incentive.

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337 Note: Products intended for sale in the US market are subject to minimum toxicity requirements. Please
338 see ENERGY STAR Program Requirements for Set-top Boxes: Partner Commitments for details.
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340 **4 TESTING**

341 **4.1 Test Methods**

342 4.1.1 Test methods identified in Table 4 shall be used to determine energy consumption.

343 **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. TBD)

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345 **4.2 Certification Options**

346 4.2.1 ENERGY STAR requirements must be met in a Set-top Box's as-deployed configuration,
347 connected to the specific service providers network or a simulated live network specific to the
348 certifying service provider. ENERGY STAR Partner must report the most consumptive results for
349 the model. The reported value may exceed the tested value.

350 4.2.2 If a Partner wishes to certify configurations of a model for which non-ENERGY STAR certified
351 alternative configurations or operating scenarios exist, the Partner must assign the certified
352 configurations an identifier in the model name/number that is unique to ENERGY STAR certified
353 configurations. This identifier must be used consistently in association with the certified
354 configurations in marketing/sales materials and on the ENERGY STAR list of certified products
355 (e.g. model A1234 for baseline configurations and A1234-ES for ENERGY STAR certified
356 configurations).

357 **5 USER INTERFACE**

358 5.1.1 Partners are encouraged to design products in accordance with the user interface standard IEEE
359 P1621: Standard for User Interface Elements in Power Control of Electronic Devices Employed in
360 Office/Consumer Environments. For details, see <http://energy.lbl.gov/controls/>.

361 **6 EFFECTIVE DATE**

362 6.1.1 Effective Date: The Version 5.0 ENERGY STAR Set-top Box specification shall take effect on
363 **January 1, 2017 for all products with the exception of Thin Clients. Thin Clients must meet**
364 **these requirements on January 1, 2018.** To qualify for ENERGY STAR, a product model shall
365 meet the ENERGY STAR specification in effect on its date of manufacture. The date of
366 manufacture is specific to each unit and is the date on which a unit is considered to be completely
367 assembled.

368 **Note: Recognizing the technical complexity of achieving deep sleep, EPA is allowing for a longer**
369 **transition time to the Version 5.0 requirements for Thin Client products alone, such that Thin**
370 **Clients must meet the eligibility requirements herein no later than January 1, 2018. Cable,**
371 **CableDTA, Satellite, MVPD IP, and OTT IP must meet the requirements on January 1, 2017.**

372 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
373 technological and/or market changes affect its usefulness to consumers, industry, or the
374 environment. In keeping with current policy, revisions to the specification are arrived at through
375 stakeholder discussions. In the event of a specification revision, please note that the ENERGY
376 STAR qualification is not automatically granted for the life of a product model.

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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 V5.0	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.

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