



ENERGY STAR[®] Program Requirements for Televisions

Partner Commitments Versions 4.0 and 5.0

FINAL DRAFT

Partner Commitments

The following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacturing of ENERGY STAR qualified televisions (TVs). The ENERGY STAR Partner must adhere to the following program requirements:

- comply with current ENERGY STAR Eligibility Criteria, defining the performance criteria that must be met for use of the ENERGY STAR certification mark on TVs. EPA may, 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 EPA's request;
- comply with current ENERGY STAR Identity Guidelines, describing how the ENERGY STAR name and mark may be used. Partner is responsible for adhering to these guidelines and for ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance;
- qualify at least one ENERGY STAR labeled TV model within six months of activating the TV portion of the agreement. When Partner qualifies the product, it must meet the specification (e.g., Version 4.0 or Version 5.0) in effect at that time;
- provide clear and consistent labeling of ENERGY STAR qualified TVs. The ENERGY STAR label must be clearly displayed on product packaging, in product literature (i.e., user manuals, spec sheets, etc.), and on the manufacturer's Internet site where information about ENERGY STAR qualified models is displayed. In addition, ENERGY STAR qualified TVs must be labeled according to one of the following three options: 1) permanent label on the top/front of the TV; 2) temporary label on the top/front of the TV; or, 3) use of an electronic label so that the ENERGY STAR certification mark appears on the TV's menu-screen for pre-set picture settings.
- provide to EPA, on an annual basis, an updated list of ENERGY STAR qualifying TV models. Once the Partner submits its first list of ENERGY STAR labeled TVs, the Partner will be listed as an ENERGY STAR Partner. Partner must provide annual updates in order to remain on the list of participating product manufacturers;
- provide to EPA, on an annual basis, unit shipment data or other market indicators to assist in determining the market penetration of ENERGY STAR. Specifically, Partner must submit the total number of ENERGY STAR qualified TVs shipped (in units by model) or an equivalent measurement as agreed to in advance by EPA and Partner. Partner is also encouraged to provide ENERGY STAR qualified unit shipment data segmented by meaningful product characteristics (e.g., capacity, size, speed, or other as relevant), total unit shipments for each model in its product line, and percent of total unit shipments that qualify as ENERGY STAR. The data for each calendar year should be submitted to EPA, preferably in electronic format, no later than the following March and may be provided directly from the Partner or through a third party. The 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; and
- notify EPA of a change in the designated responsible party or contacts for TVs within 30 days.

57 Performance for Special Distinction

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

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63 • consider energy efficiency improvements in company facilities and pursue the ENERGY STAR label
64 for buildings;

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66 • purchase ENERGY STAR qualified products. Revise the company purchasing or procurement
67 specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA
68 for periodic updates and coordination. Circulate general ENERGY STAR qualified product
69 information to employees for use when purchasing products for their homes;

70

71 • ensure the power management feature is enabled on all ENERGY STAR qualified monitors in use in
72 company facilities, particularly upon installation and after service is performed;

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74 • provide general information about the ENERGY STAR program to employees whose jobs are
75 relevant to the development, marketing, sales, and service of current ENERGY STAR qualified
76 product models;

77

78 • feature the ENERGY STAR mark(s) on Partner Web site and in other promotional materials. If
79 information concerning ENERGY STAR is provided on the Partner Web site as specified by the
80 ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources section
81 on the ENERGY STAR Web site at www.energystar.gov), EPA may provide links where appropriate
82 to the Partner Web site;

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84 • provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the
85 program requirements listed above. By doing so, EPA may be able to coordinate, communicate,
86 and/or promote Partner's activities, provide an EPA representative, or include news about the event
87 in the ENERGY STAR newsletter, on the ENERGY STAR Web pages, etc. The plan may be as
88 simple as providing a list of planned activities or planned milestones that Partner would like EPA to
89 be aware of. For example, activities may include: (1) increase the availability of ENERGY STAR
90 qualified products by converting the entire product line within two years to meet ENERGY STAR
91 guidelines; (2) demonstrate the economic and environmental benefits of energy efficiency through
92 special in-store displays twice a year; (3) provide information to users (via the Web site and user's
93 manual) about energy-saving features and operating characteristics of ENERGY STAR qualified
94 products, and (4) build awareness of the ENERGY STAR Partnership and brand identity by
95 collaborating with EPA on one print advertorial and one live press event;

96

97 • provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase
98 availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and
99 its message;

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101 • join EPA's SmartWay Transport Partnership to improve the environmental performance of the
102 company's shipping operations. SmartWay Transport works with freight carriers, shippers, and other
103 stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and
104 air pollution. For more information on SmartWay, visit www.epa.gov/smartway;

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106 • join EPA's Climate Leaders Partnership to inventory and reduce greenhouse gas emissions.
107 Through participation, companies create a credible record of their accomplishments and receive
108 EPA recognition as corporate environmental leaders. For more information on Climate Leaders, visit
109 www.epa.gov/climateleaders; and

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111 • join EPA's Green Power partnership. EPA's Green Power Partnership encourages organizations to
112 buy green power as a way to reduce the environmental impacts associated with traditional fossil
113 fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune
114 500 companies, small and medium businesses, government institutions as well as a growing
115 number of colleges and universities, visit www.epa.gov/grmpower/.



ENERGY STAR® Program Requirements for Televisions

Eligibility Criteria Versions 4.0 and 5.0 **FINAL DRAFT**

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129 Following is the **FINAL DRAFT** product specification for ENERGY STAR qualified televisions (Versions 4.0
130 and 5.0). A product must meet all of the identified criteria to be labeled as ENERGY STAR.

131

132 1) **Definitions:**

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134 A. **Television (TV):** A commercially available electronic product designed primarily for the reception and
135 display of audiovisual signals received from terrestrial, cable, satellite, Internet Protocol TV (IPTV),
136 or other digital or analog signals. A TV consists of a tuner/receiver and a display encased in a
137 single enclosure. The product usually relies upon a cathode-ray tube (CRT), liquid crystal display
138 (LCD), plasma display, or other display device.

139

140 Televisions with computer capability (e.g., computer input port) may qualify for the ENERGY STAR
141 under this specification as long as they are marketed and sold to consumers primarily as televisions.

142

143 **Note:** EPA understands that Display Power Management Signaling (DPMS) is not currently
144 included in a majority of televisions. Based on stakeholder input, EPA is proposing to remove the
145 reference to DPMS requirement for televisions in this specification. Consistent with requirements in
146 the ENERGY STAR Displays specification, EPA intends to include a requirement that televisions
147 with computer capability must offer Display Power Management for VGA and DVI connectors under
148 the Version 5.0 TV specification.

149

150 B. **Rear-Projection TV:** A type of TV whose display device is a projector that focuses images onto a
151 screen located inside the TV enclosure.

152

153 C. **Direct-View TV:** A type of TV whose display device emits light either directly from the screen surface
154 or transmits light from a source mounted directly behind the screen. Examples include CRT, LCD,
155 and plasma display technologies.

156

157 D. **TV Combination Unit:** A television system in which the TV and an additional device(s) (e.g., DVD
158 player, Blu-ray Disc player, Hard Disk Drive [HDD], VCR, etc.) are combined into a single unit and
159 which meets all of the following criteria: the additional device(s) is included in the television casing; it
160 is not possible to measure the power requirements of the two (or more) components separately
161 without removal of the television casing; and the system is connected to the wall outlet through a
162 single power cable.

163

164 E. **Component Television Unit:** A television system composed of two or more separate components
165 (e.g., display device and tuner) marketed and sold as a television under one model or system
166 designation. The system may have more than one power cord. The total power consumption of all
167 components in the system is considered for purposes of ENERGY STAR qualification.

168

169 F. **Analog:** A television product which has an NTSC, PAL, or SECAM tuner, and may have analog
170 video inputs (e.g., composite video, component video, S-video, RGB).

171

172 G. **Digital:** A television product which has at least one digital tuner or at least one digital video input
173 (e.g., HDMI). Products with an analog tuner and **both** analog and digital inputs shall be considered
174 digital products under this specification.

175

176 H. **Native Vertical Resolution:** The physical pixel count for the vertical axis of the television. For
177 example, a television with a screen resolution of 1920 x 1080 would have a native vertical resolution

178 of 1080.

179

180 I. Electronic Program Guide (EPG): An interactive, onscreen menu of TV program information (e.g.,
181 time, date, description of TV programs, etc.) downloaded from an external source.

182

183 J. External Power Supply (EPS): A component contained in a separate physical enclosure external to
184 the television casing and designed to convert line voltage AC input from the mains to lower DC
185 voltage(s) for the purpose of powering the television. An external power supply must connect to the
186 television via a removable or hard-wired male/female electrical connection, cable, cord or other
187 wiring.

188

189 K. Point of Deployment (POD) Module: A conditional access module for digital cable signal reception.

190

191 L. Luminance: The photometric measure of the luminous intensity per unit area of light traveling in a
192 given direction. Luminance describes the amount of light that passes through or is emitted from a
193 particular area, and falls within a given solid angle. The standard unit for luminance is candela per
194 square meter (cd/m²).

195

196 M. ON Mode: Where the product is connected to a mains power source, has been activated and is
197 providing one or more of its principal functions. The common terms “active”, “in-use” and “normal
198 operation” also describe this mode. The power requirement in this mode is typically greater than the
199 power requirement in Sleep and Download Acquisition Modes.

200

201 N. Sleep Mode: The mode, also sometimes referred to commonly as “Standby,” where the product is
202 connected to a mains power source, is not providing a principal function, and offers one or more of
203 the following user oriented or protective functions which may persist for an indefinite time:

204 a. To facilitate the activation of other modes (including activation or deactivation of ON mode)
205 by remote switch (including remote control), internal sensor, timer;

206 b. Continuous function: information or status displays including clocks;

207 c. Continuous function: sensor-based functions.

208

209 For purposes of this specification, Sleep Mode is defined as the time when the product is connected
210 to a power source, produces neither sound nor picture, neither transmits nor receives program
211 information and/or data (excluding data transmitted to change the unit’s condition from Sleep Mode
212 to ON Mode), and is waiting to be switched to ON Mode by a direct or indirect signal from the
213 consumer, e.g., with the remote control.

214

215 O. OFF Mode: Where the product is connected to a mains power source and is not providing any ON
216 mode or Sleep mode functions, and where the mode may persist for an indefinite time. An indicator
217 that only shows the user that the product is in the OFF position is included within the classification of
218 an OFF mode.

219

220 P. Download Acquisition Mode (DAM): Where the product is connected to a mains power source, is not
221 producing a sound or a picture, and is actively downloading channel listing information according to
222 a defined schedule for use by the electronic programming guide, monitoring for emergency
223 messaging/communications and/or otherwise communicating through a network protocol. The
224 power use in this mode is typically greater than the power requirement in Sleep and less than that in
225 ON Mode.

226

227 2) Qualifying Products: Any TV, TV Combination Unit, or Component Television Unit that is marketed to
228 the consumer as such (i.e., focusing on television as the primary function), which meets the respective
229 product type definition in Section 1, and is capable of being powered from either a wall outlet or a
230 battery unit that is sold with an external power supply is eligible to earn the ENERGY STAR. This
231 specification does not cover monitors with computer capability (e.g., a computer input port, such as
232 VGA) that are marketed and sold as 1) computer monitors or 2) dual function television and computer
233 monitors.

234

235 In addition, to qualify as ENERGY STAR, TVs must not exceed power consumption of 1 watt in Sleep
236 Mode. TVs that do not have a power state meeting the definition of Sleep Mode (e.g., Public Alert

237 CEA2009A certified models which offer 24/7/365 active features to alert users) are not able to qualify for
 238 ENERGY STAR. Additionally, this lowest power consuming Sleep state must be the default Sleep state
 239 for the TV as shipped to consumers.

240
 241 3) **Energy-Efficiency Criteria:** Only those products listed in Section 2 that meet the following criteria may
 242 qualify as ENERGY STAR. The effective date for these Version 4.0 requirements is provided in Section
 243 6 of this specification. To qualify TVs, TV Combination Units, or Component Television Units as
 244 ENERGY STAR, they must be tested according to the protocol outlined in Section 4, Test Methodology.
 245

246 EPA will make ON Mode, Sleep, and DAM Mode data available on the ENERGY STAR Web site for
 247 interested consumers. Additionally, EPA will publish an estimate of annual energy consumption
 248 (measured in kWh/year) as well as reported luminance for each ENERGY STAR qualified TV. This
 249 annual power consumption estimate will be based on a typical energy consumption (TEC) model which
 250 assumes a daily duty cycle of 5 hours in ON Mode and 19 hours in Sleep Mode.
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252 A. ON Mode Power Consumption Criteria

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 254 1. To qualify as ENERGY STAR, a product must not exceed the maximum ON Mode power
 255 consumption (P_{Max}) limit determined from the equations in Table 1, for all screen areas and
 256 native vertical resolutions. The maximum ON Mode power consumption is expressed in watts
 257 and rounded to the nearest whole number.
 258

259 In the following equations, “A” is the viewable screen area of the product, calculated by
 260 multiplying the viewable image width by the viewable image height. Example power
 261 consumption limits for TVs of various screen sizes are provided below in Table 2.
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 263

Table 1: ON Mode Power Level Requirements for TVs

Version 4.0: Effective May 1, 2010		
Screen Area	Maximum ON Mode Power Consumption (A expressed in square inches)	Maximum ON Mode Power Consumption (A expressed in square centimeters)
A < 275 square inches (1774 square centimeters)	$P_{Max} = 0.190 * A + 5$	$P_{Max} = 0.029 * A + 5$
A ≥ 275 square inches (1774 square centimeters)	$P_{Max} = 0.120 * A + 25$	$P_{Max} = 0.019 * A + 25$
Version 5.0: Effective May 1, 2012		
Screen Area	Maximum ON Mode Power Consumption (A expressed in square inches)	Maximum ON Mode Power Consumption (A expressed in square centimeters)
A < 275 square inches (1774 square centimeters)	$P_{Max} = 0.130 * A + 5$	$P_{Max} = 0.020 * A + 5$
275 ≤ A ≤ 1068 square inches (6890 square centimeters)	$P_{Max} = 0.084 * A + 18$	$P_{Max} = 0.013 * A + 18$
A > 1068 square inches (6890 square centimeters)	$P_{Max} = 108$	

264
 265 For example, under Version 4.0, the maximum power consumption allowance for a TV with a
 266 width of 36.6 inches and a height of 20.6 inches (screen area of 754 square inches) would be:
 267 $(0.120 * 754) + 25 = 115.4$ watts, or 115 watts when rounded to the nearest whole number.

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269
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271

Additional examples are provided in Table 2.

Table 2: Sample Version 4.0 and 5.0 ON Mode Power Level Requirements for Example TV Screen Sizes

Viewable Diagonal Screen Size (Inches)	Aspect Ratio	Viewable Screen Size in Inches	Screen Area in Inches ² (cm ²)	Version 4.0 Maximum ON Mode Power in watts	Version 5.0 Maximum ON Mode Power in watts
20	16:9	17.4 x 9.8	170.5 (1,100)	38	27
32	16:9	27.9 x 15.7	438.0 (2,826)	78	55
42	16:9	36.6 x 20.6	754.0 (4,865)	115	81
50	16:9	43.6 x 24.5	1068.2 (6,892)	153	108
60	16:9	52.3 x 29.4	1537.6 (9,920)	210	108

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Note: Based on stakeholder discussion at the June 24 stakeholder meeting, EPA has re-examined the ON Mode requirement for small screen sizes (less than 25 inches). Based on stakeholder recommendations, EPA is proposing to modify the Version 4.0 ON Mode requirement for TV with a screen area of less than 275 square inches to the requirement noted above. Under this new proposed requirement, fewer televisions in the 20-inch size bin currently meet the ON Mode requirement, from 61% of all models in the 20-inch size bin to 37%.

Based on this modification to the Version 4.0 ON Mode power requirement, EPA also modified the Version 5.0 ON Mode power requirement for models less than 275 square inches so that the Version 5.0 is more stringent than the Version 4.0 requirements at this size and is generally consistent with the difference between the requirements across all the other sizes up to 1068 square inches.

The Versions 4.0 and 5.0 ON Mode requirement for products 275 square inches and larger was not modified from the Draft 2 proposal.

In comments shared with EPA, some stakeholders noted that the proposed Version 4.0 ON Mode requirements are too stringent on mid- to large-sized units and would favor small, lower performing, less popular and less expensive products.

EPA's goal is that when Version 4.0 goes into effect that approximately 25% of available models will meet the ENERGY STAR requirements with reasonable selection across screen sizes. Based on EPA's current dataset, there are feature-rich, mid- and large-screen models from several different manufacturers available today that are able to meet the proposed ON Mode requirements in a variety of price points and sizes, utilizing conventional backlight technology (i.e., CCFL) and some models utilizing emerging, more efficient backlight technologies (e.g., HCFL, LED). In addition, based on input directly from several TV manufacturers and their Web sites, EPA also understands that several manufacturers have recently released new lines of LED-backlit TVs that are available in mid- and large screen sizes at a variety of price points. In addition, there are even more models that are within 5 to 15% of the proposed requirement for each size category. EPA expects that manufacturers will make relatively small modifications to these units in order to meet the Version 4.0 requirements by the effective date of May 2010. For instance, for models in the 32-inch category (32- and 37- sets), 12% of models available today meet the proposed Version 4.0 requirements. An additional 14% of all 32-inch sets in the dataset are currently within 5% of the ON Mode requirement. EPA expects developments can be made to improve the

311 efficiencies of these sets by the effective date of May 2010.

312
313 This reinforces the information EPA has been receiving from roadmaps for top panel
314 manufacturers and top tier TV manufacturers and the 2009 Society for Information Display
315 International Symposium, Seminar and Exhibition. Based on information collected, EPA
316 expects many more mid- and large-sized energy efficient models, utilizing different backlight
317 technologies, will be available by May 2010 and into May 2012, the proposed Version 5.0
318 effective date. Roadmaps for the top four panel makers show LED backlight TVs in all 32-inch
319 and larger series going forward.

320
321 Additionally, for three of the most popular screen sizes, 32-, 40-, and 46-inch models, the
322 range of Manufacturer Suggested Retail Prices (MSRPs) for the top 15 best-selling models for
323 each size category aligned closely with the range of listed MSRPs of televisions in those
324 same size categories that currently meet the Version 4.0 requirements.

325
326 EPA has used a number of information sources including: data from manufacturers,
327 conversations directly with television manufacturers, manufacturer Web sites, conversations
328 with component manufacturers, industry reports from well-known research companies that
329 were endorsed by stakeholders during the last specification revision process, and tradeshow
330 information in developing the proposed specifications. EPA believes that the combination of
331 these different sources is necessary in setting levels that ensure ENERGY STAR is
332 associated with leadership products in 2010. As part of the specification process, EPA has
333 been forthcoming with stakeholders on all the information that has been used to inform EPA's
334 decisions.

335
336 EPA has not adopted a counter proposal from numerous stakeholders that increases the
337 slope of the Version 4.0 line allowing greater qualification for televisions larger than 32 inches.
338 EPA has not accepted this proposal because market trends suggest qualification rates would
339 be unacceptably high when the specification goes into effect and because rough estimates
340 indicate that the counterproposal would result in significant lost financial and environmental
341 savings. For illustrative purposes, assuming CEA's sales projection of close to 20 million 40-
342 inch and larger units in 2010 and roughly 5 million units meeting the proposed ENERGY
343 STAR requirement, the counterproposal would result in 250 to 780 million pounds of lost
344 annual CO₂ emissions^a compared to the EPA proposal as well as \$19 to \$58 million^b in lost
345 annual consumer savings. Ranges reflect differences in watts of the two proposals for key
346 screen sizes. Smaller differences correspond to 32-inch models and the larger differences to
347 60 inch models.

348
349 One stakeholder noted that it is premature to set an On Mode limit effective 2012 with a
350 dynamic product category like TVs. Other stakeholders noted that there is significant doubt
351 among TV manufacturers about whether they will be able to produce models that can meet
352 the proposed Version 5.0 limits. Consumers rely on the ENERGY STAR program to direct
353 them to products that will help them save money and fight global warming. As TVs continue
354 to grow in size and environmental impact, EPA recognizes that there is a limit to what
355 ENERGY STAR can credibly classify as a TV that delivers both consumer savings and benefit
356 for the climate. Rather than exclude the especially large TVs from the ENERGY STAR
357 program, EPA proposed and plans to finalize an approach whereby TVs greater than 50
358 inches can earn the ENERGY STAR label as long as their consumption does not exceed that
359 specified for the 50 inch models. Trends in TV sales and technology evolution suggest that
360 even with a consumption limit imposed for especially large sizes, consumer choice across a
361 wide spectrum of sizes, including large sizes, will be accommodated.

362
363 EPA based its Version 5.0 proposed requirements on the rapid improvements in efficiency
364 realized between Version 3.0 development and the present, expected additional efficiency
365 projected for 2010 models, and trends toward efficiency projected by manufacturers and
366 market research firms to continue into the Version 5.0 timeframe. Supporting such trends is
367 significant consumer interest in energy efficient TVs and consumers' willingness in many
368 cases to pay more for such products. Further, in this time of incredible interest in efficiency
369 and stamping out greenwashing, the ENERGY STAR program is investing more than ever in

the integrity and relevance of the brand. By setting a future tier (May 2012), EPA is providing advance notice, ensuring that ENERGY STAR specifications are revised in a timely manner and that the ENERGY STAR is a mark of superior performance despite the rapid evolution of this product category. EPA is committed to revisiting requirements before they go into effect and will revise the requirements as needed.

In addition, at the 2009 Society for Information Display International Symposium, Seminar and Exhibition, television manufacturers were displaying numerous different television models, between 32- and 55-inches, with power consumption values that would easily meet the proposed Version 5.0 ON Mode requirements, even with uncertainty accounted for due to power measurements not following IEC test procedure. Although these units are prototypes now, these prototypes suggest significant manufacturer effort to lower power use and increase television efficiency, all while maintaining or improving performance. In the next three years, it seems likely the technology shown could be found in mainstream consumer televisions. EPA will continue to monitor the marketplace over the coming years to verify these efficiency trends.

EPA is committed to revisiting with stakeholders the Version 5.0 requirements before they go into effect and will revise the requirements as needed.

^aThis range was calculated by EPA as follows:

42":133W-118W=18W/unit*(1825hr TV on/yr)*(5m units)=164m kWh/yr * 1.535 lbs CO2/kWh = 250m lbs CO2/yr
60":266W-210W=56W/unit*(1825hr TV on /yr)*(5m units)=511m kWh/yr * 1.535 lbs CO2/kWh = 780m lbs CO2/yr

^bThis range was calculated by EPA as follows:

42":133W-118W=18W/unit*(1825hr TV on /yr)*(5m units)=164m kWh/yr * 0.113\$/kWh = \$19 m/yr
60":266W-210W=56W/unit*(1825hr TV on /yr)*(5m units)=511m kWh/yr * 0.113\$/kWh = \$58 m/yr

2. TVs with Automatic Brightness Control (ABC): To account for the power savings achieved through automatic brightness control, where the feature is activated by default when shipped to the end user, ON Mode power consumption should be determined as follows:

$$P_{a1_broadcast} = (0.55 * P_{o_broadcast}) + (0.45 * P_{abc_broadcast})$$

Where:

- $P_{a1_broadcast}$ is the average ON Mode power consumption in watts and rounded to the nearest whole number, taking into consideration that the TV will be in low ambient light level conditions 45% of the time;
- $P_{o_broadcast}$ is the average ON Mode power consumption in watts and rounded to the nearest whole number, and tested with a minimum ambient light level of 300 lux entering directly into the sensor; and
- $P_{abc_broadcast}$ is the average ON Mode power consumption in watts and rounded to the nearest whole number, with an ambient light level of zero (0) lux measured at the face of the sensor.

When determining ENERGY STAR qualification, products which ship with automatic brightness control enabled should compare their ON Mode power consumption ($P_{a1_broadcast}$), found using the equation above, to the maximum ON Mode power consumption allowed (P_{Max}), determined using the equations in Table 1, above. (See Section 4.E.2, below, for further information on how to test TVs with Automatic Brightness Control to determine ENERGY STAR qualification.)

3. TVs Using an EPS: To qualify, the EPS must be ENERGY STAR qualified, or it must meet the no-load and active mode efficiency levels provided in the ENERGY STAR Program Requirements for Single Voltage External Ac-Dc and Ac-Ac Power Supplies. The ENERGY STAR specification and EPS qualified product list can be found at www.energystar.gov/powersupplies.

- B. Sleep Mode Power Consumption Criteria: To qualify as ENERGY STAR under both Version 4.0 and Version 5.0 of this specification, qualified products must not consume more than one (1.0) watt

430 while in Sleep Mode. Additionally, this lowest power consuming Sleep Mode must be the default
431 Sleep for the TV as shipped to consumers.

432
433 C. User Information Requirements: In order to ensure that consumers are properly informed of the
434 benefits of keeping their TVs in the default modes as shipped, particularly for those models that
435 incorporate additional features and functionality that, if employed, would result in increased energy
436 use beyond that intended by the ENERGY STAR requirements for ON Mode and Sleep Mode, the
437 manufacturer will include with each TV one of the following:

- 438
- 439 • Information on ENERGY STAR and the benefits of keeping the TV at its factory default settings
440 that meet ENERGY STAR criteria in either a hard copy or electronic copy of the user manual.
441 Where necessary, manufacturers will also include language advising consumers that enabling
442 certain features and functionality in their TV (e.g., instant-on) will increase its energy
443 consumption, possibly beyond the limits required for ENERGY STAR qualification. This
444 information should be near the front of the user manual; or,
 - 445 • A package or box insert on ENERGY STAR and the benefits of keeping the TV in its factory
446 default modes. Where necessary, manufacturers will also include language advising consumers
447 that enabling certain features and functionality in their TV (e.g., instant-on) will increase its
448 energy consumption, possibly beyond the limits required for ENERGY STAR qualification.
- 449

450 D. Luminance: To qualify as ENERGY STAR under this specification, the peak luminance of the
451 product in the “home” mode, or in the default mode as shipped, shall not be less than 65% of the
452 peak luminance of the “retail” mode, or the brightest selectable preset mode, of the product.

453

Note: Some commentors noted that there is little evidence from call centers suggesting that
454 televisions are being shipped overly dim in order to meet the Version 3.0 On Mode requirements. It
455 has been further noted by one stakeholder that the requirements should not make it difficult for
456 consumers to adjust their TVs to their particular lighting conditions. While Automatic Brightness
457 Control is preferred, manufacturers cannot accommodate the viewing needs of all consumers with a
458 single ambient-light-to-brightness curve.

EPA believes that concerns raised by numerous television manufacturers and other stakeholders
461 independently, global action on this issue, and the increased risk of dimming as the ENERGY STAR
462 requirements increase in stringency, all call for initial action as proposed in Version 4.0 as well as
463 close attention and possibly study going forward. EPA will continue to study this issue and, if
464 needed, may choose a different path regarding luminance settings under Version 5 based on data
465 and information collected.

Based on stakeholder discussions and input, EPA is maintaining the Draft 2 proposed luminance
467 requirement to maintain harmonization with requirements outlined in the European Union. EPA
468 anticipates collecting and posting luminance and power levels for both retail and home modes for
469 ENERGY STAR qualification. EPA will review this data closely and adjust this approach prior to the
470 effective date for Version 5.0, as needed. EPA was also asked to provide greater specificity
471 regarding testing luminance and has done so in this Final Draft. Further, EPA will host a call on July
472 29 from 1:00 to 2:30pm Eastern to further discuss luminance testing issues with stakeholders.

This proposed approach provides manufacturers some flexibility when setting luminance
475 specifications for home and retail modes (i.e., does not closely couple the modes). In addition, the
476 proposal does not prevent or make it more difficult for users to adjust the brightness settings of their
477 particular set to their lighting conditions. The proposed luminance requirement only applies to the
478 home and retail preset modes.

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483 E. Download Acquisition Mode (DAM): Qualified products may automatically exit Sleep Mode
484 according to a predefined schedule to: download channel listing information for use by an electronic
485 programming guide, monitor for emergency messaging/communications, and/or otherwise
486 communicate through a network protocol. If a product has this feature, DAM must be disabled upon
487 shipping and can only be enabled by a user activating this feature. In addition, upon activation of
488 this feature by the user, there must be an additional prompt to confirm a user’s choice, noting that

489 enabling this feature may increase the power consumption of their television.

490
491 Under the Version 4.0 requirements, the additional maximum allowable level of a product when in
492 DAM is 0.08 kilowatt-hours (kWh), or 80 watt-hours, per 24-hour period.

493
494 Under the Version 5.0 requirements, the additional maximum allowable level of a product when in
495 DAM is 0.02 kilowatt-hours (kWh), or 20 watt-hours, per 24-hour period.

Note: Based on conversations EPA has had with TV manufacturers and content providers, EPA understands that based on current transmission options and certain variability concerning download acquisition mode (DAM), the 0.02 kWh/day requirement may be difficult for televisions to meet by May 2010. Therefore, EPA is proposing a DAM requirement for TVs of 0.08 kWh/day for the Final Draft of Version 4.0. This level was based on an expected power of 20 watts while in DAM for a duration of 4 hours, which EPA understands from service providers is the longest amount of time needed for a television to download information in a given day, also considering regional content differences. Manufacturers do not have to meet these power and duration levels, only the overall proposed 0.08 kWh/day requirement. This would give manufacturers a level that EPA understands is technologically feasible, while realizing energy savings. EPA has also proposed a testing protocol for DAM, which can be found in the testing portion of this document. Further, EPA will host a call on July 30 from 1:00 to 2:30pm Eastern to further discuss testing issues with stakeholders.

In this specification, EPA is proposing a DAM requirement of 0.02 kWh/day for Version 5.0. However, EPA understands that DAM technology is rapidly improving and will use less energy in the coming years. EPA expects as Ethernet connected televisions become more prevalent in the market, that a separate DAM while in Sleep Mode may no longer be necessary. EPA will be tracking this information closely to inform a DAM requirement for Version 5.0.

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516 1. Hospitality TVs: Hospitality televisions are televisions destined for the hospitality setting. To
517 be considered a hospitality television, the television must have an RJ-45 port AND installed
518 SmartPort software. EPA proposes the following Typical Electricity Consumption (TEC)
519 approach for these televisions. The TEC of a hospitality television (TEC_{hosptv}), as determined
520 by the following equation, must be less than the TEC limits as determined in Table 3.

521
$$TEC_{hosptv} = (P_{ON} \text{ [in watts]} * 5 \text{ hours}) + (P_{Sleep} \text{ [in watts]} * 19 \text{ hours}) + (E_{DAM} \text{ [in watt-hours]})$$

522
523 **Table 3: TEC Limits for Hospitality TVs**

Screen Area	TEC_{hosptv} Limits
A < 275 square inches (1774 square centimeters)	$(([0.19 * A] + 5) * 5 \text{ hours}) + (1 \text{ watt} * 19 \text{ hours}) + (80 \text{ watt-hours})$
A ≥ 275 square inches (1774 square centimeters)	$(([0.12 * A] + 25) * 5 \text{ hours}) + (1 \text{ watt} * 19 \text{ hours}) + (80 \text{ watt-hours})$

524
525
526 Where:

- 527 - P_{ON} Mode is the average ON Mode power consumption in watts and rounded to the nearest
528 whole number.
529 - P_{Sleep} is the average Sleep Mode power consumption in watts and rounded to the nearest
530 whole number.
531 - E_{DAM} is the energy in DAM in watt-hours per 24 hour period.
532 - A is the viewable screen area of the product in square inches.
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Note: Based on stakeholder input, EPA is proposing differentiating hospitality televisions by presence of an RJ-45 port AND installed SmartPort software. One stakeholder has shared the following recommendation for defining a hospitality television:

“A hospitality TV, commercial TV or software-configured version of a consumer TV, shall be defined as a TV or monitor with a control port for bi-directional communication (DB-9, RJ11, RJ12, RJ45, HDMI-CEC), AND activated hospitality protocol software (SmartPort, MPI, MTI, Serial Protocol, or similar control) for the purpose of direct access to Video-On-Demand (VOD) systems or a digital media player designed for hospitality specific applications.”

Stakeholders are encouraged to provide feedback on these definitions of hospitality TVs.

EPA proposes the proposed Typical Electricity Consumption (TEC) approach for hospitality TVs, giving manufacturers greater flexibility in meeting the ENERGY STAR kWh requirements. EPA has employed this approach with other product categories such as imaging equipment, computers, and set-top boxes.

F. User Interface (Voluntary Requirement): Although not mandatory, manufacturers are strongly recommended to design products in accordance with the Power Control User Interface Standard — IEEE 1621 (formally known as “Standard for User Interface Elements in Power Control of Electronic Devices Employed in Office/Consumer Environments”). Compliance with IEEE 1621 will make power controls more consistent and intuitive across all electronic devices. For more information on the standard see <http://eetd.LBL.gov/Controls>.

4) **Test Methodology**: Manufacturers are required to perform tests and self-certify that products meet the ENERGY STAR guidelines.

- In performing these tests, partner agrees to use the test procedures outlined in Table 3, below, with the clarifications outlined in Section 4.E.
- The test results must be reported to EPA.

Additional testing and reporting requirements are provided below.

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A. Test Conditions:

Supply Voltage:	North America:	115 (± 1%) Volts AC, 60 Hz (± 1%)
	Europe/Australia/New Zealand:	230 (± 1%) Volts AC, 50 Hz (± 1%)
	China:	220 (± 1%) Volts AC, 50 Hz (± 1%)
	Japan:	100 (± 1%) Volts AC, 50 Hz (± 1%)/60 Hz (± 1%)
<i>Note: For products rated for > 1.5 kW maximum power, the voltage range is ± 4%</i>		
Total Harmonic Distortion (THD) (Voltage):	< 2% THD (< 5% for products which are rated for > 1.5 kW maximum power)	
Ambient Temperature:	23°C ± 5°C	
Relative Humidity:	10 – 80 %	

(Reference *Draft* IEC 62301 Ed 2.0¹: Household Electrical Appliances – Measurement of Standby Power, Sections 4.2, 4.3)

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B. Models Capable of Operating at Multiple Voltage/Frequency Combinations: Manufacturers shall test their products based on the market(s) in which the models will be sold and promoted as ENERGY STAR qualified. For products that are sold as ENERGY STAR in several markets and rated for multiple input voltages, the manufacturer must test at and report the required power consumption or efficiency values at all relevant voltage/frequency combinations. For example, a manufacturer that is shipping the same model to the United States and Europe must measure, meet the specification, and report test values at both 115 Volts/60 Hz and 230 Volts/50 Hz in order to qualify the model as ENERGY STAR in both markets. If a model qualifies as ENERGY STAR at only one voltage/frequency combination (e.g., 115 Volts/60 Hz), then it may only be qualified and promoted as ENERGY STAR in those regions that support the tested voltage/frequency combination (e.g., North America and Taiwan).

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C. Approved Meter: Approved meters will include the following attributes²:

- An available current crest factor of 3 or more at its rated range value; and
- Lower bound on the current range of 10mA or less.

The power measurement instrument shall have a resolution of:

- 0.01 W or better for power measurements of 10 W or less;
- 0.1 W or better for power measurements of greater than 10 W up to 100 W; and
- 1 W or better for power measurements of greater than 100 W.

The following attributes in addition to those above are suggested:

- Frequency response of at least 3 kHz; and
- Calibration with a standard that is traceable to the U.S. National Institute of Standards and Technology (NIST).

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¹ IEC 62301, Ed 2.0 is still in draft form and under IEC committee review, as of the writing of this specification. While significant changes to the relevant portions of the IEC document are not envisioned by its authors, EPA will review the final version, when available, to ensure that no material changes have been made to the applicable sections of the document. This specification specifically references the committee draft version of IEC 62301, Ed 2.0.

² Characteristics of approved meters taken from *Draft* IEC 62301 Ed 2.0: Household Electrical Appliances – Measurement of Standby Power

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It is also desirable for measurement instruments to be able to average power accurately over any user selected time interval (this is usually done with an internal math calculation dividing accumulated energy by time within the meter, which is the most accurate approach). As an alternative, the measurement instrument would have to be capable of integrating energy over any user selected time interval with an energy resolution of less than or equal to 0.1 mWh and integrating time displayed with a resolution of 1 second or less.

- D. **Accuracy:** Measurements of power of 0.5 W or greater shall be made with an uncertainty of less than or equal to 2% at the 95% confidence level. Measurements of power of 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.

All power figures should be in watts and rounded to the second decimal place. For loads greater than or equal to 10 W, three significant figures shall be reported.

- E. **Test Procedures:**

Table 4: Test Procedures for Measuring Operational Modes

Operational Mode	Test Protocol	Source
Sleep Mode	<i>Draft</i> IEC 62301, Ed 2.0: Household Electrical Appliances – Measurement of Standby Power.	www.iec.ch
ON Mode	IEC 62087, Ed 2.0: Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment, Section 11, “Measuring conditions of television sets for ON (average) mode.”	www.iec.ch
	CEA-2037: Determination of Television Average Power Consumption	

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- Guidance on Implementation of IEC 62301:** Below, EPA provides specific guidance on using IEC 62301 for measuring TV Sleep Mode power. For purposes of determining ENERGY STAR qualification of a product, the below clarifications apply:
 - All Sleep Mode measurements shall be conducted and reported to EPA first at factory default conditions. Measurements are to be taken with the POD module, if available, not installed.
 - Manufacturers must make additional measurements as necessary, in addition to the Sleep Mode power consumption of the product at factory default settings, to report the highest observed power consumption of the product in Sleep Mode.
- Guidance on Implementation of IEC 62087:** Below, EPA provides guidance on using IEC 62087, Ed. 2.0, Section 11 **as defined by CEA-2037** for measuring TV ON Mode power. For purposes of determining ENERGY STAR qualification of a product.

Note: Some commentors asked EPA to reference a new draft CEA standard, CEA-2037 Determination of Television Average Power Consumption, once it becomes final. The commentors asked EPA to replace some of the measurement language in the ENERGY STAR specifications and simply reference CEA-2037 to help all policymaking bodies harmonize on measurement of ON Mode. EPA is considering inclusion of CEA-2037 in this specification and is seeking stakeholder input.

- Testing of Products with Network Connection:** No network connection should be active during the testing and measurement of operational modes for products with network connection capability (e.g., Ethernet, Wi-Fi).

650 F. Dark Room Conditions: All luminance testing shall be performed in dark room conditions. The display
651 screen luminance measurement (E) in Off Mode must be less than or equal to 1.0 lux. Measurements
652 should be taken perpendicular to the center of the display screen using a Light Measuring Device
653 (LMD).

654
655 G. Light Measurement Protocols:

- 656
657 1. Measurements shall be made using a reliable, accurate and reproducible measurement
658 procedure, which takes into account the generally recognized state of the art measurement
659 methods.
- 660 2. Measurements of peak luminance shall be made with a LMD, detecting that portion of the
661 screen exhibiting a test pattern (VESA FPDM Standard 2.0, A112-2H, L30) that provides a full
662 white (0.7 volts) box that occupies 30% of the image.
- 663 3. Measurements of luminance ratio shall be made without disturbing the luminance meter's
664 detection point on the display whilst switching between the home-mode condition or the on-
665 mode condition of the television as set by the supplier, as applicable, and the brightest on-mode
666 condition.
- 667 4. Measurements shall be made with the Automatic Brightness Control function, if such a function
668 exists, made it inactive. If the Automatic Brightness Control function exists and cannot be made
669 inactive, then the measurements shall be performed with the light entering directly into the
670 ambient light sensor at a level of 300 lux, or more.

671
672 **Note:** EPA is seeking stakeholder feedback on this test procedure. EPA would like to work with
673 interested stakeholders in the coming weeks to ensure the test procedure to measure luminance is
674 both appropriate, consistent, and provides clear and specific guidance. Additionally, EPA would like
675 to ensure that the procedure for measuring luminance does not favor one type of display technology
676 over another. Further, EPA will host a call on July 29 from 1:00 to 2:30pm Eastern to further discuss
677 luminance testing issues with stakeholders.

678
679 EPA anticipates observing closely the submitted data regarding luminance and will revise the test
680 procedure or approach for Version 5.0, as needed. Further, EPA is proposing to post reported
681 luminance data along with other qualified product data.

682
683 H. DAM Testing

- 684
685 1. Connect the television to an active RF terminal and set the television to Sleep Mode.
- 686 2. Using an approved power meter, collect the power consumed over a 24 hour period. Determine
687 the total energy consumed in watt-hours.
- 688 3. Multiply the Sleep Mode power consumption (in watts) of the television, measured according to
689 IEC 62087, by the difference of 24 hours subtracted by the amount of time (in hours) indicated
690 by the service provider that the products is in DAM per 24-hour period. For example, if the
691 service provider indicated that the television would be in DAM for 3 hours per day, multiple the
692 Sleep mode power consumption by 21 hours, or 24 minus 3.
- 693 4. Subtract the value calculated in Step 3, in watt-hours, from the total watt-hours measured in
694 Step 2. This value (E_{DAM}) must be less than 80 watt-hours under the Version 4.0 requirements.

695
696 In order to test DAM, EPA proposes the method described above based on several discussions
697 held with stakeholders. Stakeholders are encouraged to provide feedback on this test procedure
698 to measure DAM. EPA would like to work with interested stakeholders in the coming weeks to
699 ensure this test procedure to measure DAM is appropriate. Further, EPA will host a call on July
700 30 from 1:00 to 2:30pm Eastern to further discuss testing issues with stakeholders.

701
702 5) **Effective Date**: The date that manufacturers may begin to qualify products as ENERGY STAR will be
703 defined as the *effective date* of the agreement. Any previously executed agreement on the subject of
704 ENERGY STAR qualified TVs shall be terminated effective April 30, 2010.

705
706 A. Qualifying Products Under the Version 4.0 Specification: This Version 4.0 specification will
707 commence on **May 1, 2010**. All products, including models originally qualified under Version 3.0,
708 with a **date of manufacture** on or after **May 1, 2010** must meet the new Version 4.0 requirements in

- 709 order to qualify for ENERGY STAR. The **date of manufacture** is specific to each unit and is the
710 date (e.g., month and year) on which a unit is considered to be completely assembled.
711
- 712 B. Qualifying Products Under the Version 5.0 Specification: The second phase of this specification,
713 Version 5.0, will commence on **May 1, 2012**. All products, including models originally qualified under
714 Version 4.0, with a **date of manufacture** on or after **May 1, 2012**, must meet the Version 5.0
715 requirements in order to qualify for ENERGY STAR.
- 716
- 717 C. Elimination of Grandfathering: EPA will not allow grandfathering under this Version 4.0 ENERGY
718 STAR specification. **ENERGY STAR qualification under previous versions is not automatically**
719 **granted for the life of the product model**. Therefore, any product sold, marketed, or identified by
720 the manufacturing partner as ENERGY STAR must meet the current specification in effect at the
721 time of manufacture of the product
722
- 723 6) Future Specification Revisions: EPA reserves the right to revise the specification should technological
724 and/or market changes affect its usefulness to consumers or industry or its impact on the environment.
725 In keeping with current policy, revisions to the specification will be discussed with stakeholders. In the
726 event of a specification revision, please note that ENERGY STAR qualification is not automatically
727 granted for the life of a product model. To qualify as ENERGY STAR, a product model must meet the
728 ENERGY STAR specification in effect on the model's date of manufacture.
729