



ENERGY STAR[®] Program Requirements for Televisions

Partner Commitments Versions 4.1 and 5.1

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 TV model within one year of activating the TV portion of the agreement. When Partner qualifies a product, it must meet the specification (e.g., Version 4.1 or Version 5.1) in effect at that time;

Note: EPA will consider all partners as provisional until they have qualified a product under this specification. Once a partner has qualified a TV model, their organization will be listed on the ENERGY STAR Web site and will be given access to the ENERGY STAR certification and partner logos.

- 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 qualified 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;

Note: Effective March 30, 2010, products may no longer be labeled by manufacturers (including product packaging, product literature, Web sites, etc.) until qualifying product information, including a lab report, is submitted to and approved by EPA.

- 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.

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:

- consider energy efficiency improvements in company facilities and pursue the ENERGY STAR label for buildings;
- 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;
- ensure the power management feature is enabled on all ENERGY STAR qualified monitors 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 product models;
- feature the ENERGY STAR mark(s) on Partner Web site and in other promotional materials. If information concerning ENERGY STAR is provided on the Partner Web site as specified by the ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources section on the ENERGY STAR Web site at www.energystar.gov), EPA may provide links where appropriate to the Partner Web site;
- 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 Web pages, etc. The plan may be as simple as providing a list of planned activities or planned milestones that Partner would like EPA to be aware of. For example, activities may include: (1) increase the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrate the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) provide information to users (via the Web site and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products, and (4) build awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event;
- 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;
- join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. SmartWay Transport 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 Climate Leaders Partnership to inventory and reduce greenhouse gas emissions. Through participation, companies create a credible record of their accomplishments and receive EPA recognition as corporate environmental leaders. For more information on Climate Leaders, visit www.epa.gov/climateleaders; and

- 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, visit www.epa.gov/grmpower/.



ENERGY STAR® Program Requirements for Televisions

Eligibility Criteria Versions 4.1 and 5.1

Following is the product specification for ENERGY STAR qualified televisions (Versions 4.1 and 5.1). A product must meet all of the identified criteria to be labeled as ENERGY STAR.

1) Definitions:

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

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

- B. Rear-Projection TV: A type of TV whose display device is a projector that focuses images onto a screen located inside the TV enclosure.
- C. Direct-View TV: A type of TV whose display device emits light either directly from the screen surface or transmits light from a source mounted directly behind the screen. Examples include CRT, LCD, and plasma display technologies.
- D. TV Combination Unit: A television system in which the TV and an additional device(s) (e.g., DVD player, Blu-ray Disc player, Hard Disk Drive [HDD], VCR, etc.) are combined into a single unit and which meets all of the following criteria: the additional device(s) is included in the television casing; it is not possible to measure the power requirements of the two (or more) components separately without removal of the television casing; and the system is connected to the wall outlet through a single power cable.
- E. Component Television Unit: A television system composed of two or more separate components (e.g., display device and tuner) marketed and sold as a television under one model or system designation. The system may have more than one power cord. The total power consumption of all components in the system is considered for purposes of ENERGY STAR qualification.
- F. Hospitality Television: A television with a control port for bi-directional communication (DB-9, RJ11, RJ12, RJ45, coaxial cable, or 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.
- G. Analog: A television product which has an NTSC, PAL, or SECAM tuner, and may have analog video inputs (e.g., composite video, component video, S-video, RGB).
- H. Digital: A television product which has at least one digital tuner or at least one digital video input (e.g., HDMI). Products with an analog tuner and both analog and digital inputs shall be considered digital products under this specification.
- I. Native Vertical Resolution: The physical pixel count for the vertical axis of the television. For example, a television with a screen resolution of 1920 x 1080 would have a native vertical resolution of 1080.
- J. Electronic Program Guide (EPG): An interactive, onscreen menu of TV program information (e.g., time, date, description of TV programs, etc.) downloaded from an external source.

- K. External Power Supply (EPS): A component contained in a separate physical enclosure external to the television casing and designed to convert line voltage AC input from the mains to one or more lower voltage DC outputs for the purpose of powering the television. An external power supply must connect to the television via a removable or hard-wired male/female electrical connection, cable, cord or other wiring.
- L. Point of Deployment (POD) Module: A conditional access module for digital cable signal reception.
- M. Luminance: The photometric measure of the luminous intensity per unit area of light traveling in a given direction. Luminance describes the amount of light that passes through or is emitted from a particular area, and falls within a given solid angle. The standard unit for luminance is candela per square meter (cd/m²).
- N. On Mode: Where the product is connected to a mains power source, has been activated and is providing one or more of its principal functions. The common terms “active”, “in-use” and “normal operation” also describe this mode. The power requirement in this mode is typically greater than the power requirement in Sleep and Download Acquisition Modes.
- O. Sleep Mode: The mode, also sometimes referred to commonly as “Standby,” where the product is connected to a mains power source, is not providing a principal function, and offers one or more of the following user oriented or protective functions which may persist for an indefinite time:
 1. To facilitate the activation of other modes (including activation or deactivation of On mode) by remote switch (including remote control), internal sensor, timer.
 2. Continuous function: information or status displays including clocks.
 3. Continuous function: sensor-based functions.

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

- P. Off Mode: Where the product is connected to a mains power source and is not providing any On Mode or Sleep Mode functions, and where the mode may persist for an indefinite time. An indicator that only shows the user that the product is in the Off position is included within the classification of an Off Mode.
 - Q. Download Acquisition Mode (DAM): Where the product is connected to a mains power source, is not producing a sound or a picture, and is actively downloading channel listing information according to a defined schedule for use by the electronic programming guide, monitoring for emergency messaging/communications and/or otherwise communicating through a network protocol. The power use in this mode is typically greater than the power requirement in Sleep and less than that in On Mode.
- 2) **Qualifying Products**: Any TV, TV Combination Unit, or Component Television Unit that is marketed to the consumer as such (i.e., focusing on television as the primary function), which meets the respective product type definition in Section 1, and is capable of being powered from either a wall outlet or a battery unit that is sold with an external power supply is eligible to earn the ENERGY STAR. This specification does not cover monitors with computer capability (e.g., a computer input port, such as VGA) that are marketed and sold as 1) computer monitors or 2) dual function television and computer monitors.

TVs that do not have a power state meeting the definition of Sleep Mode (e.g., Public Alert CEA2009A certified models which offer 24/7/365 active features to alert users) are not able to qualify for ENERGY STAR.

- 3) **Energy-Efficiency Criteria**: Only those products listed in Section 2 that meet the following criteria may

qualify as ENERGY STAR. The effective dates for the Versions 4.1 and 5.1 requirements are provided in Section 5 of this specification. To qualify TVs, TV Combination Units, or Component Television Units as ENERGY STAR, they must be tested according to the protocol outlined in Section 4, Test Methodology.

EPA will make On Mode, Sleep Mode, luminance, and DAM data available on the ENERGY STAR Web site for interested consumers. On Mode and luminance data in both home and retail modes will be published on the ENERGY STAR Web site. Additionally, EPA will publish an estimate of annual energy consumption (measured in kWh/year) for each ENERGY STAR qualified TV. This annual power consumption estimate will be based on a typical energy consumption (TEC) model which assumes a daily duty cycle of 5 hours in On Mode and 19 hours in Sleep Mode.

A. On Mode Power Consumption Criteria

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

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

Table 1: On Mode Power Consumption Requirements for TVs

| Version 4.1: Effective May 1, 2010 | | |
|--|--|---|
| Screen Area | Maximum On Mode Power Consumption in Watts (A expressed in square inches) | Maximum On Mode Power Consumption in Watts (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 5.1: Effective May 1, 2012 | | |
| Screen Area | Maximum On Mode Power Consumption in Watts (A expressed in square inches) | Maximum On Mode Power Consumption in Watts (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) | $P_{Max} = 108$ | |

For example, under Version 4.1, the maximum power consumption allowance for a TV with a width of 36.6 inches and a height of 20.6 inches (screen area of 754 square inches) would be: $(0.120 * 754) + 25 = 115.4$ watts, or 115 watts when rounded to the nearest whole number. Additional examples are provided in Table 2.

Table 2: Sample Version 4.1 and 5.1 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 4.1 Maximum On Mode Power in Watts | Version 5.1 Maximum On Mode Power in Watts |
|--|--------------|--------------------------------|---|--|--|
| 20 | 16:9 | 17.4 x 9.8 | 170.5 (1,100) | 37 | 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 |

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 shall be determined as outlined in Equation 1.

$$\text{Equation 1: } P_{a1_broadcast} = (0.55 * P_{o_broadcast}) + (0.45 * P_{abc_broadcast})$$

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.
- $P_{abc_broadcast}$ 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 Equation 1 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 a list of qualified EPS products can be found at www.energystar.gov/powersupplies.
- B. Sleep Mode Power Consumption Criteria: To qualify as ENERGY STAR under both Version 4.1 and Version 5.1 of this specification, qualified products must consume no more than one (1.0) watt while in Sleep Mode. Additionally, the lowest power consuming Sleep Mode must be the default Sleep Mode for the TV as shipped to consumers.
- C. User Information Requirements: In order to ensure that consumers are properly informed of the benefits of keeping their TVs in the default modes as shipped, particularly for those models that incorporate additional features and functionality that, if employed, would result in increased energy use beyond that intended by the ENERGY STAR requirements for On Mode and Sleep Mode, the manufacturer will include with each TV one of the following:

1. Information on ENERGY STAR and the benefits of keeping the TV at its factory default settings that meet ENERGY STAR criteria in either a hard copy or electronic copy of the user manual. Where necessary, manufacturers will also include language advising consumers that enabling certain features and functionality in their TV (e.g., instant-on) will increase its energy consumption, possibly beyond the limits required for ENERGY STAR qualification. This information should be near the front of the user manual.
 2. A package or box insert on ENERGY STAR and the benefits of keeping the TV in its factory default modes. Where necessary, manufacturers will also include language advising consumers that enabling certain features and functionality in their TV (e.g., instant-on) will increase its energy consumption, possibly beyond the limits required for ENERGY STAR qualification.
- D. **Luminance:** To qualify as ENERGY STAR under this specification, the peak luminance of the product in the “home” mode, or in the default mode as shipped, shall not be less than 65% of the peak luminance of the “retail” mode, or the brightest selectable preset mode, of the product.
- E. **Download Acquisition Mode (DAM):** Qualified products may automatically exit Sleep Mode according to a predefined schedule to: (1) download channel listing information for use by an electronic programming guide, (2) monitor for emergency messaging/communications, and/or (3) otherwise communicate through a network protocol. If the TV has a DAM function the additional maximum allowable energy of a product when in DAM is noted in Table 3.

Table 3: DAM Energy Requirements

| Specification Version | Maximum Allowable Energy in DAM (kilowatt-hours/day) |
|------------------------------------|--|
| Version 4.1: Effective May 1, 2010 | 0.08 |
| Version 5.1: Effective May 1, 2012 | 0.02 |

1. Hospitality TVs: The following Typical Electricity Consumption (TEC) approach applies only to those televisions that meet the hospitality television definition in Section 1. The TEC level of a hospitality television ($TEC_{\text{hosp_tv}}$), as determined by Equation 2, must be less than or equal to the TEC limits as determined in Table 4. **Please note:** if DAM can not be measured for a hospitality television using the test procedure described in Section 4.E.5, then the hospitality television is not eligible for ENERGY STAR qualification.

$$\text{Equation 2: } TEC_{\text{hosp_tv}} = (P_{\text{On}} * 5 \text{ hours}) + (P_{\text{Sleep}} * 19 \text{ hours}) + (E_{\text{DAM}})$$

Where:

- P_{On} Mode is the average On Mode power consumption in watts and rounded to the nearest whole number.
- P_{Sleep} is the average Sleep Mode power consumption in watts and rounded to the nearest whole number.
- E_{DAM} is the energy in DAM in watt-hours per 24 hour period.

Table 4: TEC Limits for Hospitality TVs

| Screen Area | $TEC_{\text{hosp_tv}}$ Limits |
|---|--|
| A < 275 square inches (1774 square centimeters) | $(([0.19 * A] + 5) * 5 \text{ hours}) + 99$ |
| A ≥ 275 square inches (1774 square centimeters) | $(([0.12 * A] + 25) * 5 \text{ hours}) + 99$ |

Where:

- A is the viewable screen area of the product in square inches.

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 Section 4.E below.
 - The test results must be reported to EPA.

Additional testing and reporting requirements are provided below.

A. Test Conditions:

| | | |
|--|---|--|
| Supply Voltage: | North America/Taiwan: | 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 2.0*¹: Household Electrical Appliances – Measurement of Standby Power, Sections 4.2 to 4.4)

B. Models Capable of Operating at Multiple Voltage/Frequency Combinations: Manufacturers shall test their products for qualification in every market in which they will be sold and promoted as ENERGY STAR. 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 VAC/60 Hz and 230 VAC/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 VAC/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).

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 ENERGY STAR specification specifically references the latest committee draft version of IEC 62301, Ed 2.0.

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).

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 5: 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 (December 2009) | http://global.ihs.com/ |

1. 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:
 - a. All Sleep Mode measurements shall be conducted and reported to EPA with the TV settings in factory default conditions. POD modules, if available, should not be installed during testing.

² Characteristics of approved meters taken from *Draft* IEC 62301 Ed 2.0, Section 4.5.

- b. Manufacturers must make additional measurements, 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 if multiple Sleep Modes are present.
2. Guidance on Implementation of IEC 62087: For purposes of determining ENERGY STAR qualification of a product, a product's On Mode power consumption shall be testing according to the procedures outlined in IEC 62087 and CEA-2037 as appropriate. CEA-2037, *Determination of Television Average Power Consumption*, provides some clarification on using IEC 62087, Ed. 2.0, Section 11 for measuring TV On Mode power.
- a. Accuracy of Input Signal Levels: Follow guidance provided in Section 4.3 of CEA-2037.
 - b. Use of Broadcast Test Materials for Testing: Follow guidance concerning broadcast signals provided in Section 4.1 of CEA-2037.
 - c. True Power Factor: Due to increased awareness of the importance of power quality on the part of EPA and electric utilities, manufacturers shall indicate the true power factor of their sets during On Mode measurement.
 - d. Testing at Factory Default Settings: In measuring the On Mode power consumption of TVs, EPA is interested in measuring the power consumption of products *as they are shipped from the factory*. TV models that do not make use of a forced menu at initial start up, and are shipped in a "retail" or equivalent mode, must be tested in that "retail" mode for ENERGY STAR qualification. Picture level adjustments that need to be made prior to testing On Mode power consumption should be made per *section 11.4.8, "Picture level adjustments,"* if applicable.

Section 11.4.8 reads: "The contrast and brightness of the television set and the backlight level, if it exists, shall be set as originally adjusted by the manufacturer to the end user. In the case that a setting mode must be chosen on initial activation, the "standard mode" or equivalent shall be chosen. In the case that no "standard mode" or equivalent exists, the first mode listed in the on-screen menus shall be selected. The mode used during the test shall be described in the report. "Standard mode" is defined as "recommended by the manufacturer for normal home use.""

For products shipped with a forced menu where the customer must select upon initial start up the mode in which the product will operate, *section 11.4.8* states that testing must be conducted in "standard mode." To further consistent messaging to consumers about how to set their TVs for home use, the forced menu option should provide two choices: "home" or "retail." EPA will consider alternative proposals regarding the words selected to describe these two modes on a case-by-case basis. If the user selects the "retail" setting, he/she will be prompted one additional time to confirm this choice. This additional prompt is only required the first time that the user turns on the TV and selects "retail." A manufacturer may substitute the second prompt if "retail" is selected with information on the start-up menu relaying that the "home" setting is the setting in which the product qualifies for ENERGY STAR.

Information relaying that the product qualifies for ENERGY STAR in the "home" setting and that this is the setting in which power savings will be achieved will be included with the product in its packaging and posted on the partner's Web site, where information about the model is listed.

- e. Testing of TVs with Automatic Brightness Control: Follow guidance provided in Section 4.4.3.2 of CEA-2037.
3. Testing of Products with Network Connection: All products that offer network capability (e.g. Ethernet, WiFi) should have networking deactivated during Sleep and On Mode power consumption testing.

4. Light Measurement Protocols: All luminance testing shall be performed in dark room conditions. The display screen illuminance measurement (E) in Off Mode must be less than or equal to 1.0 lux. Measurements should be taken perpendicular to the center of the display screen using a Light Measuring Device (LMD). For LMDs that are not to be operated in close proximity to the screen, a 500 millimeter distance is recommended. Devices or configurations that cannot comply with this requirement must be approved and subsequently reported.

Measurements shall be made using a reliable, accurate and reproducible measurement procedure, which takes into account the generally recognized state of the art measurement methods. Measurements shall also be made with the Automatic Brightness Control function, if such a function exists, disabled. If the Automatic Brightness Control function exists and cannot be disabled, then measurements shall be performed with light entering directly into the ambient light sensor at a level of 300 lux, or greater.

- a. Ensure the television is set to the Home mode, or the default mode as shipped.
- b. Immediately following the ON Mode power testing using the dynamic broadcast-content video signal as outlined in Section 4.E.2 of the ENERGY STAR specification, display the three bar video signal provided in IEC 62087 Ed. 2, Section 11.5.5, which displays three bars of white (100%) over a black (0%) background.
- c. After the three bar video signal has been displayed for 10 minutes, measure the luminance (L_{home}). See *Note 1*.
- d. Within 1 minute of measuring L_{home} , set the television to Retail mode, or the brightest selectable preset mode, and display the three bar video signal.
- e. After the three bar video signal has been displayed for an additional 10 minutes, measure the luminance (L_{retail}). See *Notes 1 and 2*.

Note 1: For television sets that are known to stabilize within 10 minutes, this duration may be reduced if the resulting measurement can be shown to be within 2% of the result that would otherwise be achieved using the full 10 minute duration.

Note 2: When possible, measurements of luminance shall be made without changing the LMD's measurement position on the display when switching between the home mode and retail mode. If this is not possible, the tester should replicate the measurement position of the LMD so that measurements in the home-mode and retail-mode are in the same position on the display.

5. DAM Testing: For purposes of determining ENERGY STAR qualification of a product, a product's energy consumption in DAM shall be measured according to the procedure outlined in the test procedure entitled "Procedure for DAM Testing."

Note: This test procedure to measure a product's energy consumption in DAM is intended for products that incorporate a Rovi EPG. Products that have DAM but do not incorporate a Rovi EPG are not eligible for ENERGY STAR qualification at this time. EPA would like to work closely with stakeholders to develop appropriate test procedures that can accurately measure the DAM power of TVs that utilize other types of EPGs.

- 5) **Effective Date**: The date that products must meet the requirements specified under these specifications will be defined as the *effective date* of the agreement. Any previously executed agreement on the subject of ENERGY STAR qualified TVs shall be terminated effective April 30, 2010.
- A. Qualifying Products Under the Version 4.1 Specification: This Version 4.1 specification will commence on **May 1, 2010**. All products, including models originally qualified under Version 3.0, with a **date of manufacture** on or after **May 1, 2010** must meet the new Version 4.1 requirements in order to qualify for ENERGY STAR. 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.

- B. Qualifying Products Under the Version 5.1 Specification: The second phase of this specification, Version 5.1, will commence on **May 1, 2012**. All products, including models originally qualified under Version 4.1, with a **date of manufacture** on or after **May 1, 2012**, must meet the Version 5.1 requirements in order to qualify for ENERGY STAR.
 - C. Elimination of Grandfathering: EPA will not allow grandfathering under this Version 4.1 ENERGY STAR specification. **ENERGY STAR qualification under previous versions is not automatically granted for the life of the product model.** Therefore, any product sold, marketed, or identified by the manufacturing partner as ENERGY STAR must meet the current specification in effect at the time of manufacture of the product
- 6) **Future Specification Revisions**: EPA reserves the right to revise the specification should technological and/or market changes affect its usefulness to consumers or industry or its impact on the environment. In keeping with current policy, revisions to the specification will be discussed with stakeholders. In the event of a specification revision, please note that ENERGY STAR qualification is not automatically granted for the life of a product model. To qualify as ENERGY STAR, a product model must meet the ENERGY STAR specification in effect on the model's date of manufacture.