Commission Decision of 26 October 2009 determining the Community position for a decision of the management entities under the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment on the revision of the computer monitor specifications in Annex C, part II, to the Agreement (Text with EEA relevance) (2009/789/EC)

COMMISSION DECISION

of 26 October 2009

determining the Community position for a decision of the management entities under the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment on the revision of the computer monitor specifications in Annex C, part II, to the Agreement

(Text with EEA relevance)

(2009/789/EC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Council Decision 2006/1005/EC of 18 December 2006 concerning conclusion of the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment[(1)], and in particular Article 4(3) thereof,

Whereas:

(1) The computer monitor specifications should be revised in order to ensure that consumers have the opportunity to identify efficient products, thereby amending Annex C of the Agreement.

(2) The position of the Community with regard to amendment of the specifications is to be determined by the Commission.

(3) The measures provided for in this Decision take account of the opinion given by the European Energy Star Board referred to in Article 8 of Regulation (EC) No 106/2008 of the European Parliament and of the Council of 15 January 2008 on a Community energy-efficiency labelling programme for office equipment[(2)].

(4) As of 30 October 2009, the computer monitor specifications in Annex C, part II, should be repealed for computer monitors with diagonal screen sizes below 30 inches, and replaced by the specification annexed to this Decision.

(5) As of 30 January 2010, the computer monitor specifications in Annex C, part II, should be repealed for computer monitors with diagonal screen sizes from 30 to 60 inches, inclusive, and replaced by the specification annexed to this Decision,

HAS DECIDED AS FOLLOWS:

Sole Article

The position to be adopted by the European Community for a decision by the management entities under the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment on revising the computer specifications in Annex C, part II, to the Agreement shall be based on the attached draft decision.

Done at Brussels, 26 October 2009.

For the Commission

Andris PIEBALGS

Member of the Commission

ANNEX

DRAFT DECISIONof […]of the management entities under the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment on the revision of the computer monitor specifications in Annex C, part II, to the Agreement

THE MANAGEMENT ENTITIES,

Having regard to the Agreement between the Government of the United States and the European Community on the coordination of energy-efficiency labelling programmes for office equipment, and in particular Article XII thereof,

Whereas the computer monitor specifications in Annex C, part II, effective since 1 January 2006, should be repealed and replaced by revised specifications,

HAVE DECIDED AS FOLLOWS:

For computer monitors with diagonal screen sizes below 30 inches, the computer monitor specifications in Annex C, part II, to the Agreement are repealed and replaced by the specifications in the Annex to this Decision with effect from 30 October 2009.

For computer monitors with diagonal screen sizes from 30 to 60 inches, inclusive, the computer monitor specifications in Annex C, part II, to the Agreement are repealed and replaced by the specifications in the Annex to this Decision with effect from 30 January 2010.

The Decision, done in duplicate, shall be signed by the Co-chairs.

Signed in Washington DC, […]

[…]

on behalf of the United States Environmental Protection Agency

Signed in Brussels, […]

[…]

on behalf of the European Community

ANNEX

ANNEX C, PART II, TO THE AGREEMENT

II. DISPLAY SPECIFICATIONS

1. **Definitions**

A. Electronic Display (also referred to as Display)	:	A commercially-available product with a display screen and associated electronics, often encased in a single housing, that as its primary function displays visual information from (i) a computer, workstation or server via one or more inputs, such as VGA, DVI, HDMI, or IEEE 1394; or (ii) a USB flash drive, a memory card, or wireless Internet connection. Common display technologies include liquid crystal display (LCD), light emitting diode (LED), cathode-ray tube (CRT), and plasma display panel (PDP).

B. External Power Supply	:	A component contained in a separate physical enclosure external to the display casing and designed to convert line voltage AC input from the mains to lower DC voltage(s) for the purpose of powering the display. An external power supply (EPS) must connect to the display via a removable or hard-wired male/female electrical connection, cable, cord or other wiring.
C. On Mode	:	The operational mode of a display that is (i) connected to a power source; (ii) has all mechanical (hard) power switches turned on; and (iii) is performing its primary function of producing an image.
D. Sleep Mode	:	The operational mode of a display that is (i) connected to a power source; (ii) has all mechanical (hard) power switches turned on; and (iii) has been placed into a low-power mode by receiving a signal from a connected device (e.g. computer, game console, or set-top box) or by cause of an internal function such as a sleep timer or occupancy sensor. Sleep Mode is considered a "soft" low-power condition, in that the display can be brought out of Sleep Mode by receiving a signal from a connected device or by cause of an internal function.
E. Off Mode	:	The operational mode of a display that is (i) connected to a power source, (ii) engaged by a power switch, and (iii) not providing any function. The user must actuate a mechanical switch to bring the device out of Off Mode. If there is more than one such switch, the tester shall use the most readily available switch.
F. Luminance	:	The photometric measure of the luminous intensity per unit area of light travelling in a given direction. It 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/m^2).
G Automatic Brightness Control	:	For displays, automatic brightness controls is the self-acting mechanism which controls brightness of the display as a function of ambient light.

2. Qualifying products

To qualify for ENERGY STAR, the display must satisfy the following criteria:

A. Maximum viewable diagonal screen size	:	The display must have a viewable diagonal screen size of less than or equal to (≤) 60 inches.
B. Power Source	:	The display must be powered by a separate AC wall outlet, a battery unit that is sold with an AC adapter, or a data or network connection.
C. Television Tuners	:	If the display has an integrated television tuner, it may qualify for ENERGY STAR under this specification as long as it is primarily marketed and sold to consumers as a display or as a dual-function display and television. Any display with a television tuner that is marketed and sold exclusively as a television is not eligible to qualify under this specification. Under Tier 2 of this specification, only those displays without tuners may qualify; displays with tuners may qualify under Tier 2 of the Version 3.0 ENERGY STAR TV specification.
D. Automatic Brightness Control (ABC)	:	To qualify for ENERGY STAR using the Automatic Brightness Control On Mode power equation, the display must ship with ABC enabled by default.
E. External Power Supply	:	If the display is shipped with an EPS, the EPS must be ENERGY STAR qualified or meet the no-load and active mode efficiency levels provided in the ENERGY STAR Program Requirements for Single Voltage AC-AC and AC-DC External Power Supplies. The

ENERGY STAR specification and qualified product list can be found at www.energystar.gov/powersupplies.

F. Power Management Requirements : The display must have at least one mechanism enabled by default that allows the display to automatically enter Sleep or Off Mode. For instance, data or network connections must support powering down the display according to standard mechanisms, such as Display Power Management Signalling. Displays generating their own content must have a sensor or timer enabled by default to automatically engage Sleep or Off Mode.

3. **Energy-efficiency criteria**

A. *On Mode requirements*

1. Tier 1

To qualify as ENERGY STAR, the display must not exceed the maximum On Mode power consumption (PO or PO1) as calculated from the equations below. The maximum On Mode power consumption is expressed in watts and rounded to the nearest tenth of a watt.

TABLE 1

Tier 1 On Mode power consumption requirements

Display Category	**Maximum On ModePower Consumption (W)**
Diagonal Screen Size < 30 inches Screen Resolution ≤ 1,1 MP	PO = 6*(MP) + 0,05*(A) + 3
Diagonal Screen Size < 30 inches Screen Resolution > 1,1 MP	PO = 9*(MP) + 0,05*(A) + 3
Diagonal Screen Size 30 – 60 inches All Screen Resolutions	PO = 0,27*(A) + 8

Where:

MP = Display Resolution (megapixels)
A = Viewable Screen Area (square inches)

Example: The maximum On Mode power consumption for a display with 1 440 × 900 resolution, or 1 296 000 pixels, a 19-inch viewable diagonal screen size and a viewable screen area of 162 square inches, would be: ((9 × 1,296) + (0,05 × 162)) + 3 = 22,8 watts when rounded to the nearest tenth of a watt.

TABLE 2

Sample Tier 1 On Mode maximum power consumption requirements[0]

DiagonalScreen Size (inches)	**Resolution**	**Megapixels**	**Screen Dimensions(inches)**	**Screen Area (sq. in.)**	**Maximum On Mode Power Consumption(watts)**
7	800 × 480	0,384	5,9 × 3,5	21	6,4

a For displays between 30 and 60 inches, resolution must be reported when submitting a product for qualification; however, resolution is not considered when calculating the On Mode power consumption of these displays.

19	1 440 × 900	1,296	16,07 × 10,05	162	22,8
26	1 920 × 1 200	2,304	21,7 × 13,5	293	38,4
42	1 360 × 768	1,044	36 × 20	720	202,4
50	1 920 × 1 080	2,074	44 × 24	1 056	293,1

a For displays between 30 and 60 inches, resolution must be reported when submitting a product for qualification; however, resolution is not considered when calculating the On Mode power consumption of these displays.

2. Tier 2

To qualify as ENERGY STAR, the display must not exceed the following maximum On Mode consumption equations: TBD.

3. Displays with Automatic Brightness Control (ABC)

For Displays shipped with ABC features enabled by default an alternate calculation is used to calculate maximum On Mode power consumption

PO1 = (0,8 * Ph) + (0,2 * Pl)

where PO1 is the average On Mode power consumption in watts, rounded to the nearest tenth of a watt, Ph is the On Mode power consumption in high ambient lighting conditions, and Pl is the On Mode power consumption in low ambient lighting conditions. The formula assumes the display will be in low ambient lighting conditions 20 % of the time.

B. *Sleep and Off Mode requirements*

1. Tiers 1 and 2

To qualify as ENERGY STAR, the display must not exceed the maximum power consumption levels for Sleep and Off Modes provided in Table 3, below. Displays capable of multiple Sleep Modes (i.e. Sleep and Deep Sleep) must meet Sleep Mode requirements in all sleep modes.

Example: A display test result of 3 watts in Sleep and 2 watts in Deep Sleep would not qualify because power consumption in one of the Sleep Modes exceeded the 2 watt Tier 1 limit.

TABLE 3

Sleep and Off Mode power consumption requirements for all Displays

Mode	Tier 1	Tier 2
Maximum Sleep Mode power consumption (W)	≤ 2	≤ 1
Maximum Off Mode power consumption (W)	≤ 1	≤ 1

4. **Test requirements**

How to use this section

EPA and the European Commission utilise, where possible, widely accepted industry practices for measuring product performance and power consumption under typical operating conditions. The test methods in this specification are based on standards from the Video Electronics Standards Association (VESA) Display Metrology Committee and the International

Electrotechnical Commission (IEC). In cases where the VESA and IEC standards were insufficient for the needs of the ENERGY STAR program, additional testing and measurement methods were developed in cooperation with industry stakeholders.

To ensure a consistent means for measuring the power consumption of electronics products such that the test results may be reproduced, and that outside factors do not adversely affect the test results, the following protocol must be followed. It has four main components:

— Test conditions and instrumentation,
— Setup,
— Test method,
— Documentation.

Note: Test method is located in Appendices 1 and 2. Appendix 1 describes the test procedure for displays with a viewable diagonal screen size measuring less than (<) 30 inches. Appendix 2 describes the test procedure for displays with a viewable diagonal screen size measuring from 30 to 60 inches, inclusive.

Partners may elect to use an in-house or independent laboratory to provide the test results.

Facility quality control

Partners are required to perform tests and certify those product models that meet the ENERGY STAR guidelines. In order to conduct testing in support of qualification for ENERGY STAR, the product must be tested in a facility that has quality control procedures for monitoring the validity of tests and calibrations. ENERGY STAR recommends conducting these tests in a facility that follows the general requirements for the competence of testing and calibration laboratories as described in the International Standard ISO/IEC 17025.

Test conditions and instrumentation

A. *Power measurement protocols*

The average true power consumption of the display shall be measured during On Mode, Sleep Mode, and Off Mode. When performing measurements to self-certify a product model, the Unit Under Test (UUT) must initially be in the same condition (e.g. configuration and settings) as when shipped to the customer, unless adjustments need to be made pursuant to the instructions below.

1. Power measurements shall be taken from a point between the outlet or power source and the UUT.

2. If a product's electrical power comes from Mains, USB, IEEE1394, Power-over-Ethernet, telephone system, or any other means or combinations of means, the net AC electrical power consumed by the product (taking into account AC-to-DC conversion losses) must be used for qualification.

3. Products powered by a standard low voltage DC supply (e.g. USB, USB PlusPower, IEEE 1394, and Power Over Ethernet) shall utilise a suitable AC-powered source of the DC power. This AC-powered source's energy consumption shall be measured and recorded as the UUT's power consumption.

4. For a display powered by USB, a powered hub serving only the display being tested shall be used. For a display powered by Power Over Ethernet or USB PlusPower, it is acceptable to measure the power distribution device with and without the display connected, and record the difference between the two readings as the display's power consumption. The tester should confirm that this reasonably reflects the unit's DC consumption plus some allowance for power supply and distribution inefficiency.

5. Any product capable of being powered from both AC and standard low-voltage DC sources shall be tested while operating on AC power.

B. *Input AC power requirements*

Supply Voltage	North America/Taiwan	115 (± 1 %) Volts AC, 60 Hz (± 1 %)
	Europe/Australia/New Zealand	230 (± 1 %) Volts AC, 50 Hz (± 1 %)
	Japan	100 (± 1 %) Volts AC, 50 Hz (± 1 %)/60 Hz (± 1 %) *Note:* For products rated for > 1,5 kW maximum power, the voltage range is ± 4 %
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 IEC 62301 Ed 1.0: Household Electrical Appliances — Measurement of Standby Power, Sections 4.2, 4.3)		

C. *Approved meter*

Approved meters will include the following attributes[(3)]:
— an available current crest factor of 3 or more at its rated range value, and
— lower bound on the current range of 10 mA 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 US National Institute of Standards and Technology (NIST).

It is also desirable for instruments to be able to measure average power over any user-selected time interval (the most accurate devices perform an internal calculation to divide accumulated energy by elapsed time). 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[(4)].

All measurements should be recorded in watts and rounded to the nearest tenth of a watt.

E. *Darkroom conditions*

All luminance testing shall be performed in darkroom 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 centre of the display screen using a Light Measuring Device (LMD) with the display in Off Mode (Reference VESA FPDM Standard 2.0, Section 301-2F).

F. *Light measurement protocols*

When light measurements, such as illuminance and luminance, need to be made, an LMD shall be used with the display located in darkroom conditions. The LMD shall be used to take measurements at the centre of and perpendicular to the display screen (Reference VESA FPDM Standard 2.0, Appendix A115). The screen surface area to be measured shall cover at least 500 pixels, unless this exceeds the equivalent of a rectangular area with sides of length equal to 10 % of the visible screen height and width (in which case this latter limit applies). However, in no case may the illuminated area be smaller than the area the LMD is measuring (Reference VESA FPDM Standard 2.0, Section 301-2H).

Setup

A. *Peripherals*

No external devices shall be connected to Universal Serial Bus (USB) hubs or ports. Any built-in speakers, TV tuners, etc. may be placed in their minimum power configuration, as adjustable by the user, to minimise power consumption not associated with the display itself.

B. *Modifications*

Device modifications such as circuit removal, or other actions not available to a typical user, are not permitted.

C. *Analogue v Digital interface*

Partners are required to test their displays using the analogue interface, except in those cases where one is not provided (i.e. digital interface displays, which for the purposes of this test method are defined as having only a digital interface). For digital interface displays, please see footnote in Appendix 1 for voltage information, and follow the test method in Appendix 1 and/or 2, depending on the viewable diagonal screen size of the UUT, using a digital signal generator.

D. *Models capable of operating at multiple voltage/frequency combinations*

Partners shall test, qualify, and document conditions applicable to each market in which their products shall be sold as ENERGY STAR qualified.

Example: For a product to earn the ENERGY STAR label in both the United States and Europe, it must qualify at both 115 V/60 Hz and 230 V/50 Hz. If the product qualifies as ENERGY STAR at only one voltage/frequency combination (e.g. 115 V/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).

E. *External power supply*

For displays shipped with an external power supply, the supplied EPS must be used for all testing. An alternate power supply may not be substituted.

F. *Colour controls*

All colour controls (hue, saturation, gamma, etc.) shall be set to factory default settings.

G. *Resolution and refresh rate*

Resolution and refresh rate vary by technology, as follows:

1. For LCDs and other fixed pixel technologies, pixel format shall be set to the native level. LCD refresh rate shall be set to 60 Hz, unless a different refresh rate is specifically recommended by the partner, in which case that rate shall be used.

2. CRT pixel format shall be set at the preferred pixel format with the highest resolution that is intended to be driven at a 75 Hz refresh rate. A VESA Discrete Monitor Timing (DMT) or newer industry standard pixel format timing must be used for the test. The CRT display must be capable of meeting all its partner-stated quality specifications in the tested format.

H. *Warm-up*

UUT must be warmed up for a minimum of 20 minutes before any test measurements are taken (Reference VESA FPDM Standard 2.0, Section 301-2D or 305-3 for warm-up test).

I. *Stability*

All power consumption measurements shall be recorded after instrument readings are stable to within 1 % over a three-minute period (Reference IEC 4.3.1).

Test method

In performing these tests, the partner agrees to use the applicable test procedures provided in Appendices 1 and/or 2, depending on the viewable diagonal screen size of the UUT, as follows:

For displays with a viewable diagonal screen size measuring less than (<) 30 inches, use Appendix 1.

For displays with a viewable diagonal screen size measuring from 30 to 60 inches, use Appendix 2.

Documentation

A. *Submittal of qualified product data to EPA or the European Commission, as applicable*

Partners are required to self-certify those product models that meet the ENERGY STAR guidelines and report information to EPA through the Online Product Submittal tool, or to the European Commission, as applicable. ENERGY STAR qualifying product data, including information about new models, must be provided on an annual basis, or more frequently if desired by the partner.

B. *Qualifying family of products*

Families of display models that are built on the same chassis and are identical in every respect but housing and colour may be qualified through submission of test data for a single, representative model. Likewise, models that are unchanged or that differ only in finish from those sold in a previous year may remain qualified without the submission of new test data.

C. *Number of units required for testing*

Borrowing from European Norm 50301 (Reference BSI 03-2001, BS EN 50301:2001, Methods of measurement for the power consumption of audio, video, and related equipment, Annex A), EPA and the European Commission have established a test procedure where the number of units required for test depends on the test results for the first unit:

1. If the steady-state power consumption of the UUT is greater than 85 % of the ENERGY STAR qualification limit in any of the three operating modes, two additional units of the same model shall be tested.

2. The power consumption data for each of the three test units shall be reported to EPA via the Online Product Submittal tool, or to the European Commission, as applicable, along with the average On, Sleep, and Off Mode power consumption data from the three tests.

3. Testing of additional units is not required if the steady-state power consumption of the first test unit is less than or equal to 85 % of the ENERGY STAR qualification limit in all of the three operating modes.

4. None of the test values for any of the units tested may exceed the ENERGY STAR specification for the model to be ENERGY STAR qualified.

5. The following example further illustrates this approach:

   Example: For simplicity, assume the specification is 100 watts or less and only applies to one operational mode. 85 watts would represent the 15 % threshold:
   - if the first unit is measured at 80 watts, no more testing is needed and the model qualifies (80 watts is not greater than 85 % of the ENERGY STAR qualification limit),
   - if the first unit is measured at 85 watts, no more testing is needed and the model qualifies (85 watts is exactly 85 % of the ENERGY STAR qualification limit),
   - if the first unit is measured at 85,1 watts, then two more units shall be tested to determine qualification (85,1 watts is greater than 85 % of the ENERGY STAR qualification limit),
   - if three units are tested at 90, 98, and 105 watts, the model does not qualify as ENERGY STAR — even though the average is 98 watts — because one of the values (105) exceeds the ENERGY STAR specification.

5. **User interface**

Partners are strongly recommended to design products in accordance with the user interface standard IEEE P1621: Standard for user interface elements in power control of electronic devices employed in office/consumer environments. The Power Management Controls project developed this standard to make power controls more consistent and intuitive across all electronic devices. For details, see http://eetd.LBL.gov/Controls.

6. **Effective date**

The date that partners may begin to qualify products as ENERGY STAR, under the Version 5.0 specification, will be defined as the effective date of the agreement. Any previously executed agreement on the subject of ENERGY STAR qualified displays shall be terminated on 29 October 2009 for displays with a viewable diagonal screen size under 30 inches, or on 29 January 2010 for displays with a viewable diagonal screen size from 30 to 60 inches, inclusive.

A. *Qualifying products under Tier 1 of the Version 5.0 specification*

The date upon which Tier 1 of the Version 5.0 specification shall go into effect is contingent upon the size of the display, and is outlined in the table below. All products, including models originally qualified under Version 4.1, with a date of manufacture on or after that date must meet the new Version 5.0 requirements in order to qualify for ENERGY STAR (including additional shipments of models originally qualified under Version 4.1). The date of manufacture is specific

to each unit and is the date (e.g. month and year) of which a unit is considered to be completely assembled.

Display Category	Tier 1 Effective Date
Diagonal Screen Size < 30 inches	30 October 2009
Diagonal Screen Size 30 – 60 inches	30 January 2010

B. *Qualifying products under Tier 2 of the Version 5.0 specification*

The second phase of this specification, Tier 2, shall take effect on 30 October 2011, and apply to products with a date of manufacture on or after 30 October 2011. For example, a unit with a date of manufacture of 30 October 2011 must meet the Tier 2 specification in order to qualify as ENERGY STAR.

C. *Elimination of grandfathering*

EPA and the European Commission will not allow grandfathering under this Version 5.0 ENERGY STAR specification. ENERGY STAR qualification under Version 4.1 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.

7. **Future specification revisions**

EPA and the European Commission reserve the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through stakeholder discussions.

EPA and the European Commission will periodically assess the market in terms of energy efficiency and new technologies. As always, stakeholders will have an opportunity to share their data, submit proposals, and voice any concerns. EPA and the European Commission will strive to ensure that the Tier 1 and 2 specifications recognise the most energy-efficient models in the marketplace and reward those partners who have made efforts to further improve energy efficiency.

AppendixTest procedures for Displays with a viewable diagonal screen size less than (<) 30 1 inchesWHEN TO USE THIS DOCUMENT

This document describes the test procedures for displays with a viewable screen area measuring less than (<) 30 inches diagonal for the ENERGY STAR Program Requirements for Displays Version 5.0. The procedures are to be used to determine the On, Sleep, and Off Mode power consumption of the unit under test (UUT). Note this Appendix includes separate procedures for the following product types:

— CRT displays,

— fixed pixel displays without Automatic Brightness Control (ABC) enabled by default, and

— fixed pixel displays with ABC enabled by default.

1.Test method for CRT displaysA.Testing conditions, instrumentation, and setup

Before testing the UUT, ensure the proper testing conditions, instrumentation, and setup are in place as outlined in the Product test conditions and instrumentation, and Product test setup sections of the Displays specification.

B.On Mode1.

Connect the test sample to the outlet or power source and test equipment.
2.

Power on all test equipment and properly adjust power source voltage and frequency.
3.

Check for normal operation of the test unit and leave all customer adjustments set to factory default settings.
4.

Bring the test unit into On Mode either by using the remote control device or by using the ON/OFF switch on the test unit cabinet.
5.

Allow the UUT to reach operating temperature (approximately 20 minutes).
6.

Set the proper display mode (refer to Product test setup, Section G, Resolution and refresh rate).
7.

Provide darkroom conditions (refer to Product test conditions and instrumentation, Section F, Light measurement protocols, and Section E, Darkroom conditions).
8.Set size and luminance as follows:

(a) Initiate the AT01P (Alignment Target 01 Positive Mode) pattern (VESA FPDM Standard 2.0, A112-2F, AT01P) for screen size and use it to set the display to the partner's recommended image size, which is typically slightly smaller than maximum viewable screen size.

(b) Then, test pattern (VESA FPDM Standard 2.0, A112-2F, SET01K) shall be displayed that provides eight shades of grey from full black (0 volts) to full white (0,7 volts)[(5)]. Input signal levels shall conform to VESA Video Signal Standard (VSIS), Version 1.0, Rev. 2.0, December 2002.

(c) Adjust (where feasible) the display brightness control downward from its maximum until the lowest black bar luminance level is just slightly visible (VESA FPDM Standard 2.0, Section 301-3K).

(d) Display a test pattern (VESA FPDM Standard 2.0, A112-2H, L80) that provides a full white (0,7 volts) box that occupies 80 % of the image.

(e) Adjust the contrast control until the white area of the screen is set at the following luminance: 100 cd/m^2.

(f) measured according to VESA FPDM Standard 2.0, Section 302-1. (If the display's maximum luminance is less than the prescribed luminance, above, the technician shall use the maximum luminance and report the value to EPA or the European Commission, as applicable, with other required testing documentation. Similarly, if the display's minimum luminance is greater than the prescribed luminance, the technician shall use the minimum luminance and report the value to EPA or the European Commission, as applicable).

(g) The luminance value shall be reported to EPA or the European Commission, as applicable, with other required testing documentation.

9.

Once luminance is set, darkroom conditions are no longer needed.

10.

Set the power meter current range. The full-scale value selected multiplied by the crest factor rating (Ipeak/Irms) of the meter must be greater than the peak current reading from the oscilloscope.

11.

Allow the readings on the power meter to stabilise and then take the true power reading in watts from the power meter. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period (refer to Product test setup, Section I, Stability).

12.

Record power consumption and total pixel format (horizontal × vertical pixels displayed), to calculate pixels/watt.

C.Sleep Mode (Power Switch On, No Video Signal)1.

At the conclusion of the On Mode test, initiate the display's Sleep Mode. The method of adjustment shall be documented along with the sequence of events required to reach the Sleep Mode. Power on all test equipment and properly adjust operation range.

2.

Allow the display to remain in Sleep Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the unit in Sleep Mode.

3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power). If the device has different Sleep Modes that can be manually selected, the measurement should be taken with the device in the most energy consumptive of those modes. If the modes are cycled through automatically, the measurement time should be long enough to obtain a true average that includes all modes.

D.Off Mode (Power Switch Off)1.

At the conclusion of the Sleep Mode test, initiate the display's Off Mode using the power switch that is most easily accessed by the user. The method of adjustment shall be documented along with the sequence of events required to reach the Off Mode. Power on all test equipment and properly adjust operation range.

2.

Allow the display to remain in Off Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the model in Off Mode.

3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power).

E.Reporting results

Upon completion of this test procedure, please refer to the Product test documentation section of the specification for guidance on how to report your test results to EPA or the European Commission, as applicable.
2.Test method for fixed pixel displays without ABC enabled by defaultA.Testing conditions, instrumentation, and setup

Before testing the UUT, ensure the proper testing conditions, instrumentation, and setup are in place as outlined in the Product test conditions and instrumentation, and Product test setup sections of the Displays specification.
B.On Mode1.

Connect the test sample to the outlet or power source and test equipment.
2.

Power on all test equipment and properly adjust power source voltage and frequency.
3.

Check for normal operation of the test unit and leave all customer adjustments set to factory default settings.
4.

Bring the test unit into On Mode either by using the remote control device or by using the ON/OFF switch on the test unit cabinet.
5.

Allow the UUT to reach operating temperature (approximately 20 minutes).
6.

Set the proper display mode (refer to Product test setup, Section G, Resolution and refresh rate).
7.

Provide darkroom conditions (refer to Product test conditions and instrumentation, Section F, Light measurement protocols, and Section E, Darkroom conditions).
8.Set size and luminance as follows:

(a) Test pattern (VESA FPDM Standard 2.0, A112-2F, SET01K) shall be displayed that provides eight shades of grey from full black (0 volts) to full white (0,7 volts).1 Input signal levels shall conform to VESA Video Signal Standard (VSIS), Version 1.0, Rev. 2.0, December 2002.

(b) With the brightness and contrast controls at maximum, the technician shall check that, at a minimum, the white and near white grey levels can be distinguished. If white and near white grey levels cannot be distinguished, then contrast shall be adjusted until they can be distinguished.

(c) The technician shall next display a test pattern (VESA FPDM Standard 2.0, A112-2H, L80) that provides a full white (0,7 volts) box that occupies 80 % of the image.

(d) The technician shall then adjust the brightness until the white area of the screen is set at the following luminance:

Product	**Cd/m^2**

Less than or equal to 1,1 MP resolution	175
Greater than 1,1 MP resolution	200

measured according to VESA FPDM Standard 2.0, Section 302-1. (If the display's maximum luminance is less than the prescribed luminance in the table above, the technician shall use the maximum luminance and report the value to EPA or the European Commission, as applicable, with other required testing documentation. Similarly, if the display's minimum luminance is greater than the prescribed luminance, the technician shall use the minimum luminance and report the value to EPA or the European Commission, as applicable.)

(e) The luminance value shall be reported to EPA or the European Commission, as applicable, with other required testing documentation.

9.

Once luminance is set, darkroom conditions are no longer needed.

10.

Set the power meter current range. The full-scale value selected multiplied by the crest factor rating (Ipeak/Irms) of the meter must be greater than the peak current reading from the oscilloscope.

11.

Allow the readings on the power meter to stabilise and then take the true power reading in watts from the power meter. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period (refer to Product test setup, Section I, Stability).

12.

Record power consumption and total pixel format (horizontal × vertical pixels displayed), to calculate pixels/watt.

C.Sleep Mode (Power Switch On, No Video Signal)1.

At the conclusion of the On Mode test, initiate the display's Sleep Mode. The method of adjustment shall be documented along with the sequence of events required to reach the Sleep Mode. Power on all test equipment and properly adjust operation range.

2.

Allow the display to remain in Sleep Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the unit in Sleep Mode.

3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power). If the device has different Sleep Modes that can be manually selected, the measurement should be taken with the device in the most energy consumptive of those modes. If the modes are cycled through automatically, the measurement time should be long enough to obtain a true average that includes all modes.

D.Off Mode (Power Switch Off)1.

At the conclusion of the Sleep Mode test, initiate the display's Off Mode using the power switch that is most easily accessed by the user. The method of adjustment shall be documented along with the sequence of events required to reach the Off Mode. Power on all test equipment and properly adjust operation range.
2.

Allow the display to remain in Off Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the model in Off Mode.
3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power).
E.Reporting results

Upon completion of this test procedure, please refer to the Product test documentation section of the specification for guidance on how to report your test results to EPA or the European Commission, as applicable.
3.Test method for fixed pixel displays with ABC enabled by defaultA.Testing conditions, instrumentation, and setup

Before testing the UUT, ensure the proper testing conditions, instrumentation, and setup are in place as outlined in the Product test conditions and instrumentation, and Product test setup sections of the Displays specification.
B.On Mode1.

Connect the test sample to the outlet or power source and test equipment.
2.

Power on all test equipment and properly adjust power source voltage and frequency.
3.

Check for normal operation of the test unit and leave all customer adjustments set to factory default settings.
4.

Bring the test unit into On Mode either by using the remote control device or by using the ON/OFF switch on the test unit cabinet.
5.

Allow the UUT to reach operating temperature (approximately 20 minutes).
6.

Set the proper display mode (refer to Product test setup, Section G, Resolution and refresh rate).
7.

Set the power meter current range. The full-scale value selected multiplied by the crest factor rating (Ipeak/Irms) of the meter must be greater than the peak current reading from the oscilloscope.
8.The following alternate test procedure is used to calculate maximum On Mode power consumption for displays shipped with Automatic Brightness Control enabled by default. For this test procedure, high ambient lighting is to be set at 300 lux, while low ambient lighting is to be set at 0 lux, as follows:

(a) Set the ambient light level to 300 lux as measured at the face of an ambient light sensor.

(b) Allow the readings on the power meter to stabilise, and then take the high ambient lighting true power reading, Ph, in watts from the power meter. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period (refer to Product test setup, Section I, Stability).

(c) Set the ambient light level to 0 lux as measured at the face of an ambient light sensor.

(d) Allow the readings on the power meter to stabilise, and then take the low ambient lighting true power reading, Pl, in watts from the power meter.

(e) Calculate average On Mode power consumption using the equation in Section 3.A.3, Displays with Automatic Brightness Control, on page 7 of the specification.

9.

Record power consumption and total pixel format (horizontal × vertical pixels displayed), to calculate pixels/watt.
C.Sleep Mode (Power Switch On, No Video Signal)1.

At the conclusion of the On Mode test, initiate the display's Sleep Mode. The method of adjustment shall be documented along with the sequence of events required to reach the Sleep Mode. Power on all test equipment and properly adjust operation range.
2.

Allow the display to remain in Sleep Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the unit in Sleep Mode.
3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power). If the device has different Sleep Modes that can be manually selected, the measurement should be taken with the device in the most energy consumptive of those modes. If the modes are cycled through automatically, the measurement time should be long enough to obtain a true average that includes all modes.
D.Off Mode (Power Switch Off)1.

At the conclusion of the Sleep Mode test, initiate the display's Off Mode using the power switch that is most easily accessed by the user. The method of adjustment shall be documented along with the sequence of events required to reach the Off Mode. Power on all test equipment and properly adjust operation range.
2.

Allow the display to remain in Off Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the model in Off Mode.
3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power).
E.Reporting results

Upon completion of this test procedure, please refer to the Product test documentation section of the specification for guidance on how to report your test results to EPA or the European Commission, as applicable.

AppendixTest procedures for Displays with a viewable diagonal screen size from 30 to 60 inches, inclusive2 WHEN TO USE THIS DOCUMENT

This document describes the test procedures for displays with a viewable diagonal screen size from 30 to 60 inches, inclusive (large displays), for the ENERGY STAR Program Requirements for Displays Version 5.0. The procedures are to be used to determine the On, Sleep, and Off Mode power consumption of the unit under test (UUT).

TABLE 1

Test procedure for measuring operational modes

Specification Requirement	Test Protocol	Source
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

1.Testing conditions, instrumentation, and setup

Before testing the UUT, ensure the proper testing conditions, instrumentation, and setup are in place as outlined in the Product test conditions and instrumentation, and Product test setup sections of the Displays specification.
2.Measuring power in On, Sleep, and Off ModeA.On Mode (guidance on implementation of IEC 62087)

Below, guidance is provided on using IEC 62087, Ed. 2.0 for measuring large displays' On Mode power. For purposes of determining ENERGY STAR qualification of a product, the below exceptions and clarifications apply.

1. Accuracy of input signal levels: Section 11.4.12, "Accuracy of input signal levels", reminds testers that video inputs used for testing should be within ± 2 % of reference white and black levels. Section B.2 of Annex B, "Considerations for On (average) mode television set power measurements" describes the importance of input signal accuracy in further detail. EPA and the European Commission would like to emphasise the importance of using accurate/calibrated video inputs during On Mode testing and encourages testers to use HDMI inputs wherever possible.

2. True power factor: Due to increased awareness of the importance of power quality, partners shall indicate the true power factor of their displays during On Mode measurement.

3. Use of test materials for testing: To measure average On Mode power consumption, partners should measure "Po_broadcast" as described in Section 11.6.1, "On mode (average) testing with dynamic broadcast-content video signal".

4. Testing at factory default settings: In measuring the On Mode power consumption of large displays, EPA and the European Commission are interested in capturing first and foremost the power consumption of products as they are shipped from the factory. 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".

   Information relaying that the product qualifies for ENERGY STAR in a specific 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 website, where information about the model is listed.

5. Testing of displays with Automatic Brightness Control: For this test procedure, high ambient lighting is to be set at 300 lux, while low ambient lighting is to be set at 0 lux, as follows:

   (a) Set the ambient light level to 300 lux as measured at the face of an ambient light sensor.

   (b) Measure the high ambient lighting On Mode power consumption, Ph, as described in Section 11.6.1, "On mode (average) testing with dynamic broadcast-content video signal".

   (c) Set the ambient light level to 0 lux as measured at the face of an ambient light sensor.

   (d) Measure the low ambient lighting On Mode power consumption, Pl, as described in Section 11.6.1, "On mode (average) testing with dynamic broadcast-content video signal".

   (e) Calculate average On Mode power consumption using the equation in Section 3.A.3, Displays with Automatic Brightness Control, on page 7 of the specification.

B.Sleep Mode (Power Switch On, No Video Signal)1.

At the conclusion of the On Mode test, initiate the display's Sleep Mode. The method of adjustment shall be documented along with the sequence of events required to reach the Sleep Mode. Power on all test equipment and properly adjust operation range.
2.

Allow the display to remain in Sleep Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a 3-minute period. Tester shall ignore the input sync signal check cycle when metering the unit in Sleep Mode.
3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power). If the device has different Sleep Modes that can be manually selected, the measurement should be taken with the device in the most energy consumptive of those modes. If the modes are cycled through automatically, the measurement time should be long enough to obtain a true average that includes all modes.
C.Off Mode (Power Switch Off)1.

At the conclusion of the Sleep Mode test, initiate the display's Off Mode using the power switch that is most easily accessed by the user. The method of adjustment shall be documented along with the sequence of events required to reach the Off Mode. Power on all test equipment and properly adjust operation range.
2.

Allow the display to remain in Off Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1 % over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the model in Off Mode.
3.

Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e. not peak or instantaneous power).
4.

Reporting results: Upon completion of this test procedure, please refer to the Product test documentation section of the specification for guidance on how to report your test results to EPA or the European Commission, as applicable.
3.Measuring luminance

After the IEC test clip has run and the power consumption has been recorded, the technician shall measure the product's luminance using the methodology described below. Note, the technician shall not alter the product's settings from how they were set during the power consumption test.

1. Using the three bar video signal (LTL) static test image referenced in Section 11.5 of IEC 62087, measure the centre point, axial luminance of the display per the Video Electronics Standards Association (VESA) Flat Panel Display Measurements Standard (FPDM) Version 2.0, Section 301-2H.

2. Report in OPS the measured luminance value in candelas per square meter (cd/m^2), rounded to the nearest whole number.

3. All luminance measurements should be performed in accordance with the test conditions outlined above for large displays. Specifically, measuring the

luminance must be conducted with the display's settings as they are shipped from the factory. For products with a forced menu, measurements shall be conducted in standard, or home mode.

(**1**) OJ L 381, 28.12.2006, p. 24.

(**2**) OJ L 39, 13.2.2008, p. 1.

(**3**) Characteristics of approved meters taken from IEC 62301 Ed 1.0: Household electrical appliances — Measurement of standby power.

(**4**) Ibid.

(**5**) Corresponding voltage values for digital only interface displays that correspond to the brightness of the image (0 to 0,7 volts) are: 0 volts (black) = a setting of 0, 0,1 volts (darkest shade of grey analogue) = 36 digital grey, 0,7 volts (full white analogue) = 255 digital grey; please note that future digital interface specifications may widen this range, but in all cases, 0 volts shall correspond to black and the maximum value shall correspond to white, with 0,1 volts corresponding to one-seventh of the maximum value.

Changes to legislation:
There are currently no known outstanding effects for the Commission Decision of 26 October 2009 determining the Community position for a decision of the management entities under the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment on the revision of the computer monitor specifications in Annex C, part II, to the Agreement (Text with EEA relevance) (2009/789/EC).