Material 5-II

Final Report by TV sets and Video Cassette Recorders Evaluation Standard Subcommittee, Energy Efficiency Standards Subcommittee of Advisory Committee for Natural Resources and Energy

The TV sets and Video Casset Recorders (VCR) Evaluation Standard Subcommittee had deliberations on judgment standards for the manufacturers and importers (hereafter referred to as "manufacturers ") concerning improvement in performance of TV sets and Video Casset Recorders, and has made its final report as below.

I. TV sets

1. Evaluation of Current Standard

The weighted average of energy consumption efficiency by shipment number of TV sets (having cathode-ray-tube) whose target fiscal year was 2003 appeared 104kWh/year (for products shipped in the fiscal year 2003). It is a 25.7% improvement from 140kWh/year (for products shipped in the fiscal year 1997), which is the weighted average of energy consumption efficiency by shipment number before the introduction of the Top Runner Standard. This shows more improvement than the initially expected energy consumption efficiency in the case of completion of the Top Runner Standard (117kWh/year) and improvement rate (16.4%).

From the above, as a result of efforts for energy-saving by manufactures, it is evaluated that the energy-saving in TV sets has been progressed, and the current standard based on the concept of the Top Runner Program functions effectively.

2. Target Scope [See Attachment 1]

The Target scope shall include TV sets (limited to those having direct view tube type cathode-ray-tube or liquid crystal panel using direct view type fluorescence-tube backlight or plasmadisplay panel (hereafter referred to respectively as "cathode-ray-tube TV", "liquid crystal TV", and "plasma TV")) to be used by alternating-current (AC) electricity (rated frequency 50Hz or 60Hz, rated voltage 100V).

However, ones for industrial use, ones of specifications for tourists, ones for cathode-ray-tube multi-scan supported types with horizontal frequency exceeding 33.8kHz, rear projection types, ones of TV set size[1] of below size 10 or size 10V, wireless types, and plasma TVs whose number of vertical pixels exceeds 1080 shall be excluded.

[1] In this report, the receiver type size in cathode ray tube TV means the numeric value expressing the cathode-ray frame dimensions in centimeters divided by 2.54 and rounded off to the decimal point (hereafter described as "○○ type"). And, in liquid crystal TV and plasma TV, it means the numeric value expressing the driving display area's diagonal dimension in centimeters divided by 2.54 and rounded off to the decimal point (hereafter described as "○○V type").

3. Items to be Judgment Standards for Manufacturers

(1) Target fiscal year [See Attachment 2]

It shall be the fiscal year 2008. However, with regard to cathode-ray-tube TV, it shall be the same as the current one (fiscal year 2003 and each year after).

(2) Target standard value [See Attachments 3 ~ 4]

With regard to TV sets to be shipped within Japan for the target fiscal year, the weighted average of the energy consumption efficiency calculated in (3) by the number of shipment units for each manufacturer per category in the table below shall not exceed the target standard value.

Cathode-ray-tube TV (20 categories)

Category	Scanning Method	Aspect Ratio	Deflection Angle	Cathode-ray-tube Shape	Function	Calculation Equation for Target Standard Value
1	Normal scanning type	4:3	100 degrees or below	Other than flat type	Other than the below	E=2.5S+32
2					With built-in VCR (or DVD, digital versatile discs)	E=2.5S+60
3				Flat type	Other than the below	E=2.5S+42
4					With built-in VCR (or DVD)	E=2.5S+70
5			Over 100 degrees	Other than flat type	Other than the below	E=5.1S-4
6					With built- in VCR (or DVD)	E=5.1S+24
7				Flat type	Other than the below	E=5.1S+21
8					With built-in VCR (or DVD)	E=5.1S+49
9		16:9 (Wide)		Other than flat type	With no built-in VCR (or DVD) and no additive function	E=5.1S-11
10					With built-in VCR (or DVD)	E=5.1S+17
11					With no built-in VCR (or DVD) and with 1 additive function	E=5.1S+6
12					With no built-in VCR (or DVD) and with 2 additive functions	E=5.1S+13
13					With no built-in VCR (or DVD) and with 3 additive functions	E=5.1S+59

14				Flat type	With no built-in VCR (or DVD) and no additive function	E=5.1S-1
15					With built-in VCR (or DVD	E=5.1S+27
16					With no built-in VCR (or DVD) and with 1 additive function	E=5.1S+16
17					With no built-in VCR (or DVD) and with 2 additive functions	E=5.1S+23
18					With no built-in VCR (or DVD) and with 3 additive functions	E=5.1S+69
19	Double speed scanning type				Analog high-vision TV	E=5.5S+72
20					Other than analog high-vision TV	E=5.5S+41

Remarks

1 "VCR" means video casset recorder, and "DVD" means digital versatile disk.

2 "TV set size" means the numeric value expressing the cathode-ray frame dimensions in centimeters divided by 2.54 and rounded off to the decimal point

3 "Flat type" means one whose percentage of the maximum gap value between the center and the peripheral portion on cathode-ray-tube surface to the diagonal dimensions of cathode-ray-tube is 0.5% or below (provided that the measurement position of the peripheral portion and the diagonal dimension should be within the effective area plus 5mm.).

4 "Analog high-vision TV" means one which is a cathode-ray-tube TV with 1125 scanning lines and a screen of 16:9 aspect ratio, and also has a MUSE decoder and satellite broadcasting receiving function.

5 "Additive function" means 2-tuner&2-screen function, text broadcasting receiving function, and MUSE-NTSC converter.

6 "E" and "S" represent the following numeric values.

E : standard energy consumption efficiency (kWh per year)

S : TV set size

Liquid crystal TV (38 categories)

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Equation for Target Standard Value
21	4.3	Vertical pixel count being below	Under 15V type	Other than the below	Other than the blow	E=44
22					With 1 additive function	E=58

23		650			With 2 additive functions	E=72
24				With DVD play function only	Other than the blow	E=58
25					Having HDD	E=72
26			15V type or higher	Other than the below	Other than the blow	E=5.9S-45
27					With 1 additive function	E=5.9S-31
28					With 2 additive functions	E=5.9S-16
29				With DVD play function only	Other than the blow	E=5.9S-31
30					Having HDD	E=5.9S-16
31		Vertical pixel count being 650 or higher	Under 15V type	Other than the below	Other than the blow	E=49
32					With 1 additive function	E=64
33					With 2 additive functions	E=78
34				With DVD play function only	Other than the blow	E=59
35					Having HDD	E=73
36			15V type or higher	Other than the below	Other than the blow	E=5.4S-32
37					With 1 additive function	E=5.4S-17
38					With 2 additive functions	E=5.4S-3
39				With DVD play function only	Other than the blow	E=5.4S-22
40					Having HDD	E=5.4S-8
41	16:9 (Wide)	Vertical pixel count being below 650			Receiving analog broadcasting only, and also other than the below	E=8.1S-86
42					With 1 additive function	E=8.1S-72
43					With 2 additive functions	E=8.1S-58
44					Capable of receiving digital broadcasting, and also other than the below	E=7.5S-45
45					With 1 additive function	E=7.5S-31
46					With 2 additive functions	E=7.5S-17
47					With 3 additive functions	E=7.5S-3
48		Vertical pixel count being 650 or higher and below 1080			Receiving analog broadcasting only, and also other than the below	E=8.1S-66
49					With 1 additive function	E=8.1S-52
50					With 2 additive functions	E=8.1S-38
51					Capable of receiving digital broadcasting, and also other than the below	E=7.5S-40
52					With 1 additive function	E=7.5S-25

53				With 2 additive functions	E=7.5S-11
54				With 3 additive functions	E=7.5S+3
55		Vertical pixel count being 1080 or higher		Other than the blow	E=8.9S-55
56				With 1 additive function	E=8.9S-41
57				With 2 additive functions	E=8.9S-26
58				With 3 additive functions	E=8.9S-12

Remarks

1 "TV set size" means the numeric value expressing the driving display area's diagonal dimension in centimeters divided by 2.54 and rounded off to the decimal point.

2 "Additive function" means DVD (limited to one having recording function), hard disk, and double digital tuner.

3 "E" and "S" represent the following numeric values.

E : standard energy consumption efficiency (kWh per year)

S : TV set size

Plasma TV (8 categories)

Categtory	TV Set Size	Additive Function	Calculation Equation for Target Standard Value
59	Below 43V type	Other than the blow	E=7.9S+30
60		With 1 additive function	E=7.9S+44
61		With 2 additive functions	E=7.9S+58
62		With 3 additive functions	E=7.9S+73
63	43V type or higher	Other than the blow	E=15.9S-314
64		With 1 additive function	E=15.9S-300
65		With 2 additive functions	E=15.9S-286
66		With 3 additive functions	E=15.9S-272

Remarks

1 "TV set size" means the numeric value expressing the driving display area's diagonal dimension in centimeters divided by 2.54 and rounded off to the decimal point.

2 "Additive function" means DVD (limited to one having recording function), hard disk, and double digital tuner.

3 "E" and "S" represent the following numeric values.

E : standard energy consumption efficiency (kWh per year)

S : TV set size

(3) Energy consumption efficiency measurement method [See Attachment 5]

The energy consumption efficiency shall be the numeric value [kWh/year] calculated by the following equation.

$$E = \{ (P_O - P_A / 4) \times t1 + P_S \times t2 \} / 1000$$

In this equation, E, P_O, P_S, P_A, t1, t2 shall represent the following numeric values.

E : annual energy consumption (kWh/year)

P_O : operational power (W)

P_S : standby power (W)

P_A : reduced power consumption by energy-saving functions (W)

t1 : annual standard operating time (h) 1642.5 (365 days × 4.5 hours)

t2 : annual standard standby time (h) 7117.5 (365 days × 19.5 hours)

(4) Displays items and others

Items to be displayed shall follow the provisions in the Household Goods Labeling Law. The items concerning energy-saving shall be as follows.

(a) Display items

○ Cathode-ray-tube TV

Display items shall be as specified in the current regulations.

○ Liquid crystal TV, plasma TV

a) category

b) TV set size

c) energy consumption efficiency (annual energy consumption)

d) manufacturer's name

*Regarding the display of "category" and "TV set size" in the above, revision of the Electric Machinery and Appliance Quality Labeling Legislation is required.

(b) Compliance Itmes

○ Cathode-ray-tube TV

Display items shall be as specified in the current regulations.

○ Liquid crystal TV, plasma TV

a) The energy consumption efficiency shall be indicated by integers in kWh/year. In this case, the energy consumption efficiency shall be 105% or below of the displayed value.

b) At consumers' selection, the display items shown in (a) shall be clearly displayed in prominent position of catalogs and instruction manuals which describe the products' performance. In this case, the item shown in c) of (a) shall be displayed in prominent fashion, such as underlined, in

large size font, or color-changed.

4. Proposals for energy-saving

(1) Actions of manufacturers

(a) Technical development for energy-saving of TV sets shall be promoted, and the products of excellent energy consumption efficiency shall be developed.

(b) Aiming at the spread of TV sets with excellent energy consumption efficiency, "energy-saving label" according to JIS C9901 shall be swiftly introduced to catalogs or so of newly targeted products, and appropriate information shall be provided for users to select TV sets with excellent energy consumption efficiency.

(2) Actions of retailers

Sales of TV sets with excellent energy consumption efficiency shall be promoted, and by use of "energy-saving label", appropriate information shall be provided for users to select TV sets with excellent energy consumption efficiency. Also, in using the energy-saving label, it shall be displayed clearly so that users can find it easily without misconception.

(3) Actions of users

Efforts shall be made to select TV sets with excellent energy consumption efficiency, and in using TV sets, energy-saving setting shall be used positively.

(4) Actions of Government

(a) Aiming at the spread of TV sets with excellent energy consumption efficiency, efforts shall be made to take necessary measures such as spread and enlightenment activities, so as to promote actions of users and manufacturers.

(b) Implementation of the display items by manufacturers shall be checked periodically and continuously, and appropriate law management shall be made so as for correct and easy-to-understand information about energy consumption efficiency to be provided to users.

(c) The energy-saving standard based on the Top Runner Program is a very effective method for energy-saving of products; therefore, effort should be made to spread it internationally by catching appropriate opportunities.

5. Future Addition of Target Scope

Toward the countrywide development of terrestrial digital broadcasting in 2006, in liquid crystal TV and plasma TV, those with many numbers of pixels will become the mainstream from the viewpoint of both high picture quality and large screen.

In consideration of the above trend, there is a high possibility that those "plasma TVs whose vertical pixel count being 1080 or higher", which are excluded from the current target, will be guradually shipped after 2005.

Therefore, judging from the shipment condition, when the sufficient number of the products is put in the market, evaluation of them shall be started to add them to the target scope in a new standard.

II. Video Casset Recorders

1. Evaluation of Current Standard

The weighted average of energy consumption efficiency of Video Casset Recorders (hereafter, VCR) whose target fiscal year was 2003 appeared 1.20 W (for products shipped in the fiscal year 2003). It is a 73.6% improvement from the weighted average of energy consumption efficiency (4.55 W) before the introduction of the Top Runner Standard (for products shipped in the fiscal year 1997). This shows more improvement than the initially expected energy consumption efficiency in the case of completion of the Top Runner Standard (1.88 W) and improvement rate (58.7%).

From the above, as a result of efforts for energy-saving by manufactures, it is evaluated that the energy-saving in VCR has been progressed, and the current standard based on the concept of the Top Runner Program functions effectively.

2. Target Scope [See Attachment 6]

The target scope shall include VCR or digital versatile disk recorder (hereafter referred to as "DVD recorder"), to be used by AC electricity (rated frequency 50Hz or 60Hz, rated voltage 100V).

However, ones for industrial use, VCR with buit-in high-vision decoder, DVD recorder (limited to ones without hard disk (hereafter referred to as "HDD") and VCR), ones added with game function or server function, and ones having digital tuner shall be excluded.

3. Items to be Standards of Judgment for Manufacturers

(1) Target fiscal year [See Attachment 7]

It shall be the fiscal year 2008. However, with regard to VCRs, it shall be the same as the current one (fiscal year 2003 and each year after).

(2) Target standard value [See Attachments 8 ~ 9]

With regard to VCRs and DVD recorders that the manufacturers ship within Japan for the target fiscal year, the weighted average of energy consumption efficiency calculated in (3) by the number of shipment units for each company per category in the table below shall not exceed the target standard value.

(a) VCR (4 categories)

Category	Target Standard Value
1 With signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiveing functions	2.5
2 With signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions	2.0
3 Without signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions	2.2
4 Without signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions	1.7

(b) DVD recorder (16 categories)

Category	Attached Recording Device	Tuner and Signal Conversion Function	Additional Terminal	Calculation Equation for Target Standard Value
A	Having HDD only	Basic specification	Without digital network terminal	E=0.02C+45
B			With digital network terminal	E=0.02C+49
C		Having multiple tuners	Without digital network terminal	E=0.02C+55
D			With digital network terminal	E=0.02C+60
E		Having multiple MPEG encoders	Without digital network terminal	E=0.02C+63
F			With digital network terminal	E=0.02C+68
G	Having VCR only	Basic specification	Without digital network terminal	E=39
H			With digital network terminal	E=44
I		Having multiple tuners	Without digital network terminal	E=39
J			With digital network terminal	E=54

K	Having both HDD and VCR	Basic specification	Without digital network terminal	E=0.02C+58
L			With digital network terminal	E=0.02C+63
M		Having multiple tuners	Without digital network terminal	E=0.02C+68
N			With digital network terminal	E=0.02C+73
O		Having multiple MPEG encoders	Without digital network terminal	E=0.02C+76
P			With digital network terminal	E=0.02C+81

Remarks

1 "Digital network terminal" means iLink, USB, LAN, and HDMI.

2 "E" and "C" represent the following numeric values.

E : standard energy consumption efficiency (kWh per year)

C : hard disk memory capacity (gigabyte)

(3) Energy consumption efficiency measurement method [See Attachment 10]

○ Video cassette recorder

The method for measuring energy consumption efficiency and the measurement conditions shall follow the current regulations.

○ DVD recorder

The energy consumption efficiency shall be the value (kWh/year) calculated by the following equation.

i) Ones having HDD only, as well as ones having both HDD and VCR

$$E = [\{ P_{don} - (P_{don} - P_{doff}) \times 0.2 \} \times (t1 - t_{epg}) + P_{hrec} \times t2 + P_{hpl} \times t3 + P_{dvd} \times t4 + P_{epg} \times t_{epg}] / 1000$$

wherein,

E : annual energy consumption (kWh/year)

P_{don} : standby power during display state (W)

P_{doff} : standby power during non-display state (W)

P_{hrec} : operational power when HDD recording (W)

P_{hpl} : operational power when HDD playing (W)

P_{dvd} : operational power of DVD (W)

P_{epg} : power consumption at EPG (electronic program guide) acquisition (W)

t1 : annual standard standby time (h) 7482.5 (20.5h x 365 days)

t2 : annual standard HDD recording time (h) 730 (2.0h x 365 days)

t3 : annual standard HDD playing time (h) 365 (1.0h x 365 days)

t4 : annual standard DVD operating time (h) 182.5 (0.5h x 365 days)

t_{epg} : annual standard EPG acquiring time (h) *varies depending on devices.

ii) Ones having only VCR

$$E = [\{ P_{don} - (P_{don} - P_{doff}) \times 0.2 \} \times (t1 - t_{epg}) + P_{dvd} \times t2 + P_{vcr} \times t3 + P_{epg} \times t_{epg}] / 1000$$

wherein,

E : annual energy consumption (kWh/year)

P_{don} : standby power during display state (W)

P_{doff} : standby power during non-display state (W)

P_{dplvd} : operational power of DVD (W)

P_{vcr} : operational power of VCR (W)

P_{epg} : power consumption at EPG (electronic program guide) acquisition (W)

t1 : annual standard standby time (h) 7665 (21.0h x 365 days)

t2 : annual standard DVD operation time (h) 730 (2.0h x 365 days)

t3 : annual standard VCR operation time (h) 365 (1.0h x 365 days)

t_{epg} : annual standard EPG acquiring time (h) * variable among devices

(4) Display items and others

(a) Display items

○ Video casset recorders

Display items and others shall follow the current regulations.

○ DVD recorders

Display items shall be as follows.

a) name and type

b) category

c) HDD memory capacity (limited to one having HDD)

d) energy consumption efficiency (annual energy consumption)

e) manufacturer's name

(b) Compliance items

○ Video casset recorder

Compliance items shall follow the current regulations.

○ DVD recorder

a) The energy consumption efficiency shall be indicated by 3 significant figures in kWh/year. In this case, the energy consumption efficiency shall be 105% or below of the displayed value.

b) At consumers' selection, the display items shown in (a) shall be clearly displayed in prominent position of catalogs and instruction manuals which describe the products' performance. In this case, the item shown in d) of (a) shall be displayed in prominent fashion, such as underlined, in large size font, or color change.

4. Proposals for energy-saving

(1) Actions of manufacturers

(a) Technical development for energy-saving of Video Casset Recorders shall be promoted, and the products of excellent energy consumption efficiency shall be developed.

(b) Aiming at the spread of Video Cassette Recorders and DVD recorders with excellent energy consumption efficiency, "energy-saving label" according to JIS C9901 shall be swiftly introduced to catalogs or so of newly targeted products, and appropriate information shall be provided for users to select Video Cassette Recorders and DVD recorders with excellent energy consumption efficiency. Also, in using the energy-saving label, it shall be displayed clearly so that users can find it easily without misconception.

(2) Actions of retailers

Sales of TV sets with excellent energy consumption efficiency shall be promoted, and by use of "energy-saving label", appropriate information shall be provided for users to select TV sets with excellent energy consumption efficiency. Also, in using the energy-saving label, it shall be displayed clearly so that users can find it easily without misconception.

(3) Actions of users

Efforts shall be made to select Video Casset Recorders and DVD recorders with excellent energy consumption efficiency. In using Video Casset Recorders and DVD recorders, energy-saving effort, such as turning off the main power, shall also be made.

(4) Actions of Government

(a) Aiming at the spread of Video Casset Recorders and DVD recorders with excellent energy consumption efficiency, efforts shall be made to take necessary measures such as spread and enlightenment activities, so as to

promote actions of users and manufacturers.

(b) Implementation of the display items by manufacturers shall be checked periodically and continuously, and appropriate law management shall be made so as for correct and easy-to-understand information concerning energy consumption efficiency to be provided to users.

(c) The energy-saving standard based on the Top Runner Program is a very effective method for energy-saving of products; therefore, effort should be made to spread it internationally by catching appropriate opportunities.

5. Future Addition of target scope

Toward the countrywide development of terrestrial digital broadcasting in 2006, it can be expected that, in DVD recorders, those with digital tuners will become the mainstream.

In consideration of the above trend, there is a high possibility that those "with digital tuners" that have been out of the current target will rapidly increase the shipment number after 2005.

Therefore, judging from the shipment condition, when the sufficient number of the products is put in the market, evaluation of them shall be started in 2005 to add them to the target scope.

Attachment 1

Target Scope of TV Sets

The criteria shall apply to TV sets (limited to those having direct view tube type cathode-ray-tube or liquid crystal panel using direct view type fluorescence-tube backlight or plasmadispaly panel) that are utilized for AC electricity (rated frequency 50 or 60 Hz, rated voltage 100V). However, the following shall be excluded from the scope.

1. TV Sets for Industrial Use

   The equipment for broadcasting stations and those that are used for industrial purposes and have special specifications shall be excluded from the scope, because of their limited specifications and small shipment volume.

2. TV Sets with Extremely Low Market Share
   - TV sets for tourists (Volume of shipments in 2003: 1,015 sets)
   - Cathode-ray tube TV sets of multi-scan supported types whose horizontal frequency exceeds 33.8 kHz (Volume of shipments in 2003: 4,397 sets)
   - TV sets of rear projection types (Volume of shipments in 2003: 6,171 sets)
   - TV sets whose size is type 10, type 10V or lower (Volume of Shipments in 2003: 21,105 sets)
   - TV sets of wireless types (Volume of shipments in 2003: 31,119 sets)
   - Plasma televisions having the vertical pixel count being 1080 or higher (Volume of shipments in 2003: 0 set)

Consumer needs have not yet been defined for the equipment listed above that, in general, have a few models or even no model commercially available in the market. Depending on future developments, however, we shall conduct a necessary review when it is considered appropriate to include them in the scope.

Note 1: Monitors sold by theirselves only shall be included in the target, only if they are capable of TV reception by being combined with a tuner of the same manufacturer.

Note 2: Display monitors for a personal computer and having the capability of TV reception shall be excluded from the target.

Attachment 2

Target Fiscal Year and Others for TV Sets

1. In general, a considerable improvement in energy consumption efficiency of TV sets is made when a model change takes place, and a typical development period of these new products is approximately 2 years. For this reason, consideration should be given so that the manufacturers can take at least two opportunities of bringing out new models before the next target fiscal year.

On the other hand, in light of measures against global warning, in order to ensure that products that achieved the target standard value become widely used among consumers during the first commitment period of Kyoto Protocol (2008 to 2012), it would be desirable to achieve the target in as short time as possible, assuming that the tenure of use of TV sets would be approximately 10 years.

With the above in mind, the target fiscal year of liquid crystal display televisions (LCD TV) and plasma televisions, which are newly added to the target scope, shall be set to 2008; that is three years after establishment of the criteria.

In addition, the target fiscal year for cathode-ray tube televisions that have already been covered in the target scope shall be the same as at present (fiscal year 2003 and each year after).

2. In addition, the improvement rate of energy consumption efficiency by the target fiscal year (excluding cathode-ray tube televisions) is expected to be approximately 15.3% based on the assumption that there will be no change from the current volume of shipment or compositions in each category (the resut in 2004 and prospect partially included).

<Overview of Estimation (only for LCD and plasma televisions)>

(1) Energy consumption efficiency estimated from the actual achievement values of TV sets shipped in 2004: 142.3 kWh/year

(2) Energy consumption efficiency estimated from the target standard values of TV sets to be shipped in the target fiscal year: 120.5 kWh/year

(3) Improvement ratio of energy consumption efficiency

$$\frac{(142.3 - 120.5)}{142.3} \times 100 = \text{Approximately } 15.3\%$$

Attachment 3

Classification of TV Sets

I. Basic Idea

Among TV Sets, cathode-ray tube televisions were designated as specified equipment for the Top Runner Standard in 1999. However, since then, with the rise of new types of televisions such as liquid crystal display televisions (LCD TVs) or plasma televisions that have different display devices, the shipment number of the cathode-ray tube televisions has dramatically dropped.

In consideration of the fact that the market of cathode-ray tube type TVs has shrunk as described above and that digitalization is progressing, ones with the built-in digital broadcasting recepter or with the built-in DVD are expected to increase.

This is because we shall make some modifications concerning addition of new devices, while maintaining the present classification as a basis.

Because, due to differences in display devices they use, LCD and plasma televisions have a substantial impact on energy consumption efficiency (i.e., annual energy consumption, the same hereinafter) and technologies to be introduced in the future, those televisions shall be classified accordingly. In addition, as an aspect ratio (fineness ratio), pixel count, form of broadcasting that can be received, and availability of additive functions, etc., influence the energy consumption efficiency, the classification shall be made according to them also.

II. Specific Classification Method

TV Sets can be roughly divided into (1) cathode-ray tube televisions, (2) LCD (liquid crystal televisions), and (3) plasma televisions, according to display devices. Since not only differences in the display devices have a broader impact on the energy consumption efficiency, but also substances of development of energy saving technologies in the future will differ among them, it would be reasonable to classify television sets based on the type of display devices (See Figure 1).

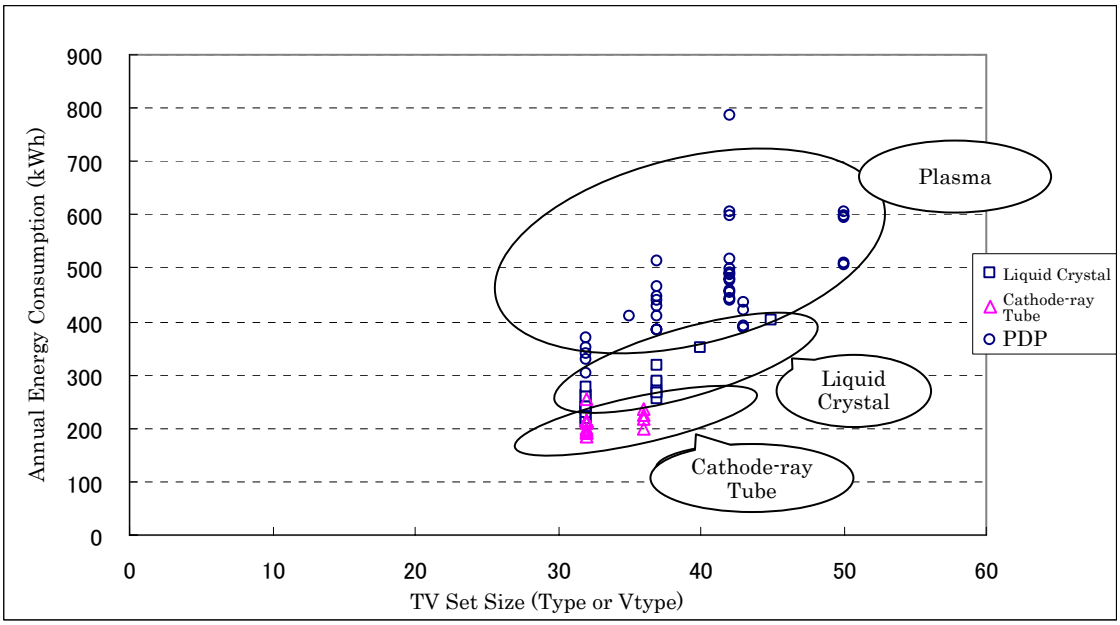


Figure 1: Relationship of Display Devices and Annual Energy Consumption (Example of TV Set Size 32 to 50)

Proposal for Classification:

(1) TV sets with cathode-ray tube (cathode-ray tube televisions)

(2) TV sets with liquid crystal panel (LCD televisions)

(3) TV sets with plasma display panel (plasma televisions)

1. Cathode-ray Tube Televisions

As discussed earlier, we shall make some modifications to the classification of the current regulation for the cathode-ray tube TVs based on changes in composition ratio of shipments and addition of a new target, etc. To be specific, with declining volume of shipments of the cathode-ray tube TVs, the product structure is shifting towards television sets with built-in digital broadcasting reception. Hence, although we basically maintain the present classification (in other words, television sets that can support digital broadcasting shall also be included in the category of TV sets supporting analog broadcasting under the present classification), we have clearly separated the category of high-vision TVs that are supposed to receive analog broadcasting according to their definition, so as to avoid confusing them with the television sets that support digital broadcasting reception. In addition, taking into consideration that the number of those with built-in DVD is rising, we shall change what is specified as "VCR" under the present classification to "VCR (or DVD)" (See III).

2. Liquid Crystal Display (LCD) Televisions

(1) Classification by Aspect Ratio (Fineness Ratio)

Similar to cathode-ray tube televisions, there are two types of LCD televisions: those with the aspect ratio of 4:3 and those with the aspect ratio of 16:9 (wide screen TVs). Their screen areas differ even in the same screen size, thus they fluence energy consumption efficiency. Therefore, we shall classify them as follows.

Proposal for Classification:

(1) LCD TVs with the aspect ratio of 4:3
(2) LCD TVs with the aspect ratio of 16:9

(2) Classification by Pixel Count

The pixel count should be increased to balance better picture quality and larger screen size in LCD televisions. Thus, even before the full-scale operation of digital broadcasting, TV sets with the higher pixel count are gradually becoming the mainstream. Typical panels by the pixel count are as follows.

-Panels with the vertical pixel count being less than 650
... Equivalent of VGA (Video Graphics Array)

-Panels with the vertical pixel count being 650 or more but less than 1080
... Equivalent of XGA (Extended Graphics Array)

-Panels with the vertical pixel count being 1080 or more
… Equivalent of FULL-HD (FULL-High Definition)

As such differences in the pixel count have an effect on luminance of the screen, brightness of backlights, and the energy consumption efficiency, we shall classify according to it (See Figure 2).

Note that as there is no TV sets with aspect ratio of 4:3 that use liquid crystal panels equivalent to FULL-HD, and as no future shipment of them is expected, classification by being equivalent of FULL-HD will not be made.

Proposal for Classification

(1) Panels with the vertical pixel count being less than 650.
(2) Panels with the vertical pixel count being 650 or more but less than 1080.
(3) Panels with the vertical pixel count being 1080 or greater.

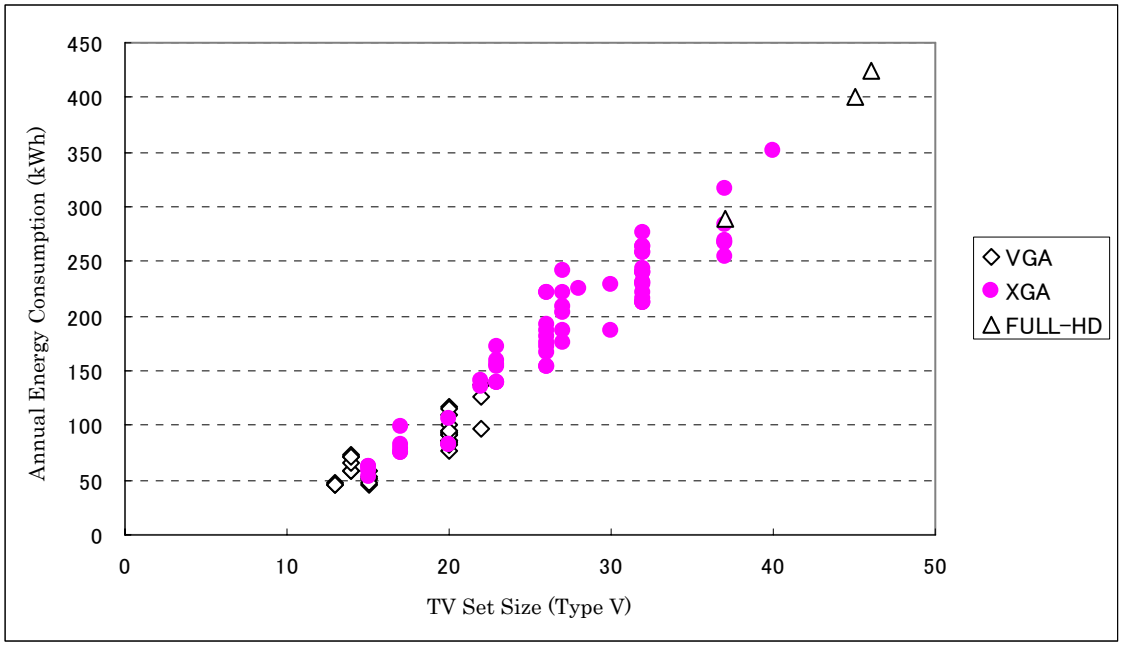


Figure 2: Relationship of Pixel Count and Annual Energy Consumption (LCD TV)

(3) Classification by Receivable Form of Broadcasting

Prior to full-scale operation of terrestrial digital broadcasting from 2006, TV sets that can receive only analog broadcasting and those that can receive both digital and analog broadcasting are mixed in the current market. Compared with the analog broadcast receivers, the digital broadcast receivers have a number of functions that the conventional analog broadcasting receivers do not have, such as data broadcasting, bidirectional functions, conditional access system (scramble broadcast), etc., as well as digital video/audio processing, which considerably increase a scale of the circuits (to be specific, an error correction circuit, MPEG decoder circuit, descrambler circuit, etc.). Since a difference in the circuit scale has an impact on the energy consumption efficiency or future technological development, we shall classify them by the receivable form of broadcasting (See Figure 3).

In addition, for LCD televisions with the aspect ratio of 4:3, even with the spread of digital broadcasting (to be broadcasted at 16:9) in the future, the models that can only support analog broadcasting are expected to be the mainstream. Thus, we shall not classify them by the form of broadcasting.

Among LCD televisions with the aspect ratio of 16:9, for those having the vertical pixel count of 1080 or greater, at present, there is only one model available which supports analog broadcasting only, and the number of the similar models is

not expected to grow in the future. Thus, we shall not classify them by the form of broadcasting.

Proposal for Classification

(1) LCD televisions that receives analog broadcasting only.

(2) LCD televisions that can receive digital broadcasting.

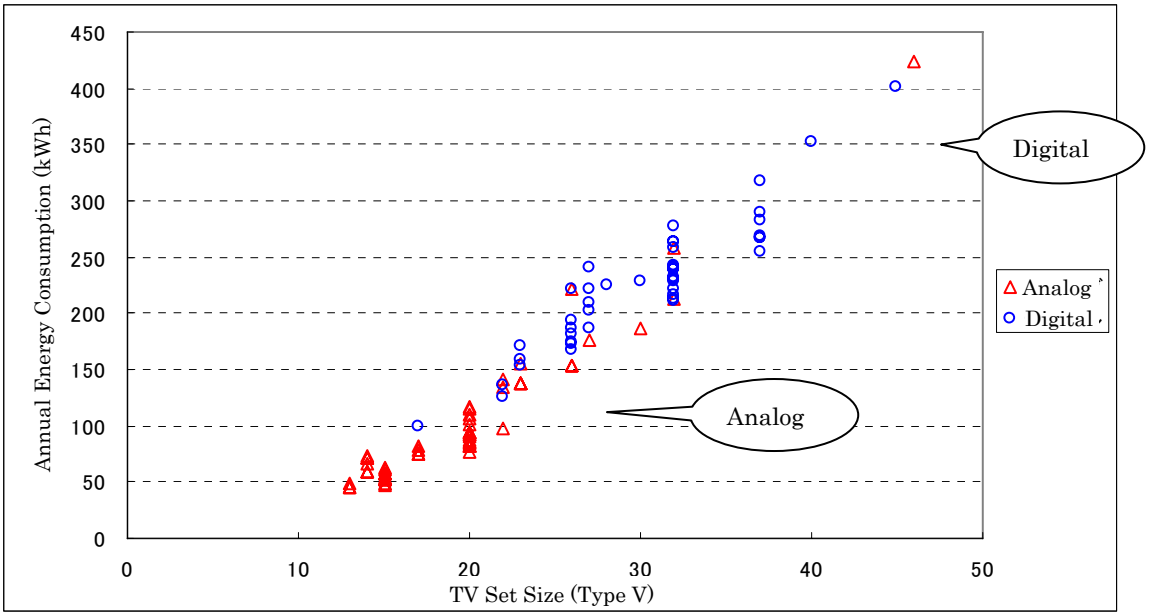


Figure 3: Relationship of Annual Energy Consumption by Analog Type and by Digital Type (LCD TVs)

(4) Classification by Availability of DVD Play Function

Many of the LCD televisions with 4:3 have a small TV size, and they are often equipped with DVD for play only as an additive function. For their case, it is believed that energy consumed by DVD play function accounts for a relatively large share of the annual energy consumption; thus, it would be difficult to compensate possible increase of the annual energy consumption attributed to the increase of additive functions by technological advancement in the future. Hence, we shall classify those TV sets by availability of DVD play function only. Note that we shall sort out DVD record function as an "additive function" (to be discussed later).

Proposal for Classification

(1) LCD TVs with DVD play function only

(2) LCD TVs other than ones with DVD play function only

(5) Classification by Additive Function

LCD TVs are equipped with various additive functions. When they are built into the LCD TVs, they influence the energy consumption efficiency. If we classify those televisions ignoring these additive functions, as a result, it is likely that ones with additive functions may no longer be produced, and then it might unduly interfere with various needs in the market. For this reason, the classification shall consider major additive functions. In light of the current product structure, we shall only address the following major additive functions: (1) "Digital Versatile Disk (DVD) (limited to those capable of recording)", (2) "Hard Disk (HDD)", and (3) "Double Digital Tuner". We shall not include functions other than the above in the classification, while expecting their technological advances in the future.

In addition, for LCD TVs with the aspect ratio of 4:3 that is capable of DVD play only, although they otherwise need to be classified by these additive functions, we shall classify them only by availability of HDD, because LCD TVs with built-in DVD capable of recording do not exist, and also because they support analog broadcasting (as stated in (3) above).

Proposal for Classification

(1) LCD TVs other than those listed below
(2) LCD TVs with one additive function
(3) LCD TVs with two additive functions
(4) LCD TVs with three additive functions (as this classification is limited to those with double digital tuner, it shall be only set for those that can receive digital broadcasting)

*)The additive functions herein refer to 3 functions, "DVD (limited to those capable of recording)", "HDD", and "double digital tuner (there should be more than one identical digital broadcast receiving tuners)".

(6) Classification by TV Set Size

For LCD TVs, because of their structure, those with a smaller TV set size have a smaller backlight fluorescent lamp. Thus, it not only degrades efficiency, but also deteriorates the aperture rate (transmissivity) resulting in lower

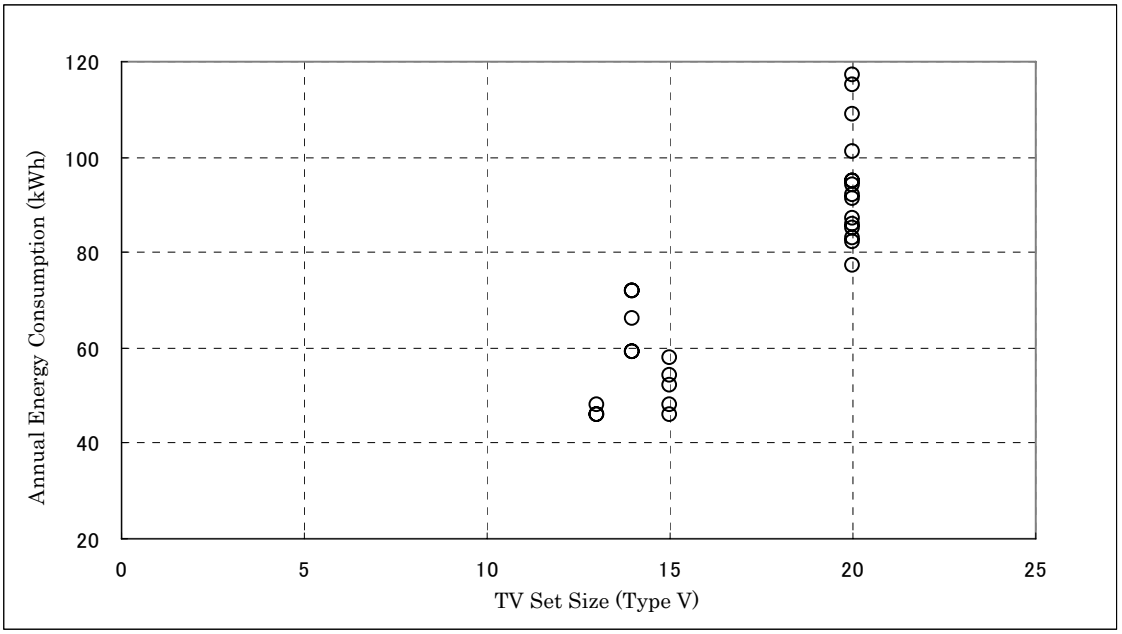
luminance of the LCD panel for those with the same pixel count. As it is necessary to make the backlight brighter in order to solve this problem, they require more electric energy. As a result of studying data of the present equipment, we found that a relationship of TV set size and annual energy consumption undergoes a change in the vicinity of 15V type (See Figure 4). If we classify LCD TVs under 15V type and those 15V type and above into the same category, it is more likely that the former can no longer be produced inspite of the needs in the market. Thus, we shall separate those under 15V type from those 15V type and above.

Note that TV set size in LCD TVs refers to a numeric value expressing the driving display area's diagonal dimension in centimeters divided by 2.54 and rounded off to the decimal point. It is so-called ○○V type.

Proposal for Classification

(1) LCD TVs under 15V type

(2) LCD TVs 15V type and above



Figurer 4: Limit of Correlation between TV Set Size and Annual Energy Consumption (Example of LCD TVs of 20V Type and below)

3. Plasma Televisions

(1) Classification by Aspect Ratio (Fineness Ratio)

As no plasma TVs with 4:3 currently exist and will exist in the future, we shall not

classify them by the aspect ratio.

(2) Classification by Pixel Count

Although, similar to the case of LCD TVs, it is appropriate to classify plasma TVs by the pixel count, it shall not take place due to the following reasons: because there are only 4 models available having the vertical pixel count of less than 650 (equivalent of VGA), because there is no model available having the vertical pixel count of 1080 or higher, and because a majority of them have the vertical pixel count of 650 or higher and less than 1080 (equivalent of XGA) (See Figure 5).

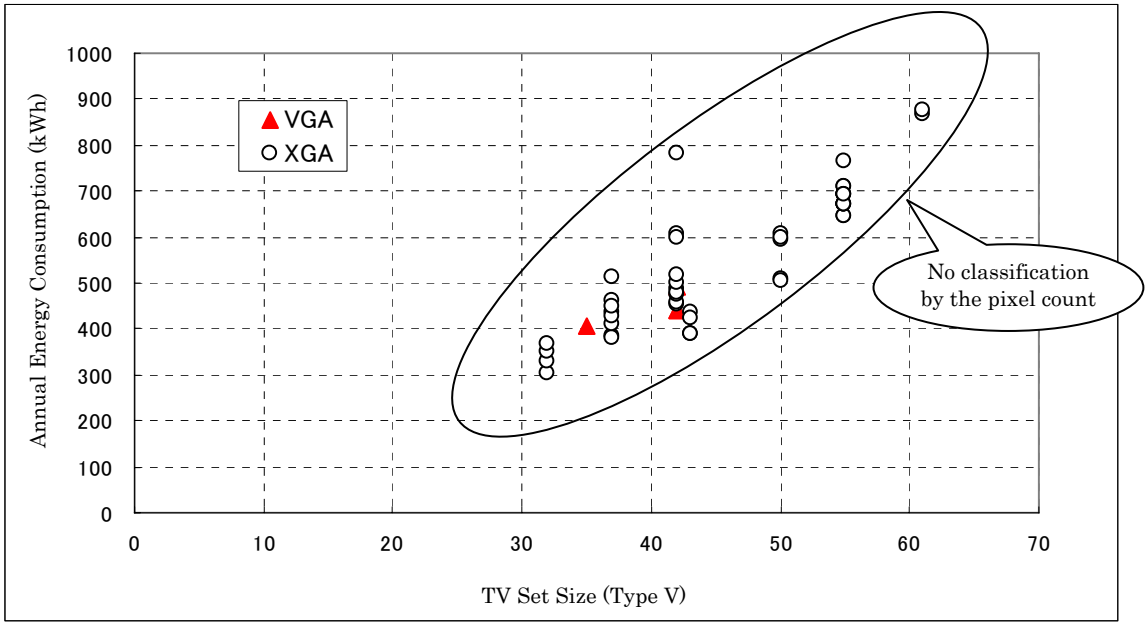


Figure 5: Relationship of Pixel Count and Annual Energy Consumption (Plasma TVs)

(3) Classification by Receivable Form of Broadcasting

Prior to full-scale operation of terrestrial digital broadcasting from 2006, TV sets that receive only analog broadcasting and those that can receive both digital and analog broadcasting are mixed in the current market. Compared with the analog broadcasting receivers, the digital broadcasting receivers have a number of functions that the conventional analog ones do not have, such as data broadcasting, bidirectional functions, conditional access system (scramble broadcast), etc., as well as digital video/audio processing, which considerably increase a scale of the circuits (to be specific, an error correction circuit, MPEG decoder circuit, descrambler circuit, etc.). Since a difference in the circuit scale has an impact on

the energy consumption efficiency or future technological development, we shall classify them by the receivable form of broadcasting (See Figure 6).

Proposal for Classification

(1) Plasma TVs that receive analog broadcasting only

(2) Plasma TVs that can receive digital broadcasting

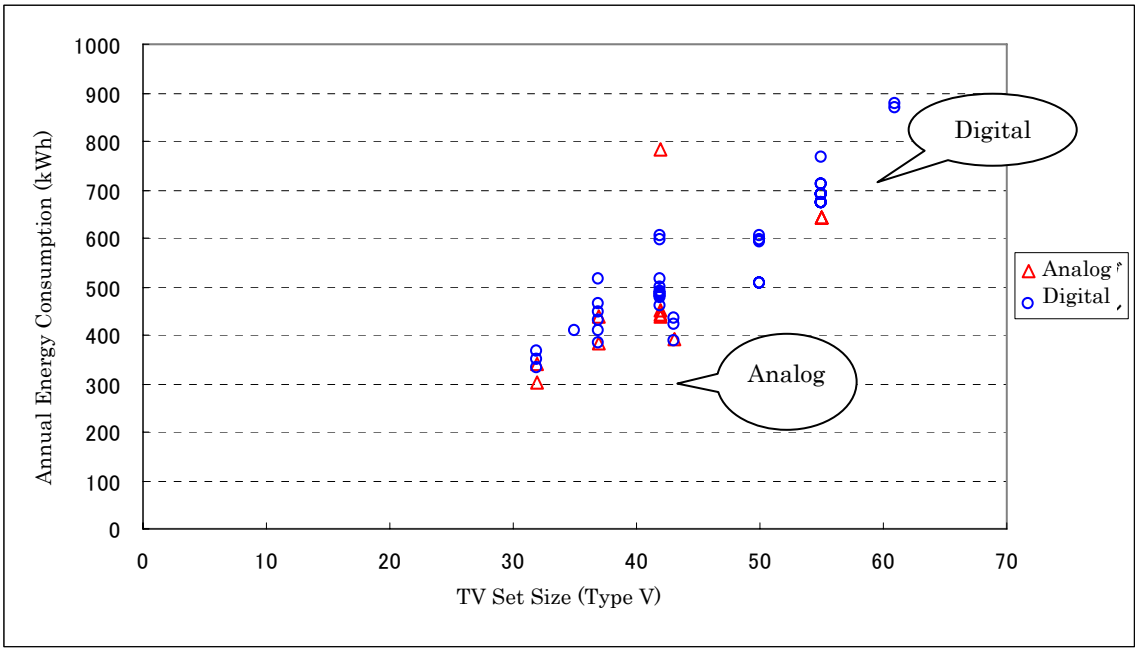


Figure 6: Relationship of Annual Energy Consumption by Analog Type and by Digital Type (Plasma TVs)

(4) Classification by Additive Functions

Plasma TVs are equipped with various additive functions. When they are built into the plasma TVs, they influence the energy consumption efficiency. If we classify those televisions ignoring these additive functions, as a result, it is likely that ones with additive functions may no longer be produced, and then it might unduly interfere with various needs in the market. For this reason, the classification shall consider major additive functions. In light of the current product structure, we shall only address the following major additive functions: (1) "Digital Versatile Disk (DVD) (limited to those capable of recording)", (2) "Hard Disk (HDD)", and (3) "Double Digital Tuner". We shall not include functions other than the above in the classification, while expecting their technological advances in the future.

Proposal for Classification

(1) Plasma TVs other than those listed below
(2) Plasma TVs with one additive function
(3) Plasma TVs with two additive functions
(4) Plasma TVs with three additive functions (as this classification is limited to those with double digital tuner, it shall be only set for those that can receive digital broadcasting)

*)The additive functions herein refer to 3 functions, "DVD (limited to those capable of recording)", "HDD", and "double digital tuner (there should be more than one identical digital broadcast receiving tuners)".

(5) Classification by TV Set Size

For plasma TVs, measurement of the present equipment has revealed that the slope of a graph showing a correlation of TV set size and annual energy consumption significantly changes in the vicinity of TV set size of 43V type (See Figure 7). As the annual energy consumption per TV set size rapidly increases for the ones of 43V type and above, we shall separate plasma TVs under 43V type from those 43V type and above.

Note that TV set size in plasma TVs refers to a numeric value expressing the driving display area's diagonal dimension in centimeters divided by 2.54 and rounded off to the decimal point. It is so-called ○○V type.

Proposal for Classification

(1) Plasma TVs under 43V type
(2) Plasma TVs 43V type and above

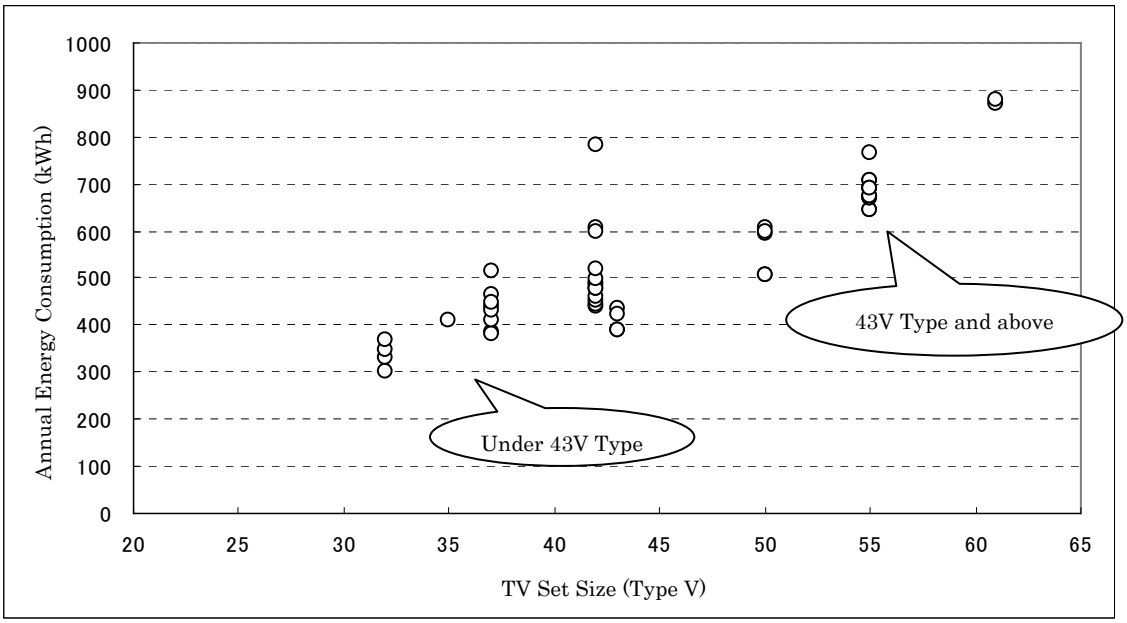


Figure 7: Limit of Correlation between TV Set Size and Annual Energy Consumption (Plasma TVs)

III. Establishment of Basic Classification Proposal

In light of the above, we shall establish a basic classification proposal, as shown in the following tables.

Cathode-Ray Tube TVs (20 categories)

Category	Form of Receiver			Cathode-Ray Tube Shape	Additive Functions
	Scanning Mode	Aspect Ratio	Deflection Angle		
1	Normal scanning type	4:3	100 degrees or below	Other than flat type	With no built-in VCR (or DVD)
2					With built-in VCR (or DVD)
3				Flat type	With no built-in VCR (or DVD)
4					With built-in VCR (or DVD)
5			Over 100 degrees	Other than flat type	With no built-in VCR (or DVD)
6					With built-in VCR (or DVD)
7				Flat type	With no built-in VCR (or DVD)
8					With built-in VCR (or DVD)
9		16:9 (Wide)	—	Other than flat type	With no built-in VTR (or DVD) nor additive functions
10			—		With built-in VTR (or DVD)
11			—		With no built-in VTR (or DVD) and with 1 additive function
12			—		With no built-in VTR (or DVD) and with 2 additve functions
13			—		With no built-in VTR (or DVD) and with 3 additive functions
14			—	Flat type	With no built-in VTR (or DVD) nor additive functions
15			—		With built-in VTR (or DVD)

16			—		With no built-in VTR (or DVD) and with 1 additive function
17			—		With no built-in VTR (or DVD) and with 2 additive functions
18					With no built-in VTR (or DVD) and with 3 additive functions
19	Double-speed scanning type	—	—		Analog high-vision TV
20		—	—		Other than analog high-vision TV

Liquid Crystal Display (LCD) TVs (38 categories)

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function
21	4:3	Vertical pixel count being less than 650	Under 15V type	Other than the below	Other than the below (basic specification)
22					With 1 additive function
23					With 2 additive functions
24				With DVD play function only	Other than the below (basic specification)
25					Having HDD
26			15V type or higher	Other than the below	Other than the below (basic specification)
27					With 1 additive function
28					With 2 additive functions
29				With DVD play function only	Other than the below (basic specification)
30					Having HDD
31		Vertical pixel count being 650 or higher	Under 15V type	Other than the below	Other than the below (basic specification)
32					With 1 additive function
33					With 2 additive functions
34				With DVD play function only	Other than the below (basic specification)
35					Having HDD
36			15V type or higher	Other than the below	Other than the below (basic specification)
37					With 1 additive function
38					With 2 additive functions
39				With DVD play function only	Other than the below (basic specification)
40					Having HDD
41	16:9 (Wide)	Vertical pixel count being less than 650			Receiving analog broadcasting only and also other than the below (basic specification)
42					With 1 additive function
43					With 2 additive functions
44					Capable of receiving digital broadcasting and also other than the below (basic specification)
45					With 1 additive function
46					With 2 additive functions
47					With 3 additive functions
48		Vertical pixel count being 650 or higher			Receiving analog broadcasting only and also other than the below (basic specification)
49					With 1 additive function

50		and less than 1080		With 2 additive functions
51				Capable of receiving digital broadcasting and also other thant the below (basic specification)
52				With 1 additive function
53				With 2 additive functions
54				With 3 additive functions
55		Vertical pixel count being 1080 or higher		Other than the below (basic specification)
56				With 1 additive function
57				With 2 additive functions
58				With 3 additive functions

Plasma TVs (14 categories)

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function
59	—		Below 43V Type	—	Receiving analog broadcasting only and also other than the below (basic specification)
60					With 1 additive function
61					With 2 additive functions
62					Capable of receiving digital broadcasting and also other than the below (basic specification)
63					With 1 additive function
64					With 2 additive functions
65					With 3 additive functions
66			43V Type and above	—	Receiving analog broadcasting only and also other than the below (basic specification)
67					With 1 additive function
68					With 2 additive functions
69					Capable of receiving digital broadcasting and also other than the below (basic specification)
70					With 1 additive function
71					With 2 additive functions
72					With 3 additive functions

Attachment 4

Target Standard Values for Television Sets

I. Idea on Establishment of Target Standard Values

1. Basic Idea

We shall set target standard values based on the idea of Top Runner Method. The specific policy shall be as follows.

(a) Target standard values should be set for every category that has been appropriately defined.

(b) As for the categories where future technological advances are expected to improve efficiency, the target standard values should allow for the improvement as much as possible.

(c) Target standard values should not conflict among categories.

2. Flow of Setting Target Standard Values

Annual energy consumption of TV Sets (cathode-ray tube TVs, liquid crystal display TVs, and plasma TVs) has a positive correlation with TV set size (See Figure 1 to 3). Thus, in a given category, if we simply set a value of a model with less annual energy consumption as a Top Runner Standard, it is more likely that models with larger TV set size may no longer be produced, which unduly interferes with various needs of the market. With the above in mind, we shall express target standard values (annual energy consumption) by linear function formulae (calculation formulae) with the TV set size as a variable. (However, we shall exclude LCD TVs with the aspect ratio of 4:3 having the TV set size under 15V. This is to be discussed later.) We shall develop the calculation formulae as follows.

In addition, we shall define TV set sizes as below.

(1) Cathode-Ray Tube TVs

The TV set size of cathode-ray tube TVs refers to the numeric value expressing the cathode-ray frame dimensions in centimeters divided by 2.54 and rounded off to the decimal point. It is so-called ○○type.

(2) Liquid Crystal Display (LCD) TVs and Plasma TVs

The TV set size of LCD and plasma TVs refers to the numeric value expressing the driving display area's diagonal dimension in centimeters

divided by 2.54 and rounded off to the decimal point. It is so-called ○○ type.

(1) Cathode-Ray Tube TVs

Among TV Sets, cathode-ray tube TVs were designated as specified equipment for the Top Runner Standard in 1999. However, since then, with the rise of new types of TVs such as liquid crystal display TVs (LCD TVs) or plasma TVs that have different display devices, the number of the cathode-ray tube TVs is expected to drop dramatically. In addition, while various manufacturers are focusing their efforts for technological development on LCD TVs or plasma TVs, further improvement in the efficiency of cathode-ray tube TVs is unlikely as its technological development is no longer expected in the future.

In light of the above, we decided to leave the target standard values for cathode-ray tube TVs unchanged.

(2) Liquid Crystal Display (LCD) TVs

First, a correlation slope of TV set size and annual energy consumption shall be determined for each of the aspect ratio, pixel count, and receivable form of broadcasting. Then, under the slope, the calculation formula is set for each category so that the intercept will be a minimum. Lastly, the target standard value shall be finalized by allowing for possible improvement that is expected by the target year.

(3) Plasma TVs

First, a correlation slope of TV set size and annual energy consumption shall be determined for each of the TV set size and receivable form of broadcasting. Then, under the slope, the calculation formula is set for each category so that the intercept of the calculation formula will be a minimum. Lastly, the target standard value shall be finalized by allowing for possible improvement that is expected by the target year.

3. Addressing Categories in which No Models Exist

We have decided to classify LCD and plasma TVs by the number of additive functions. There are a number of categories with the relevant additive functions, in which no models do exist, however. Therefore, it is impossible to set target standard values based on real Top Runner values for those categories. On the

other hand, due to advancing digitalization in the future, LCD TVs and Plasma TVs with those additive functions in these categories are expected to increase. Thus, when setting the target standard values for them, we should first calculate possible increase in annual energy consumption attributable to built-in additive functions, with the following approach. Then, by adding the increase to Top Runner Value for the basic specification and without additive functions category, we shall define the target standard values.

For TVs with built-in HDD or DVD (recording), to find the value to be added, we calculate the difference in annual energy consumption of the models that are of the same type/size and made by the same manufacturer but only different in the availability of HDD or DVD (recording).

For double digital tuners, there are no models available made by the same manufacture and only different in the availability of double digital tuners. Therefore, we calculate the difference in averages of annual energy consumption of models that are of the same type/size but only different in the availability of digital double tuners.

Table 1: An Example of Possible Increase in Annual Energy Consumption by Additive Functions

(1) With built-in HDD or DVD (recording)

TV Set Size	Annual Energy Consumption	With Built-in HDD	With Built-in DVD (Recording)	Differences
27	203	×	×	0
27	222	✓	×	19
27	241	✓	✓	19
32	239	×	×	0
32	258	✓	×	19
32	277	✓	✓	19
32	330	×	×	0
32	349	✓	×	19
32	368	✓	✓	19
37	409	×	×	0
37	429	✓	×	20
37	447	✓	✓	18
42	479	×	×	0
42	498	✓	×	19
42	517	✓	✓	19
55	671	×	×	0
55	691	✓	×	20
55	709	✓	✓	18

(2) With Built-in Double Digital Tuner

TV Set Size	Annual Energy Consumption	Double Digital Tuner	Differences
26	187	×	0
26	175	×	
26	182 (Average Annual Energy Consumption: 179)	×	
26	167	×	
26	193	×	
26	172	×	
26	222	✓	Difference: 43
32	258	×	0
32	212	×	
32	263	×	
32	240	×	
32	211	×	
32	212	×	
32	231 (Average Annual Energy Consumption: 233)	×	
32	231	×	
32	217	×	
32	229	×	
32	239	×	
32	243	×	
32	239	×	
32	263	✓	Difference: 30

We learned from (1) and (2) above that the energy consumption increases by 18 to 20 kWh for TV sets with built-in HDD or DVD (recording), and by 30 to 43 kWh for TV sets with built-in double digital tuners, respectively. We need to set additional values based on the increases. As those with built-in HDD or DVD (recording) are relative newcomers in the market, the future improvement in energy consumption efficiency due to technological development can be expected. Also, for those with double digital tuners, there might be other possible factors for the increase because these models we compared were from different manufacturers. In addition, for the both types of TV sets, from the standpoint of energy saving, all possible power-saving efforts through technological development is desired. For these reasons, we decided to set a uniform target standard value of 15kWh for these categories.

Compared with the method of determining target standard values in accordance with measurements, the decision to uniformly introduce the above additional value of 15 kWh could encourage the manufacturers to make more energy-saving efforts (i.e., stricter standard values would be set), even for the categories of TV sets with additive functions where models are currently available. Hence, in determining target standard values for these categories, we shall adopt the same method with addional

values described above, irrespective of whether or not models currently exist in those categories.

II. Room for Improvement in Energy Consumption Efficiency Through Technological Advance in the Future

Development of technologies in LCD and plasma TVs has been carried out, mainly intending to optimze image quality for the digital age and to improve user convenience such as thinner screen and longer operating life. Overall, technological developments towards higher energy consumption efficiency have just begun, although there are some differences among manufacturers. In other words, a room for improvement in efficiency still remains for LCD and plasma TVs.

LCD TVs are expected to raise the efficiency by higher transmissivity of a liquid crystal panel, less power consumption of backlight fluorescent tubes, optimal control of backlights, etc.; whereas, plasma TVs are expected to improve the efficiency through modification of PDP panel structure (optimization of gas partial pressure ratio or rib structure), higher emmision efficiency of fluorescent substance, reduced reactive power, etc. Taking into our consideration that these factors may contribute to higher efficiency, we set the target standard values by 5% up from the current Top Runner Value.

When the Top Runner Value is a numerical value, we shall set the target standard value simply by reducing it by 5%. When the Top Runner Value is a calculation formula according to TV set size, in order to proceed with energy saving of overall TV sets effectively as well as to eliminate the possibility of limiting consumer needs, the target standard value will be set with the formula with a slope obtained from the value of actual measurements allowing efficiency improvement, which is translated until the intercept become minimized. Simple translation of the original formula downward by a uniform rate of 5% would not be taken, because wide fluctuation of energy consumption efficiency according to TV set size (the steeply inclined linear function of TV set size and annual energy consumption) would result in creating a lenient demand of efficiency improvement for larger sized TVs while creating a strict demand for smaller sized TVs.

III. Specific Target Standard Values

(1) Cathode-Ray Tube TVs

As stated above, we shall leave the target standard value for this category unchanged.

(2) LCD TVs

(a) LCD TVs with the aspect ratio of 4:3 and the vertical pixel count of less than 650 (Category 21 to 30)

For the ones being under 15V type, if we classified them into the same category as that for those 15 type and above, it would become extremely difficult for them to achieve the target standard value, and it would also limit the market needs, as described in Attachment "II", "2.", (6). It has been found from the data that influence of TV set size is relatively small in the relationship with annual energy consumption of LCD TVs under 15V type. Thus, we decided to ignore possible effect of TV set size and, instead, to set the smallest value of the annual energy consumption as the Top Runner Value, for each of those with or without DVD play function. First, based on actual measurements, we decided the Top Runner Value for those of basic specification (Category 21, 24) (See Figure 5).

Then, for the category with additive functions, as we stated earlier, we calculate the Top Runner Value by adding 15kWh for each additive function.

Lastly, we determined the target standard value by including the possible improvement in efficiency of 5% into the Top Runner Value (See Figure 5).

For LCD TVs of 15V type and above, we found the correlation slope between TV set size and annual energy consumption from the data of those having the lowest annual energy consumption for each TV set size, among those with the basic specification without DVD play function (Category 26, those without additive functions) (See Figure 4). Then, we determined the calculation formula of the Top Runner Value with the slope by adopting the intercept of the one having the lowest annual energy consumption, for each LCD TV of basic specification with or without DVD play function (Category 26, 29).

For the categories with additive functions, we determined the calculation formula by adding 15 kWh per additive function to the intercept of the calculation formula of the Top Runner Value for LCD TVs of basic specification.

Finally, the calculation formula that is obtained from combining the calculation formula of the Top Runner Value and possible improvement in efficiency of 5% according to the approach described above ("II") (i.e., translating the original Top Runner Value downward by 5% with the slope multiplied by 0.95) is set for the target standard value(See Figure 5).

Then, since the target standard value (E=69) of those under 15V type with DVD play function is higher than that (E=58) of those of 15V type which is obtained from the calculation formula (E=5.9S-31) for those 15V type and above

(i.e., inverse correlation), we decided to set the value of 15V type (E=58) as the target standard value for the category of under 15V type with DVD play function.

Table 2: Top Runner Values and Target Standard Values
(Before Modification of Inverse Correlation)

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
21	4:3	Vertical pixel count being less than 650	Under 15V type	Other than the below	Other than the below (Basic specification)	E=46	5	E=44
22					With 1 additive function	E=61	5	E=58
23					With 2 additive functions	E=76	5	E=72
24				With DVD play function only	Other than the below (Basic specification)	E=73	5	E=69 (Inverse Correlation)
25					Having HDD	E=76	5	E=72
26			15V type and above	Other than the below	Other than the below (Basic specification)	E=6.2S-47	5	E=5.9S-45
27					With 1 additive function	E=6.2S-32	5	E=5.9S-31
28					With 2 additive functions	E=6.2S-17	5	E=5.9S-16
29				With DVD play function only	Other than the below (Basic specification)	E=6.2S-32	5	E=5.9S-31
30					Having HDD	E=6.2S-17	5	E=5.9S-16

Table 3: Top Runner Values and Target Standard Values

(After Modification of Inverse Correlation)

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
21	4:3	Vertical pixel count being less than 650	Under 15V type	Other than the below	Other than the below (Basic specification)	E=46	5	E=44
22					With 1 additive function	E=61	5	E=58
23					With 2 additive functions	E=76	5	E=72
24				With DVD play function only	Other than the below (Basic specification)	E=61	5	E=58
25					Having HDD	E=76	5	E=72
26			15V type and above	Other than the below	Other than the below (Basic specification)	E=6.2S-47	5	E=5.9S-45
27					With 1 additive function	E=6.2S-32	5	E=5.9S-31
28					With 2 additive functions	E=6.2S-17	5	E=5.9S-16
29				With DVD play function only	Other than the below (Basic specification)	E=6.2S-32	5	E=5.9S-31
30					Having HDD	E=6.2S-17	5	E=5.9S-16

(b) LCD TVs with the aspect ratio of 4:3 and the vertical pixel count of 650 or higher and less than 1080 (Category 31 to 40)

For LCD TVs under 15V type, similar to (1) above, if we classified them into the same category as that for those 15 type and above, it would become for them extremely difficult to achieve the target standard value and also would limit the market needs, as described in Attachment "II", "2.", (6). It has been found from the data that influence of the TV set size is relatively small in the relationship with annual energy consumption of those under 15V type. Thus, we decided to ignore possible effect of TV set size and to set the smallest value of the annual energy consumption as the Top Runner Value, for each of those with or without DVD play function.

First, based on actual measurements, we decided the Top Runner Value for

those of basic specification (Category 31, 34).

Then, for the category with additive functions, as we stated earlier, we calculate the Top Runner Value by adding 15kWh for each additive function.

Lastly, we determined the target standard value by including the possible improvement in efficiency of 5% into the Top Runner Value (See Figure 7).

Also for LCD TVs above 15V type, similar to (1) above, we found the correlation slope between TV set size and annual energy consumption from the data of those having the lowest annual energy consumption for each TV set size, among those with the basic specification without DVD play function (Category 36, those without additive functions) (See Figure 4). Then, we determined the calculation formula of the Top Runner Value with the slope by adopting the intercept of the one having the lowest annual energy consumption, for each LCD TVs of basic specification with or without DVD play function (Category 36, 39).

Then, for the categories with additive functions, as we stated earlier, we determined the Top Runner Value by adding 15 kWh per additive function.

Finally, the calculation formula that is obtained from combining the calculation formula of the Top Runner Value and possible improvement in efficiency of 5% according to the approach described above ("II") (i.e., translating the original Top Runner Value downward by 5% with the slope multiplied by 0.95) is set for the target standard value(See Figure 7).

Table 4: Top Runner Values and Target Standard Values

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
31	4:3	Vertical pixel count being 650 and above	Under 15V type	Other than the below	Other than the below (Basic specification)	E=52	5	E=49
32					With 1 additive function	E=67	5	E=64
33					With 2 additive functions	E=82	5	E=78
34				With DVD play function only	Other than the below (Basic specification)	E=62	5	E=59
35					Having HDD	E=77	5	E=73

36			15V type and above	Other than the below	Other than the below (Basic specification)	E=5.7S-34	5	E=5.4S-32
37					With 1 additive function	E=5.7S-19	5	E=5.4S-17
38					With 2 additive functions	E=5.7S-4	5	E=5.4S-3
39				With DVD play function only	Other than the below	E=5.7S-24	5	E=5.4S-22
40					Having HDD	E=5.7S-9	5	E=5.4S-8

(c) LCD TVs with the aspect ratio of 16:9 (Wide) and the vertical pixel count of less than 650 (Category 41 to 47)

Limited availability of models in these categories (namely, 1 model supporting only analog broadcasting and 2 models (in the same size) supporting digital broadcasting) did not allow us to determine a correlation slope of respective TV set sizes and annual energy consumption. Thus, alternatively, we used the slope determined from the data of those having the lowest annual energy consumption for each TV set size, among both analog and digital LCD TVs of the basic specifications having the vertical pixel count of 650 or higher and less than 1080, which will be described in (4) below (See Figure 8 and 9). Then, we determined the calculation formula of the Top Runner Value with the slope by adopting the intercept of the one having the lowest annual energy consumption, for each category of analog-supporting and digital-supporting LCD TV of basic specification (Category 41, 44) (See Figure 10).

For the categories with additive functions, we determined the Top Runner Value by adding 15 kWh per additive function to the Top Runner Value for the ones of basic specification.

Finally, the calculation formula that is obtained from combining the calculation formula of the Top Runner Value and possible improvement in efficiency of 5% according to the approach described above ("II") (i.e., translating the original Top Runner Value downward by 5% with the slope multiplied by 0.95) is set for the target standard value(See Figure 10).

Table 5: Top Runner Values and Target Standard Values

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
41	16:9	Vertical pixel count being less than 650			Receiving analog broadcasting only and also other than the below	E=8.5S-90	5	E=8.1S-86
42					With 1 additive function	E=8.5S-75	5	E=8.1S-72
43					With 2 additive functions	E=8.5S-60	5	E=8.1S-58
44					Capable of receiving digital broadcasting and also other than the below	E=7.9S-48	5	E=7.5S-45
45					With 1 additive function	E=7.9S-33	5	E=7.5S-31
46					With 2 additive functions	E=7.9S-18	5	E=7.5S-17
47					With 3 additive functions	E=7.9S-3	5	E=7.5S-3

(d) LCD TVs with the aspect ratio of 16:9 and the vertical pixel count of 650 or higher and less than 1080 (Category 48 to 54)

We determined a correlation slope of TV set size and annual energy consumption from the data of those having the lowest annual energy consumption for each TV set size, among each analog-only-supporting and digital-supporting LCD TVs of the basic specifications (Category 48, 51). Then, we determined the calculation formula of the Top Runner Value with the slope by adopting the intercept of the one having the lowest annual energy consumption, for each category of analog-supporting and digital-supporting LCD TVs of basic specification (Category 48, 51) (See Figure 11).

For the categories with additive functions, we determined the Top Runner Value by adding 15 kWh per additive function to the Top Runner Value for the ones of basic specification.

Finally, the calculation formula that is obtained from combining the

calculation formula of the Top Runner Value and possible improvement in efficiency of 5% according to the approach described above ("II") (i.e., translating the original Top Runner Value downward by 5% with the slope multiplied by 0.95) is set for the target standard value (See Figure 11).

Table 6: Top Runner Values and Target Standard Values

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
48	16:9	Vertical pixel count being 650 or higher and less than 1080			Receiving analog broadcasting only and also other than the below	E=8.5S-70	5	E=8.1S-66
49					With 1 additive function	E=8.5S-55	5	E=8.1S-52
50					With 2 additive functions	E=8.5S-40	5	E=8.1S-38
51					Capable of receiving digital broadcasting and also other than the below	E=7.9S-42	5	E=7.5S-40
52					With 1 additive function	E=7.9S-27	5	E=7.5S-25
53					With 2 additive functions	E=7.9S-12	5	E=7.5S-11
54					With 3 additive functions	E=7.9S+3	5	E=7.5S+3

(e) LCD TVs with the aspect ratio of 16:9 and the vertical pixel count of 1080 or higher (Category 55 to 58)

As for this category, only 3 models have just entered the market, and a correlation of TV set size and annual energy consumption of these 3 models would have a extremely steep inclination. Setting the target standard value based on the correlation would make it extremely difficult to achieve the target standard value for the LCD TVs in the categories under 37V type that have currently no product on the market but are expected to grow with advancing digitalization in the future. In addition, future engineering development in these categories is

unclear. Thus, the slope shall be determined with the following approach, rather than using actual measurements.

Because of their structure, brightness of the backlight need to be improved to compensate for a drop of transmittance (decreased numerical aperture) due to increased pixel count. In addition, power consumption of liquid crystal drive circuits and image circuits need to be improved by accelerating speed of signal processing. In theory, the models in these categories are expected to consume energy by about 1.2 times as TV set size increased, compared with the models described in (d) above. Thus, we adopted the value 9.4 as the correlation slope of TV set size and annual energy consumption, which is obtained by multiplying the slope of digital-supporting LCD TVs in (d) above by 1.2 (See to Figure 12).

We determined the calculation formula of the Top Runner Value with the slope by adopting the intercept of the one having the lowest annual energy consumption, among the ones of basic specification (Category 55) (See Figure 13).

For the categories with additive functions, we determined the Top Runner Value by adding 15 kWh per additive function to the Top Runner Value for the ones of basic specification.

Finally, the calculation formula that is obtained from combining the calculation formula of the Top Runner Value and possible improvement in efficiency of 5% according to the approach described above ("II") (i.e., translating the original Top Runner Value downward by 5% with the slope multiplied by 0.95) is set for the target standard value (See Figure 13).

Table 7: Top Runner Values and Target Standard Values

Category	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
55	16:9	Vertical pixel count being 1080 or higher			Other than the below	E=9.4S-59	5	E=8.9S-55
56					With 1 dditive function	E=9.4S-44	5	E=8.9S-41
57					With 2 dditive functions	E=9.4S-29	5	E=8.9S-26
58					With 3 additve functions	E=9.4S-14	5	E=8.9S-12

(3) Plasma TVs

Similar to LCD TVs, in the case of plasma TVs, those receiving analog

broadcasting only and those capable of receiving digital broadcasting are mixed in the market. However, the former is generally of old type, and many manufacturers focus the effort on development of the latter. Therefore, it seems inappropriate to find a correlation slope of TV set size and annual energy consumption from the data of those receiving analog broadcasting only. Thus, with respect to the slope, we shall uniformly apply the slope of those capable of receiving digital broadcasting.

(a) Plasma TVs under 43 V type, receiving analog broadcasting only (Category 59 to 61before integration)

(b) Plasma TVs under 43 type, capable of receiving digital broadcasting (Category 62 to 65 before integration)

For (a) and (b) above, we determined the correlation slope of TV set size and annual energy consumption from the data of those having the lowest annual energy consumption for each TV set size, among the ones of the basic specification and being capable of receiving digital broadcasting (Category 62 before integration). Note that as the correlation changes around 43V type, we include d the data of 43V type to determine the correlation slope (See Figure 14). Then, we determined the calculation formula of the Top Runner Value with the slope by adopting the intercept of the one having the lowest annual energy consumption, for each category of analog-supporting and digital-supporting LCD TVs of basic specification (Category 59, 62 before integration) (See Figure 15).

For the categories with additive functions, we determined the Top Runner Value by adding 15 kWh per additive function to the Top Runner Value for the ones of basic specification.

Then, the calculation formula that is obtained from combining the calculation formula of the Top Runner Value and possible improvement in efficiency of 5% according to the approach described above ("II") (i.e., translating the original Top Runner Value downward by 5% with the slope multiplied by 0.95) is set for the target standard value (See Figure 15).

Since the target standard value (E=7.9S+32) of those receiving analog broadcasting only in (a) is higher than that (E=7.9S+30) of those capable of receiving digital broadcasting in (b) (i.e., inverse correlation), we decided to set the latter (E=7.9S+30) as the target standard value for the category of those receiving analog broadcasting only.

(c) Plasma TVs above 43 V type, receiving analog broadcasting only (Category

66 to 68 before integration)

(d) Plasma TVs above 43 type, capable of receiving digital broadcasting (Category 69 to 72 before integration)

For (c) and (d) above, if we find the correlation slope of TV set size and annual energy consumption from the data of those having the lowest annual energy consumption for each TV set size among those of the basic specification and (Category 69 before integration), the slope would be steep; and setting the target standard value based on the slope might result in creating a lenient target standard for larger screen TV sets. This is because some 43V type and 50V type televisions have particularly less annual energy consumption. So far the screens of plasma TVs have kept getting bigger, and in order to effectively cope with the increase in energy consumption attributed to the tendency, we consciously decided to find the slope based on those 2 types of plasma TVs with better efficiency (See Figure 16).

For the categories with additive functions, we determined the Top Runner Value by adding 15 kWh per additive function to the Top Runner Value for the ones of basic specification.

Then, the calculation formula that is obtained from combining the calculation formula of the Top Runner Value and possible improvement in efficiency of 5% according to the approach described above ("II") (i.e., translating the original Top Runner Value downward by 5% with the slope multiplied by 0.95) is set for the target standard value (See Figure 16).

Since the target standard value (E=15.9S-263) of those receiving analog broadcasting only in (c) is higher than that (E=15.9S-329) of those capable of receiving digital broadcasting in (b) (i.e., inverse correlation), we decided to set the latter (E=15.9S-329) as the target standard value for the category of those receiving analog broadcasting only.

Consequently, since the identical values are applied to the target standard values for both analog-only-supporting and digital-supporting plasma TVs, we integrate the categories of these plasma TVs.

Table 8: Top Runner Values and Target Standard Values

(Before Modification of Inverse Correlation)

Category	TV Set Size	Receivable Form of Broadcasting	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
59	Under 43V type	Rreceiving analog broadcasting only and other than the below	E=8.3S+34 (Inverse Correlation)	5	E=7.9S+32 (Inverse Correlation)
60		With 1 additive function	E=8.3S+49 (Inverse Correlation)	5	E=7.9S+46 (Inverse Correlation)
61		With 2 additive functions	E=8.2S+64 (Inverse Correlation)	5	E=7.9S+60 (Inverse Correlation)
62		Capable of receiving digital broadcasting and other than the below	E=8.3S+32	5	E=7.9S+30
63		With 1 additive function	E=8.3S+47	5	E=7.9S+44
64		With 2 additive functions	E=8.3S+62	5	E=7.9S+58
65		With 3 additive functions	E=8.3S+77	5	E=7.9S+73
66	43V type and above	Receiving analog broadcasting only and other than the below	E=16.7S-275 (Inverse Correlation)	5	E=15.9S-263 (Inverse Correlation)
67		With 1 additive function	E=16.7S-260 (Inverse Correlation)	5	E=15.9S-248 (Inverse Correlation)
68		With 2 additive functions	E=16.7S-245 (Inverse Correlation)	5	E=15.9S-234 (Inverse Correlation)
69		Capable of receiving digital broadcasting and other than the below	E=16.7S-329	5	E=15.9S-314
70		With 1 additive function	E=16.7S-314	5	E=15.9S-300
71		With 2 additive functions	E=16.7S-299	5	E=15.9S-286
72		With 3 additive functions	E=16.7S-284	5	E=15.9S-272

Table 9: Top Runner Values and Target Standard Values

(After Modification of Inverse Correlation/After Integration)

Category	TV Set Size	Receivable Form of Broadcasting	Calculation Formula of Energy Consumption Efficiency (Top Runner Value)	Improved Efficiency (%)	Calculation Formula of Target Standard Value
59	Under 43V type	Other than the below	E=8.3S+32	5	E=7.9S+30
60		With 1 additive function	E=8.3S+47	5	E=7.9S+44
61		With 2 additive functions	E=8.3S+62	5	E=7.9S+58
62		With 3 additive functions	E=8.3S+77	5	E=7.9S+73
63	43V type and above	Other than the below	E=16.7S-329	5	E=15.9S-314
64		With 1 additive function	E=16.7S-314	5	E=15.9S-300
65		With 2 additive functions	E=16.7S-299	5	E=15.9S-286
66		With 3 additive functions	E=16.7S-284	5	E=15.9S-272

Summary <Target Standard Values for Cathode-Ray Tube Televisions/Liquid Crystal Display Televisions/Plasma Televisions>

Cathode-Ray Tube Televisions (20 categories)

Category	Scan Mode	Aspect Ratio	Deflection Angle	Cathode-Ray Tube	Function	Calculation Formula of Target Standard Values
1	normal scan type	4:3	100 degrees or lower	Normal	With no built-in VCR (or DVD)	E=2.5S+32
2					With built-in VTR (or DVD)	E=2.5S+60
3				Flat	With no built-in VCR (or DVD)	E=2.5S+42
4					With built-in VTR (or DVD)	E=2.5S+70
5			Over 100 degrees	Normal	With no built-in VCR (or DVD)	E=5.1S-4
6					With built-in VTR (or DVD)	E=5.1S+24
7				Flat	With no built-in VCR (or DVD)	E=5.1S+21
8					With built-in VTR (or DVD)	E=5.1S+49
9		16:9 (Wide)		Normal	With no built-in VCR (or DVD) nor additive functions	E=5.1S-11
10					With built-in VTR (or DVD)	E=5.1S+17
11					With no built-in VCR (or DVD) and with 1 additive function	E=5.1S+6

12					With no built-in VCR (or DVD) and with 2 additive functions	E=5.1S+13
13					With no built-in VCR (or DVD) and with 3 additive functions	E=5.1S+59
14				Flat	With no built-in VCR (or DVD) nor additive functions	E=5.1S-1
15					With built-in VTR (or DVD)	E=5.1S+27
16					With no built-in VCR (or DVD) and with 1 additive function	E=5.1S+16
17					With no built-in VCR (or DVD) and with 2 additive functions	E=5.1S+23
18					With no built-in VCR (or DVD) and with 3 additive functions	E=5.1S+69
19	Double-speed scanning type				Analog high-vision TV	E=5.5S+72
20					Other than analog high-vision TV	E=5.5S+41

Liquid Crystal Display Televisions (38 categories)

Catergory	Aspect Ratio	Pixel Count	TV Set Size	Function	Additive Function	Calculation Formula of Target Standard Values
21	4:3	Vertical pixel count being less than 650	Under 15V Type	Other than the below	Other than the below	E=44
22					With 1 additive function	E=58
23					With 2 additive functions	E=72
24				With DVD play function only	Other than the below	E=58
25					Having HDD	E=72
26			15V Type and above	Other than the below	Other than the below	E=5.9S-45
27					With 1 additive function	E=5.9S-31
28					With 2 additive functions	E=5.9S-16
29				With DVD play function only	Other than the below	E=5.9S-31
30					Having HDD	E=5.9S-16
31		Vertical pixel count being 650 or higher	Under 15V Type	Other than the below	Other than the below	E=49
32					With 1 additive function	E=64
33					With 2 additive functions	E=78
34				With DVD play function only	Other than the below	E=59
35					Having HDD	E=73

36			15V Type and above	Other than the below	Other than the below	E=5.4S-32
37					With 1 additive function	E=5.4S-17
38					With 2 additive functions	E=5.4S-3
39				With DVD play function only	Other than the below	E=5.4S-22
40					Having HDD	E=5.4S-8
41	16:9 (Wide)	Vertical pixel count being less than 650			Receiving analog broadcasting only and other than the below	E=8.1S-86
42					With 1 additive function	E=8.1S-72
43					With 2 additive functions	E=8.1S-58
44					Capable of receiving digital broadcasting and other the below	E=7.5S-45
45					With 1 additive function	E=7.5S-31
46					With 2 additive functions	E=7.5S-17
47					With 3 additive functions	E=7.5S-3
48		Vertical Pixel Count being 650 or higher and less than 1080			Receiving analog broadcasting only and other than the below	E=8.1S-66
49					With 1 additive function	E=8.1S-52
50					With 2 additive functions	E=8.1S-38
51					Capable of receiving digital broadcasting and other the below	E=7.5S-40
52					With 1 additive function	E=7.5S-25
53					With 2 additive functions	E=7.5S-11
54					With 3 additive functions	E=7.5S+3
55		Vertical pixel count of 1080 or higher			Other than the below	E=8.9S-55
56					With 1 additive function	E=8.9S-41
57					With 2 additive functions	E=8.9S-26
58					With 3 additive functions	E=8.9S-12

Plasma Televisions (8 categories)

Category	TV Set Size	Additive Function	Calculation Formula of Target Standard Value
59	Under 43V	Other than the below	E=7.9S+30
60		With 1 additive function	E=7.9S+44
61		With 2 additive functions	E=7.9S+58
62		With 3 additive functions	E=7.9S+73
63	43V and above	Other than the below	E=15.9S-314
64		With 1 additive function	E=15.9S-300
65		With 2 additive functions	E=15.9S-286
66		With 3 additive functions	E=15.9S-272

1. Correlation of TV Set Size and Annual Energy Consumption

(1) Cathode-Ray Tube Televisions

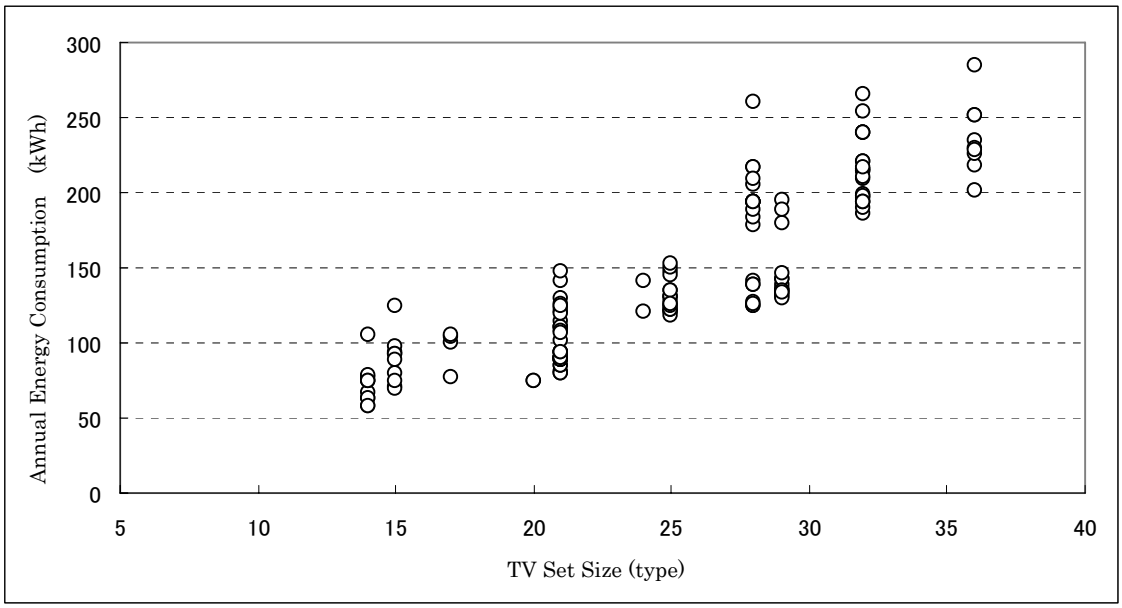


Figure 1: TV Set Size – Annual Energy Consumption (Cathode-Ray Tube TV)

(2) LCD Televisions

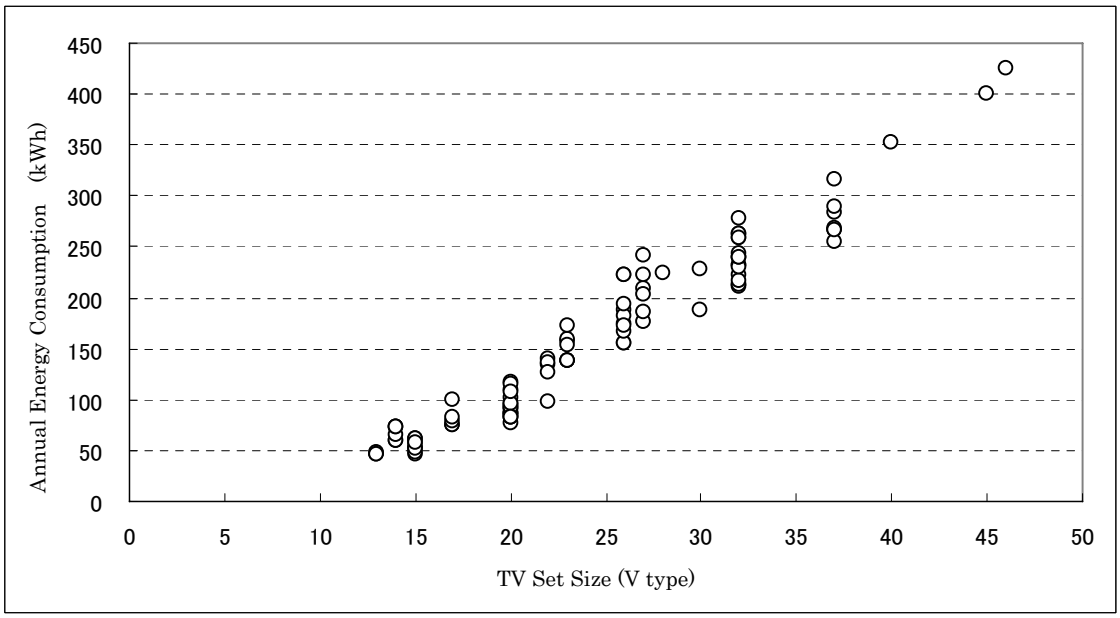


Figure 2: Screen Size – Annual Energy Consumption (LCD TV)

(3) Plasma Televisions

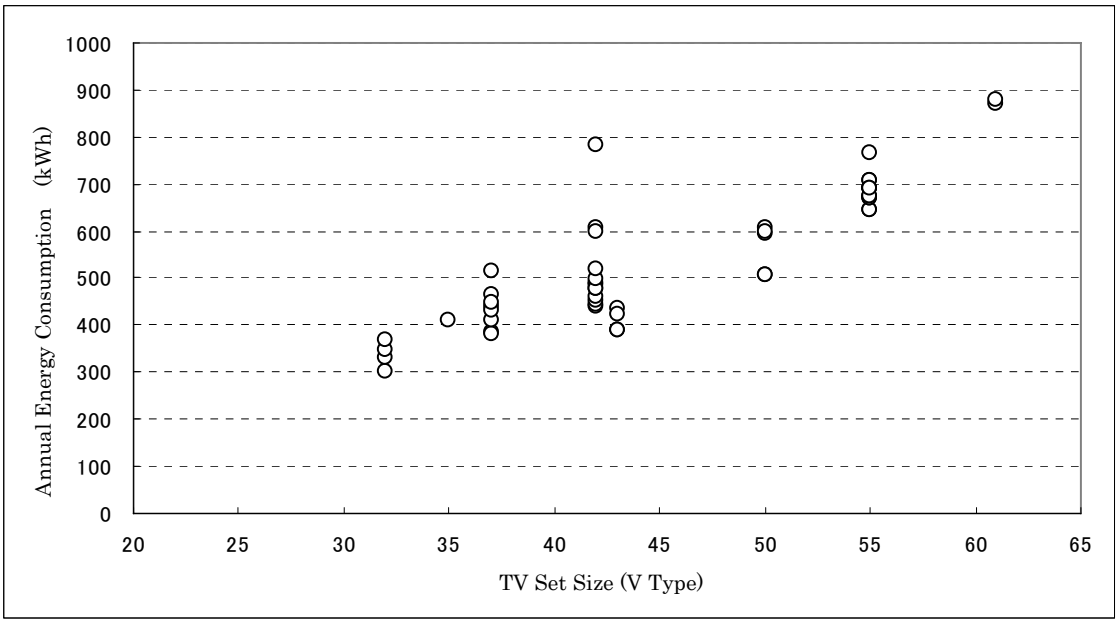


Figure 3: TV Set Size – Annual Energy Consumption (Plasma TV)

2. Calculation Formula of Target Standard Values

(1) LCD Televisions

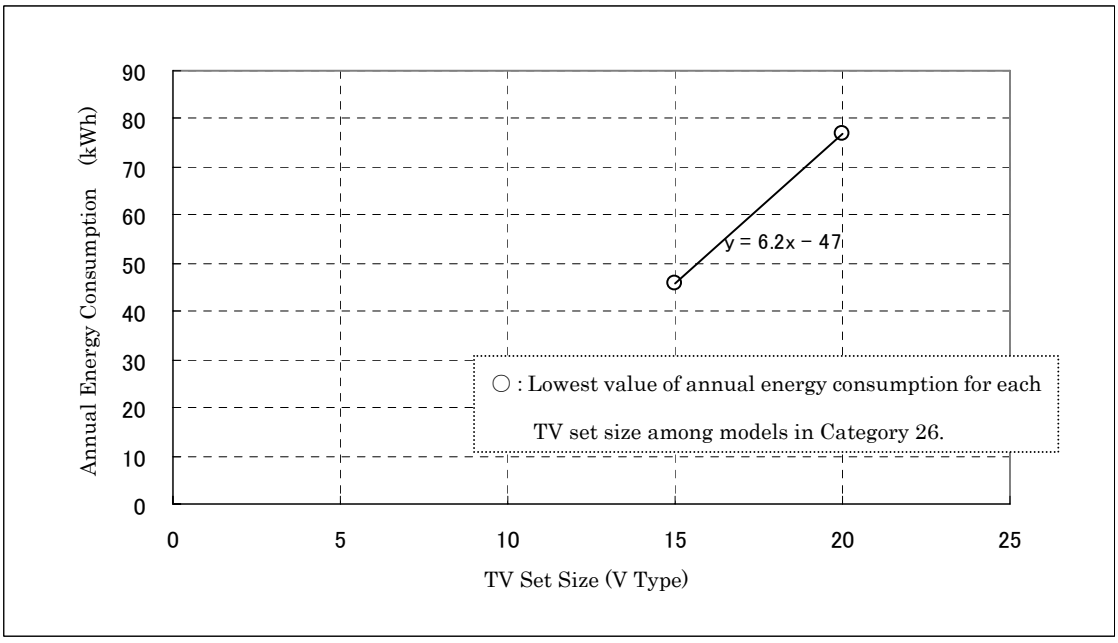


Figure 4: TV Set Size – Annual Energy Consumption (Calculation of Slope) (Category 26 to 30)

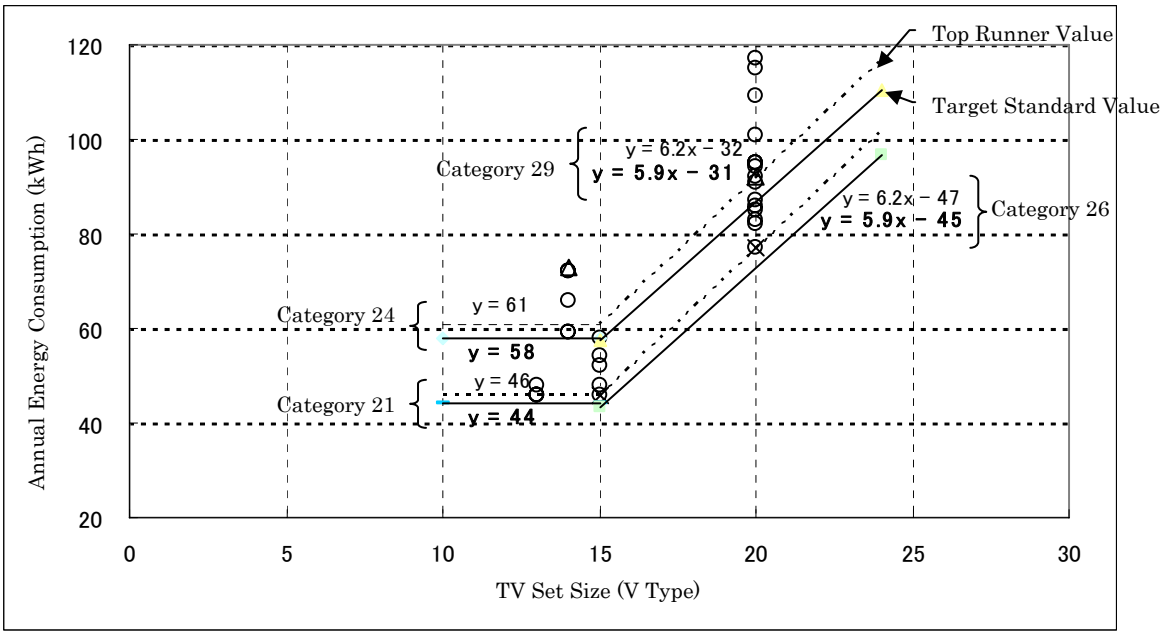


Figure 5: TV Set Size – Target Standard Value (Category 21 to 30)

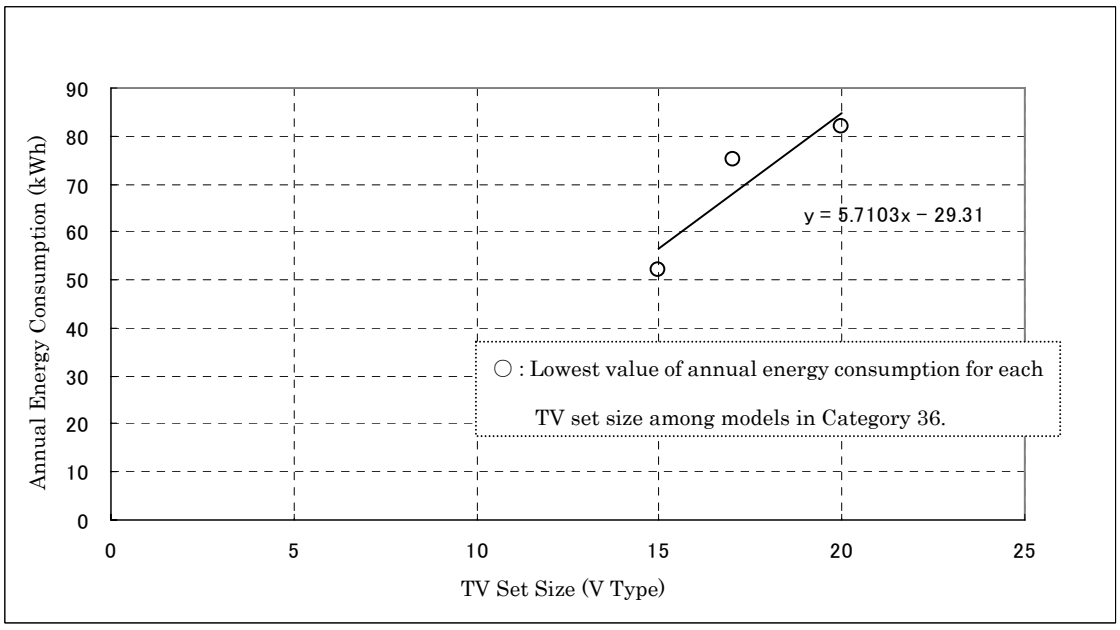


Figure 6: TV Set Size – Annual Energy Consumption (Calculation of Slope)
(Category 36 to 40)

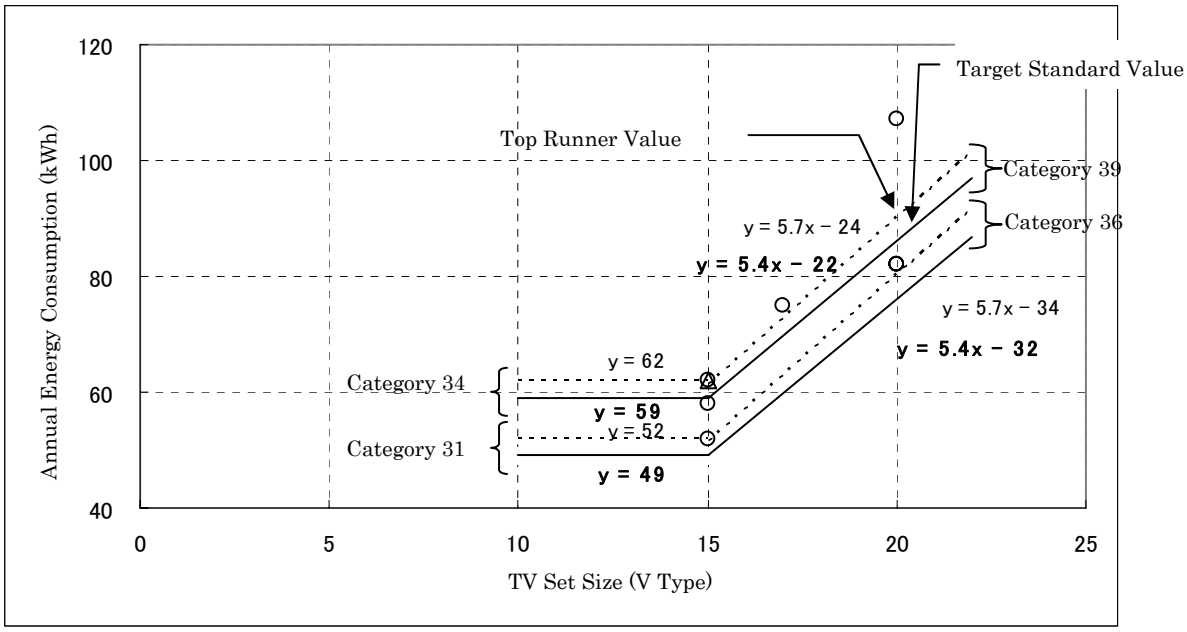


Figure 7: TV Set Size – Target Standard Value (Category 31 to 40)

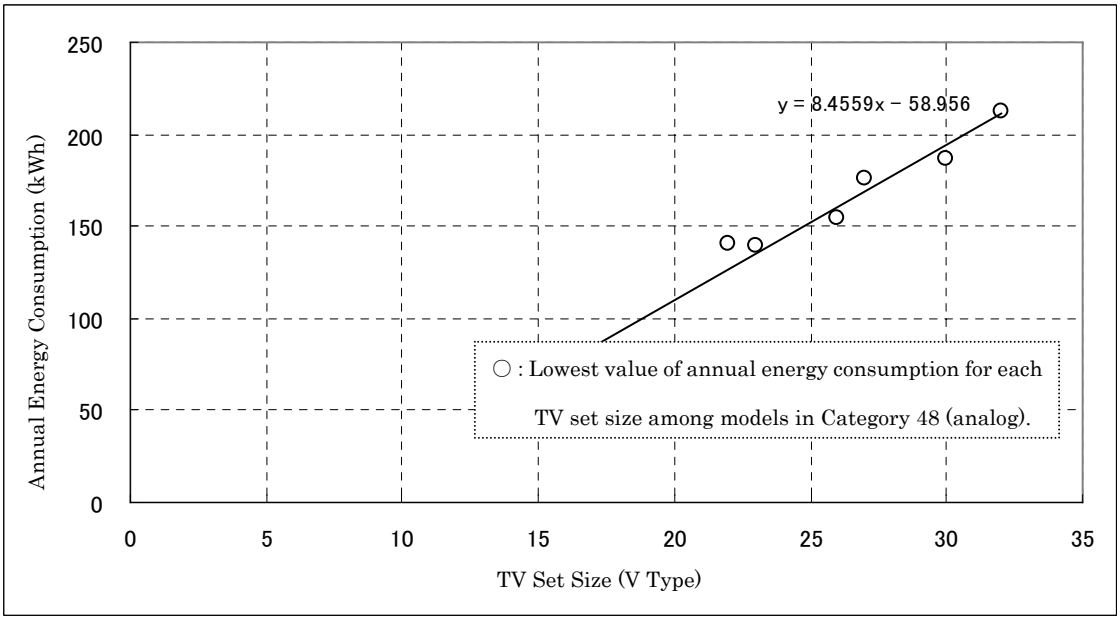


Figure 8: TV Set Size – Annual Energy Consumption (Calculation of Slope)
(Category 41 to 43 and Category 48 to 50)

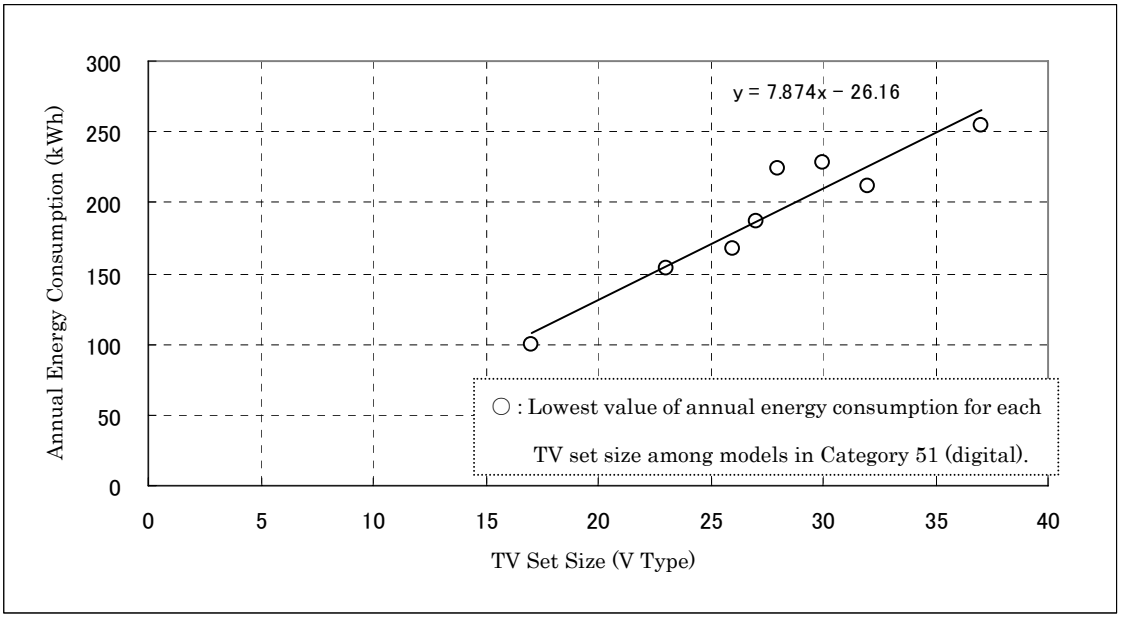


Figure 9: TV Set Size – Annual Energy Consumption (Calculation of Slope)
(Category 44 to 47 and Category 51 to 54)

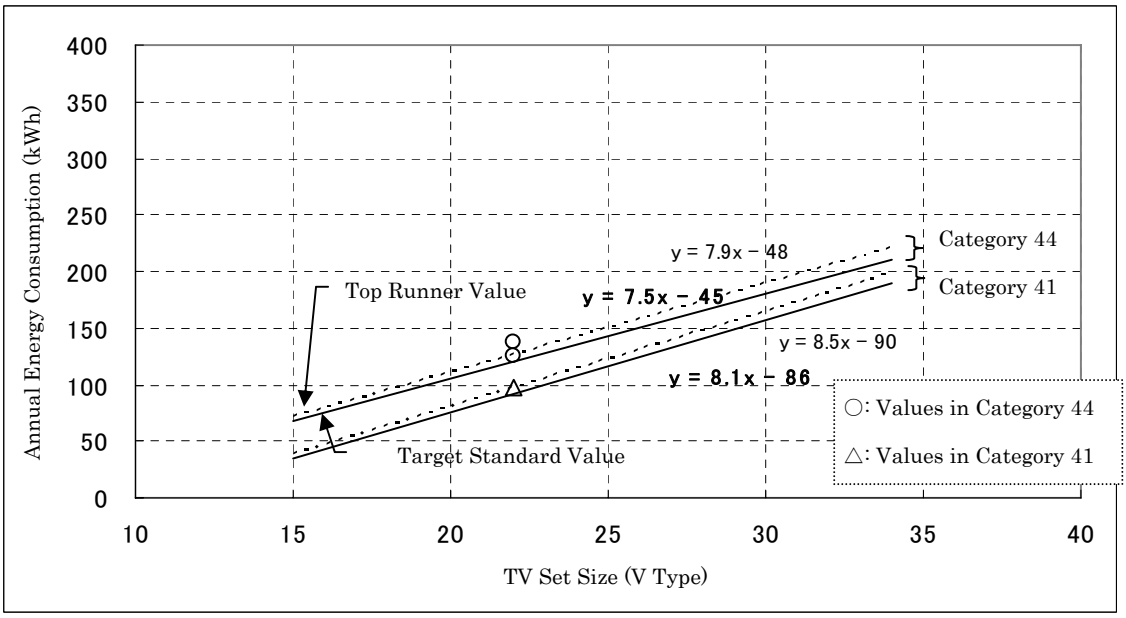


Figure 10: TV Set Size – Target Standard Value (Category 41 to 47)

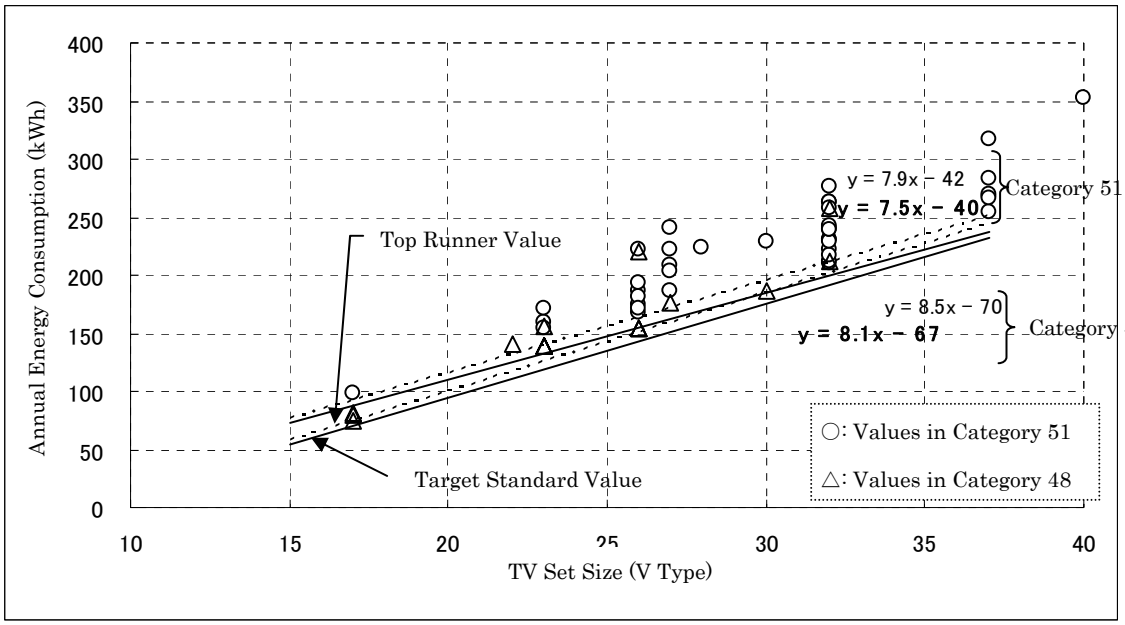


Figure 11: TV Set Size – Target Standard Value (Category 48 to 54)

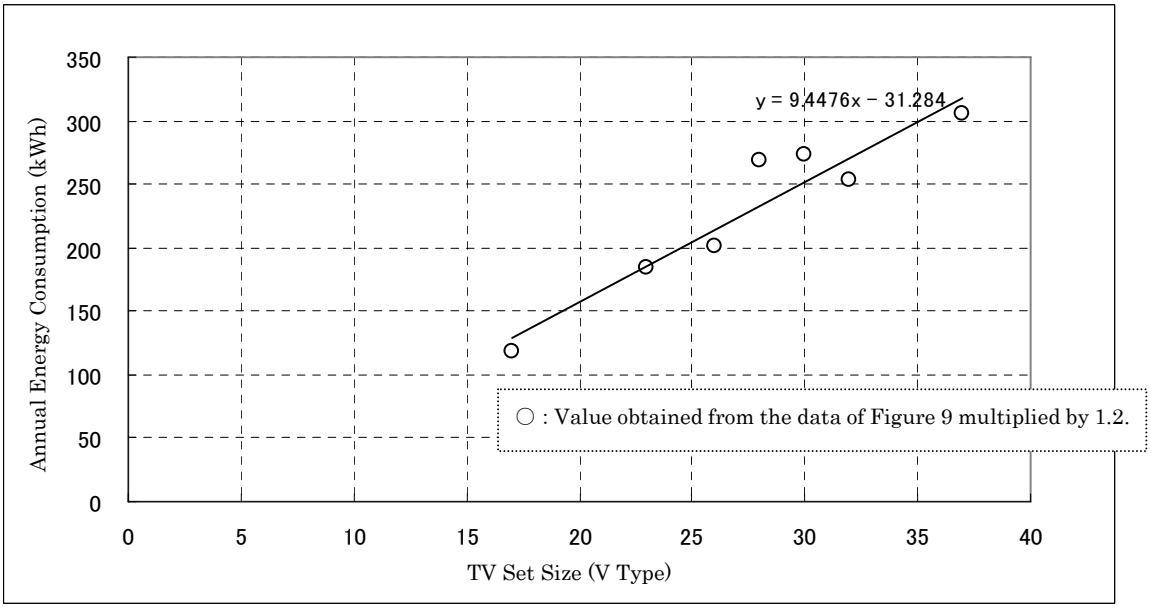


Figure 12: TV Set Size – Annual Energy Consumption (Calculation of Slope)
(Category 55 to 58)

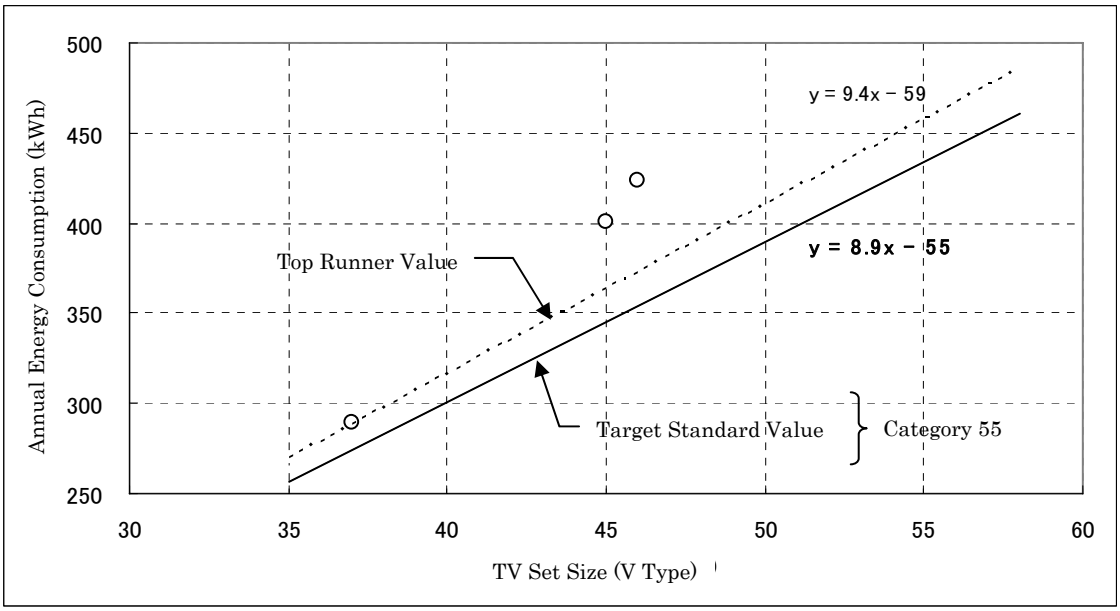


Figure 13: TV Set Size – Target Standard Value (Category 55 to 58)

(3) Plasma Televisions

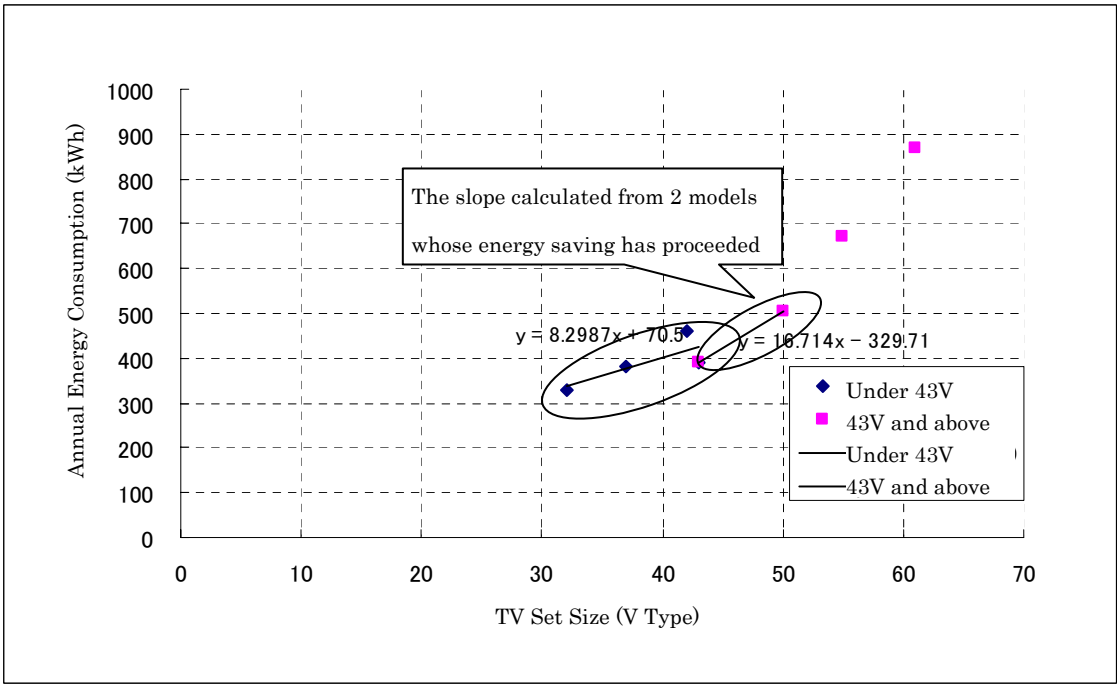


Figure 14: TV Set Size – Annual Energy Consumption (Calculation of Slope)
(Category 59 to 72 Before Integration)

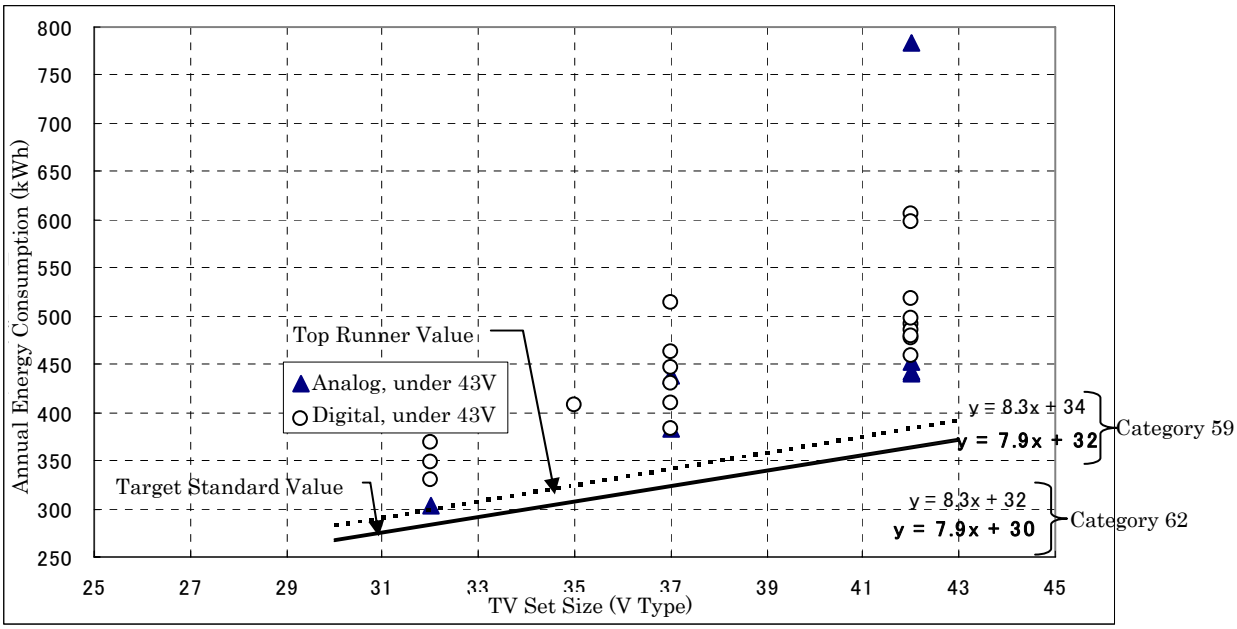


Figure 15: TV Set Size – Target Standard Value (Category 59 to 65 Before Integration)

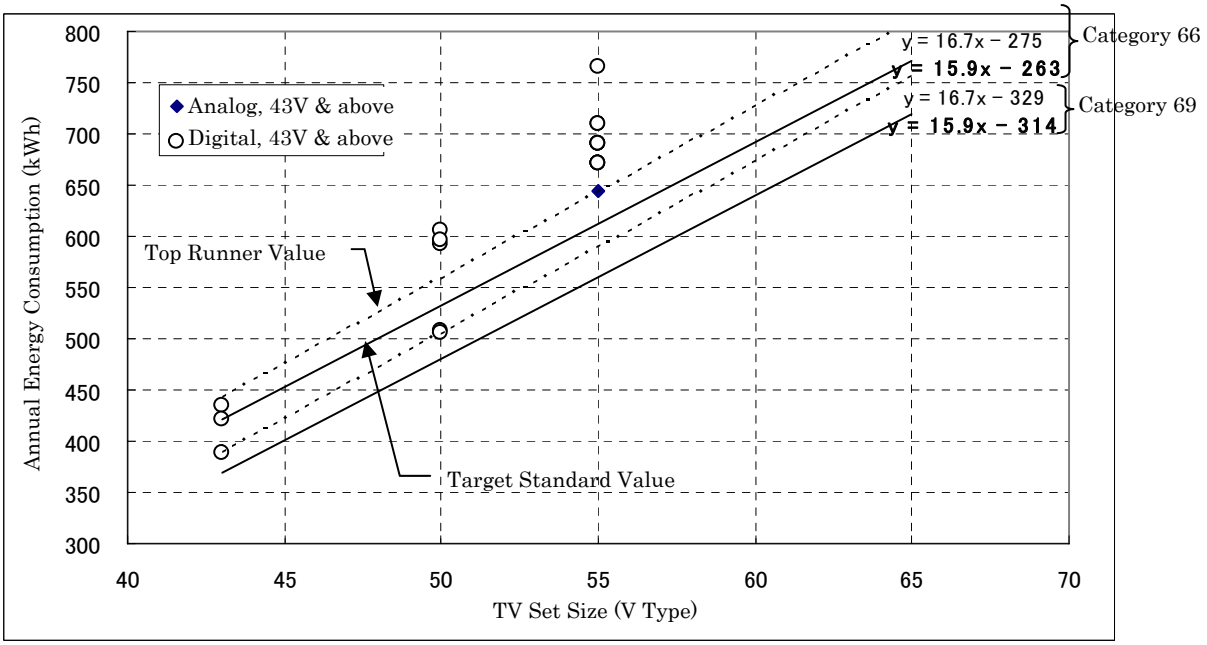


Figure 16: TV Set Size – Target Standard Value (Category 66 to 72 Before Integration)

Attachment 5

Energy Consumption Efficiency of TV Sets and Method for Measurement

1. Basic Idea

As for TV sets, when they were designated as specified equipment of the Top Runner Standard in 1998, "Annual Eenery Consumption" was introduced as a realistic indicator of energy consumption efficiency.

It is reasonable to continue to use it as the relevant indicator of energy consumption efficiency of TV sets, because of no particular technical flaw and its intelligibleness.

In addition, as far as cathode-ray tube televisions are concerned, there would be no particular problem in continuously using the conventional measuring method. Thus, amendment to the measuring method accompanying this review are mainly attributed to plasma and LCD televisions which are newly added to the target scope.

2. Specific Energy Consumption Efficiency and Measuring Method

The energy consumption efficiency of TV sets shall be "Annual Energy Consumption", and shall be a numeric value [kWh/year] calculated with the following equation:

$$E = \{(P_O - P_A / 4) \times t1 + P_S \times t2\} / 1000$$

In this equation, E, Po, Ps, P_A, t1 and t2 shall represent the following numeric values.

E: annual energy consumption (kWh/year)

Po: operational power (Watt)

Ps: standby power (Watt)

P_A: reduced power consumption by energy-saving function (Watt)

t1: annual standard operating time (hour) 1642.5 (365 days × 4.5 hours)*

t2: annual standard standby time (hour) 7117.5 (365 days × 19.5 hours)*

* We shall use conventional values of t1 (annual standard operating time) and t2 (annual standard standby time), as there is no pronounced change in the actual status of the usage of TV sets.

(1) Po: operating power (W)

The operating power shall be the mean value of power consumption of flat level white signal (Pw) and that of flat level black signal (Pb). Note, however, that for LCD and plasma TVs, the operating power shall be obtained by taking the mean of the aforementioned power consumption values plus those of color bar signal (Pc) and three-vertical-strip signal (Pt). The measurement shall take place while the energy-saving function is inactive. (*)

(a) In the case of cathode-ray tube TVs: $P_O = (Pw + Pb) / 2$

(b) In the case of plasma and LCD TVs: $P_O = \{(Pw + Pb) / 2 + Pc + Pt\} / 3$

In addition, for TV sets designed to have different power consumption depending on input signals, power consumption should be measured with each of them, and the mean of the maximum and minimum values shall be taken as the operating power.

$P_O = (P_{OMax} + P_{OMin}) / 2$

* Unlike in case of cathode-ray tube TVs, the operating power of LCD and plasma TVs tends to be smaller than that in actual use, when it is the mean of power consumption of flat level white signal and that of flat level black signal. For this reason, for LCD and plasma TVs, while using signals to be generally employed in product design, we determined the operating power by taking the mean of power consumptions of these signals plus those of color bar signals and three-stripe signals, in order to bring measurement result closer to actual use.

(2) Ps: standby power (W)

The standby power shall be the mean of power consumption of when power is turned off by main power (P_{S1}) and that of when power is turned off by a remote controller while the main power remains on (P_{S2}). Note, however, that in the case that a power switch is only controlled by either a main power or a remote controller, the standby power shall be the power consumption of when the power switch is turned off.

$P_S = (P_{S1} + P_{S2}) / 2$

(3) P_A: reduced power consumption by energy-saving function (W)

Reduced power consumption by energy-saving function shall be the larger value (either P_{A1} or P_{A2}), when color bar signal is used as video signal.

(a) P_{A1}: reduced power consumption by the function which automatically controls

video images according to ambient illuminance (hereinafter referred to as "automatic brightness adjustment function") (W)

The reduced power consumption by the automatic brightness adjustment function shall be a numeric value to be obtained by subtracting a power consumption value of when the ambient illuminance is 0 lux (P_{A1Min}) from the smaller of power consumption values of either when the ambient illuminance is 300 luxes or higher or when the power saving function is switched off (P_{A1Max}).

$P_{A1} = P_{A1Max} - P_{A1Min}$

(b) P_{A2}: reduced power consumption by an energy-saving switch (W)

The reduced power consumption by an energy-saving switch shall be a numeric value obtained by subtracting a power consumption value of when the energy-saving switch is turned on (P_{A2Min}) from a power consumption value of when the energy-saving swtich is turned off (P_{A2Max}).

$P_{A2} = P_{A2Max} - P_{A2Min}$

(4) Condition for Measurements

Except for the cases listed below, power consumption measurements of (1) to (3) mentioned above shall take place under the conditions specified by "General Condition" of the Japan Industrial Standard C6101-1, 3.1.

(a) For (1) and (2), the contrast control of televisions shall be set so that power consumption of when receiving flat level white signals will be maximized. For (3), it shall be set to a factory default. In addition, the brightness control shall be set to a factory default.

On the other hand, the contrast, brightness and backlight controls for LCD TVs and the contrast and brightness controls for plasma TVs shall be set to the standard setting (which is recommended by manufacturers and to be used at general households).

(b) Audio output of television shall be set to the default specified in "Measuremment Method", the Japan Industrial Standard C6101-1, 4.2.1.

(c) Satellite dish, additive functions and others which can be arbitrarily turned ON/OFF shall be turned OFF.

(d) Measurement should take place only when a TV set is in stable condition, even in the period of switching test signals. However, in the case of plasma TVs, the measurement should take place before burn-in protecting function is

activated.

(5) Input Signals

When measuring power consumption described in (1) to (3) above, signal input shall conform to the followings.

(a) Measurement through input of a terrestrial wave band signal (analog or digital) or a baseband signal

a. A flat level white signal, flat level black signal, color bar (75/0/75/0) signal and three-vertical-stripe signal specified in "Test Video Signal", the Japan Industrial Standard C6101-1, 3.2.1 shall be used as a video signal.

b. An audio signal shall be a 1kHz sinusoidal signal.

c. A high frequency wave television signal specified in C6101-1, 3.3, of the same standard shall be used as an analog input signal.

d. As for the level of digital input signals, signals that conform to the standard transmission method of the digital and high-definition broadcastings which are of standard television broadcasting by broadcasting stations shall be used as an input signal. The level of the input signal shall be -49 dB (mW).

(b) Measurement through input of a satellite broadcasting wave band signal (analog or digital)

a. A flat level white signal, flat level black signal, color bar (75/0/75/0) signal and three-vertical-stripe signal specified in "Test Video Signal", the Japan Industrial Standard C6101-1, 3.2.1 shall be used as a video signal.

b. An audio signal shall be a 1kHz sinusoidal signal, and the modulation factor of PCM modulation shall be set to -18dB of the peak modulation.

c. The signals converted to the first intermediate frequency band that conform to the standard transmission method of the standard and high-definition television broadcasting by the satellite broadcasting stations shall be used as an analog input signal. The level of the input signal shall be –45 dB (mW).

d. The signals converted to the first intermediate frequency band that conform to the standard transmission method of digital broadcasting which is of the standard and high-definition television broadcasting, ultrashort wave broadcasting, and data broadcasting within the frequency band rage of 11.7 to 12.2 GHz by the satellite broadcasting stations shall be used as

an input signal. The level of the input signal shall be -45dB (mW).

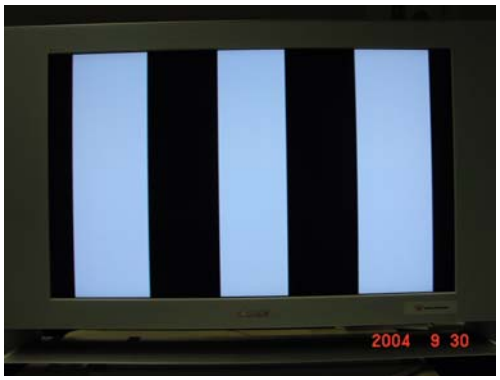
(Exhibit)

Screen of All-white Signal

Screen of All-black Signal

Screen of Color Bar Signal

Screen of Three-Vertical-Stripe Signal



Attachment 6

Target Scope of Video Cassette Recorders

The criteria shall apply to VCR (Video Cassette Recorders) or DVD recorders that are utilized by AC electric circuits (rated frequency of 50 or 60 Hz, rated voltage of 100V). However, the followings shall be excluded from the target scope.

1. VCR or DVD Recorders for Industrial Use

   They are the models for industrial purposes, such as the ones for broadcasting whose picture input/output form is RGB or component output, whose video input/output terminals are BNC terminals, and whose external synchronization terminal is input/output terminals for synchronized signals, or any others of special specifications. They shall be excluded because they have limitations in the specifications and because their volume is still modest.

2. VCR or DVD Recorders With Extremely Low Market Share
   - VCR with a built-in high-vision decoder
     (Volume of shipments in 2003: 16,855 sets)
   - DVD recorders with no VCR nor HDD
     (Volume of shipment in 2003: 286,416 sets)
   - Those with game or server function
     (Volume of shipment in 2003: 181,723 sets, the number of models: 2 types)
   - Those with digital tuner
     (Volume of shipment in 2004: 144,000 sets, the number of models: 6 types)

Consumer needs have not yet been defined for the equipment listed above that, in general, have a few models available in the market. Depending on future developments, however, we shall conduct a necessary review when it is considered appropriate to include them in the scope.

Note 1: Hard disk recorders shall be excluded, because both the market share and the number of models available in the market are low. However, those with a DVD recorder shall be included in the scope.

Note 2: "Blu-ray recorders" and "HDDVD recorders", which are the next-generation

recording devices, shall be excluded from the scope, because both of the maket share and the number of models available in the market are low.

Attachment 7

Target Fiscal Year and Others for Video Cassette Recorders, etc.

1. In general, a considerable improvement in energy consumption efficiency of VCR, etc. is made when a model change takes place, and a typical development period of these new products is approximately 2 years. For this reason, consideration should be given so that the manufacturers can take at least two opportunities of bringing out new models before the next target fiscal year.

On the other hand, in light of measures against global warning, in order to ensure that products that achieved the target standard value become widely used among consumers during the first commitment period of Kyoto Protocol (2008 to 2012), it would be desirable to achieve the target in as short time as possible, assuming that the tenure of use of VCR, etc. would be approximately 10 years.

With the above in mind, the target fiscal year of DVD recorders (limited to those with either VCR or HDD), which are newly added to the target, shall be set to 2008; that is three years after establishment of the criteria.

In addition, the target fiscal year for VCRs that have already been covered in the target scope shall be the same as at present (fiscal year 2003 and each year after).

2. In addition, the improvement rate of energy consumption efficiency in the target fiscal year (excluding VCR) is expected to be approximately 22.4% based on the assumption that there will be no change from the current volume of shipment or compositions in each category (the resut in 2004 and prospect partially included).

<Overview of Estimation (only for DVD recorders)>

(1) Energy consumption efficiency estimated from values of actual achievements of DVD recorders shipped in 2004: 66.0 kWh/year

(2) Energy consumption efficiency estimated from the target standard values of DVD recorders to be shipped in the target fiscal year: 51.2 kWh/year

(3) Improvement ratio of energy consumption efficiency

$$\frac{(66.0 - 51.2)}{66.0} \times 100 = \text{Approximately } 15.3\%$$

Attachment 8

Classification of VCR, etc.

I. Basic Idea

VCR were designated as specified equipment for the Top Runner Standard in 1999. However, since then, with the rise of new types of recording devices such as DVD recorders, etc., the volume of shipments of VCR has dramatically dropped (See Figure 1).

We shall continuously utilize the present classifications for VCR, because the volume of shipment is expected to remain decreasing in the future, and because there has been no such significant change which requires the modification of the conventional indicators used in the classifications.

DVD recorders can be roughly divided into (a) those having HDD only, (b) those having VCR only, and (c) those having both HDD and VCR, by availability of the attached recording device. As these attached recording devices differently influence energy consumption efficiency (annual energy consumption, the same hereinafter) and development of energy saving technologies in the future, DVD recorders shall be classified by the attached recording devices. In addition, with the increasing storage capacity and advancing digitalization, most of DVD recorders have multiple tuners, encoders, terminals as well as digital networking terminals for input/output of digital signals and for exchange of digital control signals, in order to enable simultaneous recording. Since these features also influence energy consumption efficiency and future technological development, DVD recorders shall be classified by availability of them as well.

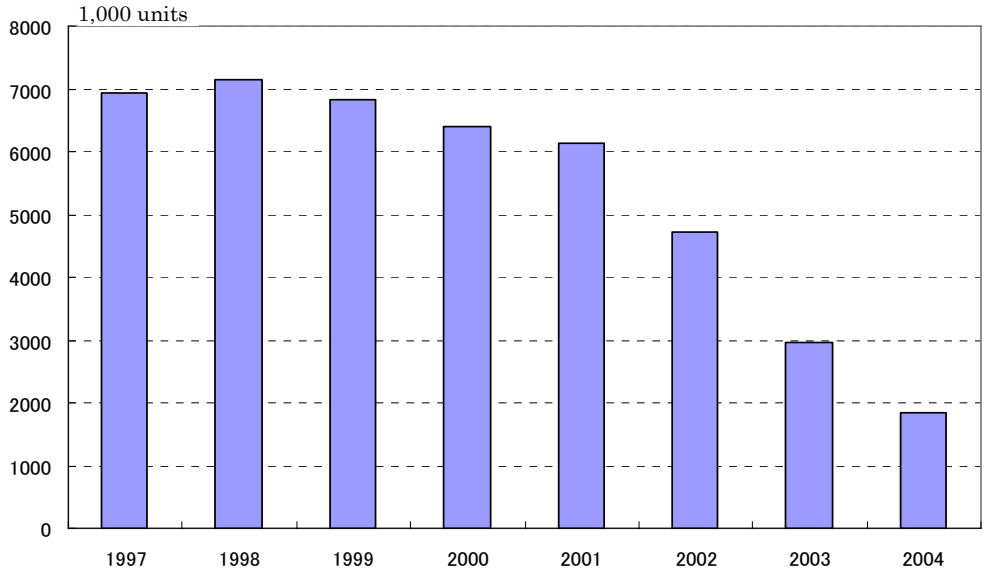


Figure 1: VCR Shipment Trends (The value for 2004 is provisional.)

II. Specific Classification Method

1. VCR

As we stated earlier, the classifications for VCR shall remain unchanged.

(a) VCRs with signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions

(b) VCRs with signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions

(c) VCRs without signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions

(d) VCRs without signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions

2. DVD Recorders

DVD recorders can be roughly divided into (a) those having HDD only, (b) those having VCR only, and (c) those having both HDD and VCR, by availability of the attached recording device. As these attached recording devices differently influence energy consumption efficiency (annual energy consumption, the same hereinafter) and development of energy saving technologies in the future, DVD recorders shall be classified by the attached recording devices. In addition, with the increasing memory capacity and advancing digitalization, most of DVD recorders have multiple tuners, encoders, terminals as well as digital networking terminals for input/output of digital

signals and for exchange of digital control signals, in order to enable simultaneous recording. Since these features also influence energy consumption efficiency and future technological development, DVD recorders shall be classified by availability of them as well.

(1) Classification by Availability of Attached Recording Device

DVD recorders can be roughly divided into (a) those with HDD only, (b) those with VCR only, and (c) those with boh HDD and VCR, by availability of the attached recording device. As these attached recording devices differently influence energy consumption efficiency and development of energy saving technologies in the future, DVD recorders shall be classified by them.

Note that "DVD recorders with HDD only" refers to a type of DVD recorders which is additionally equipped with HDD as a memory device, and which can temporarily record the vast amount of images in HDD and copy them to DVD as necessary. "DVD recorders with VCR only" refers to a DVD recorder integrated with VCR, which can function as both DVD recorder and VCR in one housing. "DVD recorders with both HDD and VCR" refers to a DVD recorder integrated with HDD and VCR, which can function as both DVD recorder with built-in HDD and VCR in one housing.

Proposal for Classification

(a) DVD recorders with HDD only
(b) DVD recorders with VCR only
(c) DVD recorders with both HDD and VCR

(2) Classification by Number of Tuners and Signal Conversion Functions

The DVD recorders now on the market have at least one each of a terrestrial broadcasting analog tuner and an MPEG encoder (converting an analog signal into a digital signal of MPEG format), in order to achieve its basic functions. Like VCRs, in order to expand the choice of programs to record, some DVD recorders are equipped with multiple tuners, such as terrestrial broadcasting analog tuners and satellite broadcasting tuners. Furthermore, some of those with HDD and multiple tuners are equipped with an additional MPEG encoder for simultaneous recording of multiple broadcasting signals. Since these features influence energy consumption efficiency, DVD recorders shall be classified by them. Note, however, that additional MPEG encoders shall be classified separately, because they are

incorporated after equipment of multiple tuners, and because increased power differs between when a MPEG encoder is added and when a tuner is added (when a tuner added: approx. 8W, and when a MPEG encoder added: approx. 6W). The term "basic specifications" used herein shall be defined as "those having one each of terrestrial broadcasting analog tuner and MPEG encoder". "Those having multiple tuners" refer to those having more than one tuner, but those having multiple MPEG encoders shall be excluded. "Those having multiple MPEG encoders" refers to those having more than one MPEG encoder.

For DVD recorders with VCR only, there is no necessity to add an MPEG decoder because these DVD recorders cannot record multiple digital signals simultaneously. Thus, they shall not be classified by availability of MPEG encoder.

Proposal for Classification

(a) DVD recorders of basic specification
(b) DVD recorders having multiple tuners (excluding those having multiple MPEG encoders)
(c) DVD recorders having multiple MPEG encoders

(3) Classification by Availability of Digital Network Terminals

With advancing digitalization, various digital-supporting terminals have been developed. As addition of them has an impact on energy consumption efficiency, DVD recorders shall be classified by the availability of them.

Proposal for Classification

(a) DVD recorders without digital network terminals
(b) DVD recroders with digital network terminals

* "Digital network terminal" refers to i) iLink, ii) USB, iii) LAN, and iv) HDMI.

i) iLink: another name of "IEEE 1394" standard that is one of the transmission methods connecting a PC and imaging equipment with peripheral devices, and it is expected to be the general standard. At the same time, there is a move to utilize it in LAN for homes. Examples include an external output terminal of a digital video camera (commonly known as "DV terminal").
ii) USB (Universal Serial Bus): it is one of the standards for a data transmission channel connecting peripheral devices such as a keyboard, mouse, modem, joystick, etc. with

personal computers, etc.

iii) LAN (Local Area Network): A network of computers, imaging equipment, and printers in the same building and connected by pair cables, fiber-optica cables, etc. with the purpose of data exchange. There are some variations depending on connection form and communication control method, yet Ethernet standard is the most prevalent.

iv) HDMI (High-Definition Multimedia Interface): A new standard of digital video/audio input/output interface, mainly for home appliances and AV equipment. Since video/audio/control signals can be transmitted/received through 1 cable, it will allow to control multiple AV devices with one remote-controller.

III. Establishment of Basic Classification Proposal

Based on the above, we shall set the basic classification proposals as listed in the tables below.

(a) VCR (4 categories)

Provisional Category
1. With signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions
2. With signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions
3. Without signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions
4. Without signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions

(b) DVD Recorders (16 categories)

Provisional Category	Recording Device	Tuner and Signal Conversion Function	Additional Terminal
A	Having HDD only	Basic specification	Without digital network terminal
B			With digital network terminal
C		With multiple tuners	Without digital network terminal
D			With digital network terminal
E		With multiple MPEG encoders	Without digital network terminal

F			With digital network terminal
G	Having VCR only	Basic specification	Without digital network terminal
H			With digital network terminal
I		With multiple tuners	Without digital network terminal
J			With digital network terminal
K	Having HDD and VCR	Basic specification	Without digital network terminal
L			With digital network terminal
M		With multiple tuners	Without digital network terminal
N			With digital network terminal
O		With multiple MPEG encoders	Without digital network terminal
P			With digital network terminal

Attachment 9

Target Standard Values for Video Cassette Recorders, etc.

I. Idea on Establishment of Target Standard Values

1. Basic Idea

We shall set target standard values based on the idea of Top Runner Method. The specific policy shall be as follows:

(a) Target standard values should be set for every category that has been appropriately defined.

(b) As for the categories where future technological advances are expected to improve efficiency, the target standard values should allow for the improvement as much as possible.

(c) Target standard values should not conflict among categories.

2. Flow of Setting Target Standard Values

(1) VCRs

Video cassette recorders (VCRs) were designated as specified equipment of Top Runner Standard in 1999. However, with the rise of new types of recording devices such as DVD recorders, the volume of shipment of VCRs is expected to drop rapidly in the near future. In addition, considering the situation where various manufacturers are focusing their efforts for technological development on the other recording devices, further improvement in efficiency is hardly expected for VCRs, since there will be no room for technological development of VCRs.

In light of the above, we decided to leave the target standard values for VCRs unchanged (See III).

(2) DVD Recorders

Among DVD recorders, annual energy consumption of "DVD recorders with HDD only" and "DVD recorders with both HDD and VCR" has a positive correlation with storage capacity of HDD (See Figure 1). Thus, in a given category, if we simply set a value of a model with less annual enrgy consumption as a target standard value (annual energy consumption), it is

more likely that models with larger HDD storage capacity may no longer be produced. With the above in mind, we shall express target standard values (annual energy consumption) by a linear function formula (calculation formula) with the HDD storage capacity as a variable.

Since "DVD recorders with VCR only" do not incorporate an HDD, we shall express their target standard values (annual energy consumption) by a numerical value of the annual energy consumption.

We established specific target standard values as described below.

(a) "DVD recorders with HDD only" and "DVD Recorders with HDD and VCR"

First of all, with certain number of data, we found a correlation slope between storage capacity of HDD and annual energy consumption for "DVD recorders with HDD only" of basic specification (one terrestrial analog tuner and one MPEG encoder), from which a relationship of the HDD capacity and annual energy consumption can be extracted as strictly as possible. As this resulted in the slope of 0.02 (kWh/GB), we decided to uniformly use the slope of 0.02 (kWh/GB) for all categories of those with HDD (including "DVD recorders with boyh HDD and VCR"). Then, under the slope, the calculation formula is set for each category so that the intercept will be a minimum. Finally, in the consideration of improvement in efficiency by the target fiscal year, a calculation formula obtained by translating the above calculation formula downward shall be set for the target standard value.

(b) "DVD recorders with VCR only"

For each of those with or without a digital network terminal, the smallest numeric value of annual energy consumption shall be a Top Runner Value. Then, an improvement in efficiency by the target fiscal year will be added to the above smallest annual energy consumption, and it shall become a target standard value.

3. Handling Categories in Which No Models Presently Exists

Although we decided to classify DVD recorders by the availability of multiple tuners/MPEG encoders or digital network terminals, some categories (Category F, K, L, O, and P) presently have no models; therefore, we cannot set the target standard values based on actual measurements. On the other hand, due to advancing digitalization in the future, the number of models is expected to increase in these categories. Thus, in order to set the target standard values for

these categories, we first determined an additional value due to incorporation of digital network terminals as well as that due to addition of built-in tuners or MPEG encoders. Then, we set the Top Runner Values by adding or subtracting them to numeric target standard values of categories in which models exist.

When calculating the additional value attributed to addition of tuners, we calculated the difference of Top Runner Values between a pair of those without terminals and the difference of Top Runner Values between a pair of those with terminals (difference between Category A and C: 17 kWh, difference between Category B and D: 11 kWh), and we adopted the lower value (i.e., 11 kWh). To calculate the additional value attributed to addition of MPEG encoders, as only those without terminals are actually existing, we adopted the difference of Top Runner Values between them (difference between Category A and E: 19 kWh).

In addition, for the digital network terminals, we used the difference of Top Runner Values between those with terminals and without terminals among "DVD recorders with HDD only" of the basic specification (the difference between Category A and B of 5 kWh), which has the largest number of models.

Further, for any categories in which models currently exist, intending to encourage more energy saving efforts (setting stricter standard values), we compared the values plus the additional values with actual measurements, and adopted the smaller of them as a Top Runner Value.

II. Room for Improvement in Energy Consumption Efficiency Through Technological Advance in the Future

Technological development for DVD recorders has been carried out, mainly for improvement of user convenience. Overall, technological development towards higher energy consumption efficiency have just begun, although it depends on a manufacturer. In other words, a room for improvement in efficiency still remains for DVD recorders.

DVD recorders are expected to raise the efficiency through power saving efforts of an LSI (Large Scale Integration) or HDD (hard disk), or CPU (Central Processing Unit). Taking into our consideration such possible improvement in efficiency and efforts toward energy saving, we set the target standard value by 5% up from the current Top Runner Value.

III. Specific Target Standard Values

(1) VCR

We left the target standard values of VCR unchanged as we discussed in "I", 2.

(2) DVD Recorders

(a) "DVD Recorders with HDD Only" (Category A to F)

For those having the basic specification in the categories in which models exist(Category A and B), under the correlation slope of HDD storage capacity and annual energy consumption determined in "I", 2, (2), we determined the calculation formula of the Top Runner Value by adapting the intercept to the one having the lowest annual power consumption for each category (See Figure 3 and 4).

For other categories in which models exist (Category C, D, and E), with the same slope in the above, we first determined the calculation formula of the Top Runner Value by adapting the intercept to the one having the lowest annual energy consumption for each category. At the same time, we also determined the Top Runner calculation formula by adding the additional values determined in "I" to the values of those having the basic specification. Then, comparing these formulas, we decided to adopt the calculation formula expressing less annual energy consumption (more energy-saving) (See Figure 5 to 7).

For the categories in which no model exists (Category F), as we could not make actual measurement, we worked out the calculation formula by adding the additional values determined in "I", 3 to the calculation formula for the categories in which models exist (See Figure 7).

After going through the process described above, we determined the target standard values by adding the efficiency of improvement of 5% to the calculation formula of the Top RunnerValues.

(b) "DVD Recorders with VCR only" (Category G to J)

First, for each category, we determined a numeric value of the one with the lowest annual energy consumption as the Top Runner value. At the same time, we also determined the numeric Top Runner Value calculated by adding the additional values determined in "I", 3 to the values of those having the basic specification. Then, comparing these values, we decided to adopt the

numeric value expressing less annual energy consumption (more energy-saving).

Then, we determined the target standard values by adding 5% improvement in efficiency to the Top Runner Values.

Now, the target standard value for DVD recorders of basic specification and with no digital network terminal (E=46) is higher than that for those having multiple tuners but no digital network terminal (E=39) (inverse correlation). Thus, we used the value of the latter.

(c) "DVD Recorders with HDD and VCR" (Category K to P)

For the category of DVD recorders having multiple tuners but no digital network terminals where models actually exist (Category M), we worked out the calculation formula of the Top Runner Value by adapting to those with the lowest annual energy consumption, under the correlation slope of between HDD storage capacity and annual energy consumption determined in "I", 2., (2) (See Figure 8).

For the category of DVD having multiple tuners and digital network terminals where models actually exist (Category N), using the same slope as the above, we determined the Top Runner calculation formula by adapting to those with the lowest annual energy consumption. At the same time, we also determined the Top Runner calculation formula by adding the additional values determined in "I", 3 to the values for those having multiple tuners but no digital network terminal (Category M). Then, comparing these formulae, we decided to adopt the calculation formula expressing less annual energy consumption (more energy-saving) (See Figure 9).

For the categories in which no model exists (Category K, L, O and P), as we could not make actual measurement, we found the calculation formula by adding or subtracting the additional values to or from the Top Runner calculation formulae for Category M and N (See Figure 7).

Then, we determined the target standard values by adding 5% improvement in efficiency to the Top Runner Values.

Top Runner Values and Target Standard Values (16 categories)

Category	Attached Recording Device	Tuner and Signal Conversion Function	Additional Terminal	Calculation Formula for Energy Consumption Efficiency (Actual Measurement)	Calculation Formula for Energy Consumption Efficiency (Calculated Value)	Improved Efficiency [%]	Calculation Formula for Target Standard Value
A	Having HDD only	Basic specification	Without digital network terminal	E=0.02C+47	←	5	E=0.02C+45
B			With a digital network terminal	E=0.02C+52	←	5	E=0.02C+49
C		Having multiple tuners	Without digital network terminal	E=0.02C+64	E=0.02C+58 (Category A+11)	5	E=0.02C+55
D			With a digital network terminal	E=0.02C+63	E=0.02C+63 (Category C+5) or (Category B+11)	5	E=0.02C+60
E		Having multiple MPEG encoders	Without digital network terminal	E=0.02C+66	E=0.02C+66 (Category A+19)	5	E=0.02C+63
F			With a digital network terminal	Not existing	E=0.02C+71 (Category E+5) or (Category B+19)	5	E=0.02C+68
G	Having VCR only	Basic specification	Without digital network terminal	E=48	←	5	E=46 → E=39 (Inverse Correlation) (I)
H			With a digital network terminal	E=46	E=53 (Category G+5)	5	E=44
I		Having multiple tuners	Without digital network terminal	E=41	E=59 (Category G+11)	5	E=39
J			With a digital network terminal	E=133	E=57 (Category I+5) or (Category H+11)	5	E=54
K	Having both HDD and VCR	Basic specification	Without digital network terminal	Not existing	E=0.02C+61 (Category M-11)	5	E=0.02C+58
L			With a digital network terminal	Not existing	E=0.02C+66 (Category K+5)	5	E=0.02C+63

M		Having multiple tuners	Without digital network terminal	E=0.02C+72	←	5	E=0.02C+68
N			With a digital network terminal	E=0.02C+163	E=0.02C+77 (Category M+5) or (Category L+11)	5	E=0.02C+73
O		Having multiple MPEG encoders	Without digital network terminal	Not existing	E=0.02C+80 (Category K+19)	5	E=0.02C+76
P			With a digital network terminal	Not existing	E=0.02C+85 (Category O+5) or (Category L+19)	5	E=0.02C+81

E: Energy consumption efficiency [kWh/year]

C: Storage capacity of hard disk [GB]

Summary <Target Standard Values of VCR/DVD Recorders>

(a) VCR (4 categories)

Category	Target Standard Value
1. With signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions	2.5
2. With signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions	2.0
3. Without signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions	2.2
4. Without signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions	1.7

(b) DVD Recorders (16 categories)

Category	Attached Recording Device	Tuners and Signal Conversion Function	Additional Terminal	Calculation Formula for Target Standard Value
A	Having HDD only	Basic specification	Without digital network terminal	E=0.02C+45
B			With a digital network terminal	E=0.02C+49
C		Having multiple tuners	Without digital network terminal	E=0.02C+55
D			With a digital network terminal	E=0.02C+60
E		Having multiple MPEG encoders	Without digital network terminal	E=0.02C+63

F			With a digital network terminal	E=0.02C+68
G	Having VCR only	Basic specification	Without digital network terminal	E=39
H			With a digital network terminal	E=44
I		Having multiple tuners	Without digital network terminal	E=39
J			With a digital network terminal	E=54
K	Having both HDD and VCR	Basic specification	Without digital network terminal	E=0.02C+58
L			With a digital network terminal	E=0.02C+63
M		Having multiple tuners	Without digital network terminal	E=0.02C+68
N			With a digital network terminal	E=0.02C+73
O		Having multiple MPEG encoders	Without digital network terminal	E=0.02C+76
P			With a digital network terminal	E=0.02C+81

E: Energy consumption efficiency (annual power consumption) [kWh/year]

C: Storage capacity of hard disk [GB]

1. Correlation of Hard Disk Storage Capacity and Annual Energy Consumption

(1) All models in [DVD recorders with HDD only] and [DVD recorders with both HDD and VCR].

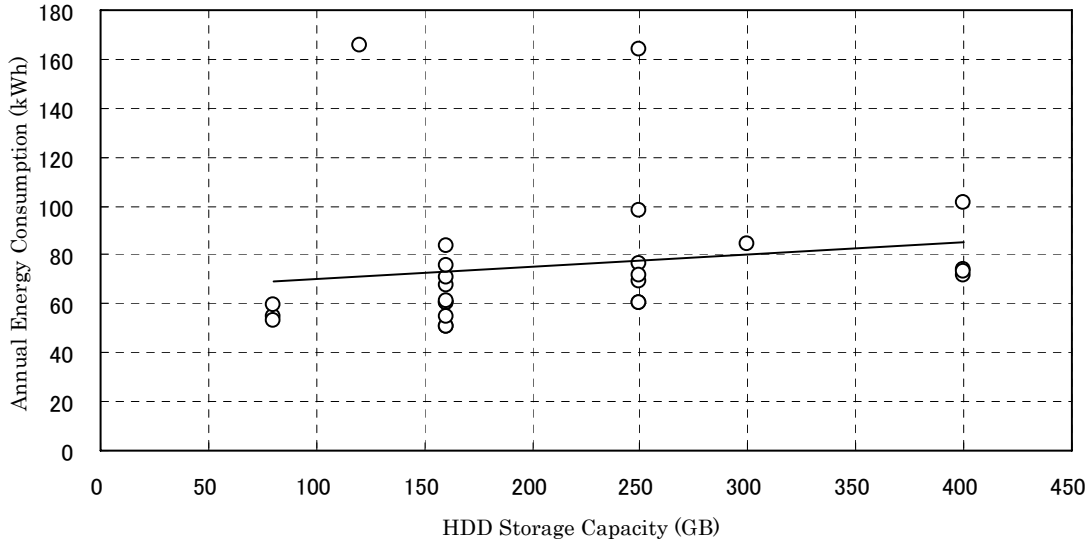


Figure 1: Hard Disk Storage Capacity - Annual Energy Consumption (Overall)

(2) "DVD recorders with HDD only" and of basic specification

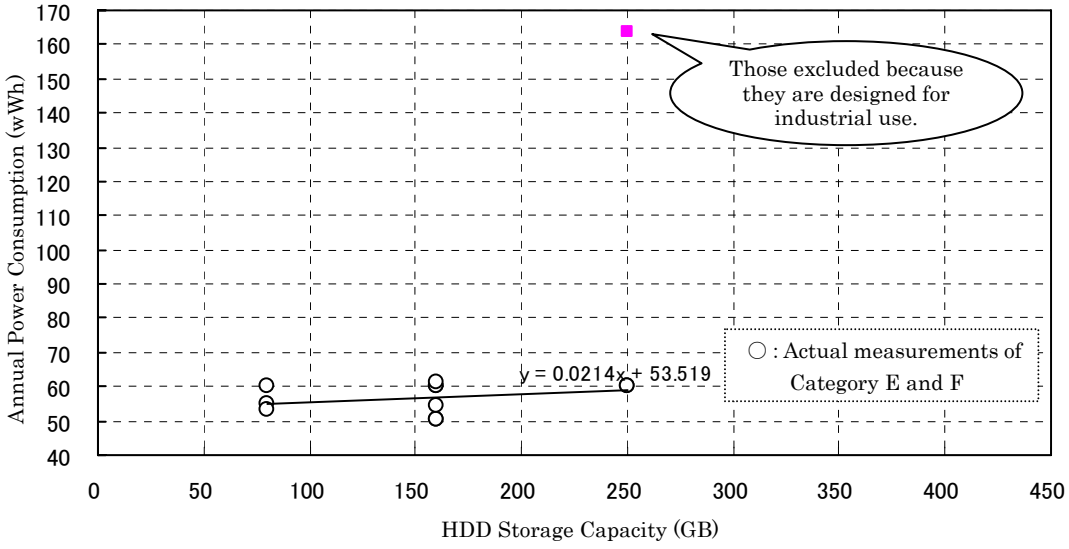


Figure 2: Hard Disk Storeage Capacity – Annual Energy Consumption (Slope)

2. Calculation Formula of Target Standard Values

(1) DVD Recorders having HDD

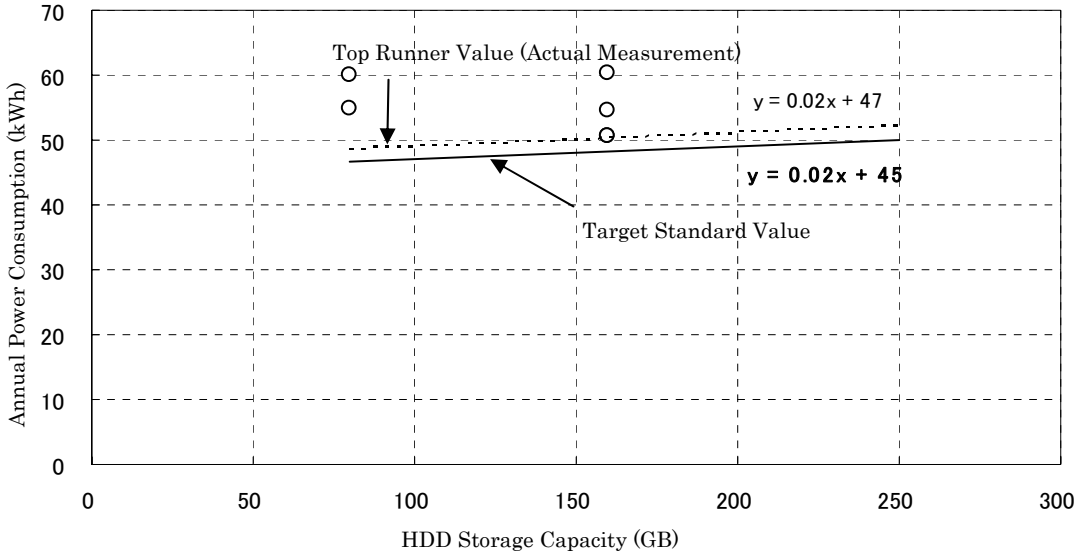


Figure 3: Hard Disk Storage Capacity – Energy Consumption Efficiency (Category A)

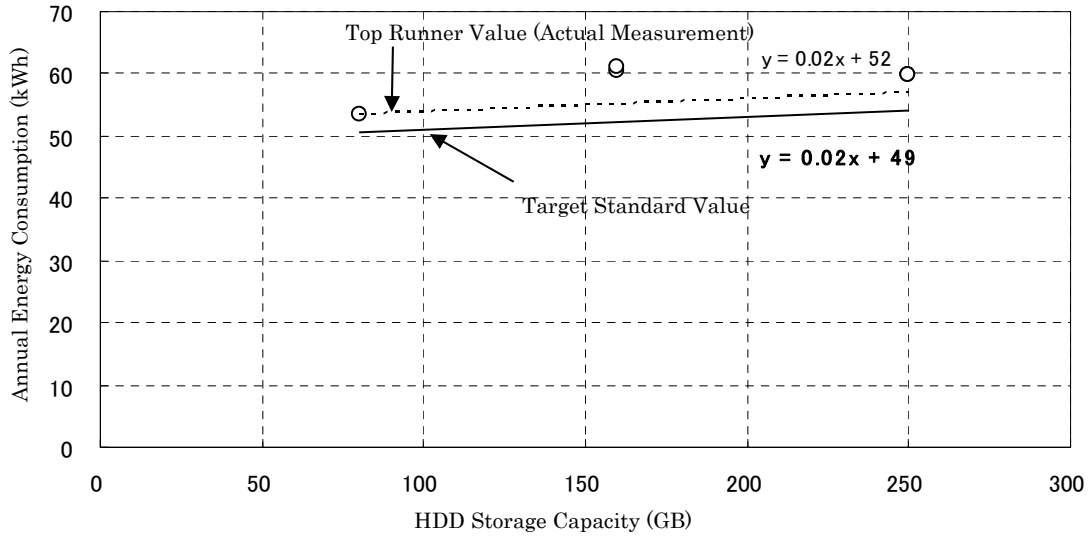


Figure 4: Hard Disk Storage Capacity – Energy Consumption Efficiency (Category B)

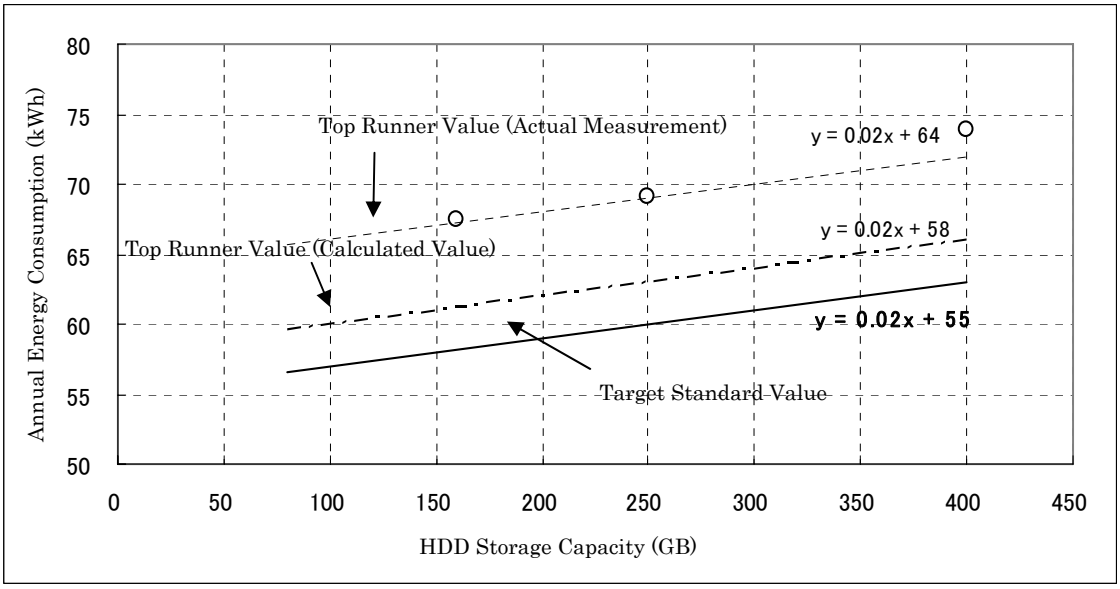


Figure 5: Hard Disk Storage Capacity – Energy Consumption Efficiency (Category C)

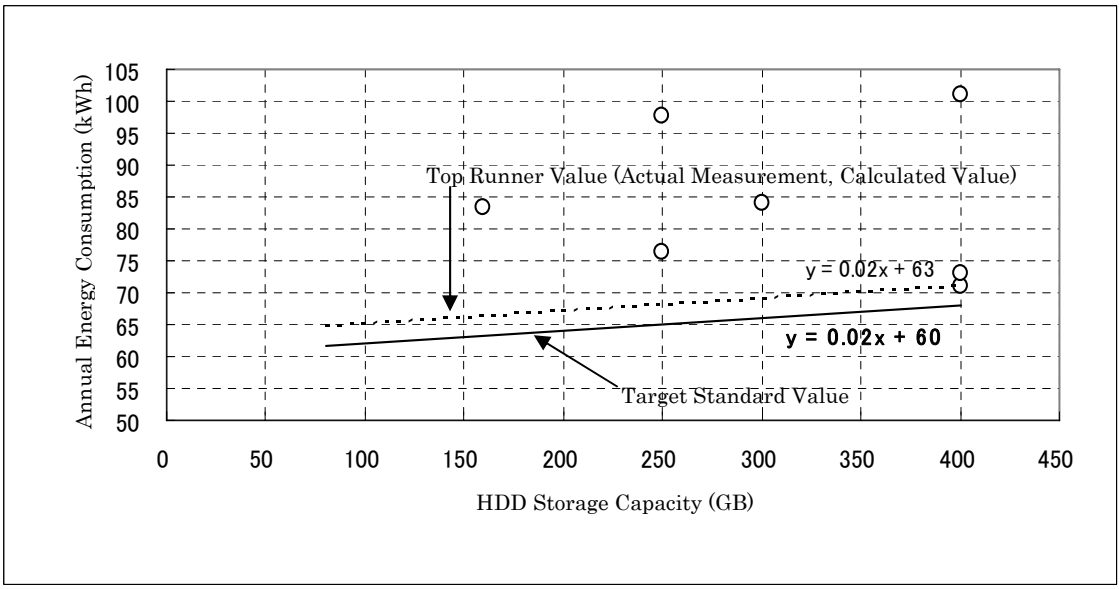


Figure 6: Hard Disk Storage Capacity – Energy Consumption Efficiency (Category D)

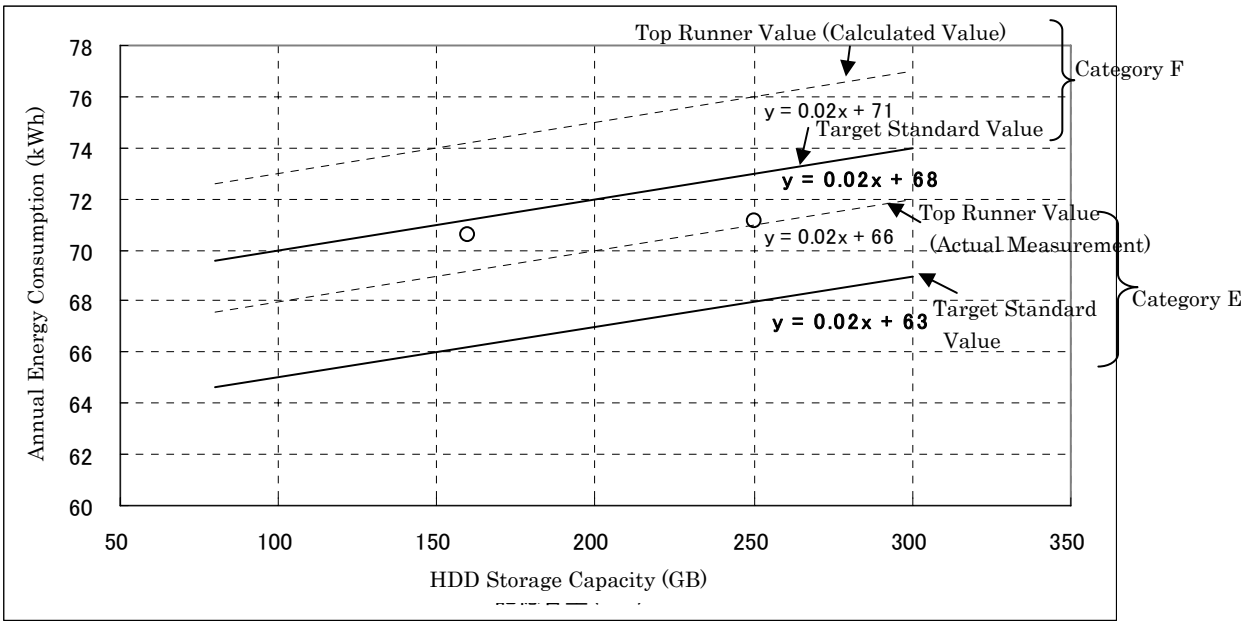


Figure 7: Hard Disk Storage Capacity – Energy Consumption Efficiency
(Category E and F)

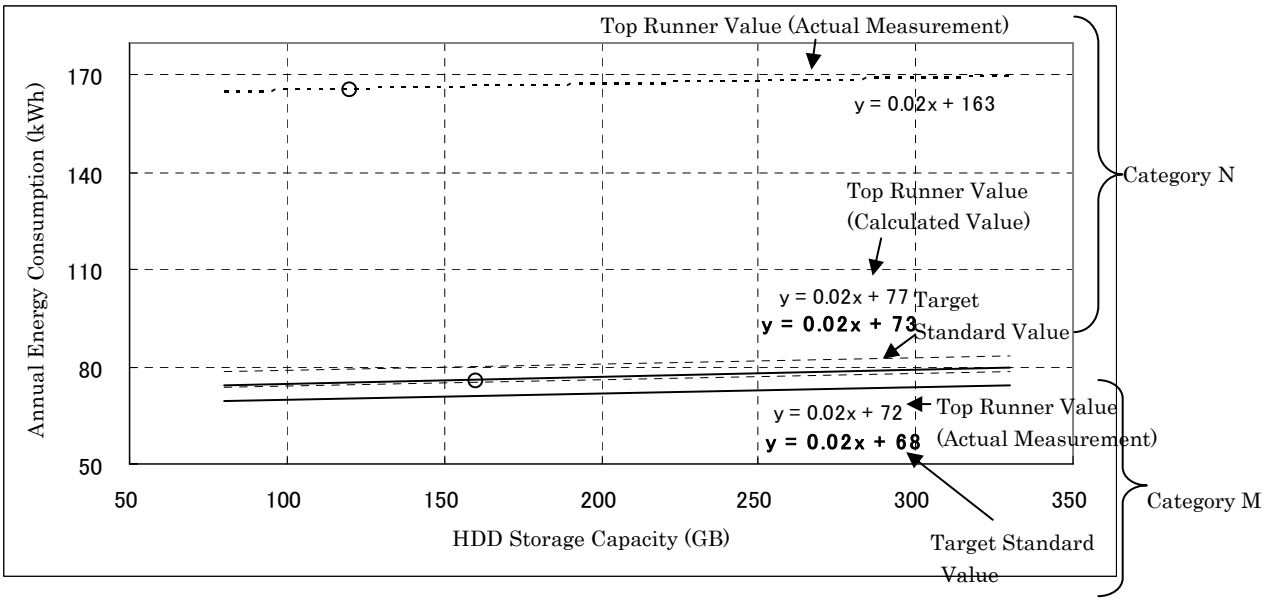


Figure 8: Hard Disk Storage Capacity – Energy Consumption Efficiency
(Category M and N)

Attachment 10

Energy Consumption Efficiency of VCR and DVD Recorders and Method of Measurement

1. Basic Idea

As for Video Cassette Recorders (VCR), when they were designated as specified equipment of the Top Runner Standard in 1999, "Standby Power Consumption" was introduced as a realistic indicator on energy consumption efficiency. As far as VCRs are concerned, when making a review this time, we took into consideration the following: (a) no new specification that may have impact on the actual status of the usage has been added, (b) there has been no particular change in the amount of TV watching time, (c) the volume of shipment of video tapes is on a downward trend, etc. It is unlikely that the operating time of VCRs increase than before, and we believe that they are still mainly in standby state. Hence, it would be reasonable to adopt the standby power and the existing method of measurement, which have been conventionally used.

In addition, for DVD recorders, as the operating power accounts for more of the total power consumption, contrary to the case of VCR, we adopted annual power consumption as their energy consumption efficiency and specified a new method of measurement.

2. Specific Energy Consumption Efficiency and Measuring Method

(1) VTR

a) Method of Measuring Energy Consumption Efficiency

The energy consumption efficiency shall be standby power, and shall be a numeric value in Watt obtained by the following method and calculated to one place of decimals.

(a) Measurement shall take place under the condition, where the AC power is supplied, VCR is turned off, and remote control operation is ready (hereinafter referred to "standby state").

(b) For models with display function (such as of clock) that can be selected to be display/non-display, the energy consumption efficiency shall be calculated with the following expression:

$P = P_{don} - (P_{don} - P_{doff}) \times 0.2$

P: standby power (Watts)

P_{don}: standby power during display state (Watts)

P_{doff}: standby power during non-display state (Watts)

(c) In the case of that power is supplied to any device other than a main body of VCR, it shall not be included in the standby power.

b) Conditions of Measurement

(a) The acceptable variation of AC power supply shall be: voltage of 100(V) ± 2 (%), and frequency of 50 or 60 (Hz) ±1 (Hz).

(b) If a display unit (such as of clock) has light/dark switching function, it shall be set to a factory default. In addition, the clock shall be set to "10:00".

(c) Measurement should take place only when power consumption of a recorder is in adequately stable condition.

(d) A wattmeter to be used for measuring power consumption shall be equipped with averaging measurements function, shall be capable of measuring a waveform with the power peak factor up to 3, and shall be calibrated so that the accuracy falls within 1%.

(2) DVD Recorders

a) Method of Measuring Energy Consumption Efficiency

The operational power is greater than VCRs, and addition of new features is expected to extend the operating time as well. Thus, energy consumption efficiency shall be annual energy consumption comprised of not only standby power but also operational power, and it will be measured by the following method.

i) DVD recorders with HDD only, and DVD recorders with both HDD and VCR

$$E = [\{P_{don} - (P_{don} - P_{doff}) \times 0.2\} \times (t1 - t_{epg}) + P_{hrec} \times t2 + P_{hpl} \times t3 + P_{dvd} \times t4 + P_{epg} \times t_{epg}] / 1000$$

E: annual energy consumption (kWh/year)

P_{don}: standby power during display state (W)

P_{doff}: standby power during non-display power (W)

P_{hrec}: operational power when HDD recording (W)

$P_{hpl:}$ operational power when HDD playing (W)

$P_{dvd:}$ operational power of DVD (W)

P_{epg}: power consumption at EPG (electronic program guide) acquisition (W)

t1: annual standard standby time (h) 7482.5 (20.5h × 365 days)

t2: annual standard HDD recording time (h) 730 (2h × 365 days)

t3: annual standard HDD playing time (h) 365 (1h × 365 days)

t4: annual standard DVD operating time (h) 182.5 (0.5 h × 365 days)

t_{epg}: annual standard EPG aquiring time (h) *varies depending on devices.

ii) DVD recorders with VCR only

$E = [\{P_{don} - (P_{don} - P_{doff}) \times 0.2\} \times (t1 - t_{epg}) + P_{dvd} \times t2 + P_{vcr} \times t3 + P_{epg} \times t_{epg}] / 1000$

E: annual energy consumption (kWh/year)

P_{don}: standby power during display state (W)

P_{doff}: standby power during non-display power (W)

P_{dvd}: operational power of DVD (W)

P_{vcr}: operational power of VCR (W)

P_{epg}: power consumption at EPG (electronic program guide) acquisition (W)

t1: annual standard standby time (h) 7665 (21h × 365 days)

t2: annual standard DVD operating time (h) 730 (2 h × 365 days)

t3: annual standard VCR operating time (h) 365 (1h × 365 days)

T_{epg}: annual standard EPG acquiring time (h) *varies depending on devices.

(a) P_{don}: standby power during display state (W)

The standby power during display state shall be power consumption measured when a unit under test is turned off but able to be operated by a remote control (hereinafter referred to this state as “standby”).

(b) P_{doff}: standby power during non-display state (W)

The standby power during non-display state shall be standby power when the display device is turned OFF. In addition, if the display unit do not have non-display, it shall be standby power during display state.

(c) P_{hrec}: operational power when HDD recording (W)

The operational power when HDD recording shall be power consumption required to record received signals from 1ch (in standard recoding mode) by built-in terrestrial analog tuner.

(d) P_{hpl}: operational power when HDD playing (W)

The operational power when HDD playing shall be power consumed to play the video which is recorded in (c) above.

(e) P_{dvd}: operational power of DVD (W)

The operational power of DVD shall be power consumed to play location which is from 24mm to 27.4mm in radius of DVD to be used in the measurement.

(f) P_{vcr}: operational power of VCR (W)

The operational power of VCR shall be power consumption required to record received signals from 1ch (in standard recoding mode) by built-in terrestrial analog tuner.

(g) P_{epg}: power consumption at EPG acquisition (W)

The power consumption at EPG acquisition shall be operational power when EPG acquiring.

b) Conditions of Measurement

(a) The acceptable variation of AC power supply shall be: voltage of 100(V) ± 2 (%), and frequency of 50 or 60 (Hz) ±1 (Hz).

(b) If a display unit (such as of clock) has light/dark switching function, it shall be set to a factory default. In addition, the clock shall be set to "10:00".

(c) Measurement should take place only when power consumption of a recorder is in adequately stable condition.

(d) A wattmeter to be used for measuring power consumption shall be equipped with averaging measurements function, shall be capable of measuring a waveform with the power peak factor up to 3, and shall be calibrated so that the accuracy falls within 1%.

(e) A unit under test shall be connected as follows. No connection other than those described below must be made. In addition, even though there are any other terminals available in the unit, they shall be unconnected.

i) Inter-television sets

A video output terminal shall be RCA terminal (a video signal shall be a composite signal).

An audio output terminal shall be RCA terminal (an audio signal shall be L and R signals). In this state, a connecting terminal shall

be connected with 1 given system only, and any other terminals shall be unconnected.

ii) To an RF signal generator

An RF antenna input terminal shall be one for a terrestrial analog tuner. If a unit has multiple RF antenna input terminals, the connection shall be made with 1 given terminal only, and any other terminals shall remain unconnected.

(f) EPG acquisition function shall be turned OFF (except when measuring P_{epg}). If the function cannot be turned OFF, measurement shall take place while the function is inactive.

(g) Just clock function (automatic clock adjustment function) shall be turned OFF. If the function cannot be turned OFF, measurement shall take place while the function is inactive.

(h) Other functions of the unit under test shall be set as follows.

i) BS antenna power supply setting: OFF
ii) BS antenna output setting: OFF
iii) Input/output switching: terrestrial analog tuner
iv) Channel setting: VHF 1ch
v) Program setting: unset
vi) Signal detecting automatic video recording function: OFF
vii) HDD standby mode setting: Factory default
viii) Digital network terminal: OFF
ix) Picture quality setting: factory default
x) Audio setting (input/output): factory default
xi) Setting other than the above: factory default

(i) Measurement shall take place, while any record playing media which are not to be used in measurement (DVD, CD (compact disk), VCR tape, etc.) shall being uninserted.

c) RF antenna input signal

An input signal shall be a terrestrial analog signal based on the following conditions:

Standard modulation method: M
Color system: NTSC
Video carrier frequency: 91.25 MHz < 1ch >
Video signal: Color bar signals (75/0/75/0) of the JIS Standard (C6101-1)

Audio signal: 1 kHz MONO (60% modulation)
High frequency wave input signal level: 70 dB (μ V)

(Reference)

Concept of Setting DVD Recorder Operating Time Based on
the Survey of Actual Status of the Usage

Since DVD recorders are evaluated in terms of annual energy consumption including annual operational power as well as annual standby power, we need to set operating time for every action, such as recording/playing. In this section, we shall set the annual standard operating time based on the survey result of actual status of the usage.

1. DVD Recorders with HDD Only

(1) Survey result on actual status of the usage

(a) HDD recording time: 1.88 hours/day
(b) HDD playing time: 1.20 hours/day
(c) DVD recording time: 0.33 hour/day
(d) DVD playing time: 0.05 hour/day
(e) Copying time (HDD ⇔ DVD): 0.2 hours/day

(2) The time listed in (1) above shall be rounded off in 0.5-hour unit

i) HDD recording time: 2.0 hours/day
ii) HDD playing time: 1.0 hour/day
iii) DVD recording time: 0.5 hour/day
iv) DVD playing time: 0 hour/day
v) Copying time (HDD ⇔ DVD): 0 hour/day

DVD recorders with HDD only

	Operating (Standby) Time per Day (A)	Annual Standard Operating (Standby) Time (A)×365 days
HDD recording time	2.0 hours	730
HDD playing time	1.0 hour	365
DVD operating time	0.5 hour	182.5
Standby time	20.5 hours	7482.5

2. DVD Recorders with VCR Only

(1) Survey resutl on actual status of the usage

(a) DVD recording time: 0.82 hour/day

(b) DVD playing time: 0.85 hour/day

(c) VCR recording time: 0.46 hour/day

(d) VCR playing time: 0.40 hour/day

(e) Copying time (DVD ⇔ VCR): 0.03 hour/day

(2) The time listed in (1) above shall be rounded off in 0.5-hour unit

i) DVD recording time: 1.0 hour/day

ii) DVD playing time: 1.0 hour/day

iii) VCR recording time: 0.5 hour/day

iv) VCR playing time: 0.5 hour/day

v) Copying time (DVD⇔ VCR): 0 hour/day

DVD recorders with VCR only

	Operating Time per Day (A)	Annual Standard Operating Time (A) × 365 days
DVD Operating Time	2.0 hours	730
VCR Operating Time	1.0 hour	365
Standby Time	21.0 hours	7665

3. DVD Recorders with both HDD and VCR

We could not obtain reliable data for those with both HDD and VCR, because there are only a few users at present. However, taking into consideration that use of VCR is on a decline for DVD and HDD functions, and that use of VCR function is transient, it can be assumed that actual status of the useage of DVD recorders with both HDD and VCR will not be significantly different from the status of DVD recorders with HDD only. Accrodingly, the same operating time as in 1. for DVD recorders with HDD only was also applied to DVD recordes with both HDD and VCR.

DVD Recorders with both HDD and VCR

	Operating Time per Day (A)	Annual Standard Operating Time (A) × 365 days
HDD recording time	2.0 hours	730
HDD playing tTime	1.0 hour	365
DVD operating time	0.5 hour	182.5
Standby Time	20.5 hours	7482.5

Attachment 11

TV sets and Video Casset Recorders Evaluation Standard Subcommittee,

Energy Efficiency Standards Subcommittee of

Advisory Committee for Natural Resources and Energy

List of Members

Chairman:
MITSUTOSHI HATORI, Professor in Department of Electrical, Electronic and Communication Engineering, Faculty of Science and Engineering, Chuo University

Members:
HITOSHI AIDA, Professor in Graduate School of Frontier Science, The University of Tokyo

HIROAKI IKEDA, Professor in Department of Urban Environment System, Faculty of Engineering, Chiba University

HIROYUKI INOUE, Project General Manager of Expert Committee for Energy-Saving fo Televisions, TV/Network program Committee, Japan Electronics and Information Technology Industries Association

KAZUO UENO, Vice Research Manager of Energy Technology Research Institute, National Institute of Advanced Industrial Science and Technology

AKIKAZU KANAI, Manager of Consumers' Advisory Center, Japan Consumers' Association

MASATO TANABE, Chairman of AV Storage and Network Program Committee, Japan Electronics and Information Technology Industries Association

AKIHIRO TSURUSAKI, Senior Researcher of Jyukankyo Research Institute Inc.

TOSHIHISA MASUDA, General Manger of Technical Department, The Energy Conservation Center, Japan

TAEKO YUINE, Managing Director of Nippon Association of Consumer Specialists

HIROSHI HARUHARA, Managing Director of Japan Machinery Importers' Association (Resigned as of March 31, 2005, due to dissolution of the association)

Attachment 12

TV sets and Video Cassette Recorders Evaluation Standard Subcommittee,
Energy Efficiency Standards Subcommittee of
Advisory Committee for Natural Resources and Energy
Background of Holding

First subcommittee meeting (August 8, 2004)

- Disclosure of meetings of TV sets and Video Cassette Recorders Evaluation Standard Subcommittee
- Achievement status of TV sets and video cassette recorders, etc.
- Current situation of TV sets
- Target scope of TV sets
- Current situation of video cassette recorders, etc.
- Target scope of video cassette recorders, etc.

Second subcommittee meeting (October 5, 2004)

- Name change of Evalucation Standard Subcommittee
- Energy consumption efficiency of TV sets and the method of measurement
- Energy consumption efficiency of video cassette recorders, etc. and the method of measurement

Third subcommittee meeting (February 25, 2005)

- Categories, target standard values, and target fiscal year for TV sets
- Categories, target standard values, target fiscal year as well as (amended) method of measurement for video cassette recorders, etc.

Fourth subcommittee meeting (April 6, 2005)

- Intermediate report

Fifth subcommittee meeting (June 2, 2005)

- Final report