Reference 2

General Resources Energy Investigation Committee, Energy Savings Standards Section, Computer and Hard Disk Drive Judging Standards Subcommittee Final Report

February 14th, 2003

In this "General Resources Energy Investigation Committee, Energy Savings Standards Section, Computer and Hard Disk Drive Judging Standards Subcommittee Interim Report (Dec. 17, 1998)", concerning judging standards, etc. of computers and hard disk drives (HDDs), "since technological progress and changes in market trends is significant, evaluations shall be made to revise judging standards in FY2002, based on the performance in FY2001."

For this purpose, this subcommittee based on the above request was convened to evaluate judging standards and other issues of manufacturers and importers (hereinafter "manufacturers, etc.") of computers and HDDs, and the following is an final report.

I. Interim evaluation of current standards

As is clear from the actual performance values[1] of the energy consumption efficiency of computers and HDDs in FY2001, a considerable number of computers and HDDs have already achieved the current target standard values (target year: FY2005).

Comparing the energy consumption efficiency of the current standards at time of establishment (FY1997 actual performance values) and current values (FY2001 actual performance values), power consumption for computers has decreased by about 1/25 per unit of computing power and 1/10 per unit storage volume for HDDs (see table below).

	Time of establishing standards (FY1997 performance)	Current (FY2001 performance)	Energy Savings Progress status
Computers			
No. of general units shipped (Thousands of units)	5,885	9,873	—
Power consumption (Watts)	42	11	—
Energy consumption efficiency (Watts/one million calculations	0.17	0.0065	Reduced by about 1/25
HDDs			
No. of general units shipped (Thousands of units)	7,259	7,950	—
Power consumption (Watts)	11	14	—
Energy consumption efficiency (Watts/gigabyte)	1.4	0.14	Reduced by about 1/10

Note: "Power consumption" indicates the power consumed (average value) per device or unit. "Energy consumption efficiency" indicates the energy consumption efficiency (average value) per device or unit. The devices listed are targets in the Law concerning the Rational Use of Energy (hereinafter the Energy Conservation Law)

(Source) Ministry of Economy, Trade and Industry survey

Concerning computers that have a low-power mode, by acknowledging considerations of achievement judgments of target standard values of energy saving effects by low-power

[1] Please see 1. (1) and 2. (1) in Reference Material 4

modes, low-power modes in client-side computers have been expanding rapidly.[2]

As above, energy savings in computer and HDDs through current standards implementation is happening more quickly than initial forecasts and developing by leaps and bounds. The current standards, based on the top-runner basic approach, are having an extraordinarily effective function for energy saving in computers and HDDs.

II. Comparisons with current standards

1. Relationship with current standards

Concerning the current regulations, they are deferred and will continue to be valid until the target fiscal year of FY2005. Regarding the judging standards, etc. decided upon at the next subcommittee, the judging standards, etc. in the new target year will be as indicated below.

2. Major improvement points

From the viewpoint of further strengthening energy saving measures, the judging standards, etc. decided upon at the next subcommittee will be compared with the current standards and aim for the main improvements listed below.

(1) Computers

1. Expansion of applicable scope

- Computers with a composite theoretical performance (CTP)[3] over 10,000mtops and under 50,000mtops (originally a portion of supercomputers) will be newly added as targets.
- Portion of massively parallel processors (for calculations using processors with between 100-256 processors will be newly added as targets.

2. Establishment of target standard values based on the top-runner approach

Based on 2001 actual performance, the target standard values (standard energy consumption efficiency) will be based on the top-runner basic approach.

3. Target standard values established taking power consumption of both standby time and operation time into consideration

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[2] See reference material 2

[3] Composite theoretical performance is the value expressed in the unit of one million calculations in the Energy Savings Law implementation regulations (1979 Ministry of Trade and Industry law no. 74) in attached table No. 2 upper section for computers and lower section for other items.

To have target standard values even more appropriately reflect the usage conditions of computers, target standard values will be established taking into consideration both standby times (idle status[4]) and operation times for client-side computers.

4. Revision of definition of server-type computers and client-side computers.
Given the large volume increases in main storage volumes in client-side computers, the original classification will be changed from 4GB to 6GB based on the main storage volume of client-side computers and server-side computers.

(2) HDDs

1. Expansion of applicable scope
Subsystems with maximum data transfer speeds of over 3,200MB/sec to under 70GB a second will be added as new targets.

2. Establishment of target standard values based on the top-runner approach
Based on 2001 actual performance, the target standard values (standard energy consumption efficiency) will be set based on the top-runner basic approach.

3. Unification of classifications in subsystems
The classification settings by data transfer speed in subsystems will be eliminated and the classification unified to aim for simplification.

III. Computers

1. Targets and scope (see Attachment 1)

In accordance with current regulations, the targets are digital CPUs (5211) and PCs (5212), determined by the Japanese Standard Product Classification.

However, the following items are excluded: 1) items with a CTP of 50,000mtops or above, 2) items which can execute calculations using calculation processing equipment consisting of over 256 processors, 3) items with 512 or more I/O signal transmission paths[5]

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[4] See "2. (3) Energy consumption efficiency measurement methods"

[5] The I/O signal path is the signal transmission path connected to the CPU and the main memory (includes applicable signal transmission paths and other transmission paths that have the same transmission capabilities) that directly branches off or signal transmission path splitter equipment that is connected to that from the direct splitter, and items other than those used only to connect externally to the graphics display or keyboard.

(limited to items with a max. data transmission speed of 100mbps or above), 4) items with a CTP of within 100mptops, 5) items that use batteries entirely internal and which do not receive their power supply from a power line and which do not have an internal HDD, 6) any CPUs, main memory, I/O control devices and power supply equipment that are in a multiplexed configuration (fault tolerant).

2. Necessary items for judging standards of manufacturers, etc.

(1) Target year (see Attachment 2)

FY2007

(2) Target standard values (see Attachment 3)

Manufacturers, etc., concerning computers shipped within Japan by the target fiscal year, shall not exceed the target standard value (standard energy consumption efficiency) listed in the right-hand column below weighted by units shipped per classification in the table below for energy consumption efficiency measured by established laws (3).

Classification				Standard energy consumption efficiency
Computer Type	No. of I/O Signal Transmission Paths	Main Memory Size	Classification label	
Server-side computers	64 or over		A	3.1
	8 or over, less than 64		B	0.079
	4 or over, less than 8	16GB or over	C	0.071
		Below 16GB	D	0.068
	Less than 4	16GB or over	E	0.053
		4GB or over, less than 16GB	F	0.039
		2GB or over, less than 4GB	G	0.024
		Under 2GB	H	0.016
Items other than battery-driven types among client-side computers	2 or over, under 4	Under 6GB	I	0.027
	Under 2	2GB or over, under 6GB	J	0.0048
		Under 2GB	K	0.0038
Battery-operated computers among client-side computers		Over 1GB, under 6GB	L	0.0026
		Under 1GB	M	0.0022

Notes 1. “Server-side computers” are those other than client-side computers

2. The I/O signal transmission path is the signal transmission path connected to the CPU and the main memory (includes

applicable signal transmission paths and other transmission paths that have the same transmission capabilities) that directly branches off or signal transmission path splitter equipment that is connected to that from the direct splitter. Among items other than those used only to connect externally to external the graphics display or keyboard, the main path has a max. data transmission speed of 100Mbit/sec. or over.

3. Battery driven types use entirely internal batteries and those which do not receive a power supply from a power line.
4. "Client-side computers" are those that have a graphics display port and keyboard port (includes those with internal displays or internal keyboards) and those that have a main memory under 6GB and under four I/O signal transmission paths.

Reference Current Target Standard Values (Target Standard Values in FY2005)

Classification				Standard energy consumption efficiency Computer Type
Computer Type	No. of I/O Signal Transmission Paths	Main Memory size	Classification label	
Server-side computers	32 or more		A	21
	Over 16, less than 32		B	3.6
	Over 8, less than 16	16GB or over	C	2.0
		4GB or over, less than 16GB	D	2.0
		Under 4GB	E	1.4
	Over 4, less than 8	16GB or over	F	1.8
		4GB or over, less than 16GB	G	0.41
		Under 4GB	H	0.41
	Less than 4	16GB or over	I	1.8
		4GB or over, less than 16GB	J	0.41
		2GB or over, less than 4GB	K	0.29
		Under 2GB	L	0.28
Items other than battery-driven types among client-side computers	2 or over, under 4	2GB or over, under 4GB	M	0.19
		1GB or over, less than 2GB	N	0.19
		Under 1GB	O	0.17
	Under 2	2GB or over, less than 4GB	P	0.19
		1GB or over, less than 2GB	Q	0.12
		Under 1GB	R	0.043
Battery-operated computers among client-side computers	—	—	S	0.0065

(Note) "Client-side computers" are those that have a graphics display port and keyboard port (includes those with internal displays or internal keyboards) and those that have a main memory within 4GB and within four I/O signal transmission paths.

(3) Energy consumption efficiency measurement method

i) Energy consumption efficiency is calculated by the following formula.

$$E = \{(W_1 + W_2)/2\} / Q$$

In this formula, E, W_1, W_2 and Q represent the following values.

E : Energy consumption efficiency (unit: watts/million calculations)

$(W_1+W_2)/2$: Power consumption (unit: watts)

W_1 : Power consumption in idle state (unit: watts)

The power consumption of the idle state (hereinafter "idle state") is when operation is possible without resetting the initial programs and in the states before operating in low power mode such as standby mode and suspended mode in accordance with the ACPI standards[6]

W_2 : Power consumption in low power mode (unit: watts)

The power consumption of low power mode is the low power mode of standby mode and suspended mode in ACPI standards (however, limited to states in which program and data are store in the main memory). Concerning server-side computers and client-side computers that do not have low power modes, the value of W_1 is used for W_2.

Q : Composite theoretical performance (CTP) (unit: million of calculations)

ii) W_1 is expressed in watt units for values measured by the method below.

1. Ambient temperature between 16°C and 32°C.
2. Power supply voltage in ±10% specified input voltage. However, for items with specified input voltage of 100 volts, it is ±10% of 100 volts.
3. Power supply frequency at standard frequency.
4. Without losing the computer's basic functionality, measurements are done with the maximum configuration on a scope that removes I/O control equipment, communications control equipment, HDDs, etc. that can be disconnected from the computer. For items to which the number of processors can be expanded, measurements shall be done with the minimum configuration of processors. For items other than battery-driven types among client-side computers, measurements can be done with the power supply to the graphic display turned off.

iii) W_2 is expressed in watt units for values measured by the method below.

1. Ambient temperature shall be 16 to 32°C.
2. The power supply voltage shall be within the range of the rated input voltage

[6] Abbreviation of a standard concerning power management offered by Microsoft and other companies in the U.S. ACPI stands for Advanced Configuration and Power Interface.

±10%. If a computer has a rated input voltage of 100 volts, the power voltage shall be within the range of 100 volts ±10%.

3. The power supply frequency shall be the rated frequency.

4. The measurement shall be made using a system configuration which retains a maximum of basic computer functions while the I/O control unit, communication control unit, magnetic disk drive unit and other removable units disconnected from the computer. However, if the computer is of a type that allows more processors to be installed, the measurement shall be performed using the number of processors required for a minimum configuration.

(4) Items to indicated, etc.

1. Items to be indicated

Manufacturers, etc. must indicate the following items which relate to the energy consumption efficiency of computers.

a) Product name or model

b) Classification name

c) Energy consumption efficiency

d) Name or designation of manufacturer, etc.

e) A statement to the effect that the energy consumption efficiency value has been calculated by dividing the power consumption, measured according to the definition in the Energy Conservation Law), by the value representing the composite theoretical performance defined in the Energy Conservation Law.

2. Matters to be observed

a) The energy consumption efficiency must be indicated using two or more significant digits given in the lower column of Annexed Table 3 to the Enforcement Regulations for the Energy Conservation Law.

b) The indication items enumerated in 2a above must be indelibly and conspicuously written in a catalog containing information related to a computer's performance and documentation to be provided by a manufacturer, etc. for selecting computers.

3. Comments concerning energy savings

(1) Initiatives of Users

1. Together with striving to select computers with good energy consumption efficiency, users shall strive to aim for better energy savings when using computers in more appropriate and efficient ways.
2. Users shall strive to set up and use the low power mode when using computers with a low-power mode.

(2) Initiatives of manufacturers, etc.

1. Manufacturers, etc. shall promote technology development for the purpose of making energy-saving computers and developing computers with good energy consumption efficiency.
2. Concerning devices that have low power mode functions, manufacturers, etc. shall strive to ship with states that have the applicable functions once again operating within the possible range. Furthermore, they shall aim for user's understanding in order to promote the use of the low power mode by users.
3. From the viewpoint of spreading computers with good energy consumption efficiency and in aiming for rapid deployment of "energy saving labels", manufacturers, etc. shall strive to provide users with appropriate information so that they can select computers with good energy consumption efficiency. For these energy saving labels, the display details shall be made in consideration of being easily understandable by the user and not cause any misinterpretation.

(3) Initiatives of the government

1. From the viewpoint of spreading computers with good energy consumption efficiency, initiatives of users and manufacturers, etc. must be promoted, and necessary measures shall be enacted for government support and spreading awareness, etc.
2. Striving to grasp periodically and continuously the implementation progress of manufacturers, etc. and apply appropriate laws so that information concerning energy consumption efficiency for users is correct and easy-to-understand.

IV. HDDs

1. Scope of target (see Attachment 4)

In accordance with the current regulations, HDDs (52131) established by the Japan Standard Product Classification are the target.

However, the following are excluded: 1) disks with a diameter of 40mm or below, 2) items with a storage capacity under 1GB and 3) items which exceed a max. transfer speed of 70GB/s.

2. Necessary items for judging standards of manufacturers, etc.

(1) Target year (see Attachment 5)

FY2007

(2)Target standard values (see Attachment 6)

Concerning HDDs shipped in Japan in the target year, manufacturers, etc. shall not exceed the target standard values in the right column in the table below, values averaged from units shipped per classification of energy consumption efficiency below measured by methods established in (3). The target standard value is calculated by a formula for classifications in the table below with N as the number of revolutions (unit: rpm) of the applicable device in the standard energy consumption efficiency formula.

Classification			Standard Energy Consumption Efficiency Formula
HDD Type	HDD Size and Performance	Classification	
Single disk	Disk size over 75mm; 1 disk	A	E=exp (2.98×ln (N)-28.6)
	Disk size over 75mm; 2 or 3 disks	B	E=exp (2.98×ln(N)-29.3)
	Disk size over 75mm; 4 disks or more	C	E=exp (2.98×ln(N)-29.5)
	Disk size over 50mm under 75mm, 1 disk	D	E=exp (2.98×ln(N)-28.6)
	Disk size over 50mm under 75mm; 2 or 3 disks	E	E=exp (2.98×ln(N)-29.4)
	Disk size over 50mm under 75; 4 disks or more	F	E=exp (2.98×ln(N)-29.8)
	Disk size over 40mm under 50mm; 1 disk	G	E=exp (2.98×ln(N)-27.2)
	Disk size over 40mm under 50mm; 2 disks or more	H	E=exp (2.98×ln(N)-28.8)
Subsystem	-	I	E=exp (2.00×ln(N)-19.7)

Notes 1. “Single Disk” means the disk drive itself. “subsystems” are for systems with multiple disk drives. However, for single disks, it is one unit in a case with a model name. For subsystems, they are one unit combining the hard disk control unit and hard disk drive unit (for items that only have the hard disk control unit internally in the computer, one unit that has a case and a model name.)

2. E and N represent the following values
   E: Standard energy consumption efficiency
   N: Number of revolutions (unit: times a minute)

3. ln indicates log base e

(Reference) Current Target Standard Values (target standard values in 2005)

Classification			Standard Energy Consumption Efficiency Formula
HDD Type	HDD Size and Performance	Classification	
Single disk	Disk size over 75mm; 1 disk	A	E=exp(2.98×ln(N)-25.6)
	Disk size over 75mm; 2 or 3 disks	B	E=exp(2.98×ln(N)-26.7)
	Disk size over 75mm; 4 disks or more	C	E=exp(2.98×ln(N)-27.2)
	Disk size over 40mm, under 75mm; 1 disk	D	E=exp(2.98×ln(N)-25.6)
	Disk size over 40mm, under 75mm; 2 or 3 disks	E	E=exp(2.98×ln(N)-26.7)
	Disk size over 40mm, under 75mm; 4 disks or more	F	E=exp(2.98×ln(N)-27.6)
Subsystem	Data transfer speed of over 160MB/s	G	E=exp(2.00×ln(N)-17.1)
	Data transfer speed of under 160MB/s	H	E=exp(2.00×ln(N)-17.2)

(3) Energy consumption efficiency measurement method

For energy consumption efficiency, the values displayed in watts for power consumption measured by the method below shall be values of storage capacity divided by a value indicated in GB units. However, if actual measurements are difficult, calculations will be acknowledged depending on the calculation method.

1. Ambient temperature shall be 16 to 32°C.
2. The power supply voltage shall be within the range of the rated input voltage ±10%. If a computer has a rated input voltage of 100 volts, the power voltage shall be within the range of 100 volts ±10%.
3. The power supply frequency shall be the rated frequency.
4. For single disks, the control device is internal, and measurements in the range of cache memory for buffer use and disk drive.
5. For subsystems, measurements will be done of the control device, cache memory for buffer use and necessary power supply and control equipment to operate the HDD with the maximum number of disk drives possible for connection to the control equipment and maximum number of I/O signal transmission paths range.
6. Power is input and measurements made at a status where it is possible to immediately

read and write data.

(4) Items to indicated, etc.

1. Items to be indicated

Manufacturers, etc. must indicate the following items which relate to the energy consumption efficiency of HDDs.

a) Product name or model

b) Classification name

c) Energy consumption efficiency

d) Name or designation of manufacturer, etc.

e) Something to the effect that the energy consumption efficiency has the composite theoretical performance, established by the Energy Conservation Law energy consumption efficiency measured by the measurement methods established in the Energy Conservation Law, excluded.

2. Matters to be observed

a) The energy consumption efficiency must be indicated using two or more significant digits given in the lower column of Annexed Table 3 to the Enforcement Regulations for the Energy Conservation Law.

b) The indication items enumerated in 2a above must be indelibly and conspicuously written in a catalog containing information related to a computer's performance and documentation to be provided by a manufacturer, etc. for selecting computers.

3. Comments concerning energy savings

(1) Initiatives of users

Together with striving to select HDDs with good energy consumption efficiency, users shall strive to aim for better energy savings when using HDDs in more appropriate and efficient ways.

(2) Initiatives of manufacturers, etc.

1. Manufactures, etc. shall promote technology development for the purpose of making energy-saving HDDs and developing HDDs with good energy consumption efficiency.

2. From the viewpoint of spreading HDDs with good energy consumption efficiency and in aiming for the rapid deployment of "energy saving labels", manufacturers shall strive to provide users with appropriate information so that users can select HDDs with good energy consumption efficiency. For these energy saving labels, the indicated details shall be made in consideration of being easily understandable by the user and not cause any misinterpretation.

(3) Initiatives of the government

1. From the viewpoint of spreading HDDs with good energy consumption efficiency, initiatives of users and manufacturers, etc. must be promoted, and necessary measures shall be enacted for government support and spreading awareness, etc.
2. Striving to grasp periodically and continuously the implementation progress of manufacturers, etc and apply appropriate laws so that information concerning energy consumption efficiency for users is correct and easy-to-understand.

Attachment 1

Scope of Target Computers

1. Scope of "computers"
   Digital CPUs (5211) and PCs (5212), determined by the Japanese Standard Product Classification.

2. Excluded items

(1) Items possessing high processing power
   Items possessing high processing power will be excluded as they are limited to special uses.

   1. Supercomputers
      Under the current regulations, supercomputers being used mainly in scientific and medical technology research with a composite theoretical performance (CTP) of 10,000mtops or more are excluded. However, this judging of standards will further limit the exclusion range, and it will newly be set to exclude supercomputers with a CTP of 50,000mtops.

   2. Massively Parallel Processing (MPP)
      Under the current regulations, based on supercomputers, massive parallel processors which can execute calculations using processing equipment consisting of 100 processors or more are excluded. However, this judging of standards will further limit the exclusion range, and newly set to exclude MPP devices capable of executing operations using over 256 CPUs.

   3. Computers that execute special I/O controls (computers that control many I/O signal transmission paths)
      In this judging of standards as well, in accordance with current regulations, mission-critical computers that have been specialized with I/O signal transmission paths with the purpose of network management, data management or the like, will continue to be excluded. Specifically, items with 512 or more I/O signal transmission paths (limited

to those with a max. data transmission speed of 100MB/s or more) will be excluded.

4. Fault tolerant computers

In this judging of standards as well, in accordance with current regulations, fault tolerant computers, for which heavy importance has been placed on safety and reliability in particular, will continue to be excluded as they are systems that bear mission-critical systems for the economy and society. Specifically, all configurations of multiplexed computers, main memory, I/O control equipment and power supplies will be excluded.

(2) Computers dedicated to work processing such as office computers

In this judging of standards as well, in accordance with current regulations, computers with extremely low processing power, computers that have been specialized for salary calculations and work information management and the like used mainly in small to mid-sized enterprises, will continue to be excluded. Specifically, computers with a CTP of under 100mtops will be excluded.

(3) Portable information terminals (mobile computers)

In this judging of standards as well, in accordance with current regulations, portable information terminals will continue to be excluded given their low power consumption (around several watts) and the lack of clarity regarding future technology and market trends in the future and other issues. Specifically, items which entirely use internal batteries, do not receive their power from a power line, and do not have a HDD will be excluded.

Since technological advances and market trends for computers change at an incredible pace, it is necessary to take into consideration products that do not fully reflect energy saving designs given the relationship of design and development and so on. Therefore, for this judging of standards as well, in the same way as the current regulations, products that have already exceeded their sales peak must be excluded and will not be applied to models that had shipments lower than 10% of the maximum units shipped of a past fiscal year in FY2007.

Attachment 2

Target Year for Computers

1. The average product cycle for computers is about four years for PCs and about five years for midrange computers and mainframe computers. Therefore, as a period covering five years from the setting of standards, FY2007 as the target fiscal year is appropriate.

2. As for the improvement ratio of energy consumption efficiency in the target year, it is premised on there being no changes in the composition of units currently shipped (actual FY2001 performance) and per classification, forecast at about 69%.

<Outline of Calculation>
Energy consumption efficiency (average value) of current (actual FY2001 performance): 0.012W/MTOPs
Energy consumption efficiency of target fiscal year (average value of target standard value of each classification): 0.0037W/MTOPs
(0.012－0.0037)/0.012×100= approximately 69%

Attachment 3

Target Standard Values and Classifications of Computers

I. Classifications to set standards

1. Classifications based on product characteristics

Computers are largely classified in terms of the nature of their usage and necessary functions into server-side computers (mainframe computers, mid-range computers, etc.) and client-side computers (workstations, desktop PCs, etc.). Client-side computers are further divided into desktop computers (non-battery-driven) and notebook PCs (battery-driven).

Special Characteristics and Uses of Each Product's Features

Classification	Main Characteristics (major items)	Use
Server-side computers	- From general work to special work, used in many fields. - Many ranges of functionality such as meeting demands in system management for reliability, in data communications for high speed and special parallel processing functionality for multiple jobs.	- Large-scale system management - Financial, etc. settlement work - Operator, etc. mission-critical work - Network connections - scientific calculations, etc.
Client-side computers (excluding battery-driven types)	- Computers used for individual work, etc. - Used with direct input (display, etc.) - Used for comparatively light, simple work - Includes workstations	- Offices - Homes - Schools, etc.

Client-side computers (battery-driven) (notebook PCs)	- Importance placed on functionality coexists with focus on greater mobility. - Unified LCD display and keyboard - Internal battery for mobile use	- Offices - Homes - Schools, etc.

(1) Classification of server-side computers and client-side computers

"Client-side computers" are defined as those that have graphic display ports and keyboard ports (including those that have built-in displays instead of graphic display ports).

For server-side computers as well, since some have keyboard ports and graphic display ports, used mostly for maintenance and the like, server-side computers and client-side computers are classified in consideration of actual conditions of performance indicators. Specifically, client computers, in addition to the above definition, are computers with main memory under 6GB and under four I/O signal transmission paths. Under the current regulations, main memory in the performance indicator definition is "under 4GB"; however, given developments in increasing memory in client-side computers recently, this will be increased one rank up to "under 6GB".

(2) Classification of desktop computers and notebook computers

In accordance with the current regulations, notebook PCs among client-side computers will be defined as using completely internal batteries and which are used (battery-driven types) receiving none of their power supply from power lines.

Classification Based on Product Characteristics

Product classification		Presumed Product Group
Server-side computers		- Mainframe computers - Mid-range servers - PC servers
Client-side computers (Have graphic display port and keyboard port (including those with built-in display or keyboard) and which have a main memory under 6GB and under 4 I/O transmission channel paths)	Non-battery-driven	- Desktop PCs (built-in display) (external display) - Workstations
	Battery-driven (Uses built-in battery entirely, and usable with no power supply received from a power line.)	- Notebook PCs (desktop notebook PC) (mobile notebook PC)

2. Classification based on performance characteristics

Concerning main memory and the I/O signal path control sections, performance varies according to user and use, therefore, setting classifications by fixed performance values aiming for energy consumption efficiency improvements by each classification is appropriate.

(1) Number of I/O signal transmission paths (I/O)

Since I/O signal transmission paths, etc. secondarily split do not execute calculations, classifications are made by the number of primary split I/O signal transmission paths from the system bus (signal transmission path connecting the processing unit and the main memory unit). However, extremely slow transmission paths (under 100Mbit/s) are excluded. Concerning numbers of I/O signal transmission paths that have expandability, classification is by the maximum number of I/O signal transmission paths possible for expansion in the applicable device based on measurement methods.

Specific classifications based on the number of I/O signal transmission paths for server-side computers are as follows: under four I/O signal transmission paths; four or over, under eight; eight or over, under 16, 16 or over, under 64, and 64 or over. For client-side computers (not battery-drive and battery-driven), the classifications are under two and two or over, under four. Under current regulations, the classification settings “16 or over, under 32” and “32 or over”; however, given current trends in the computer market, increases are continuing to be seen in server-side computers that have a comparatively large number of I/O signal transmission paths, therefore the number has been raised to “64 paths”.

(2) Main memory

The main memory is classified by main memory size, using GB units to express size, excluding cache memory. For devices that have expandable main memory, classification shall be by the maximum memory size possible by expansion for the applicable device based on measurement methods.

Specifically, referring to the current classifications, server-side computers are classified by main memory of under 2GB; 2GB or over, under 4GB; 4GB or over, under 16GB; and client-side computers (not battery-driven) into under 1GB, 1G or over, under 2GB; and 2GB or over, under 6GB. For battery-driven client-side computers, under the current regulations there are items for which classifications do not exist by main memory size are currently “desktop” and “mobile notebook” notebook PCs. By examining the current situation in which the division is becoming increasingly clear, they can be newly classified concerning memory size in battery-driven client-side computers. Specifically, they will be classified into under 1GB (mobile notebook types) and 1GB or over, under 6GB (desktop notebook types).

As compositional factors for consuming power, performance targets can be considered for reliability, expandability, ease-of-use, internal HDD memory capacity, internal expansion

boards, etc., but complicating the classification makes it difficult to assign target values, and therefore abstract.

The results of the above evaluation are shown below in the table of classification settings (provisional classifications) based on computer product specifics and performance characteristics.

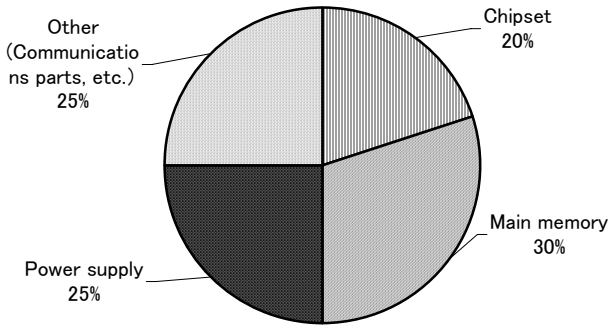
Provisional Classifications) Based on Computer Product Specifics and Performance Characteristics

Computer Type	Number of I/O Signal Data Transmission Paths	Main Memory	Classification
Server-side computers	64 or over	－	a
	16 or over, under 64	－	b
	8 or over, under 16	16GB or over	c
		4GB or over, under 16GB	d
		Under 4GB	e
	4 or over, under 8	16GBor over	f
		4GB or over, under 16GB	g
		Under 4GB	h
	Under 4	16GB or over	I
		4GB or over, under 16GB	j
		2GB or over, under 4GB	k
		Under 2GB	l
Client-side computers ［Non-battery-driven］	2 or over, under 4	2GB or over, under 6GB	m
		1GB or over, under 2GB	n
		Under 1GB	o
	Under 2	2GB or over, under 6GB	p
		1GB or over, under 2GB	q
		Under 1GB	r
Client-side computers ［battery driven］	－	1GB or over, under 6GB	s
		Under 1GB	t

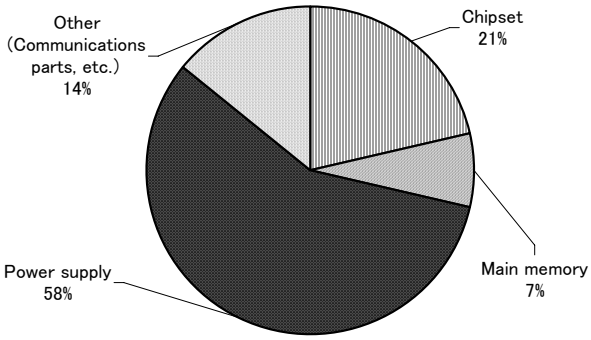
3. Measurement units for energy consumption efficiency

Under the current regulations, the unit for measuring energy consumption efficiency is a value expressed in watts of power consumption in ready mode, divided by figures representing composite theoretical performance (CTP) in mtops. For this reason, if devices with high CTP that use similar energy saving mode technology (low-power mode) with ones with low CTP, the devices with low CTP will have worse energy consumption efficiency. However, since these execute the same calculations, it means that they consume more power and from the viewpoint of energy savings measures, it is necessary to encourage improvement of energy consumption efficiency of these kinds of computers.

On the other hand, given the thinking above, a significant correlation is needed between energy consumption in ready mode and CTP. If there is no significant relationship between energy consumption in ready mode and CTP, it will be like measuring the ratio of metabolism when a person is sleeping and athletic ability when a person is awake—it has no meaning. For server-side computers, while there is a loose significant correlation between energy consumption efficiency in ready mode and CTP, the significance of that correlation is not absolutely clear. Therefore, first of all, analysis is made of which parts consume power (see figure below) in the ready mode (low-power mode) of client-side computers. From there, the presence or absence of a significant relationship between energy consumption efficiency in the ready mode of client-side computers and CTP is evaluated.



Power Consumption (in S3 mode) for Each Composite Part in Various Types of Desktop PCs



Power Consumption (in s3 mode) for Each Composite Part in Various Types of Notebook PCs

In client-side computers, the path blocks in operation during the ACPI standard S3 mode (the most advanced low-power mode recognized by the Energy Conservation Law) are 1) the power supply, 2) main memory 3) chipset and 4) other items (communications parts, etc.).

ACPI standard Levels Concerning Computers

	State	Scope accepted by Energy Conservation Law	CPU	Cache memory	Main Memory	Chipset	HDD	Power supply
S1	Standby mode	Yes	Clock frequency lowers	Operating	Holding data	Operating	Spinning or stopped	Main power supply
S2	General suspended mode	Yes	Clock frequency stopped	Power supply stopped	Holding data	Operating	Spinning stopped	Main power supply
S3	Deepest suspended mode	Yes	Power supply stopped	Power supply stopped	Holding data	Portion operating	Power supply stopped	Main power supply or auxiliary power supply
S4	Hibernation mode	No	Power supply stopped	Power supply stopped	Not holding data	Stopped	Power supply stopped	Main power supply or auxiliary power supply
S5	Power off by software	No	Power supply stopped	Power supply stopped	Not holding data	Stopped	Power supply stopped	Auxiliary power supply

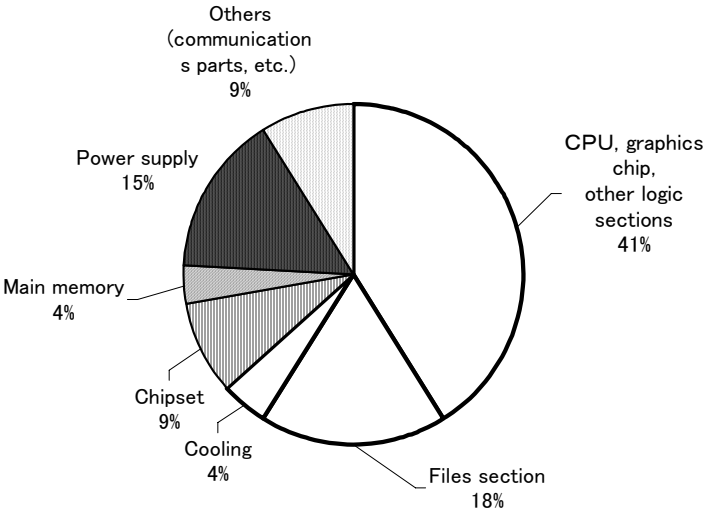
In this, the power consumption in the power supply unit consumes power through a transformer, which is one of the power supply's main component parts, and since this is proportional to the output amount of the computer, there is a significant correlation with the computer's CTP. For the power consumption in the main memory as well, it uses refresh

power to hold data, therefore, it can be said that there is power consumption and fixed power in the main memory; namely there is a positive correlation with the computer's CTP. On the other hand, in the chipset and other portions (communications parts, etc.), no correlation exists for the power consumption in the chipset with the computer's CTP. Furthermore, it is the same in other sections as well. Therefore, for client-side computers, it can be considered that a correlation exists partially for power consumption in the low power mode and CTP, but overall, that correlation cannot be completely clarified (see Reference Materials 1). In particular, among client-side computers, for notebook PCs ("Classification S" under current regulations), there is a stronger correlation with battery charge power/charge speed with power consumption in the power supply unit. Therefore, the result is that the correlation between CTP and power consumption of the power supply unit is extremely weak.

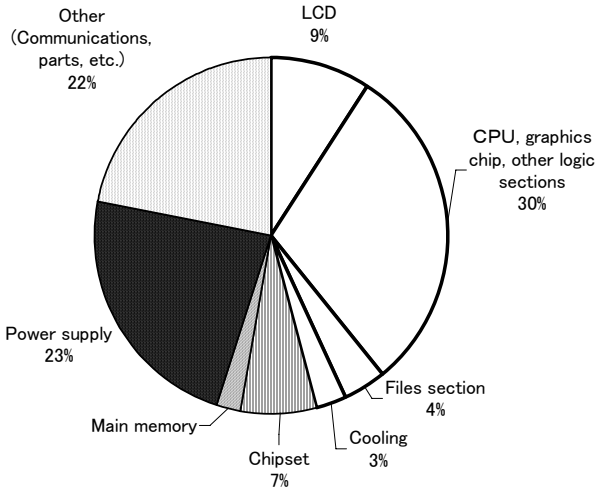
Given this situation, from the thinking that energy consumption in the ratio with computer's performance for only client-side computers, the method of deciding on top-runner standards based on data indicated in watts of power consumption in the ready mode such as can be seen in the International Energy Star program was also evaluated. However, in the case of deciding upon top-runner standards based on absolute values of power consumption, for notebook-type PCs, for example, the power supply occupies a major part of power consumption, namely that just by reducing the power consumption in the battery and the transformer for it, such as making the battery size smaller or the charging speed faster, will bring about a notebook PC with the best energy consumption efficiency. Using this kind of measurement unit in the case of setting top-runner standards greatly hampers the diversity of products among notebook PCs and has a high probability of distorting the market to an extreme degree. Therefore, it is not appropriate to set top-runner standard targets using only absolute values for power consumption in ready mode. While it can be considered to have actual measurements of power consumption during operation and target standard values set, to begin with, it is possible to change in various ways power consumption during operation through installed program software and functions of the computer, and it is difficult in actuality to make measurements, unify standards into classification settings and then set standards.

Furthermore, from the viewpoint of the significance of the correlation between power consumption and CTP, not only has power used during low-power mode up to now for power consumption of client-side computers, but proposals on use of only values for the state prior to executing the low power mode (idle mode) have also been evaluated. However, in the current judging standards, promotion has been aimed at for the spread of low-power mode in computers by giving regular evaluations for power consumption in the low-power mode (see Reference Materials 2). Therefore, prioritizing the correlation between energy consumption efficiency and CTP in the case of setting target standard values using only power consumption (see figure below) in the state before operating in

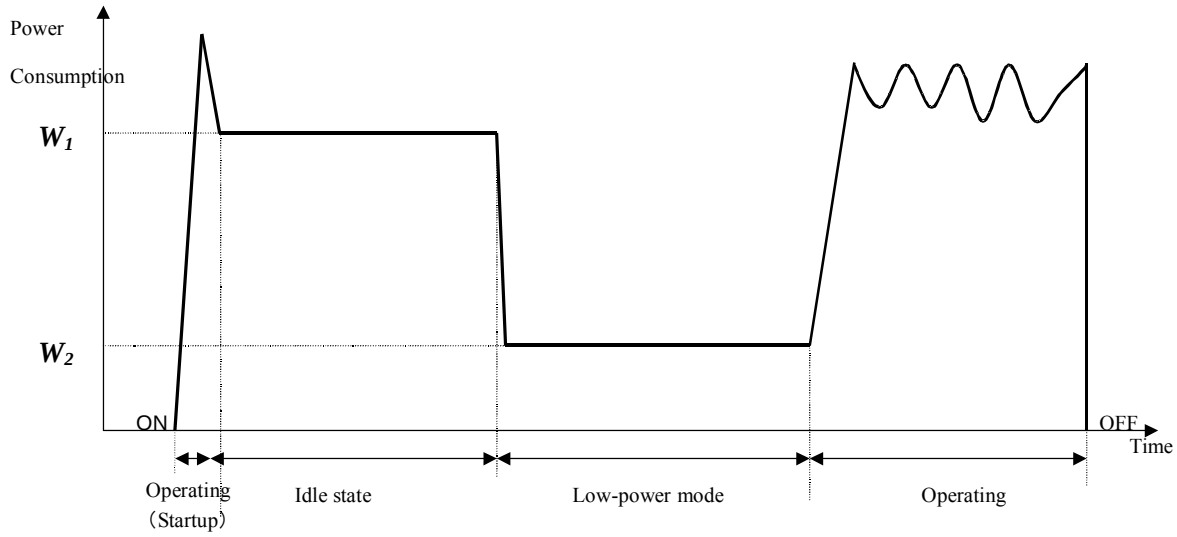
low-power mode (idle state) runs the risk of regressing the promotion of the spread of low-power modes in client-side computers. Pattern diagrams are shown on the next page showing changes of power consumption when operating and in idle mode and low-power mode.



Power Consumption (idle state) by Composition Part in Main Models of Desktop PCs



Power Consumption (idle state) by Composition Part in Main Models of Notebook PCs



Changes in Power Consumption in Client-side Computers (pattern diagram)

As seen from the above discussion, concerning the measurement unit involving power consumption of client-side computers, those that fulfill the following conditions are desirable.

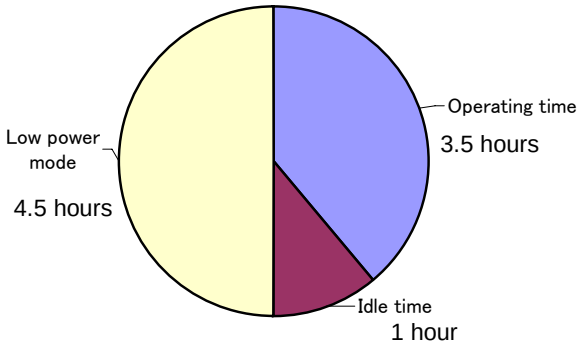
a) Energy consumption efficiency must be thought of in contrast to CTP, which is first and foremost the basic performance indicator of a computer. To that end, a significant correlation between measured power consumption and CTP must exist to a certain degree.

b) It is not necessary for the measurement units to retrograde to the spread of low-power modes.

c) The measurement unit of server-side computers must be as consistent as possible.

Results evaluated under the above conditions and energy consumption efficiency of client-side computers will be used to calculate with formulas based on usage states (modes). According to data from the Japan Electronic Industry Development Association[7], results have been gained for 4.5 hours in low-power mode, one hour in the idle state before entering low-power mode and 3.5 hours of operating time for the usage modes of client-side computers. (See the figure below.)

[7] Japan Electronic Industry Development Association (now Japan Electronics and Information Technology Industries Association) “Simulation of Energy Saving Effects by the International Energy Star Program for Energy Savings in PCs and Peripherals” (issued March 2000)



Usage States of Client-side Computers in a Work Period (9 hours) at an Average Workplace

For this reason, power consumption in low-power mode and power consumption in an idle state including operating time[8] is evaluated with a weighted average and the energy consumption efficiency (***E***) of client-side computers is calculated using the formula below.

$$E = \{(W_1 + W_2)/2\} / Q$$

W_1 : Power consumption in idle state (W)
W_2 : Power consumption in low-power mode (W)
Q : Composite theoretical performance (MTOPs)

However, in the case of client-side computers that do not have a low power mode, $W_2 = W_1$. An evaluation of the suitability of the energy consumption efficiency calculated based on the above equation is as follows.

First of all, concerning condition a) above, in the same way as in current regulations, energy consumption efficiency is compared with the computer's CTP. Power consumption in the idle state before entering the low power mode, including operation, and CTP is compared with only power consumption of low power modes up to now, divided by CTP, raising the correlation between the numerator and denominator (See Reference Materials 3).

Second, concerning condition b) above, since consideration is made for power consumption in the low power mode, the measurement method is a way to continue to contribute to the spread of low-power modes.

Third, concerning condition c) above, client-side computers that do not have low-power modes and server-side computers (in the case of server-side computers, they are nearly

[8] This is because there is not much of a significant difference in the power consumption between operating and idle states. Idle state power consumption is about 90% that of the operating state.

always in normal operation 24 hours-a-day, and it is extremely rare for the operation state to shift to low-power mode), W_2 is integrated into W_1. Since this does not change from the current formulas, the above formula includes the measurement method of energy consumption efficiency of server-side computers to date.

Therefore, given the results of the above evaluation, computer energy consumption efficiency, including all server-side computers, is calculated with the formula below

$$E = \{(W_1 + W_2)/2\} / Q$$

However,

$(W_1 + W_2)/2$: Power consumption (W)

W_1 : Power consumption of the idle state (W)

W_2 : Power consumption of the low-power mode (W)

Q : Composite theoretical performance (MTOPs)

W_2 is the same value as W_1 for server-side computers and client-side computers that do not have a low power mode.

II. Target Standard Values in Each Classification

According to the above provisional classifications, the actual measurement values of energy consumption efficiency (survey target models: 2,775 models) were studied and top-runner values decided upon for each provisional classification. For the evaluations of the top-runner values, from the viewpoint of considering technological progress up to the target year, it was thought to include data including an expanded target scope in this revision (namely items with a CTP of 10,000mtops or over, under 50,000mtops, etc.). Following previous examples, for the characteristic functions in cases where the top-runner value of the applicable classification is worse than the top-runner value of the top classification ("reverse correlation"), then the applicable classification is integrated into the top classification or the top classification value is used.

As for manufacturers, etc., concerning computers shipped in Japan in the target fiscal year, the values, which are weighted averages of number of units shipped by classifications shown in the following table for energy consumption efficiency measured by methods established this subcommittee, shall not be above the target standard value.

Computer Type	Number of I/O Signal Transport Paths	Main Memory	Provisional Classification	Top-runner Actual Measurement Value [W/MTOPs]	Classification Organization	Classification after Organization	Performance Characteristics after Organization		Target Standard Value [W/MTOPs]
							Number of I/O Signal Transport Paths	Main Memory	
Server-side computers	64 or over	—	a	0.27	→ (special values excluded)	A	64 or over	—	3.1
	16 or over, under 64	—	b	0.079	→	B	8 or over, under 64	—	0.079
	8 or over, under 16	16GB or over	c	0.15	Reverse correlation (integrated with b)				
		4GB or over, under 16GB	d	0.35	Reverse correlation (integrated with b)				
		Under 4GB	e	0.30	Reverse correlation (integrated with b)				
	4 or over, under 8	16GB or over	f	0.071	→	C	4 or over, under 8	16GB or over	0.071
		4GB or over, under 16GB	g	0.068	→	D		Under 16GB	0.068
		Under 4GB	h	0.12	Reverse correlation (integrated with g)				
	Under 4	16GB or over	i	0.053	→	E	Under 4	16GB or over	0.053
		4GB or over, under 16GB	j	0.039	→	F		4GB or over, under 16GB	0.039
		2GB or over, under 4GB	k	0.024	→	G		2GB or over, under 4GB	0.024
		Under 2GB	l	0.016	→	H		Under 2GB	0.016

Client-side computers [non-battery driven]	2 or over, under 4	2GB or over, under 6GB	m	0.027	→	I	2 or over, under 4	Under 6GB	0.027
		1GB or over, under 2GB	n	0.070	Reverse correlation (integrated with m)				
		1GB	o	0.064	Reverse correlation (integrated with m)				
	Under 2	2GB or over, under GB	p	0.0048	→	J	Under 2	2GB or over, under 6GB	0.0048
		1GB or over, under 2GB	q	0.0038	→	K		Under 2GB	0.0038
		Under 1GB	r	0.0044	Reverse correlation (integrated with q)				
Client-side computers [battery driven]	—	1GB or over, under 6GB	s	0.0026	→	L	—	1GB or over, under 6GB	0.0026
		Under 1GB	t	0.0022	→	M		Under 1GB	0.0022

(Note) Concerning basic product data see 1. in Reference Materials 4

[Points of Consideration in Setting the Target Standard Values]

Concerning the classification of A (provisional classification a), looking at mainframe computers that have many I/O signal transmission paths making up a major portion of this classification, provisionally top-runner values in this classification for energy consumption efficiency of mid-range computers (models with overwhelming high energy consumption efficiency in provisional classification a) with a CTP of 30,000mtops will eliminate the existence of mainframe computers which have many I/O signal transmission paths and create a high probability of shaking the market to an extreme degree. Therefore, for the energy consumption efficiency of the applicable mid-range computers, they will be excluded as special products when setting top-runner values in this classification. In the target values of these standards (FY2007), the production volume of mid-range computers with 64 or more I/O signal transmission paths is expected to be about 20 units, which is equivalent to 3.8% of the 530 units shipped of computers in this classification A. For this reason, when setting the target standard values in the applicable classification, it is affected by the weighted average of energy consumption efficiency concerning mid-range computers, resulting in 3.1 W/mtops.

Attachment 4

Scope of Target Hard Disk Drives

1. Scope of "Hard Disk Drives (HDDs)"
   HDDs (52131) established by the Japan Standard Product Classification, are the target.

2. Excluded Products

(1) Small HDDs used for special purposes

For these judging standards as well, in the same way as the existing judging standards, small HDDs used for special purposes will continue to be excluded. Specifically, HDDs having a disk diameter of under 40mm will be excluded.

(2) HDDs with under 1GB of storage capacity

For these judging standards as well, in the same way as the existing judging standards, and given the rapidly decreasing market needs, items with small storage capacity with have little room technologically for energy savings, will continue to be excluded. Specifically, HDDs with a storage capacity of under 1GB will continue to be excluded.

(3) Subsystems that have special data transfer speeds

Under the current regulations, special subsystems that exceed max. data transfer speeds of 3,200MB/s are excluded. However, in this judging of standards, the applicable exclusion scope is more limited, with the exclusion to be newly set at items exceeding max. data transfer speeds of 70GB/s.

Since technological advances and market trends for computers change at an incredible pace, it is necessary to take into consideration products that do not fully reflect energy saving designs given the relationship of design and development and so on. Therefore, for this judging of standards as well, in the same way as the current regulations, products that have already exceeded their sales peak must be excluded and will not be applied to models that had shipments lower than 10% of the maximum units shipped of a past fiscal year in 2007.

Attachment 5

Target Fiscal Year of HDDs

1. The product cycle of HDDs used in, bundled with, and connected to computers can be thought to be based on the average product cycle of computers. Therefore, in the same way as the target fiscal year for computers, the target fiscal year for HDDs set at 2007 is appropriate.

2. For the improvement ratio of energy consumption efficiency in the target fiscal year, it is forecast to be about 71% premised on now changes in the composition per classification of units shipped currently (FY2001 performance)

<Outline of Calculations>
Current (FY2001 performance) energy consumption efficiency: 0.14W/GB
Target fiscal year (FY2007) energy consumption efficiency (average value of the target standard value in each classification): 0.040W/GB
(0.14－0.040)/0.14×100= about 71%

Attachment 6

HDD Target Standard Values and Classifications

I. Classifications to Set Standards

1. Classifications based on product characteristics

HDDs are classified into single disk units that for combination in computer units, etc., single disks in multiple installations, and subsystems to be used as large external storage capacity for computers. In this judging standards as well, based on the current regulations, disk drives will be divided into “single disk” single units and “subsystems”, which have multiple disk drives.

2. Classifications based on product characteristics

(1) Single disk

1. Disk size (diameter)

There is a positive correlation of power consumption needed for the spinning of the disk drive and the disk’s diameter.

Looking at the current HDD market trends, HDDs with a disk size of 3.5 inches (95mm) are widely used in desktop PCs, mid- to large computers, and as subsystem internal disk drives. HDDs with a disk size of 2.5 inches (65mm), in addition to being used in mid- to large computers and as subsystem internal disk drives, are also widely used in notebook PCs, which place weight on smaller sizes in particular. As a result of developments of technological innovation concerning HDDs, drives with a disk size of 1.8 inches (48mm) have begun to come out, and in the future a large increase in demand can be expected. Therefore, it is necessary to consider in particular the spread of these kinds of technologically new smaller HDDs, and it is appropriate to have a classification for HDDs with a disk size of 1.8 inches (48mm).

In addition to these disk sizes, there are also HDDs in the market which use 5.25-inch and 3-inch sizes, but these are used for relatively special uses.

These kinds of HDDs are continuing to be replaced by 3.5-inch, 2.5-inch and 1.8-inch HDDs.

Given the surrounding market trends, there are three classifications by disk size, 3.5

inch, 2.5 inch and 1.8 inch. Specifically, the current regulations will be revised and classified at the standards of 75mm and 50mm for disk size.

2. Number of disks

If the number of disks is increased, power consumption is increased and since power consumption is regularly needed concerning the number of disks such as the energy needed to spin the spindle, power consumption does not increase relative to increase in disk capacity. Therefore, energy consumption efficiency is improved as disks are added.

Therefore, as in the current regulations, classifications will be set according to number of appropriate disks, while taking market trends into consideration. Specifically, the classifications, will be 1, 2-3, and 4 or above.

3. Disk spinning speed (number of revolutions)

There is a positive correlation between power consumption needed to spin the disk drive and the disk's spinning speed.

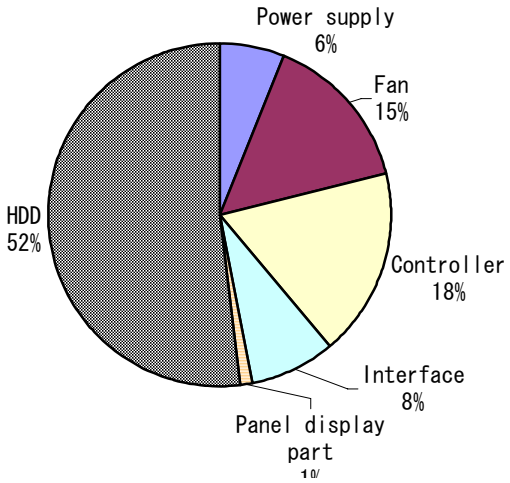
Together with improvements in computer capability, data read/write speed is increased and needs for faster speeds continue to increase, therefore classifications are set by a fixed range of number of revolutions, and in setting target standard values, there are concerns that they can't fully respond to future increases in number of revolutions.

The degrading energy consumption efficiency from the increase in number of revolutions shall be clear and since it is not appropriate to target standard value establishing classifications with one value, target standard values shall be indicated via a function of number of revolutions and energy consumption efficiency, as in the current regulations.

(2) Subsystems

1. Data transfer speeds

Subsystems have HDDs, control paths, power supplies and so on as their component elements, but products are increasing that are different from subsystems up to now due to changes in recent product types. For example, in a subsystem that can be connected to a computer via the Internet is shipped and file system control, originally managed on the OS level, is executed on the subsystem side, there is a tendency for the power consumption ratio to increase (see figure below). Therefore, the ratio accounting for power consumption of independent HDDs has dropped to the 50% level.



Power Consumption by Component Part in Types of Subsystems

Among these, it cannot be said that there is a correlation between subsystem power consumption and data transfer speeds, therefore, the classification by data transfer speeds in subsystems will be eliminated.

2. Disk rotation speed (number of rotations)

In the same way as with single disks, for subsystems as well, there is a positive correlation with the number of disk rotations and power consumption. Therefore, target standard values will be set by number of rotations.

3. Disk size and number of disks

For disk drives equipped with subsystems, since the disk size is generally 3.5 inches, in the same way as current regulations, classifications will not be set by disk size.

For the number of disks as well, since normally there are multiple disk drives, in the same way as current regulations, classifications will not be set by the number of disks.

The results of the above evaluations, the classification settings (provisional classifications) based on HDD product and performance characteristics are shown in table below.

Provisional Classifications Based on Product and Performance Characteristics

HDD Type	HDD Configuration and Performance		Provisional Classification
	Disk size	Number of Disks	
Single Disk	Over 75mm	1	a
		2, 3	b
		4 or over	c
	Over 50mm, under 75mm	1	d
		2, 3	e
		4 or over	f
	Over 40mm, under 50mm	1	g
		2 or over	h
Subsystem			i

(Note) "Single Disk" means the disk drive itself. "Subsystems" are for systems with multiple disk drives. However, for single disks, it is one unit in a case with a model name. For subsystems, they are one unit that combines the hard disk control unit and hard disk drive unit (for items that only have the hard disk control unit internally in the computer, one unit that has a case and a model name.)

II. Target standard values for each classification

Following the provisional classifications above, according to a study (target study models: 650 models) done of actual measurement values of energy consumption efficiency, and based on the premise of not changing the values established by the current regulations for the gradient in the relational expression with the current number of disk revolutions and top-runner values, the top-runner values in each provisional classification were used and a segment of the relational expression was newly calculated. In the case of values of the applicable top runner relational expression being worse ("negative correlation") for performance (disk size, number of disks, data transfer speed), then it is integrated into the top classification or the value of the top classification is used.

Concerning HDDs shipped in Japan in the target year, manufacturers, etc. shall not exceed the target standard values in the right column in the table below, which are values averaged from units shipped per classification of energy consumption efficiency below measured by methods established in (3). The target standard value is calculated by a formula for classifications in the table below with N as the number of revolutions (unit: rpm) of the applicable device in the standard energy consumption efficiency formula.

Classification				Top-runner Value (Calculation Method)	Classification Organization	Classification after Organization	Target Standard Value (calculation formula)
HDD Type	HDD Configuration and Performance		Provisional classification				
	Disk size	Number of Disks					
Single Disk	Over 75mm	1	a	E = exp (2.98*ln(N)-28.6)	→	a	E = exp(2.98*ln(N)-28.6)
		2, 3	b	E = exp (2.98*ln(N)-29.3)	→	b	E = exp(2.98*ln(N)-29.3)
		4 or over	c	E = exp (2.98*ln(N)-29.5)	→	c	E = exp(2.98*ln(N)-29.5)
	Over, 50mm, under 75mm	1	d	E = exp (2.98*ln(N)-28.4)	inverse correlation (a)	d	E = exp(2.98*ln(N)-28.6)
		2, 3	e	E = exp (2.98*ln(N)-29.4)	→	e	E = exp(2.98*ln(N)-29.4)
		4 or over	f	E = exp (2.98*ln(N)-29.8)	→	f	E = exp(2.98*ln(N)-29.8)
	Over 40mm, under 50mm	1	g	E = exp (2.98*ln(N)-27.2)	→	g	E = exp(2.98*ln(N)-27.2)
		2 or over	h	E = exp (2.98*ln(N)-28.8)	→	h	E = exp(2.98*ln(N)-28.8)
Subsystems			i	E = exp (2.00*ln(N)-19.7)	→	i	E = exp(2.00*ln(N)-19.7)

(Note) For specific product data see 2. of Reference Materials 4

[Points for Consideration in Setting Target Standard Values]

For Classification g (provisional classification g) and classification h (provisional classification h) the applicable disks mainly have sizes of 1.8 inches (48mm), but concerning the applicable classifications, d (provisional classification d) and classifications e and f (provisional classifications e and f) have inverse correlations. Therefore, under normal circumstances these would be integrated, but supposing a case in which they were integrated on the basis of the inverse correlation relationship, then for this forecast, the classification settings would lose their meaning as new standards for a disk size of 50mm. Furthermore, for HDDs with a disk size of 1.8 inches, their storage capacity is quite small compared to 3.5-inch and 2.5-inch HDDs, so there is a high possibility of having a subordinate energy consumption efficiency.

Therefore, the inverse correlations of classifications e and f will not be used.

Attachment 7

General Resources Energy Investigation Committee, Energy Savings Standards Section,
Computer and Magnetic Disk Equipment Judging Standards Subcommittee
Details of Sessions

1st Subcommittee (July 29, 2002)
- Holding the Subcommittee
- Current state of computers and HDDs
- Trends of energy consumption efficiency
- Revisions in applicable scope

2nd Subcommittee (September 5, 2002)
- Analysis of current state of energy consumption efficiency
- Revisions in applicable scope

3rd Subcommittee (October 7, 2002)
- Revisions in judging standards
- Classifications and target standard values
- Status involving energy saving of computers in Japan and overseas

4th Subcommittee (November 25, 2002)
- Target standard values and classifications
- Revisions in judging standards

5th Subcommittee (December 16, 2002)
- Interim Report

6th Subcommittee (February 14, 2003)
- Final Report

Attachment 8

General Resources Energy Investigation Committee, Energy Savings Standards Section,
Computer and Magnetic Disk Equipment Judging Standards Subcommittee
List of Members

Chairman	
Yutaka Matsushita	Professor, Tokyo University of Technology; Visiting Professor, Science and Technology Department, Keio University
Members	
Masako Ariyama	Consumer Life Consultant, Japan Consumer's Association
Kazuhito Ohmaki	Director, National Institute of Advanced Industrial Science and Technology (AIST), an Independent Administrative Institution
Hajime Ogi	Group Leader, Physical and Ecological Usability Design Group, National Institute of Bioscience and Human Technology
Hideo Kajimura	Managing Director, Japan Machinery Importers' Association
Seiichi Shin	Assistant Professor, Mathematical Engineering and Information Physics, Graduate School, University of Tokyo
Teruo Nakagawa	Chief, General Affairs Division, The Energy Conservation Center, Japan
Yukio Nakano	Senior Researcher, Customer Systems Department, Komae Research Laboratory, Central Research Institute of Electric Power Industry
Tadashi Yoshizawa	No. 2 Bureau Chief, Nikkei Business Publications
Haruhito Yamamoto	Committee Member, IT Energy Savings Measures Committee, Japan Electronics and Information Technology Industries Association
Taeko Yuine	Special Member, Nippon Association of Consumer Specialists