Final Report
Vending Machines Evaluation Standard Subcommittee, Energy Efficiency Standards Subcommittee of the Advisory Committee for Natural Resources and Energy

Vending Machines Evaluation Standard Subcommittee had deliberations on the evaluation standards for the manufacturers and importers (hereinafter referred to as "manufacturers") concerning the improvement of the performance of vending machines, and adopted the following final report.

1. Evaluation of Current Standards

As for vending machines whose target fiscal year was fulfilled in FY 2005, the weighted average of energy consumption efficiency was 1,642 kWh/year. It is improved by 37.3% from 2,617 kWh/year which is the value of those (shipped in FY 2000) before Top Runner standards are introduced. In addition, the result is better than originally assumed efficiency of 1,729 kWh/year and assumed improvement of 33.9%, which are the estimates when the Top Runner standards are achieved.

In the light of the above, the energy saving of vending machines has been progressing as a result of the manufacturers' efforts, and it can be recognized that the current standards based on the Top Runner method are working effectively.

2. Target Scope [See Attachment 1]

The target scope includes those for canned/bottled beverages, those for beverage in paper containers, and those for beverage served in cups, all of which are specified in the scope described in "Annex (Specifications)" of JIS B8561: 2007 Vending Machines – Test Methods. However, the following products shall be excluded.

- Those having a storage space for goods kept at or near room temperature
- Compact table-top models used on tables
- Those intended to be used at specific places such as in vehicles
- Those cooling beverages (raw materials) by means of an electronic cooling (e.g., Peltier cooling)

3. Details of Evaluation Standards for Manufacturers

(1) Target fiscal year [See Attachment 2]

FY 2012

(2) Target standard value [See Attachment 3 and 4]

Concerning vending machines to be shipped by a manufacturer for the domestic market in the target fiscal year, for each category in the table below, the manufacturer has to make sure that the value obtained by weighting and averaging energy consumption efficiency (annual energy consumption) measured according to (3) with the number of shipped units shall not exceed the target standard value.

Category	Beverages to be Sold			Formula for Target Standard Value
I	Canned and/or bottled beverages	Machines serving cold only, or Machines serving hot or cold		E = 0.218V + 401
II		Machines serving hot and cold (Internal depth is below 400 mm)		E = 0.798Va + 414
III		Machines serving hot and cold (Internal depth is 400 mm or greater)	Without electronic money processing device	E = 0.482Va + 350
IV			With electronic money processing device	E = 0.482Va + 500

V	Beverage in paper containers	Type A (Dummy samples are used for selling goods)	Machines serving cold only	E = 0.948V + 373
VI			Machines serving hot and cold (having two internal compartments)	E = 0.306Va + 954
VII			Machines serving hot and cold (having three internal compartments)	E = 0.63Va + 1474
VIII		Type B (Actual goods are used for visual display and selling goods)	Machines serving cold only	E = 0.477V + 750
IX			Machines serving hot and cold	E = 0.401Va + 1261
X	Beverage served in cups	—		E = 1020 〔T ≤ 1500〕 E=0.293T+580 〔1500 < T〕

(Note 1) E: Annual energy consumption (kWh/year)
(Note 2) V: Net internal volume (A volume calculated from the internal dimensions of the goods storage compartment. Unit: L)
(Note 3) Va: Adjusted internal volume (A volume obtained by correcting the difference in energy consumption per unit-volume, assuming that a hot storage compartment is replaced by a cold storage compartment. Unit: L)
(Note 4) T: Adjusted heat capacity (Heat capacity calculated from hot-water tank capacity, cold-water tank capacity and ice storage capacity. Unit: kJ)

(3) Measurement method of energy consumption efficiency [See Attachment 5]

Energy consumption efficiency of vending machine shall be defined as annual energy consumption, and measured in accordance with the method specified in JIS B8561: 2007.

(4) Display items and related matters

(a) Display items shall be as follows.

i) Product name and model name
ii) Category
iii) Net internal volume, adjusted internal volume, or adjusted heat capacity
iv) Energy consumption efficiency (Annual energy consumption)
v) Name of manufacturer

(b) Compliance items

i) As for items specified in (a) iii) above, net internal volume and adjusted internal volume shall be indicated as integer values in liters, and adjusted heat capacity shall be indicated as an integer value in kilo joules.
ii) Items as specified in (a) above shall be displayed in catalogs describing machine performances as well as at easily observable locations on the main body of a vending machine. The items shall be either directly printed on the machine or printed on a label such as a metallic or plastic plate firmly fixed to the machine. In addition, the display shall be made in a durable manner.

4. Proposals for Energy-Saving

(1) Actions of users

(a) Efforts shall be make to select vending machines with excellent energy consumption efficiency and to reduce energy consumption by efficient machine operation such as appropriate lighting adjustment and using a timer control.

(b) When involved in a discussion of design and specifications of vending machines, efforts shall be made to take account of energy consumption efficiency.

(2) Actions of manufacturers

(a) Technological development for energy-saving of vending machines shall be promoted, and efforts shall be made to develop those of excellent energy consumption efficiency.

(b) In view of that vending machines are operated under various meteorological conditions, etc., efforts shall be made to engage in product development in consideration of different operating environments.

(c) Aiming at the spread of vending machines with excellent energy consumption efficiency, efforts shall be made to provide appropriate information so that users are able to select such vending machines.

(d) As for cigarette vending machines, the standards are not adopted in this report. However, since further energy-saving needs to be advanced for cigarette vending machines taking account of the amount of energy they consume, manufacturers shall promote voluntary actions for energy-saving and also make efforts to gain users' understanding about it.

(3) Actions of Government

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

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

(c) Energy efficiency standards based on the Top Runner method is a very effective means for energy-saving of products; therefore, effort shall be made to promote better understanding about the Top Runner method and to have it spread internationally by catching appropriate opportunities.

Attachment 1

Scope of Vending Machines

1. Target Scope

Subject vending machines reviewed this time are those selling beverage in containers (other than paper containers) and keeping them cold and/or hot, which are specified in the scope of "Annex (Specifications): Electric Power Consumption Test" in JIS B8561; namely, vending machines for canned/bottled beverages with the capability of keeping them cold and/or hot.

In addition, as JIS B8561:2007 was publicly notified on May 21, 2007, the measuring methods are now specified in JIS for vending machines for beverage in paper containers and vending machines for beverage served in cups. Thus, these types of vending machines shall also be subject to this review.

2. Scope of Exclusion

[Vending Machines for Canned/Bottled Beverages]

- Vending machines having a storage space for keeping goods at or near room temperature

  The measurement condition to measure energy consumption efficiency of such vending machines does not conform to JIS B8561, and thus they are excluded.

  * Shipping volume: 736 units (FY 2005)

- Compact table-top models used on tables

  These machines are likely to be shipped to specific customers and built to custom order specifications. Besides, the shipping volume and number of models are extremely low. Thus, they are excluded.

  * Shipping volume: 191 units (FY 2005)

- Vending machines used at specific places such as in vehicles

  These machines are placed in vehicles, etc. and used for special purposes mainly with a non-commercial power supply. There is no established measurement method to measure energy consumption efficiency of these machines, and the shipping volume is extremely low. Thus, they are excluded.

  * Shipping volume: 20 units (FY 2005)

[Vending Machines for Beverage in Paper Containers]

- Vending machines having a storage space for keeping goods at or near room temperature

  The measurement condition to measure energy consumption efficiency of such vending machines does not conform to JIS B8561, and thus they are excluded.

  * Shipping volume: 54 units (FY 2005)

- Vending machines used at specific places such as in vehicles

  These machines are placed in vehicles, etc. and used for special purposes mainly with a non-commercial power supply. There is no established measurement method to measure energy consumption efficiency of these machines, and the shipping volume is extremely low. Thus, they are excluded.

  * Shipping volume: None (FY 2005)

[Vending Machines for Beverage Served in Cups]

- Vending machines in which beverages (raw materials) are cooled by an electronic cooling device (e.g., Peltier cooling)

  In response to the request of users, some vending machines are equipped with a special cooling mechanism (electronic cooling with a special technology such as Peltier cooling) to refrigerate liquid coffee concentrate. Since such cooling mechanisms are imported, it is difficult to apply the same energy-saving efforts as done for the models of this type of vending machines commonly manufactured by Japanese makers. Besides, the shipping volume is low. Thus, they are excluded.

  * Shipping volume: 300 units (FY 2005)

In addition, vending machines other than those for canned or bottled beverages, beverage in paper containers and beverage served in cups are excluded from the target scope for the following reasons:

(1) Vending Machines for Alcoholic Beverages (Except Beer)

The cold and/or hot storage temperature does not conform to the temperature of goods sold that is specified in JIS B8561, because preferred temperature differs due to the nature of the goods. Besides, the shipping volume is low. Thus, they are excluded.

* Shipping volume (FY 2005): 10,000 units (2.0%)

(2) Cigarette Vending Machines

While the number of cigarette vending machines installed accounts for approximately 14.2% of all vending machines for selling goods, because of their structure, they account for approximately 5.6% of the annual energy consumption of all vending machines currently operating. In a cigarette vending machine, 70 to 80% of the power consumption is due to lighting fixtures (mainly fluorescent light), and the rest is due to solenoids or small driving motors, etc., which operate only momentarily when dispensing cigarettes. Since the driving mechanism has only limited room for efficiency improvement, it is important to seek the improvement in the lighting fixtures (e.g., adoption of LED lighting or Hf fluorescent lighting, and use of dimming control); however, the technological development by vending machine manufacturers can contribute to only a limited portion of the progress. Thus, they are excluded.

* Shipping volume (FY 2005): 128,000 units (25.4%)

(3) Food Vending Machines

There are a wide variety of food vending machines such as those for gums and candies, for bread and snacks, for packed lunches and instant noodles. However, the shipping-volume percentage is small, and the measurement method to measure energy consumption efficiency of these machines is not specified yet. Thus, they are excluded.

* Shipping volume (FY 2005): 3,000 units (0.6%)

(4) Ice Cream and Ice Vending Machines

These machines are equipped with a mechanism to chill goods up to the freezing point. The shipping volume is low, and the measurement method to measure energy consumption efficiency of these machines is not specified. Thus, they are excluded.

* Shipping volume (FY 2005): 2,000 units (0.4%)

(5) Ticket Vending Machines

There are many types such as those for train tickets and food tickets. However, the shipping volume is low, and the annual energy consumption of these vending machines in operation accounts for only approximately 0.7% of the annual energy consumption of all vending machines in operation. Besides, there remains little room for efficiency improvement. Thus, they are excluded.

* Shipping volume (FY 2005): 7,000 units (1.4%)

(6) Other Vending Machines

Other vending machines account for 1% of the total shipping volume, with a very wide range of types, such as for toys, stamps, newspapers/magazines, prepaid telephone cards/prepaid train-fare cards (orange cards), batteries, cosmetics, other daily commodities, and other groceries. Among them, vending machines for toys account for 84%, but most of them are manual operation types.

In addition, the standardized measurement method to measure energy consumption efficiency is not specified. Thus, they are excluded.

Shipping Volume of Vending Machines for Selling Goods by Type
(on the basis of shipment volume in Year 2005)

Machine Type		Shipment (thousand units)	Composition Ratio (%)	Included/Excluded in This Review (Included/Excluded in Previous Review)
Beverage Vending Machines	Soft Drinks (incl. Beer)	306	61.0%	Included (Included)
	Paper Container	21	4.2%	Included (Excluded)
	Cup	19	3.8%	Included (Excluded)
	Alcohol (excl. Beer)	10	2.0%	Excluded (Excluded)
	(Sub Total)	356	70.9%	
Cigarette Vending Machine		128	25.4%	Excluded (Excluded)
Food Vending Machine		3	0.6%	Excluded (Excluded)
Ice Cream/Ice Vending Machine		2	0.4%	Excluded (Excluded)
Ticket Vending Machine		7	1.4%	Excluded (Excluded)
Other Vending Machine		6	1.2%	Excluded (Excluded)
Total		502		

Source: Current Survey of Production in FY 2005,
Ministry of Economy, Trade and Industry

Energy Consumption of Vending Machines for Selling Goods by Type
(on the basis of the number of installed units in Year 2005)

Machine Type	Installed Units (thousand units)	Annual Energy Consumption per Unit kW·h/unit	Overall Annual Energy Consumption Million kW·h	(Composition Ratio %)
Beverage Vending Machine	2,675	2,224	5,949	(89.6)
Food Vending Machine	103	2,576	265	(4.0)
Cigarette Vending Machine	616	614	378	(5.6)
Ticket Vending Machine	43	1,023	44	(0.7)
Other Vending Machines	907	4	4	(-)
Total	4,344	-	6,640	(100.0)

(Note) Estimated from the values of typical models

Source: Japan Vending Machine Manufacturers Association

(Reference 1)

Cigarette Vending Machines

1. Current Status of Cigarette Vending Machines

On an installed unit basis, cigarette vending machines account for approximately 14.2% of all vending machines for selling goods, while their energy consumption accounts for approximately 5.6% of that of all vending machines for selling goods.

Table: Energy Consumption of Vending Machines for Selling Goods by Type
(On the basis of the number of installed unit in Year 2005)

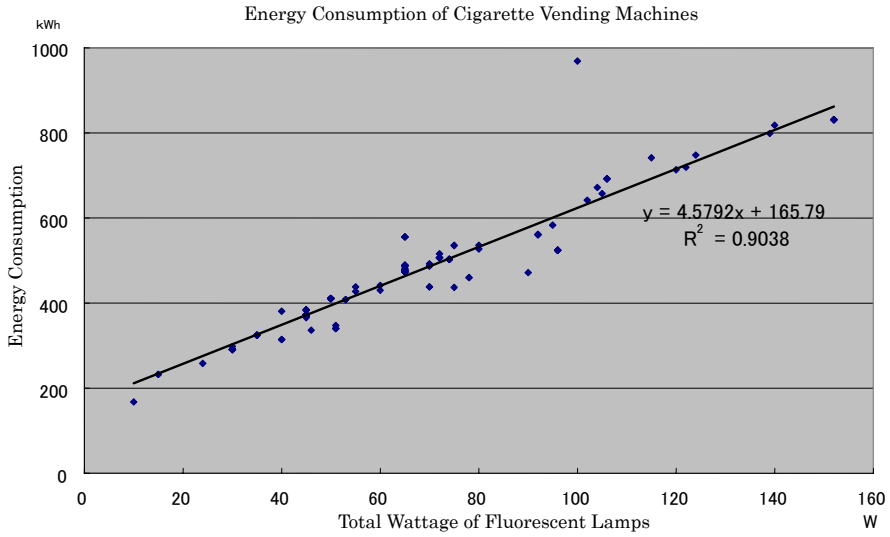
Machine Type	Installed Units (thousand units)	Annual Energy Consumption per Unit kW·h/unit	Overall Annual Energy Consumption Million kW·h	(Composition Ratio %)
Beverage Vending Machine	2,675	2,224	5,949	(89.6)
Food Vending Machine	103	2,576	265	(4.0)
Cigarette Vending Machine	616	614	378	(5.6)
Ticket Vending Machine	43	1,023	44	(0.7)
Other Vending Machines	907	4	4	(-)
Total	4,344	-	6,640	(100.0)

(Note) Estimated from the values of typical models

Source: Japan Vending Machine Manufacturers Association

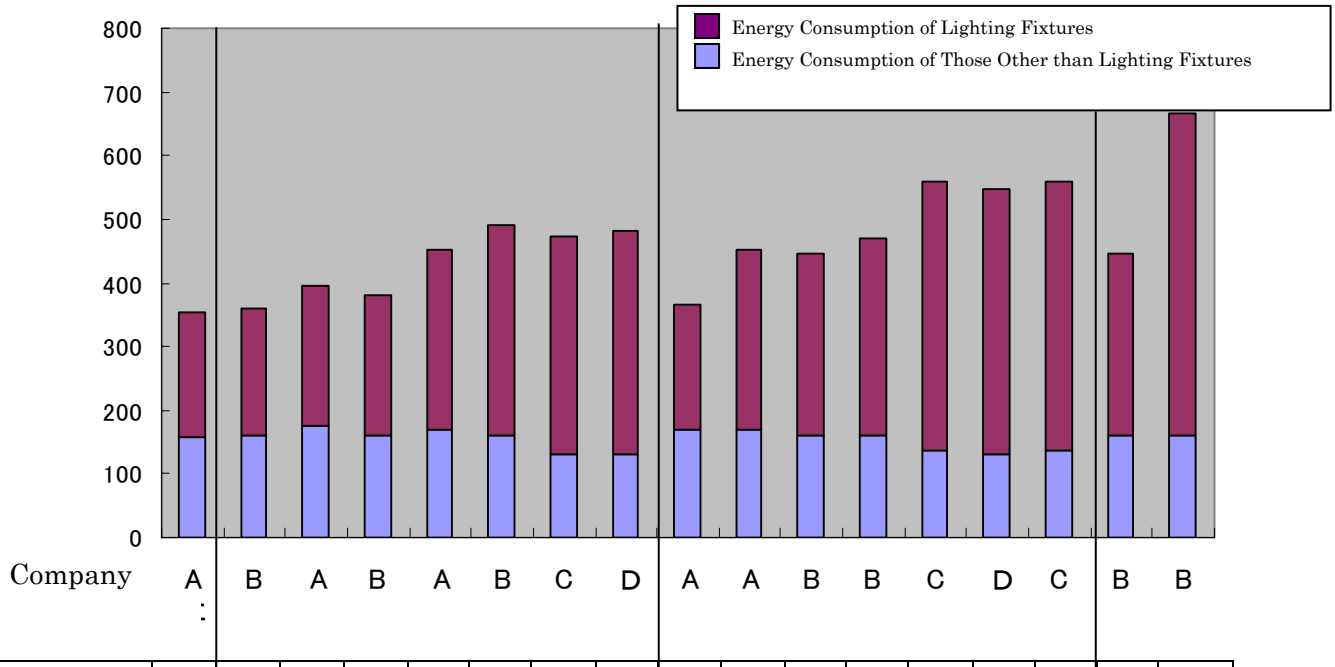
2. Power Consumption of Cigarette Vending Machines

The kinds and the numbers of fluorescent lamps installed in the lighting fixtures of vending machines vary depending on the size of vending machines and the number of displayed goods. As a result, annual energy consumption of a cigarette vending machine ranges from about 200 kWh to about 800 kWh.



Annual energy consumption of typical cigarette vending machines (width: 800 mm, displayed goods: 40 to 60) are summarized as follows.

Cigarette Vending Machines, 800 mm in Width, 40 to 60 Buttons



Number of display rows	4	5	5	5	5	5	5	5	6	6	6	6	6	6	6	7	7
Number of fluorescent lamps	3	3	3	3	4	5	5	5	3	4	4	4	6	6	6	4	7
Total wattage of fluorescent lamps	45	45	50	50	65	75	78	80	45	65	65	70	96	95	96	65	115

Power consumption of cigarette vending machines mainly consists of that of lighting fixtures (mainly fluorescent lamps), that of solenoids or small driving motors which operate momentarily only when dispensing cigarettes, and standby power. As for lighting fixtures, the energy consumption significantly differs depending on the number of display rows and the installation condition of fluorescent lamps. Energy consumption of those other than lighting fixtures also shows a slight difference due to these factors.

3. Use of LED Lighting

In a standard cigarette vending machine, typical fluorescent lamps which are inverter-controlled with a rating of 120 W (30 W × 4) are used. Assuming that a comparable level of luminous power (approximately 2900 lumens) is ensured by LED lighting devices, a comparison regarding brightness, power consumption and cost is made and summarized as below.

Lighting Type	Specifications	Physical Space	Power Consumption	Cost for Purchasing (Yen)
Fluorescent lamp	30W × 4 lamps	○	136 W	Approx. 6,000 yen
Standard LED	2100 chips	×	201 W	Approx. 400,000 yen
High brightness LED	120 chips	×	225 W	Approx. 50,000 yen
Super high brightness LED	72 chips	○	129 W	Approx. 70,000 yen

At this time, LEDs are not necessarily more efficient than fluorescent lamps. Considering an average price of around 300,000 yen for a cigarette vending machine, it is difficult to adopt LEDs in terms of cost.

As LEDs' efficiency improves and price lowers, energy-saving effect by adopting LEDs will be brought about in cigarette vending machines also.

4. Use of Fluorescent Lamps for High Frequency Lighting (Hf Fluorescent Lamps)

The specifications of fluorescent lamps are specified in JIS; however, availability of efficient Hf types is limited for the 30-watt or lower level of fluorescent lamps which are usually installed in vending machines.

Types of Fluorescent Lamps Specified in JIS (Tube Length: 1,000 mm or shorter)

Fluorescent Lamp Category	Size (watt/type)	Tube Length (mm)
Starter Type Fluorescent Lamp	4	134.5
	6	210.5
	8	287
	10	330
	15	436
	20S, 20SS	580
	30S	630
Hf Fluorescent Lamp	Hf16	588.5
	Hf24S	549

Vending machines have various body widths to cope with different setup locations, and they use different types of fluorescent lamps depending on row. It is thus difficult to uniformly adopt the same type of lamps.

Once various types of Hf fluorescent lamps are commercialized as they spread, it is expected that the efficiency of cigarette vending machines will be improved by adopting such lamps.

5. Treatment of Cigarette Vending Machine in This Review

As described above, cigarette vending machines are thought to have room for further energy-saving. At this time, however, it is unlikely that a drastic improvement will be achieved by the efforts of vending machine manufacturers alone. Meanwhile, as for the arrangement of fluorescent lamps, it is also impossible to advance energy-saving by the efforts of the manufacturers alone. The arrangement is made mostly in response to users' request; therefore, it is necessary to gain users' understanding.

At this moment, in order to strengthen the measures for preventing smoking by minors, introduction of cigarette vending machines with a built-in age verifier is being promoted by Tobacco Institute of Japan, National Federation of Tobacco Dealers Cooperative Associations, and Japan Vending Machine Manufacturers Association. The validation test is currently in progress with a scheduled nation-wide introduction by Year 2008.

Vending machines with a built-in age verifier are equipped with non-contact type IC card readers and communication devices; therefore, they consume more energy than conventional cigarette vending machines. Such unknown parameters make it difficult to determine the target standard values based on the Top Runner method.

Therefore, the standard values for cigarette vending machines are not specified in this review. However, it is necessary to promote voluntary efforts by manufacturers, since further energy-saving of cigarette vending machines needs to be advanced taking into consideration the amount of energy they consume.

(Reference 2)

Voluntary Efforts on Cigarette Vending Machines

Japan Vending Machine Manufacturers Association

With the following actions, while setting Year 2012 as a target year, efforts shall be made to reduce the power consumption by 36% taking the level of models shipped in Year 2007 as a baseline. Approximately once a year, the Japan Vending Machine Manufacturers Association will conduct a survey on voluntary actions taken by the association members to figure out the status of the actions. To enhance the effect of these actions, the Association will also conduct a campaign, where appropriate, to promote the efforts by cigarette vending machine users.

1) Actions on Dimming Control

(a) Default Setting of Dimming Control Function (Reduction by 28%)

A dimming control shall be adjusted to generate 50% illuminance for all models as a factory default.

(b) Technology Development for Dimming Control Function (Reduction by 6%)

Current dimming control function is capable to reduce illuminance to the 50% level. Efforts shall be made to develop technologies for further reduction of illuminance down to 40%.

2) Actions on Reduction of Standby Power (Reduction by 2%)

Energy consumption efficiency of money handling mechanisms, age verifiers and power supplies shall be improved.

Attachment 2

Target Fiscal Year for Vending Machines and Related Matters

1. In general, a considerable improvement in energy consumption efficiency of vending machines is made when a model change takes place, and a typical development period of these new models is approximately 3 to 4 years, but approximately 5 years for vending machines for beverage in paper containers and for beverage served in cups. For this reason, consideration should be given so that manufacturers can take at least two opportunities of bringing out new models before a target fiscal year.

   Consequently, for vending machines, it is appropriate to determine next target fiscal year to be FY 2012, five years after this revision of the standards.

2. The improvement rate of energy consumption efficiency in the target fiscal year is expected to be 33.9% based on the assumption that there will be no change from the current status (the result in FY 2005) regarding the shipment volume and the composition of each category. (Approximately 36.3% for vending machines for canned/bottled beverages, approximately 26.7% for vending machines for beverage in paper containers, and approximately 17.9% for vending machines for beverage served in cups).

<Overview of Estimation>

(1) Energy consumption efficiency calculated from the actual values of vending machines shipped in FY 2005:

Approximately 1,711 kWh/year

(2) Energy consumption efficiency estimated from the target standard values for vending machines to be shipped in the target fiscal year:

Approximately 1,131 kWh/year

(3) Improvement rate of energy consumption efficiency:

$$\frac{(1{,}711-1{,}131)}{1{,}711}\times 100 = Approx.33.9\%$$

<Overview of Estimation: Vending Machines for Canned/Bottled Beverages>

(1) Energy consumption efficiency calculated from the actual values of vending machines for canned/bottled beverages shipped in FY 2005:

Approximately 1,642 kWh/year

(2) Energy consumption efficiency estimated from the target standard values for vending machines for canned/bottled beverages to be shipped in the target fiscal year:

Approximately 1,046 kWh/year

(3) Improvement rate of energy consumption efficiency:

$$\frac{(1{,}642-1{,}046)}{1{,}642}\times 100 = Approx.36.3\%$$

<Overview of Estimation: Vending Machines for Beverage in Paper Containers>

(1) Energy consumption efficiency calculated from the actual values of vending machines for beverage in paper containers shipped in FY 2005:

Approximately 2,202 kWh/year

(2) Energy consumption efficiency estimated from the target standard values for vending machines for beverage in paper containers to be shipped in the target fiscal year:

Approximately 1,608 kWh/year

(3) Improvement rate of energy consumption efficiency:

$$\frac{(2{,}202 - 1{,}608)}{2{,}202} \times 100 = \textit{Approx.}27.0\%$$

<Overview of Estimation: Vending Machines for Beverage Served in Cups>

(1) Energy consumption efficiency calculated from the actual values of vending machines for beverage served in cups shipped in FY 2005:

Approximately 2,142 kWh/year

(2) Energy consumption efficiency estimated from the target standard values for vending machines for beverage served in cups to be shipped in the target fiscal year:

Approximately 1,759 kWh/year

(3) Improvement rate of energy consumption efficiency:

$$\frac{(2{,}142 - 1{,}759)}{2{,}142} \times 100 = \textit{Approx.}17.9\%$$

Attachment 3

Categories of Vending Machines for Target Setting and Related Matters

1. Current Categories of Vending Machines

Currently, the Top Runner target standards are specified only for vending machines for canned/bottled beverages. In the current concept, they are categorized as below based on the two parameters that will have impact on annual energy consumption (energy consumption efficiency) and the future development of energy-saving technologies. For each category, the standard is defined as a linear function taking adjusted internal volume, etc. as a variable.

(a) Categorization by the cold and/or hot storage capability
(b) Categorization by the depth

Table 1: Current Categories

Current Category (Vending Machines for Canned and/or Bottled Beverages)
Machines serving cold only, or machines serving hot or cold
Machines serving hot and cold (internal depth is below 400 mm)
Machines serving hot and cold (internal depth is 400 mm or greater)

2. New Categorization Method for Vending Machines

(1) Basic concept

New Top Runner standards for vending machines will cover those for canned/bottled beverages, those for beverage in paper containers, and those for beverage served in cups. These vending machines are dealing with different kinds of beverage, and the measurement methods are also different each other. Thus, these three kinds of vending machines are considered as different categories and dealt with independently.

(2) Vending machines for canned/bottled beverage

(a) Categories by the cold and/or hot storage capability

According to the cold and/or hot storage capability, vending machines for canned/bottled beverages are categorized into three groups: machines serving cold only, machines serving hot and cold, and machines serving hot or cold. Since the difference in the cold and/or hot storage capability affects energy consumption by means of causing a variation in temperature differences from the ambient temperature, etc., and also since their measurement methods are different each other, each group is considered as a category. For machines serving hot or cold, however, the energy consumption measuring method specified by JIS is the same as the one for machines serving cold only; thus, these two groups are assigned to one category.

(b) Categories by the depth

When many vending machines were once installed protruding onto public roads, local governments addressed the issue for improvement. With such a background and in response to the customers' request for a machine that can be placed in a space of little depth, vending machines thinner than the standard models have been developed.

In order to load the same amount of goods as loaded in a standard model, a thin-depth vending machine needs be wider. It makes the surface area become relatively larger, resulting in a greater amount of heat being radiated/absorbed and also resulting in

increased energy consumption due to increased lighting. Since the depth of vending machines affects energy consumption, categorization by the depth shall be made. Specifically, vending machines are largely categorized as thin or standard by the threshold of internal depth of 400 mm; thus, the demarcation between thin and standard is made at this threshold value.

(c) Categories by the availability of an electronic money processing device

Recently, the shipment volume of vending machines equipped with an electronic money processing device such as for IC cards is increasing. Availability of such device affects energy consumption because it always stays in a mode ready for reading and writing onto IC cards or the like; thus, categorization shall be made by the availability of the device. However, since most of the vending machines equipped with an electronic money processing device fall into the category for those serving hot and cold of the standard depth, only this category is divided into subcategories by the availability of the device.

(d) Net internal volume and adjusted internal volume

For vending machines for canned/bottled beverages, energy consumption correlates with net internal volume (a volume calculated from the internal dimensions of the goods storage compartment) in the case of machines serving cold only and machines serving hot or cold, while it correlates with adjusted internal volume* (a volume obtained by correcting the difference in energy consumption per unit-volume assuming that a hot storage compartment is replaced by a cold storage compartment) in the case of machines serving hot and cold. Therefore, if the target standard is defined as a single value, production in each category would concentrate on the machines having small net internal volume or adjusted internal volume that could clear the target value, making it difficult to meet customers' needs. Consequently, the target standard value shall be defined as annual energy consumption expressed by a linear function (calculation formula) taking net internal volume or adjusted internal volume as a variable.

* Adjusted internal volume

Following the concept of adjusted internal volume that is adopted in the current Top Runner standards, it shall be calculated as follows with a coefficient of 40/11. The coefficient is obtained from the difference between the ambient temperature of 15ºC and the storage temperature of hot storage compartment of 55ºC and the difference between the ambient temperature of 15ºC and the storage temperature of cold storage compartment of 4ºC.

Adjusted internal volume = Internal volume of cold storage compartment
+ Internal volume of hot storage compartment × 40/11

(3) Vending Machines for Beverage in Paper Containers

(a) Categories by the goods display method

Vending machines for beverage in paper containers are categorized into two types by the goods display method: those using dummy samples for display and guide (type A) and those having actual goods visible for selection (type B). In a type B machine, a glass wall separates the storage compartment from the outside air so that the goods are visually confirmed. As a result, there is a difference in insulation performance between type A and type B, which affects the energy consumption. In addition, the measurement methods for these types are different. Thus, each type is assigned as a category.

(b) Categories by the cold and/or hot storage capability

According to the cold and/or hot storage capability, vending machines for beverage in paper containers are categorized into two groups: machines serving cold only and machines serving hot and cold. As in the case of vending machines for canned/bottled beverages, the difference in the cold and/or hot storage capability affects energy consumption; moreover, the measurement methods for these two groups are different. Thus, each group is assigned as a category. Among type A, three-compartment type and two-compartment type are available, and such difference causes a difference in usage (cold/hot storage setting); moreover, their measurement methods are different. Thus, each compartment type is also assigned as a category.

(c) Net internal volume and adjusted internal volume

As in the case of vending machines for canned/bottled beverages, the target standard value of vending machines for beverage in paper containers shall be defined as annual energy consumption expressed by a linear function (calculation formula) taking net internal volume or adjusted internal volume as a variable.

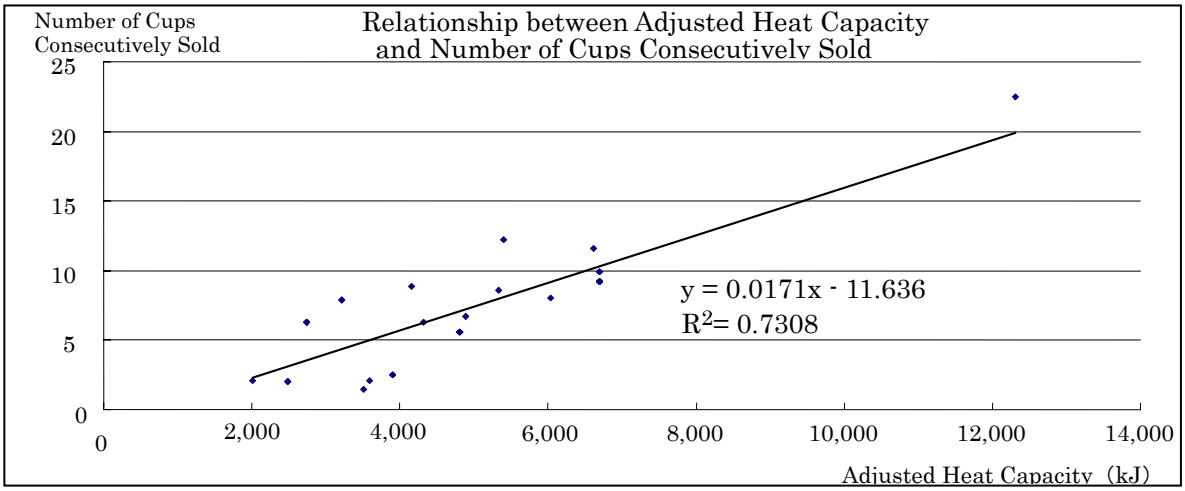
* Adjusted internal volume

Following the concept of adjusted internal volume that is adopted in the current Top Runner standards, it shall be calculated as follows with a coefficient of 40/10 = 4. The coefficient is obtained from the difference between the ambient temperature of 15ºC and the storage temperature of hot storage compartment of 55ºC and the difference between the ambient temperature of 15ºC and the storage temperature of cold storage compartment of 5ºC.

Adjusted internal volume = Internal volume of cold storage compartment
+ Internal volume of hot storage compartment × 4

(4) Vending Machines for Beverage Served in Cups

Energy consumption of vending machine for beverage served in cups greatly differs depending on the sales capacity. If the target standard is defined as a single value, production in each category would concentrate on the machines having small sales capacity that could clear the target standard value, making it difficult to meet customers' needs. For this reason, the target standard needs to be defined as a formula, taking the sales capacity as a fundamental indicator; however, due to the lack of a clearly defined measurement method or available data, it is impossible to consider the sales capacity as the indicator. Meanwhile, the sales capacity is limited by hot-water tank capacity, cold-water tank capacity, and ice storage capacity. Based on these indicators, adjusted heat capacity* (a corrected heat capacity taking into account the temperature changes) can be calculated and is consequently used as a fundamental index. Besides, looking at a referential data showing the relationship between adjusted heat capacity and the number of cups consecutively sold, a significant correlation can be observed. Thus, the target standard value shall be calculated by a linear function (calculation formula) taking adjusted heat capacity as a variable.



Other than the sales capacity, vending machines for beverage served in cups have no additional parameters that affect energy consumption due to their structure, etc. Thus, they constitute a single category as vending machines for beverage served in cups.

* Adjusted heat capacity

As in the case of adjusted internal volume of vending machines for canned/bottled beverages, an adjustment is made using the difference between the ambient temperature of 15ºC and the hot-water tank temperature of 95ºC and the difference between the ambient temperature of 15ºC and the cold-water tank and ice maker temperature of 0ºC. Taking into consideration the heat of solidification of water (80 kcal/kg) and the specific gravity of ice (0.917) with respect to the ice storage capacity (kg), adjusted heat capacity shall be calculated as follows:

Adjusted heat capacity (kJ) = (Hot-water tank capacity × 80 + Cold-water tank capacity × 15
+ Ice storage capacity × (15 + 80) / 0.917) × 4.19

3. Proposal for Basic Categories

From the above considerations, preliminary basic categories are determined as below.

<table>
<tr><td>Tentative Category</td><td>Beverages to be Sold</td><td colspan="3"></td></tr>
<tr><td>I</td><td rowspan="4">Canned and/or bottled beverages</td><td colspan="3">Machines serving cold only, or
Machines serving hot or cold</td></tr>
<tr><td>II</td><td colspan="3">Machines serving hot and cold
(Internal depth is below 400 mm)</td></tr>
<tr><td>III</td><td colspan="2" rowspan="2">Machines serving hot and cold (Internal depth is 400 mm or greater)</td><td>Without electronic money processing device</td></tr>
<tr><td>IV</td><td>With electronic money processing device</td></tr>
<tr><td>V</td><td rowspan="5">Beverage in paper containers</td><td rowspan="3">Type A
(Dummy samples are used for selling goods)</td><td colspan="2">Machines serving cold only</td></tr>
<tr><td>VI</td><td colspan="2">Machines serving hot and cold (having two internal compartments)</td></tr>
<tr><td>VII</td><td colspan="2">Machines serving hot and cold (having three internal compartments)</td></tr>
<tr><td>VIII</td><td rowspan="2">Type B
(Actual goods are used for visual display and selling goods)</td><td colspan="2">Machines serving cold only</td></tr>
<tr><td>IX</td><td colspan="2">Machines serving hot and cold</td></tr>
<tr><td>X</td><td colspan="4">Beverage served in cups</td></tr>
</table>

Attachment 4

Target Standard Values for Vending Machines

1. Basic Concept

Based on the concept of the Top Runner Method, target standard values are determined using data of machines shipped in FY 2005. Specific policies are as follows:

(a) Target standard values shall 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 shall allow for the improvement as much as possible.
(c) Target standard values shall not conflict among categories.

2. Determination of Baseline to Define Target Standard Values

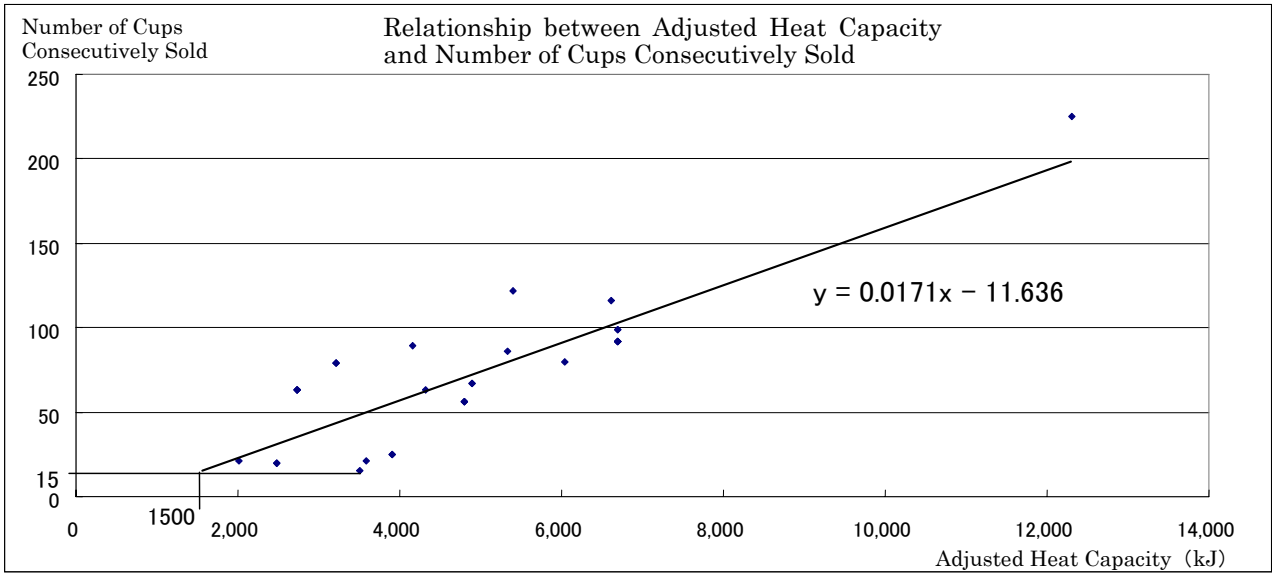
(1) Determination of baseline

Depending on the vending machine category, annual energy consumption (energy consumption efficiency) correlates with either net internal volume, adjusted internal volume or adjusted heat capacity. Therefore, the target standard value shall be expressed as a linear function taking adjusted internal volume, etc. as a variable. Then, in principle, specific calculation formula for each category shall be set according to the following procedures.

Vending machines in a category are segmented by every 200 L of adjusted internal volume, etc., and in each segment, annual energy consumption of the most energy-efficient product is taken as the top value. For the group of these top values, an approximation line is obtained by the least-squares method. By shifting down the approximation line until it reaches to the best top runner value of the category, the baseline for setting the target standard value is determined. Upon shifting the line downward, it shall be done so that the reduction rate from the approximation line shall be equal throughout the ranges of adjusted internal volume, etc.

(2) Exception for vending machines for beverage served in cups

Among vending machines for beverage served in cups being shipped, there is one model with an instantaneous heating boiler. General vending machines for beverage served in cups sell goods using hot water stored in a hot-water tank. On the other hand, this model is equipped with an instantaneous heating boiler. Use of the boiler allows for drastic reduction of hot-water tank capacity (200 ml); as a result, this model achieves energy-saving. If a base line is drawn as described above, it would be difficult for the model to clear the target, even though it is an energy efficient product. Meanwhile, vending machines for beverage served in cups need to have a certain sales capacity to be a marketable product. With it in mind, a constant target value is adopted for those whose adjusted heat capacity is equal to or below the point that is the adjusted heat capacity when the number of cups consecutively sold of a product having the least sales capacity in the current market is applied to the relational formula shown in the figure below.



(3) Models to be treated as special products

When target standard values are determined based on the Top Runner method, certain models shall be treated as special products and considered as exceptions. These products shall be those which employ special technologies, whose market share is fairly low at this time compared to the whole, and which are recognized to have many uncertain factors now and in future. If energy consumption efficiency of the products using such technologies is taken as the target standard value, other models that employ widely used technologies could not exist, resulting in an extreme market distortion and a disturbance in improvement and innovation of other technologies.

In this revision, vending machines for canned/bottled beverages that warm hot storage compartments using heat pump technology and vending machines for beverage served in cups equipped with an instantaneous heating boiler shall be treated as special products.

3. Room for Improvement in Energy Consumption Efficiency Driven by Technological Advancement in the Future

Concerning the improvement in energy-saving performance of vending machines, while technological development has been conducted to achieve the Top Runner standards, each element technology has already reached close to the limit.

[Examples of Major Efficiency Improvement Technologies for Vending Machines]

- Cooling and Heating: Improvement in compressor efficiency
- Heat leakage: Improvement in air tightness, and adjustment for orderly flow of internal cold or hot air
- Lighting: Improvement in the dimming rate of fluorescent lamps
- Control system: Efficiency improvement of money handling equipment

While these technologies have already been applied to the current top runner machines, each manufacturer is making efforts for further improvements in efficiency. So it can be said that there remains room for efficiency improvement in each technological development.

In addition, heat pump technology is anticipated to spread in the future and this technology is thought to be applied to vending machines for heating up the hot storage compartment (HP vending machine). Although this type of vending machine has been excluded in the determination process of the Top Runner values, the efficiency improvement by 30% or so can be expected for this type compared to the conventional models. Consequently, a potential efficiency improvement corresponding to the spread of the technology is taken into consideration for Category III, IV and VII, as a future technological

improvement.

Information displays (e.g., character information display) are anticipated to spread in future, and they shall be considered as an efficiency degradation factor all categories.

Concerning vending machines equipped with an electronic money processing device, their shipments are expected to increase from now on. There are already many kinds of electronic money available, and energy consumption varies depending on the electronic money which they handle. At this time, development efforts are focused on the spread of electronic money processing device, and some of them still consume large amount of energy. With an expectation of that efforts, such as reducing standby power, will be made for the improvement of energy consumption efficiency, the reduction of energy consumption from the current average of 300 kWh/year to the half shall be taken into consideration.

Based on the above-described factors and considering the effect of each technology, a potential energy efficiency improvement is estimated for each category as follows.

<table>
<tr><th>Category</th><th>Beverages to be Sold</th><th colspan="2"></th><th>Efficiency Improvement (%)</th><th>Efficiency Improvement Technologies, etc.</th></tr>
<tr><td>I</td><td rowspan="4">Canned and/or bottled beverages</td><td colspan="2">Machines serving cold only, or
Machines serving hot or cold</td><td>7.1</td><td>- Cooling and heating efficiency improvement
- Heat leakage improvement
- Lighting improvement
- Control system improvement
- Efficiency degradation by information display</td></tr>
<tr><td>II</td><td colspan="2">Machines serving hot and cold
(Internal depth is below 400 mm)</td><td>6.5</td><td>Same as above</td></tr>
<tr><td>III</td><td rowspan="2">Machines serving hot and cold (Internal depth is 400 mm or greater)</td><td>Without electronic money processing device</td><td>8.4</td><td>- Cooling and heating efficiency improvement
- Heat leakage improvement
- Lighting improvement
- Control system improvement
- Spread of HP vending machines
- Efficiency degradation by information display</td></tr>
<tr><td>IV</td><td>With electronic money processing device</td><td>22.4</td><td>- Cooling and heating efficiency improvement
- Heat leakage improvement
- Lighting improvement
- Control system improvement
- Spread of HP vending machines
- Efficiency improvement in electronic money processing device
- Efficiency degradation by information display</td></tr>
</table>

V	Beverage in paper containers	Type A (Dummy samples are used for selling goods)	Machines serving cold only	7.1	- Cooling and heating efficiency improvement - Heat leakage improvement - Lighting improvement - Control system improvement - Efficiency degradation by information display
VI			Machines serving hot and cold (having two internal compartments)	5.9	Same as above
VII			Machines serving hot and cold (having three internal compartments)	8.5	- Cooling and heating efficiency improvement - Heat leakage improvement - Lighting improvement - Control system improvement - Spread of HP vending machines - Efficiency degradation by information display
VIII		Type B (Actual goods are used for visual display and selling goods)	Machines serving cold only	8.6	- Cooling and heating efficiency improvement - Heat leakage improvement - Lighting improvement - Control system improvement - Efficiency degradation by information display
IX			Machines serving hot and cold	7.2	Same as above
X	Beverage served in cups			7.3	- Insulation efficiency improvement - Lighting improvement - Control system improvement - Efficiency degradation by information display

4. Specific Target Standard Values

By adding potential efficiency improvements in future, etc. to the baseline for setting target standard values, target standard values are finalized for each category as follows.

<table>
<tr><th>Category</th><th>Beverages to be Sold</th><th colspan="2"></th><th>Formula for Target Standard Value</th></tr>
<tr><td>I</td><td rowspan="4">Canned and/or bottled beverages</td><td colspan="2">Machines serving cold only, or Machines serving hot or cold</td><td>E = 0.218V + 401</td></tr>
<tr><td>II</td><td colspan="2">Machines serving hot and cold (Internal depth is below 400 mm)</td><td>E = 0.798Va + 414</td></tr>
<tr><td>III</td><td rowspan="2">Machines serving hot and cold (Internal depth is 400 mm or greater)</td><td>Without electronic money processing device</td><td>E = 0.482Va + 350</td></tr>
<tr><td>IV</td><td>With electronic money processing device</td><td>E = 0.482Va + 500</td></tr>
<tr><td>V</td><td rowspan="5">Beverages in paper containers</td><td rowspan="3">Type A (Dummy samples are used for selling goods)</td><td>Machines serving cold only</td><td>E = 0.948V + 373</td></tr>
<tr><td>VI</td><td>Machines serving hot and cold (having two internal compartments)</td><td>E = 0.306Va + 954</td></tr>
<tr><td>VII</td><td>Machines serving hot and cold (having three internal compartments)</td><td>E = 0.630Va + 1474</td></tr>
<tr><td>VIII</td><td rowspan="2">Type B (Actual goods are used for visual display and selling goods)</td><td>Machines serving cold only</td><td>E = 0.477V + 750</td></tr>
<tr><td>IX</td><td>Machines serving hot and cold</td><td>E = 0.401Va + 1261</td></tr>
<tr><td>X</td><td>Beverages served in cups</td><td colspan="2">–</td><td>E = 1020 〔T ≤ 1500〕
E=0.293T+580 〔1500 < T〕</td></tr>
</table>

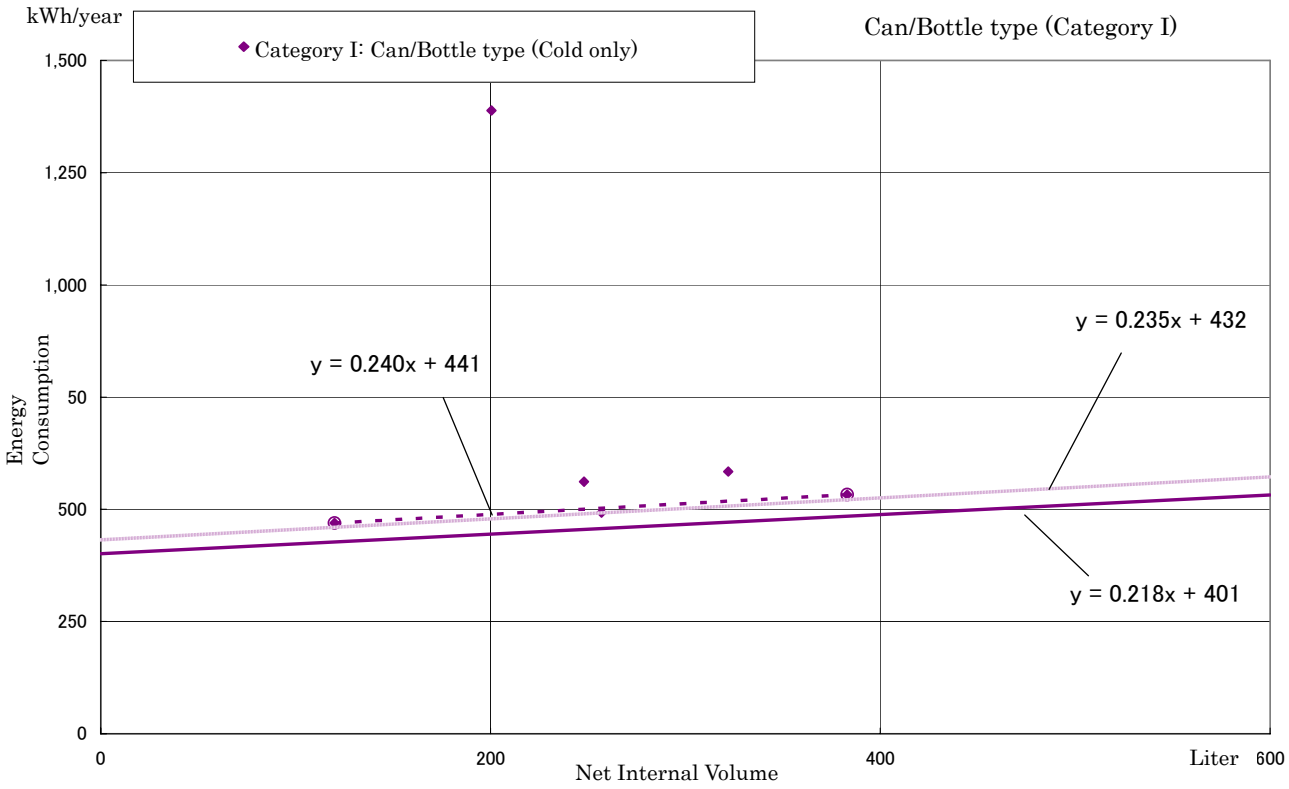
(Note 1) E: Annual energy consumption (kWh/year)

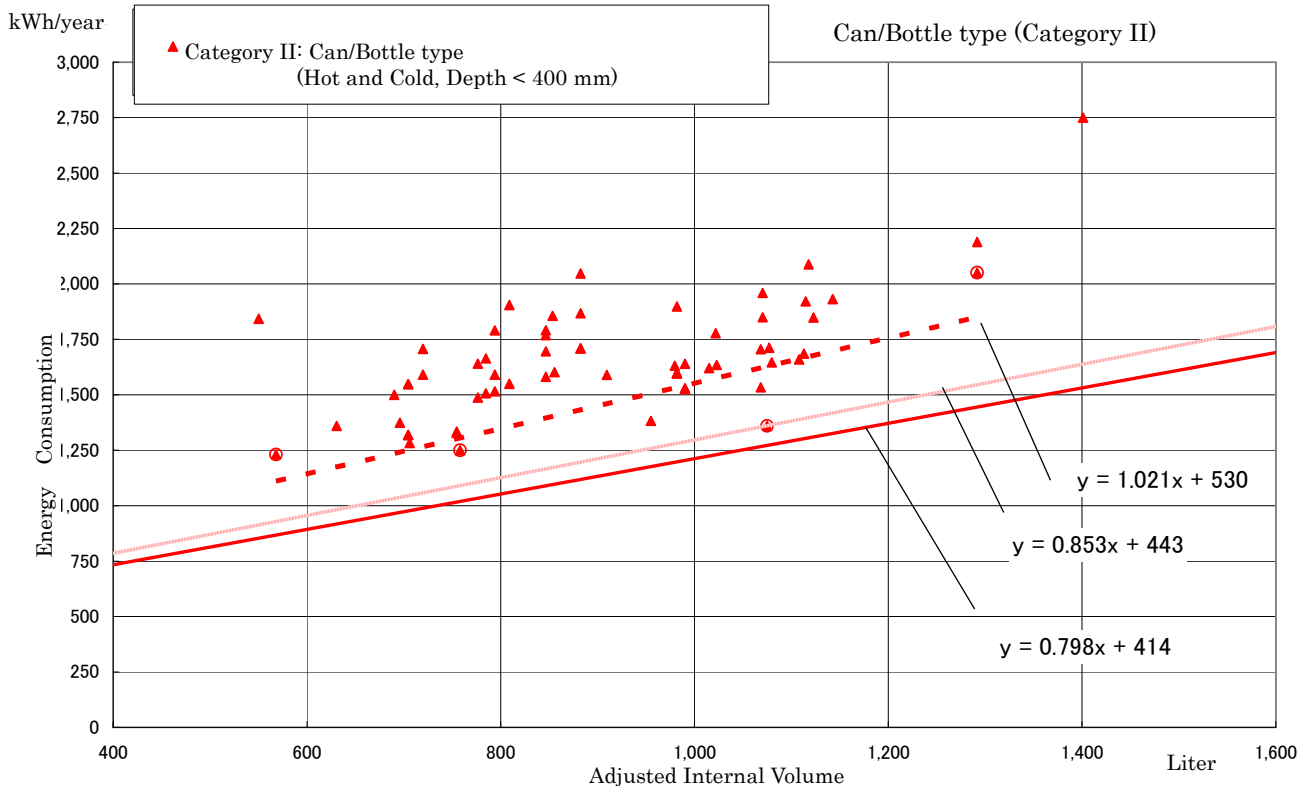
(Note 2) V: Net internal volume (A volume calculated from the internal dimensions of the goods storage compartment. Unit: L)

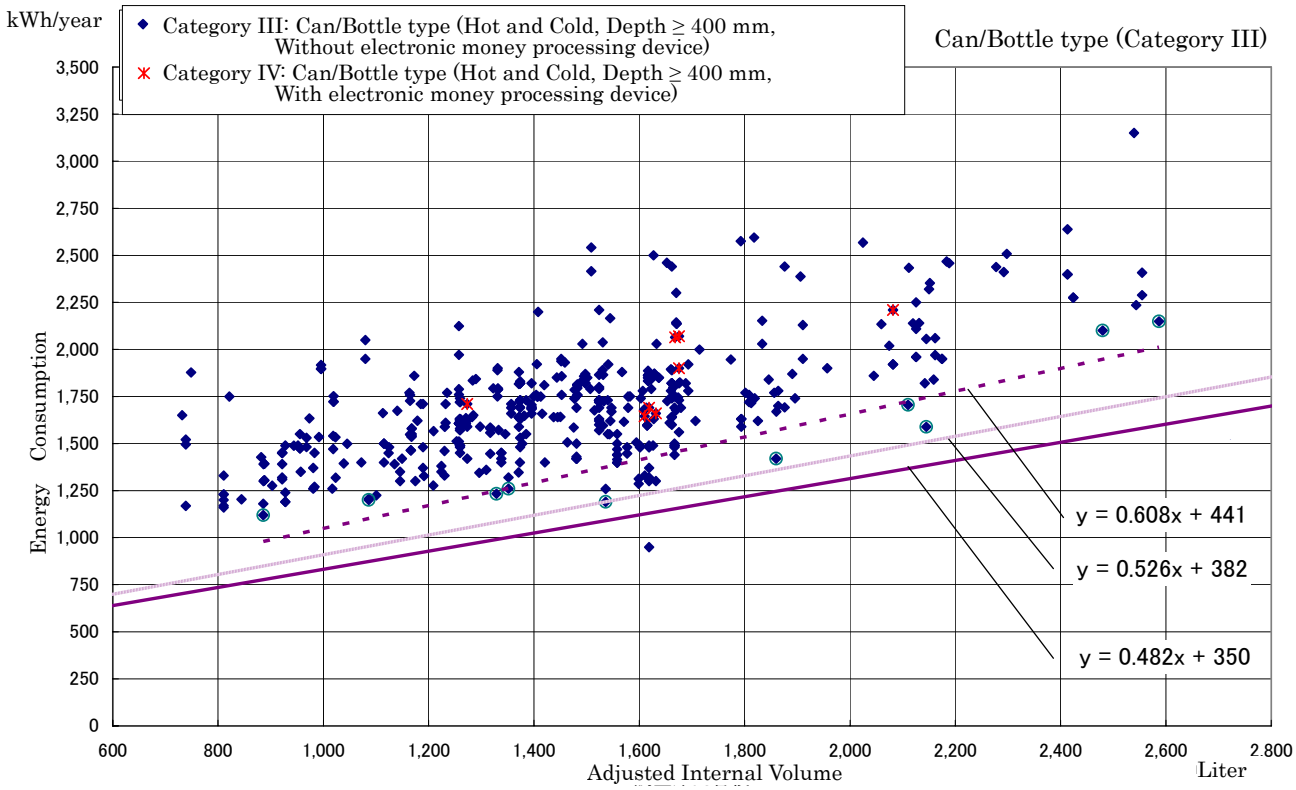
(Note 3) Va: Adjusted internal volume (A volume obtained by correcting the difference in energy consumption per unit-volume assuming that a hot storage compartment is replaced by a cold storage compartment. Unit: L)

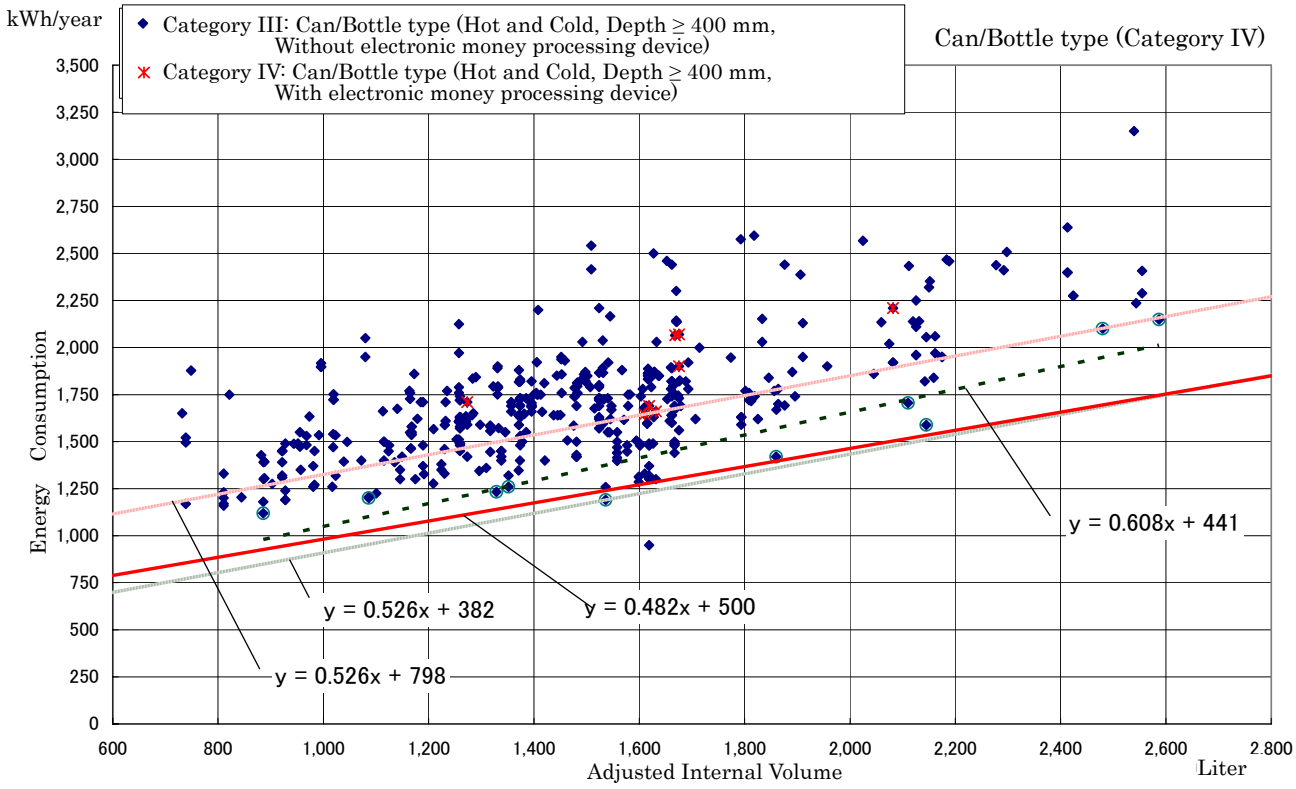
(Note 4) T: Adjusted heat capacity (Heat capacity calculated from hot-water tank capacity, cold-water tank capacity and ice storage capacity. Unit: kJ)

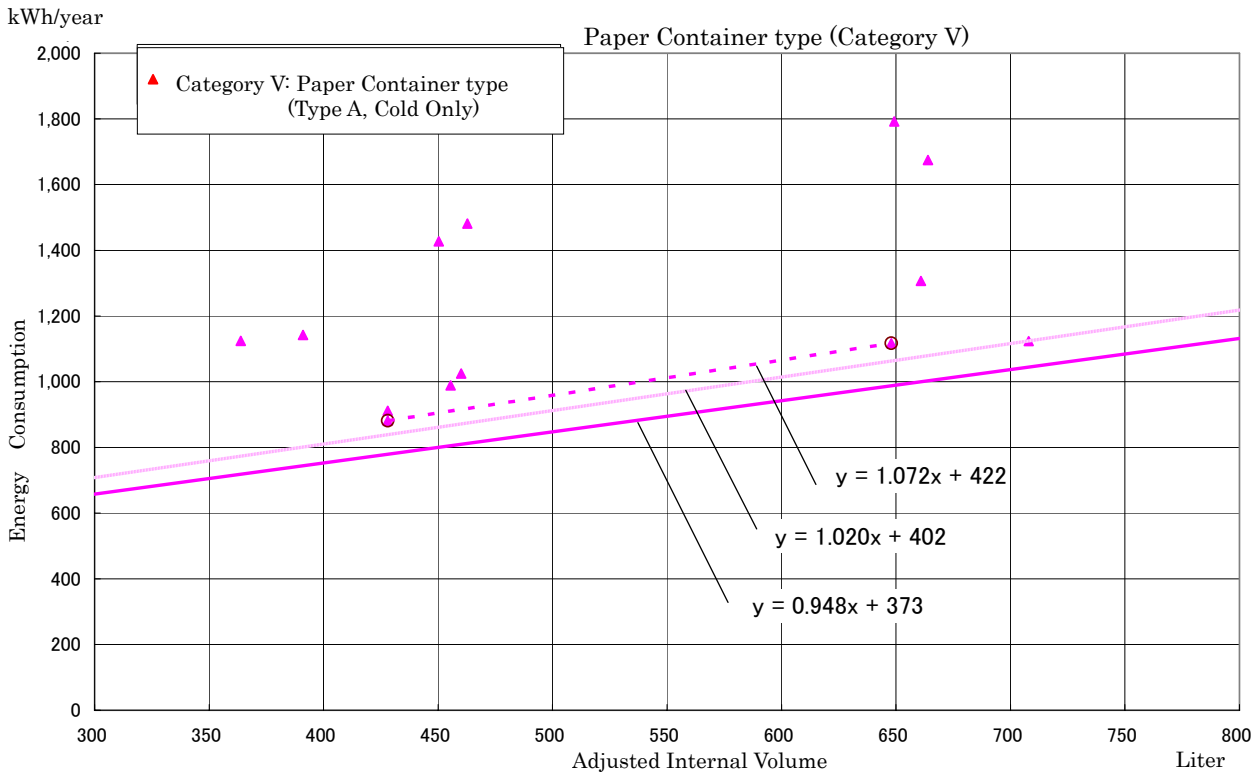
(Reference 1)

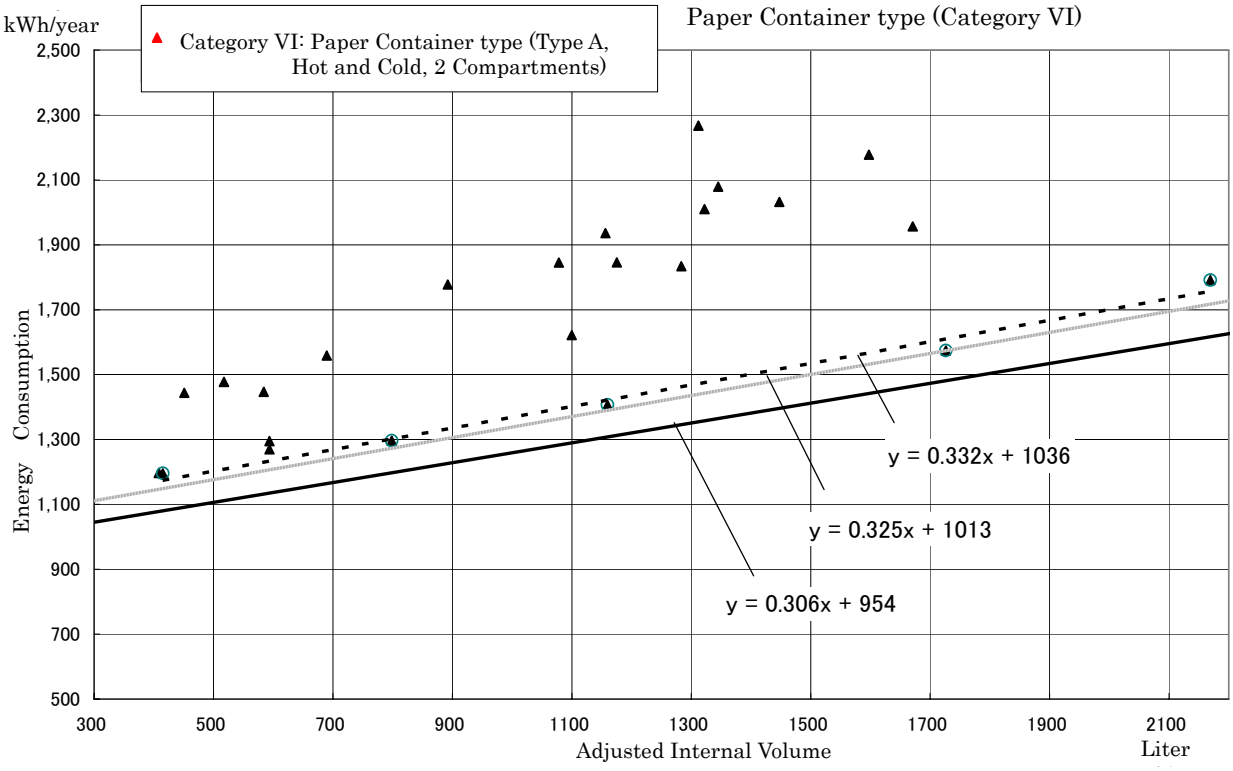

kWh/year
Category I: Can/Bottle type (Cold only)
Can/Bottle type (Category I)
1,500
1,250
1,000
50
500
250
0
Energy Consumption
y = 0.240x + 441
y = 0.235x + 432
y = 0.218x + 401
0
200
400
600
Liter
Net Internal Volume

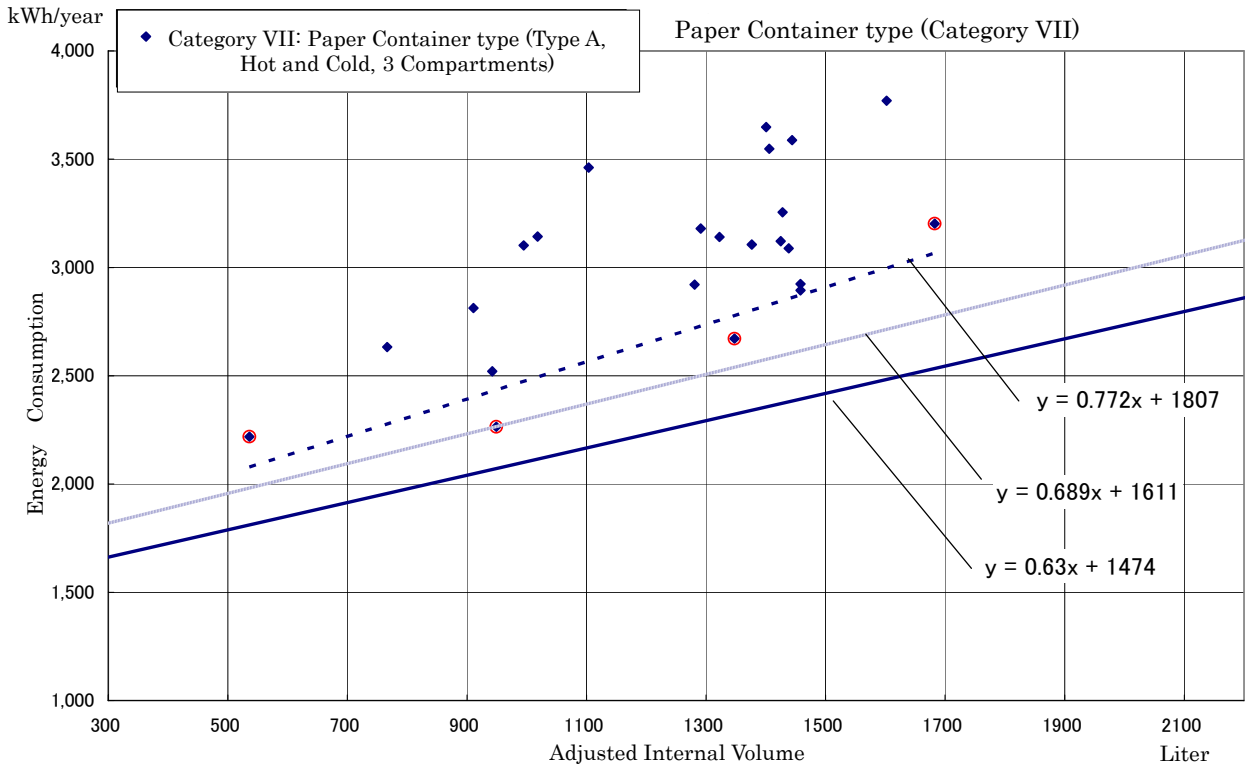

kWh/year
Category II: Can/Bottle type
(Hot and Cold, Depth < 400 mm)
Can/Bottle type (Category II)
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
Energy Consumption
y = 1.021x + 530
y = 0.853x + 443
y = 0.798x + 414
400
600
800
1,000
1,200
1,400
1,600
Liter
Adjusted Internal Volume

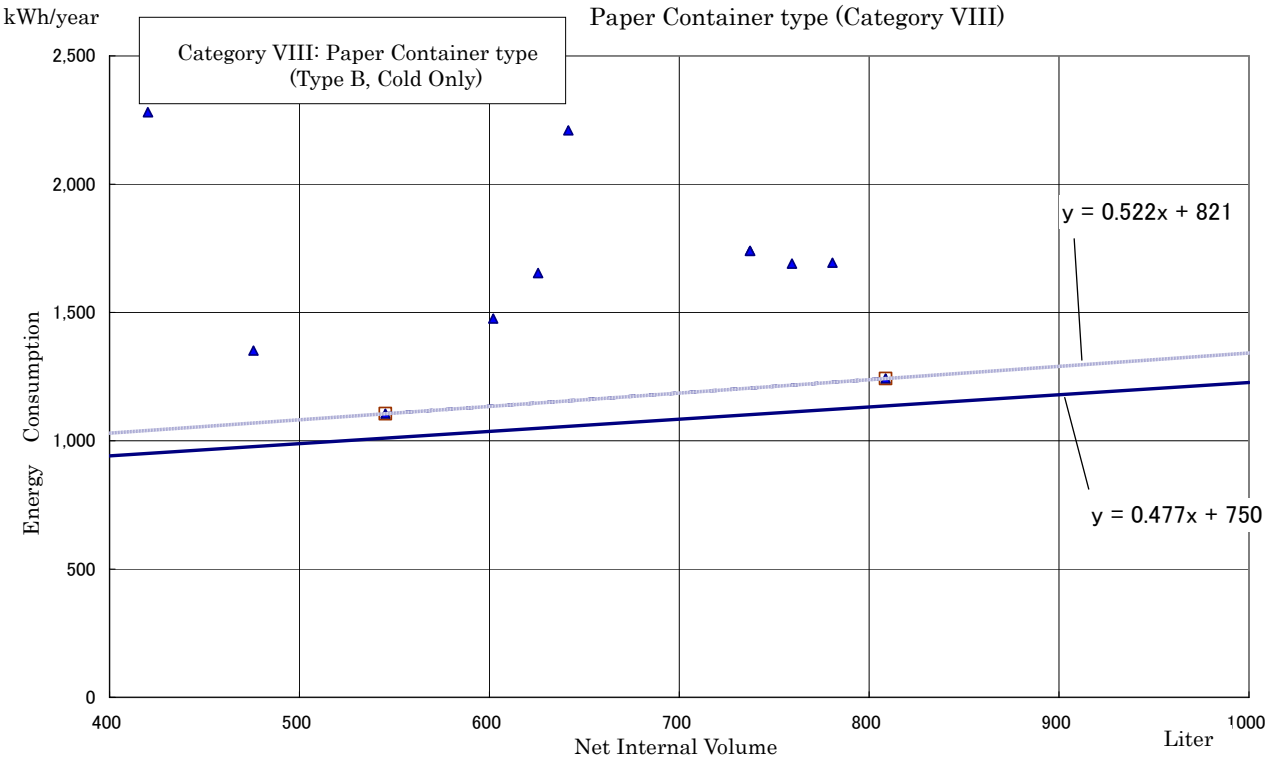

kWh/year
Category III: Can/Bottle type (Hot and Cold, Depth ≥ 400 mm, Without electronic money processing device)
Category IV: Can/Bottle type (Hot and Cold, Depth ≥ 400 mm, With electronic money processing device)
Can/Bottle type (Category III)
Energy Consumption
3,500
3,250
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
y = 0.608x + 441
y = 0.526x + 382
y = 0.482x + 350
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
Adjusted Internal Volume
Liter

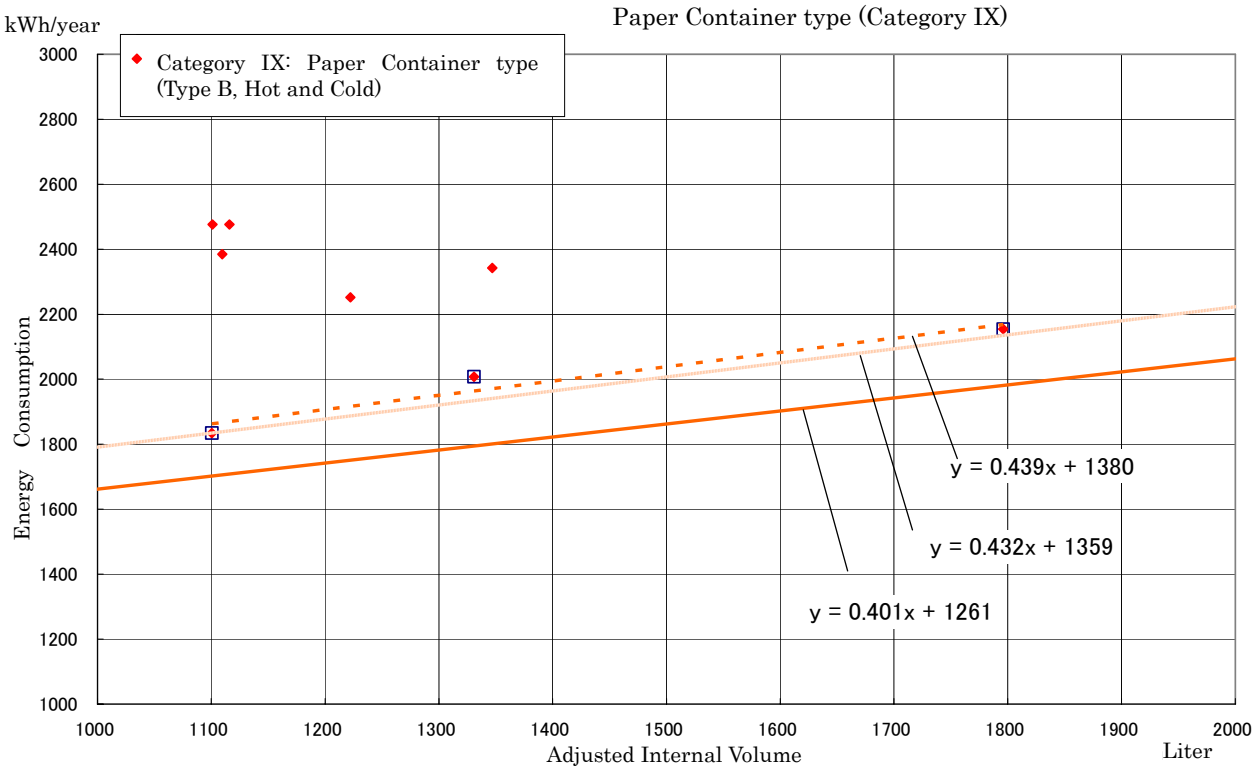

kWh/year
Category III: Can/Bottle type (Hot and Cold, Depth ≥ 400 mm, Without electronic money processing device)
Category IV: Can/Bottle type (Hot and Cold, Depth ≥ 400 mm, With electronic money processing device)
Can/Bottle type (Category IV)
Energy Consumption
3,500
3,250
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
y = 0.608x + 441
y = 0.526x + 382
y = 0.482x + 500
y = 0.526x + 798
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
Adjusted Internal Volume
Liter

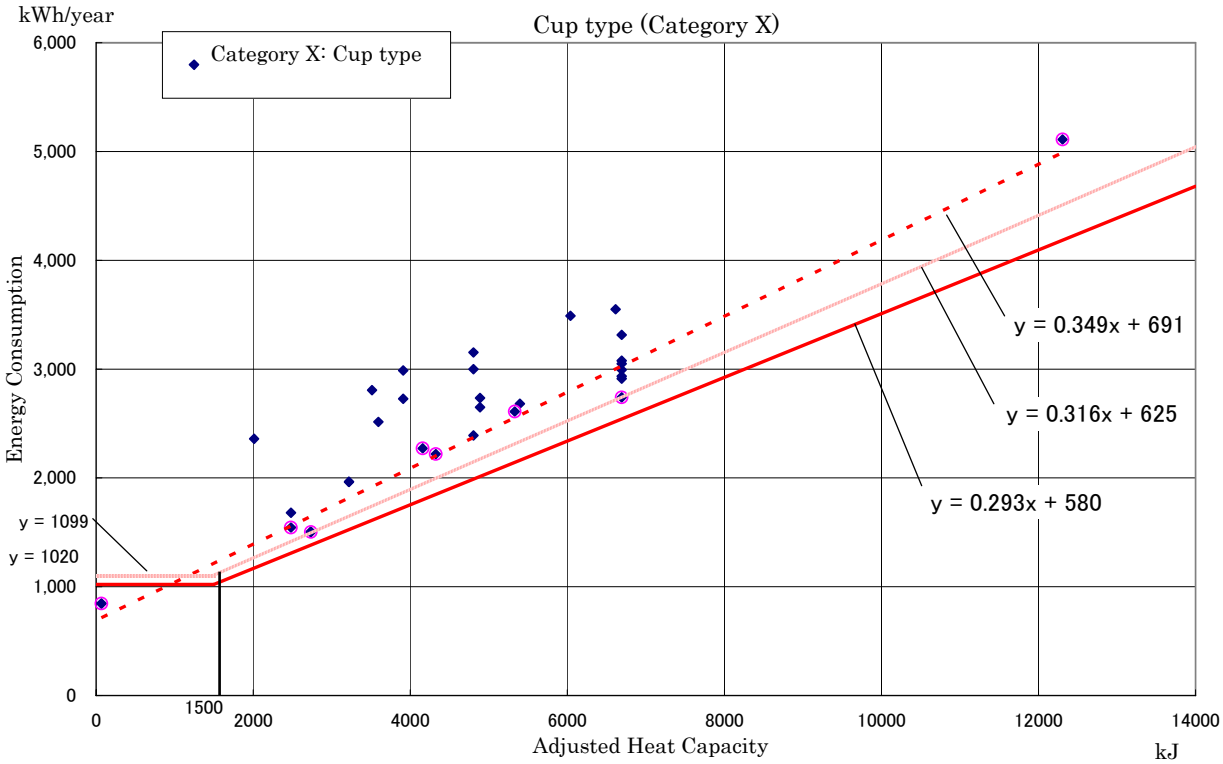

kWh/year
Paper Container type (Category V)
Category V: Paper Container type (Type A, Cold Only)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Energy Consumption
y = 1.072x + 422
y = 1.020x + 402
y = 0.948x + 373
300
350
400
450
500
550
600
650
700
750
800
Adjusted Internal Volume
Liter


kWh/year
Paper Container type (Category VI)
Category VI: Paper Container type (Type A, Hot and Cold, 2 Compartments)
2,500
2,300
2,100
1,900
1,700
1,500
1,300
1,100
900
700
500
Energy Consumption
y = 0.332x + 1036
y = 0.325x + 1013
y = 0.306x + 954
300
500
700
900
1100
1300
1500
1700
1900
2100
Adjusted Internal Volume
Liter


kWh/year
Paper Container type (Category VII)
Category VII: Paper Container type (Type A, Hot and Cold, 3 Compartments)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
Energy Consumption
y = 0.772x + 1807
y = 0.689x + 1611
y = 0.63x + 1474
300
500
700
900
1100
1300
1500
1700
1900
2100
Adjusted Internal Volume
Liter


kWh/year
Paper Container type (Category VIII)
Category VIII: Paper Container type (Type B, Cold Only)
2,500
2,000
1,500
1,000
500
0
Energy Consumption
y = 0.522x + 821
y = 0.477x + 750
400
500
600
700
800
900
1000
Net Internal Volume
Liter


Paper Container type (Category IX)
kWh/year
Category IX: Paper Container type (Type B, Hot and Cold)
Energy Consumption
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
y = 0.439x + 1380
y = 0.432x + 1359
y = 0.401x + 1261
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Adjusted Internal Volume
Liter


Cup type (Category X)
kWh/year
Category X: Cup type
Energy Consumption
6,000
5,000
4,000
3,000
2,000
1,000
0
y = 1099
y = 1020
y = 0.349x + 691
y = 0.316x + 625
y = 0.293x + 580
1500
0
2000
4000
6000
8000
10000
12000
14000
Adjusted Heat Capacity
kJ

Attachment 5

Energy Consumption Efficiency of Vending Machines and Measurement Method

1. Basic Concept

In Year 2002, when vending machines for canned/bottled beverages were designated as the designated machineries and products for Top Runner Standards, "annual energy consumption" was adopted as a realistic indicator of energy consumption efficiency. The annual energy consumption shall be the value measured by the method specified in JIS B8561: 2000 "Annex (Specifications): Energy Consumption Test" (hereinafter referred to as "JIS B8561").

However, the measurement method specified in JIS B8561: 2000 does not cover vending machines for beverage in paper containers and vending machines for beverage served in cups. In addition, the setting conditions, etc. have deviated from the reality, along with the changes in actual usage of vending machines and other factors. For these reasons, JIS B8561: 2000 was reviewed, and the new JIS B8561: 2007 was publicly notified on May 21, 2007.

2. Specific Definition of Energy Consumption Efficiency and the Measurement Method

Energy consumption efficiency of vending machines shall be annual energy consumption, which is measured as specified in JIS B8561: 2007.

(Reference 1)

Energy Consumption: List of Measurement and Calculation Conditions

Item	Vending Machine for Canned/Bottled Beverages	Vending Machine for Beverage in Paper Containers	Vending Machine for Beverage in Served in Cups
Control Procedure	JIS B8561: 2007		
Goods to be Sold	Canned, bottled, and/or PET bottled beverages	Beverages in paper containers and/or canned beverages	Beverages served in cups
Subject Products	(a) Machines serving cold only (b) Machines serving hot or cold (c) Machines serving hot & cold	(a) Type A, machines serving cold only (goods selection by dummy) (b) Type A, machines serving hot & cold (goods selection by dummy) (c) Type B, machines serving cold only (selection by actual goods) (d) Type B, machines serving hot & cold (selection by actual goods)	(a) Machines serving cold only (b) Machines serving hot only (c) Machines serving hot & cold
Setting Conditions	*Clearance from the wall shall be at least 30 cm on the left, right, front and top of vending machine, and at least 5 cm on the rear.*		*Clearance from the wall shall be at least 30 cm on the left, right, front and top of vending machine, and at least 10 cm on the rear.*
Ambient Temperature	*15ºC ± 1ºC*		
Temperature of Supply Water	Since beverages are in containers, there is no water supply.		*15ºC ± 1ºC*
Setting of Internal Storage Compartments	(a) Machines serving cold only: all compartments for cold storage (b) Machines serving hot or cold: all compartments for cold storage (c) Machines serving hot & cold: half of the compartments for cold storage and the rest for hot storage (*1)	(a) Machines serving cold only: all compartments for cold storage (b) Machines serving hot & cold with 2 compartments: all compartments for cold storage, or one compartment for cold storage & the other for hot storage (c) Machines serving hot & cold with 3 compartments: 2 compartments for cold storage and the other for hot storage (*2)	There is no internal storage compartment setting, because beverages are prepared for each sale.
Loaded Goods	Goods having the greatest load	Cold storage: 250 ml paper container, Hot storage: 350 ml can	Raw materials of the goods that result in the largest energy consumption
Temperature of Goods Sold	Cold storage: *4ºC ± 2ºC* Hot storage: *55ºC ± 2ºC*	Cold storage: 5ºC ± 4ºC (*3) Hot storage: 55ºC ± 4ºC	Cold beverages: 5ºC or lower (with ice) 10ºC or lower (without ice) Hot beverages: *First cup is 65ºC or higher, second and following cups are 70ºC or higher.*
Operating Conditions	Normal operation mode including power-saving functions (*4)		
Goods Selling Test	2 cans/bottles from each column	Type A: 2 packs/cans from each column Type B: 1 pack/can from each column	Continuous sales of 30 minutes for both cold and hot beverages
Lighting Time	12 hours		
Dimming Control	Dimming level at the default setting		
Power Supply Frequency	Either 50 Hz or 60 Hz which results in larger energy consumption		
Measurement Conditions and Calculation Formula	WA: energy consumption in 24 hours after startup WB: energy consumption in 24 hours following WA WF: energy consumption of lighting per day Energy consumption per day: Wd Wd = (WA + WB × 13)/14 + WF Annual energy consumption = Wd × 365	[Machines serving cold only, Machines serving hot & cold with 3 compartments] Same as those for vending machines for canned/bottled beverages [Machines serving hot & cold machine with 2 compartments] WA1: energy consumption in 24 hours after startup with all compartments set for cold storage WB1: energy consumption in 24 hours following WA with all compartments set for cold storage WA2: energy consumption in 24 hours after startup with one compartment set for cold storage and the other set for hot storage WB2: energy consumption in 24 hours following WA with one compartment set for cold storage and the other set for hot storage WF: energy consumption of lighting per day Energy consumption per day with cold/cold setting: Wd1 Wd1 = (WA1 + WB1 × 13)/14 + WF Energy consumption per day with hot/cold setting: Wd2 Wd2 = (WA2 + WB2 × 13)/14 + WF Annual energy consumption = Wd1 × 275 + Wd2 × 90	WA: energy consumption in standby per day WBH: energy consumption per selling a cup of hot beverage WBC: energy consumption per selling a cup of cold beverage WF: energy consumption of lighting per day H: Average sales quantity of hot beverages per day C: Average sales quantity of cold beverages per day Cold only: H = 0, C = 50 Hot only: H = 50, C = 0 Hot & Cold: H = 25, C = 25 Energy consumption per day: Wd Wd = WA + WBH × H + WBC × C + WF Annual energy consumption = Wd × 365
Note	(*1) If compartments cannot be divided into two groups, an excess compartment shall be set for cold storage. In the case of 3 compartments, the middle compartment is set for cold storage.	(*2) Middle compartment is set for cold storage. If both of the others are capable of hot setting, the compartment having a greater net internal volume shall be set for cold storage. (*3) Compartments for cold goods shall be set so as to keep all of the goods in the specified temperature.	(*4) Concerning power-saving functions such as a “human sensor” and “weekly timer,” if they are the default as shipped, the vending machines shall be measured with the default settings.

(Reference 2)

Summary of Changes in Measurement Method for Vending Machines

Item	Type of Vending Machines	Current Measurement Method	Changes	Reason for Change
Setting Conditions	Can/bottle Paper container Cup	Clearance from the wall and the left, right, front, rear and top of vending machine shall be at least 30 cm.	Clearance from the wall shall be at least 30 cm on the left, right, front and top of vending machine, and at least 5 cm (10 cm for the cup type) on the rear.	To bring the setting condition closer to the reality, the clearance between the wall and the rear surface is changed to 5 cm. Because of supply water piping, vending machines for beverages served in cups need a wider rear space than those for canned/bottled beverages and those for beverages in paper containers; therefore, the clearance in the rear is set to 10 cm.
Ambient Temperature	Can/bottle Paper Container Cup	15°C ± 2°C	15°C ± 1°C	
Temperature of Supply Water	Cup	15°C ± 5°C	15°C ± 1°C	Since the temperature of supply water has a significant impact on energy consumption, the tolerance is narrowed as much as possible.
Setting of Internal Storage Compartments	Can/bottle	(a) Machines serving cold only: all compartments for cold storage (b) Machines serving hot or cold: all compartments for cold storage (c) Machines serving hot & cold: half of the compartments for cold storage and the rest for hot storage (If compartments cannot be divided into two groups, an excess compartment shall be set for cold storage. In the case of 3 compartments, the middle compartment is set for cold storage.)	Same as at present	Since FY 1999, vending machines serving hot or cold have barely been shipped. In addition, a hearing conducted to vending machine service companies revealed that these machines are used in the same manner as those serving cold only. Vending machines serving hot or cold are therefore measured with all compartments set for cold storage in the same way as at present. As a result of a hearing conducted to vending machine service companies on the reality of operations, the response was obtained that the current measurement condition is appropriate, taking account of the sales ratio between cold and hot beverages. Even though the seasonal variations are taken into consideration, it is thought to be appropriate to set the percentage of cold beverages greater than that of hot beverages.
	Paper container	(a) Machines serving cold only: all compartments for cold storage (b) Machines serving hot & cold with 2 compartments: all compartments for cold storage, or one compartment for cold storage and the other for hot storage (c) Machines serving hot & cold with 3 compartments: 2 compartments for cold storage and the other for hot storage (The middle compartment is set for cold storage. If both of the others are capable of hot setting, the compartment having a greater net internal volume shall be set for cold storage.)	Same as at present	As a result of a hearing conducted to vending machine service companies on the reality of operations, the response was obtained that there are hardly any vending machines for beverage in paper containers in a hot setting. At certain locations, however, some of the machines are set for hot storage. Thus, the current setting ratio between cold and hot is thought to be appropriate.

<table>
<tr>
<td>Temperature of Goods Sold</td>
<td>Can, Bottle</td>
<td>Cold storage: 4ºC ± 3ºC
Hot storage: 55ºC ± 3ºC</td>
<td>Cold storage: 4ºC ± 2ºC
Hot storage: 55ºC ± 2ºC</td>
<td>Considering a survey result on the temperature of goods sold in each column of vending machines for canned/bottled beverages, it was decided to narrow the tolerance from 3ºC to 2ºC.
<table>
<tr><th></th><th>Current tolerance</th><th>Vender A
30 selections</th><th>Vender B
25 selections</th><th>Vender C
20 selections</th></tr>
<tr><td>Can, Cold</td><td>4 ± 3</td><td>4.1 ± 0.8</td><td>3.9 ± 0.8</td><td>4.5 ± <u>1.4</u></td></tr>
<tr><td>Can, Hot</td><td>55 ± 3</td><td>55.1 ± <u>1.3</u></td><td>54.9 ± 1.1</td><td>55.3 ± 1.2</td></tr>
</table>
As for vending machines for beverage in paper containers, the survey result on the temperature of goods sold in each column indicated that it is difficult to narrow the tolerance, and thus it remains the same as at present.
<table>
<tr><th></th><th>Current tolerance</th><th>Vender A
24 selections</th><th>Vender B
25 selections</th><th>Vender C
20 selections</th></tr>
<tr><td>Paper container, Type A , Cold</td><td>5 ± 4</td><td>5.1 ± 0.8</td><td>5.6 ± <u>2.0</u></td><td>5.3 ± 1.6</td></tr>
<tr><td>Paper container, Type A , Hot</td><td>55 ± 4</td><td>53.6 ± 3</td><td>56.8 ± 3.4</td><td>53.3 ± <u>3.4</u></td></tr>
</table>
<table>
<tr><th></th><th>Current tolerance</th><th>Vender A</th><th>Vender B</th><th>Vender C</th></tr>
<tr><td>Paper container, Type B , Cold</td><td>5 ± 4</td><td>5.7 ± <u>3.1</u></td><td>5.3 ± 2.7</td><td>4.7 ± 2.3</td></tr>
<tr><td>Paper container, Type B , Hot</td><td>55 ± 4</td><td></td><td>56.2 ± 1.6</td><td>54.3 ± <u>3.1</u></td></tr>
</table>
(Note)
Paper container, Type A: vending machines with goods selection by using dummies
Paper container, Type B: vending machines with goods selection by using actual goods</td>
</tr>
<tr>
<td></td>
<td>Cup</td>
<td>Cold beverages: 5ºC or lower (with ice)
10ºC or lower (without ice)
Hot beverages: 65ºC or higher.</td>
<td>Cold beverages:
5ºC or lower (with ice)
10ºC or lower (without ice)
Hot beverages:
First cup is 65ºC or higher, second and following cups are 70ºC or higher.</td>
<td>As for the first cup, the beverage runs through cold pipes experiencing a big temperature drop. For this reason, the specification remains the same as at present. For the second and following cups, the pipes being already warmed, high temperature of beverage can be maintained. Therefore, the specification is revised to 70ºC or higher.</td>
</tr>
<tr>
<td>Goods Selling Test</td>
<td>Can, Bottle</td>
<td>2 cans/bottles from each column</td>
<td>Same as at present</td>
<td>Statistics of vending machines for canned/bottled beverages in FY 2005:
Sales values : 2,349,062,100,000 yen … (a)
Installed machines : 2,280,000 units … (b)
Unit price of goods : 130 yen … (c)
((a) / (b))/ 365 days / (c) ≈ 22 bottles (daily sales quantity per machine)
Sales quantity per column, assuming an average number of columns to be 27:
22 bottles / 27 columns ≈ <u>0.8 bottles</u> (sales quantity per column)
From the above, the slightly higher estimation of 2 bottles is thought to be appropriate for the sales quantity per column.</td>
</tr>
<tr>
<td></td>
<td>Paper Container</td>
<td>Type A: 2 packs from each column
Type B: 1 pack from each column</td>
<td>Same as at present</td>
<td>Statistics of vending machines for beverage in paper containers in FY 2005:
Sales values : 172,380,780,000 yen … (a)
Installed machines : 181,000 units … (b)
Unit price of goods : 100 yen … (c)
((a) / (b)) / 365 days / (c) ≈ 26 packs (daily sales quantity per machine)
Average number of columns on Type A machines: 21 columns
26 packs / 21 columns ≈ <u>1.2 packs</u> (sales quantity per column)
Average number of columns on Type B machines: 42 columns
26 packs / 42 columns ≈ <u>0.6 packs</u> (sales quantity per column)
From the above, the current sales quantity is thought to be appropriate.</td>
</tr>
<tr>
<td>Lighting Time</td>
<td>Can, Bottle
Paper Container
Cup</td>
<td>12 hours (per day)</td>
<td>Same as at present</td>
<td>As a hearing conducted to vending machine service companies on the reality of operations, the response was obtained that the average lighting time is shorter than 12 hours, because the increasing number of vending machines always turn off the lighting in indoor locations and because vending machines installed in outdoor locations control the lighting by using timer settings. Thus, the slightly higher estimation of 12 hours (per day) is thought to be appropriate.</td>
</tr>
</table>

Attachment 6

Vending Machines Evaluation Standard Subcommittee,
Energy Efficiency Standards Subcommittee of
the Advisory Committee for Natural Resources and Energy
Background of Holding

1st Subcommittee Meeting (November 9, 2006)

- Opening of Vending Machines Evaluation Standard Subcommittee
- Achievement status of vending machines
- Current status of vending machines
- Target scope of vending machines
- Energy consumption efficiency of vending machines and the measurement method

2nd Subcommittee Meeting (December 26, 2006)

- Energy consumption efficiency of vending machines and the measurement method
- Cigarette vending machines

3rd Subcommittee Meeting (April 11, 2007)

- Categories of vending machines for target setting
- Concept on the target standard values for vending machines

4th Subcommittee Meeting (April 26, 2007)

- Target standard values for vending machines
- Interim report

Interim report was open for public comments during the period from May 2, 2007 through June 4, 2007; however, no particular comment was received. Thus, it was adopted as the final report.

Attachment 7

Vending Machines Evaluation Standard Subcommittee,
Energy Efficiency Standards Subcommittee of
the Advisory Committee for Natural Resources and Energy
List of Members

Chairman:	Eiji Hihara	Professor, Graduate School of Frontier Sciences, The University of Tokyo
Members	Misao Harine	Deputy Technical Director, Japan Vending Machine Manufacturers Association
	Yuji Karino	Member of Food Safety Committee, Japan Automatic Merchandising Association
	Kyoichi Kudo	General Manager, Technology Department, The Energy Conservation Center, Japan
	Yoshiaki Shibata	Executive Researcher, Jyukankyo Research Institute Inc.
	Kikuko Tatsumi	Managing Director & Chairperson of Environment Committee, Nippon Association of Consumer Specialists
	Yosinori Tani	Manager, Vending Machine Development Group, Tokyo Research and Development Center, Coca-Cola Co., Ltd.
	Osami Tsukamoto	Professor, Graduate School of Engineering, Yokohama National University
	Satoshi Hirano	Executive Researcher, Thermal Energy Applications Group, Energy Technology Research Institute, National Institute of Advanced Industrial Science and Technology