Mapping Document

Country:	Japan
Technology:	Domestic refrigerated appliances
Sub Category:	Refrigerators, refrigerator-freezers and freezers

Introduction

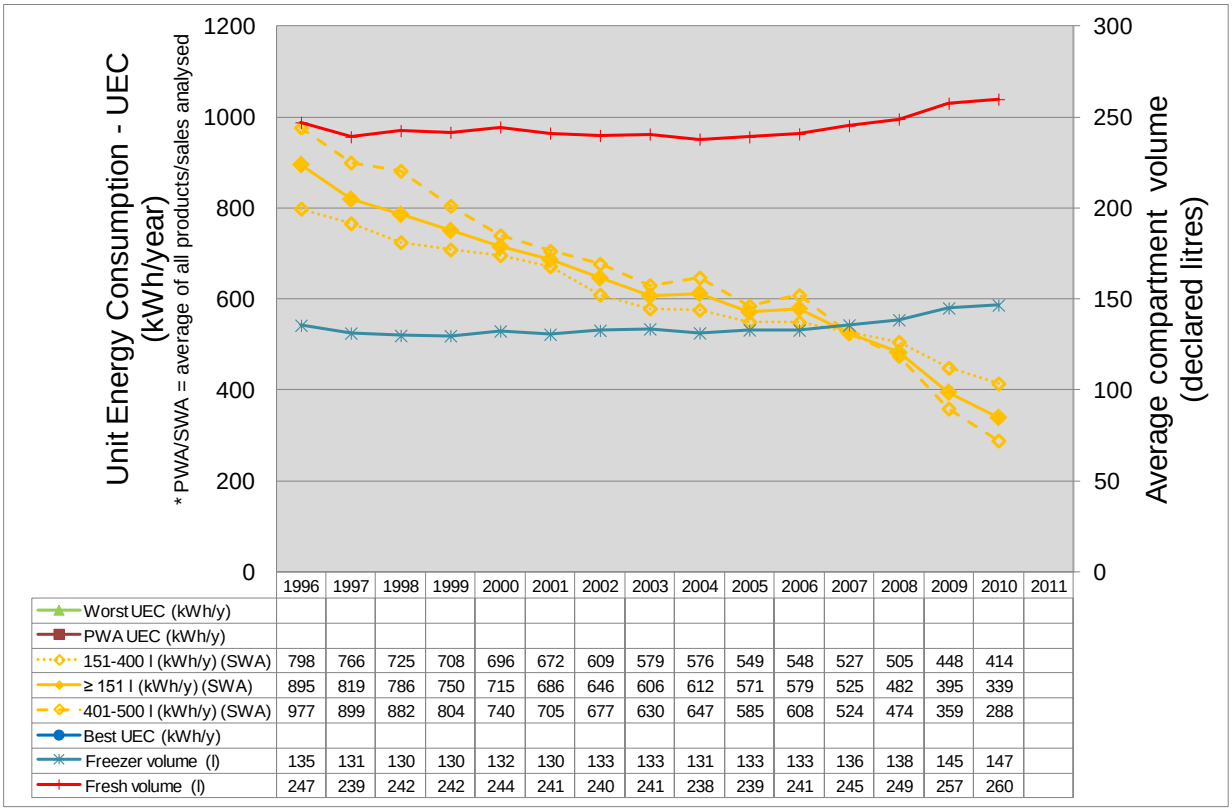
The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. This ensures that comparison between the participating countries is done against a specific and consistent set of products.

The summary definition for this product is:

M&B Category	Description
Refrigerator only and refrigerators with freezer compartments	The primary compartment is for fresh storage in the temperature range 5°C >= T> 0°C *and* • The unit has no freezer compartment, *or* • The unit has a freezer compartment of any temperature rating but a volume of less than 14 litres, *or* • The unit has a frozen food compartment of any volume that is rated as 0°C >= T > -15°C
Refrigerator/Freezer	The primary compartment for fresh storage in the temperature range 5°C >= T> 0°C *and* the primary frozen food compartment is greater than 14 litres and has a rated temperature T <= -15°C
Freezer only	A unit where *all* compartments have a temperature rating T <= -15°C

The detailed product definition can be found at the Annex website:
http://mappingandbenchmarking.iea-4e.org/matrix?type=product&id=13

Unit Energy Consumption of new refrigerator freezers in Japan



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Worst UEC (kWh/y)																
PWA UEC (kWh/y)																
151-400 l (kWh/y) (SWA)	798	766	725	708	696	672	609	579	576	549	548	527	505	448	414	
≥ 151 l (kWh/y) (SWA)	895	819	786	750	715	686	646	606	612	571	579	525	482	395	339	
401-500 l (kWh/y) (SWA)	977	899	882	804	740	705	677	630	647	585	608	524	474	359	288	
Best UEC (kWh/y)																
Freezer volume (l)	135	131	130	130	132	130	133	133	131	133	133	136	138	145	147	
Fresh volume (l)	247	239	242	242	244	241	240	241	238	239	241	245	249	257	260	

Key notes on Graph (see notes section 1)

- Average Unit Energy Consumptions (UEC) values are presented in 3 volume ranges, 151-400L, 401-500L and all products ≥151L. This is to provide observers with information on the relative impact of policy on products in the range with the largest sales, ie 400-500L
- UEC data was submitted to the Annex as the average UEC for all products with total (fresh and frozen) compartment volumes in the following ranges: 151-200L, 201-250L, 251-300L, 301-350L, 351-400L, 401-450L, 451-500L, 501-550L, and over 550L. Sales data for each total compartment volume range was also provided.
- No data is provided to the Annex on products with a total volume of less than 151L as these are deemed to be specialist product by the data provider, or on the best or worst performing products overall or in any particular band.

Unit Energy Consumption of new freezers in Japan

Key notes on Graph (see notes section 1)

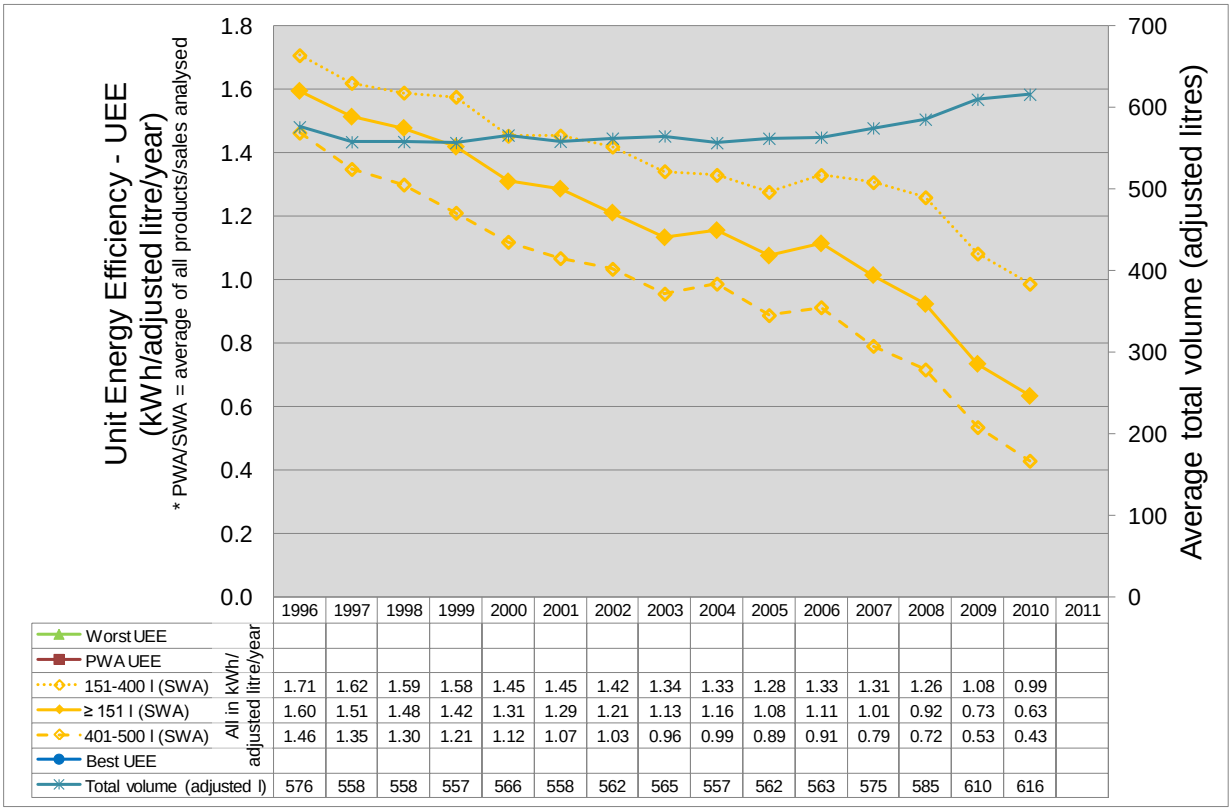
- No data on the UEC of freezer only units was supplied by Japan as these units have marginal penetration in the market.

Unit Energy Consumption of new refrigerators and refrigerators with freezer compartments in Japan

Key notes on Graph (see notes section 1)

- No data on the UEC of refrigerators and refrigerators with freezer compartments was supplied by Japan as these units have marginal penetration in the market.

Unit Energy Efficiency of new refrigerator freezers in Japan



All in kWh/ adjusted litre/year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Worst UEE																
PWA UEE																
151-400 l (SWA)	1.71	1.62	1.59	1.58	1.45	1.45	1.42	1.34	1.33	1.28	1.33	1.31	1.26	1.08	0.99	
≥ 151 l (SWA)	1.60	1.51	1.48	1.42	1.31	1.29	1.21	1.13	1.16	1.08	1.11	1.01	0.92	0.73	0.63	
401-500 l (SWA)	1.46	1.35	1.30	1.21	1.12	1.07	1.03	0.96	0.99	0.89	0.91	0.79	0.72	0.53	0.43	
Best UEE																
Total volume (adjusted l)	576	558	558	557	566	558	562	565	557	562	563	575	585	610	616	

Key notes on Graph (see notes section 1)

- Average Unit Energy Efficiency (UEE) values are presented in 3 volume ranges, 151-400L, 401-500L and all products ≥151L. This is to provide observers with information on the relative impact of policy on products in the range with the largest sales, ie 400-500L.
- Unit Energy Consumptions (UEC) data was submitted to the Annex as the average for all products with total (fresh and frozen) compartment volumes in the following ranges: 151-200L, 201-250L, 251-300L, 301-350L, 351-400L, 401-450L, 451-500L, 501-550L, and over 550L. Sales data for each total compartment volume range was also provided.
- Average total adjusted compartment volumes were calculated based on declared fresh and frozen compartment volumes from the same volume ranges. However the method used to calculate adjusted volumes means that sales weighting these averages introduces uncertainty to the result and therefore average adjusted volumes should be viewed with caution.
- Sales Weighted Average (SWA) UEE values were calculated for each of the total compartment volume range using the SWA UEC and adjusted volumes in each range. This combining of averages introduces further uncertainty into the calculations and therefore the UEE values should be viewed with caution.
- No data is provided to the Annex on products with a total volume of less than 151L as these are deemed to be specialist product by the data provider, or on the best or worst performing products overall or in any particular band.

Unit Energy Efficiency of new freezers in Japan

Key notes on Graph (see notes section 1)

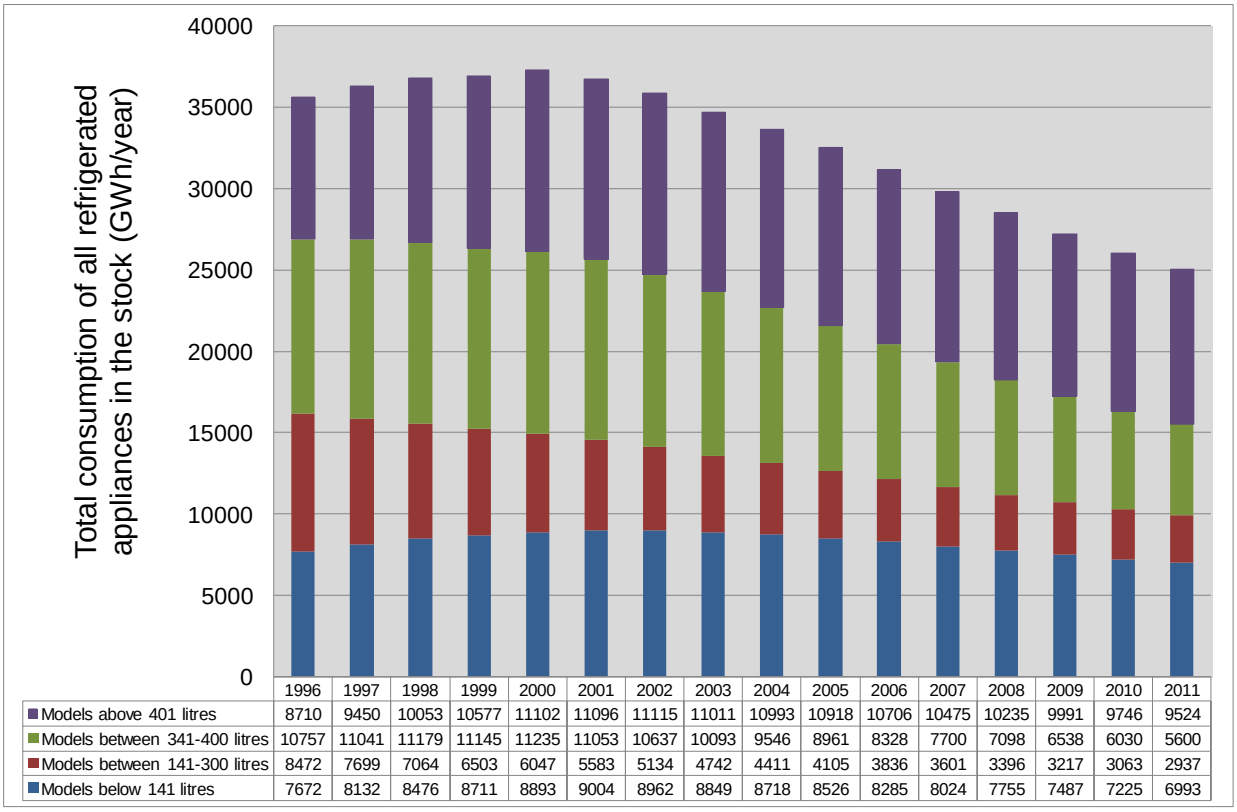
- No data on the UEE of freezers only units was supplied by Japan as these units have marginal penetration in the market.

Unit Energy Efficiency of new refrigerators and refrigerators with freezer compartments in Japan

Key notes on Graph (see notes section 1)

- No data on the UEE of refrigerators and refrigerators with freezer compartments was supplied by Japan as these units have marginal penetration in the market.

Energy Consumption of the installed stock of refrigerated appliances in Japan



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Models above 401 litres	8710	9450	10053	10577	11102	11096	11115	11011	10993	10918	10706	10475	10235	9991	9746	9524
Models between 341-400 litres	10757	11041	11179	11145	11235	11053	10637	10093	9546	8961	8328	7700	7098	6538	6030	5600
Models between 141-300 litres	8472	7699	7064	6503	6047	5583	5134	4742	4411	4105	3836	3601	3396	3217	3063	2937
Models below 141 litres	7672	8132	8476	8711	8893	9004	8962	8849	8718	8526	8285	8024	7755	7487	7225	6993

Key notes on Graph (see notes section 2)

- Estimation of the total electrical consumption (TWh/year) of all installed Japanese refrigerated appliances presented separated by declared *"physical"* volume ranges[1].

[1] Presentation - APP (Asia-Pacific Partnership) Buildings and Appliances Taskforce, BATF 06-05 project of Harmonization of Test Procedures for Household Refrigerators 4th Formal Meeting, 7th, December 2009 (Kyoto, Japan), Kiyoshi SAITO (JEMA: The Japan Electrical Manufacturers' Association)

Major Policy Interventions (*see notes section 3)*

The primary policy intervention related to domestic refrigeration appliances in Japan is the *Top Runner* programme. The programme requires domestic suppliers to continually improve the overall performance of their product ranges, and also has consumer information/ labelling element. Beginning 1998 for refrigerators and freezers, the programme requires:

- Meeting of minimum efficiency targets (initial requirements set for 2004 and annually since). Under the current top runner standards, these requirements are set based on the type and size of products, specifically:
    - Natural convection type - In a Japanese market, it is mainly (small-size) compact refrigerator – about 100L
    - Forced circulation type - without specified technology
    - Forced circulation type - using specified technology

  Specified technologies (inverter control and vacuum insulation material) are not required in units with volume of 300L and less still yet as the required increase in price is not recoverable from lower running costs.
- Labels are required to display in a place readily seen by the consumer and include the following information: rated internal volume, annual energy consumption, external dimensions, precautions for use, manufacturer's name.

The impact of Top Runner in refrigerators is:

- Efficiency was improved by about 55.2% between financial year 1998 and the target financial year 2004 (initially about 30.5% improvement had been expected).
- Efficiency is expected to be improved by about 21.0% between financial year 2005 and the target financial year 2010.

Cultural Issues (*see notes section 4)*

Japanese consumers use large amounts of fresh food (vegetables, fruit and fish) all of which needs refrigeration. The average household (3.2 persons) has a refrigerator with total fresh and frozen food capacity of 400 litre and opens the door an average of:

- Refrigerator – 37 times per day
- Freezer – 8 times per day

Doors are opened more often in summer (to retrieve cool drinks) and in the evenings. However, recently refrigerators have more compartments specific to user needs and therefore there is less heat rise when doors are opened.

Section 1. Unit Energy Consumption and Unit Energy Efficiency Graphics

1.1 Test methodologies and Product Definitions

1.1.1 Test Methodologies[2]

- 1979-1993: JIS C9607
- 1993-1999: JIS C9607 (1993)
- 1999-2006: JIS C 9801(1999)
- 2006 – present: JIS C 9801 (2006) – revision based on user information gained from surveying of 1,300 households in Japan.

Note all data presented has been "normalised" to JIS C 9801 (2006). The following table summarises the test conditions:

Test conditions of revised JIS C 9801(2006)

		JIS C9801(old)		JIS C9801 (revised)	
Year		1999		2006	
Type		Forced circulation	Natural convection	Forced circulation	Natural convection
Ambient temperature		25°C		30°C : 180days 15°C : 185days	
Relative humidity		70%±5%		30°C : 70%±5% 15°C : 55%±5%	
Installation	back	On the wall		On the wall	
	sides	300mm away from walls		50mm away from walls	
Load	fresh food	No	No	Put in during testing	No
	freezer	No	Yes		Yes
Storage temperature	fresh food	≦5°C		≦4°C	
	freezer (***)	≦-18°C		≦-18°C	
	vegetable	Set to minimize energy use		Set to factory preset mode	
Open/close door	fresh food	25 times		35 times	No
	freezer	8 times		8 times	No
Automatic ice making		Off		On	Off
Other optional function such as deodorizing		Off (if users can turn on/off)		Set to factory preset mode	

[2] Presentation – "*Lessons learned in Japan with Checking Performance"* given at the IEA 26th February 2008, Kiyoshi SAITO(JEMA: The Japan Electrical Manufacturers' Association)

1.2 Data sources and limitations

Data has been sourced from the Japan Electrical Manufacturers' Association.

Annual data for average Unit Energy Consumption (UEC) and Fresh and Frozen compartment volumes was supplied as averages for units with total compartment volume ranges 151-200L, 201-250L, 251-300L, 301-350L, 351-400L, 401-450L, 451-500L, 501-550L, and over 550L. UEC for all years was supplied as annual kWh values normalised to the most recent JIS C9801 test methodology. The normalisation process was undertaken prior to the submission of data and used the following processes:

- Specific units older units that were originally subject to test under the JIS C 9801 (1999) methodology were sampled from the refrigerator stock (currently in use in households) and from recycling plants.
- The sampled units were then tested for actual energy consumption based on the JIS C 9801 (2006) methodology (all unit types were tested).
- This actual measured energy consumption was then corrected (with assistance from manufacturers based on design data) to account for the increases in energy consumption resulting from use in the home environment (compared to the testing of a newly manufactured refrigerator).
- Corrected energy use based on the JIS C 9801 (2006) test was then compared with declared values for energy use based on JIS C 9801 (1999) tests to develop a conversion factor that could be applied to different refrigerator types before and after the introduction of the new test methodology.

Annual sales data was supplied for each total volume compartment range as summarised in the following table:

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sales in >151L dataset	3,584	3,423	3,481	3,380	3,771	2,937	3,159	2,981	3,223	3,190	3,121	3,026	3,040	3,252	3,560
Sales analysed	3,584	3,423	3,481	3,380	3,771	2,937	3,159	2,981	3,223	3,190	3,121	3,026	3,040	3,252	3,560
% Sales included	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sales in 151-400L dataset	1,933	2,081	2,145	1,927	2,153	1,666	1,454	1,373	1,586	1,543	1,575	1,413	1,305	1,304	1,406
Sales in 151-450L dataset	2,855	3,231	3,045	2,856	3,218	2,486	2,599	2,467	2,743	2,751	2,615	2,271	2,172	2,203	2,372
Sales in 401-500L dataset	1,385	1,332	1,308	1,436	1,612	1,269	1,699	1,605	1,632	1,577	1,377	1,267	1,299	1,279	1,354
Sales in 451-500L dataset	463	182	408	507	547	449	554	511	475	369	337	409	432	380	388

1.3 Data manipulations and specific limitations

Annual values for Unit Energy Efficiency values (UEE) in kWh/adjusted litres were calculated for each total compartment volume range based on the declared UEC and adjusted compartment volumes. Adjusted compartment volumes we calculated as follows:

*Total Adjusted Volume = Fresh Compartment Volume + (Factor*Frozen Compartment Volume)*

Where

Factor = (External Temperature-Frozen Compartment)/(External Temperature-Fresh Compartment)

However, as shown in notes section 1.1.1, two external test temperatures are used in the Japanese JIS C9801 test method; 30^{o}C for 180 days and 15^{o}C for 185 days (fresh compartment temperature is a maximum 4^{o}C, and frozen compartment temperature is a maximum -18^{o}C for all tests). As UEC values have not been provided for each of the two external test temperature periods, it is necessary to use a "days-weighted" average *Factor* of 2.431 to derive the total adjusted volumes and resulting UEEs. This will inevitably introduce a degree of inaccuracy into the adjusted volume results, the scale of which is unknown.

The Sales Weighted Average (SWA) UECs, Adjusted Volumes and UEEs have been weighted based on the averages of the total compartment volume ranges rather than individual products. The uncertainty of the of average adjusted volume calculations for each volume range, combined with the limitations of using average UEC and average adjusted volume values for entire ranges introduces uncertainty into the UEE results, the scale of which is unknown.

Box A. Notes on the Normalised of the JIS C 9801 (2006) data to the IEC 62552 (25°C) method used in the benchmarking.

In the benchmarking analysis of the energy consumption/efficiency per unit of the refrigerator by the M&B Annex, all results are normalised to IEC 62552 (25°C). However, given the relative complexity of the JIS C 9801 (2006) test method used in Japan, in particular the dual external test temperature, the normalisation approach used for performance data from other countries was not appropriate.

However, Japanese experts were kind enough to develop procedures that performed the normalisation from JIS C 9801 (2006) to IEC 62552 (25°C) method. These procedures are detailed below.

In the case of benchmarking analysis, normalised the JIS C 9801 (2006) data to the IEC 62552 (25°C) method was carried out by following procedures based on a Japanese expert's knowledge.

Procedures to normalised the JIS C 9801 (2006) data to the IEC 62552 (25°C) method

STEP1

30℃ : 15℃ = 70 : 30 Reference: The average of pick-up test result from JP's market in 2009 y and 2010 y

➡ Declared Value $\times \frac{70}{100} \times \frac{365}{180}$ ＊Calculated "energy consumption (30℃)/y"

STEP2

■ Energy consumption Reference: The average of pick-up test result from JP's market in 2009 y and 2010 y

Steady / Actual measured = 80%

➡ Eannual(30℃) × 80% = Esteady(30℃)

■ Temperature in the refrigerator

・Compartment of Refrigerator ・・・ Steady + 3 K = Actual measured
・Compartment of Freezer ・・・ Steady + 1.5K = Actual measured

STEP3

Ambient temperature (1K) ・・・Energy consumption changes about 5%

➡ Esteady(25℃) = Esteady(30℃) × 0.95^5

STEP4

Consider the increased by defrosting (1 time = 100Wh、1 time in 48 hours)

➡ Eannual(IEC62552,25℃) = Esteady(25℃) + 50Wh ×0.365

STEP5

Eannual(IEC62552,25℃) = Declared Value × 87.9% + 18.25

Data from Japan that has been normalised *using this process is shown in "Benchmarking Analysis Report for Domestic Refrigerated Appliances" by IEA 4E M&B ANNEX.*

Section 2. Energy Consumption of the installed stock of refrigerated appliances graphic

No further notes.

Section 3. Major Policy Interventions

The primary policy intervention related to domestic refrigeration appliances in Japan is the *Top Runner* programme. The programme requires domestic suppliers to continually improve the overall performance of their product ranges, and also has a consumer information/labelling element. Details of the top runner programme are given below, with specific details related to refrigerators following[3].

3.1 The Top Runner Program: Background

Although Japan's final energy consumption was temporarily reduced under intensive energy conservation efforts in the industrial sector after two oil crises, it turned upward in 1982. While the industrial sector's final energy consumption has since been curbed due to industry efforts, the residential and commercial sector and transportation sectors' have risen continuously except during the oil crisis periods, when these sectors' final energy consumption temporarily stagnated. It is thought that this phenomenon was caused by the continuous economic development during the period and by the public's pursuit of richer lifestyles as a result of economic development. However, energy consumption in the transportation sector has recently levelled out or begun decreasing.

In planning for energy conservation in the residential and commercial sector and the transportation sector, improvements in the energy efficiency of cars, electric appliances, etc., (hereafter machinery and equipment) would be an extremely effective measure. From the beginning, the Energy Conservation Law contained energy consumption efficiency standards for machinery and equipment to stimulate equipment energy conservation. Initially, the types of machinery and equipment covered by the regulations were limited to three items: electric refrigerators, air conditioners, and passenger cars. Efficiency standard values were established with the idea that technological improvements would enable achievement of the values by the target fiscal year. In addition, these values were set primarily to stimulate manufacturers and importers (hereafter referred to as manufacturers) to achieve energy efficiency standards through their voluntary efforts. The Kyoto Protocol was entered into and greenhouse gas reduction goals were established. Strengthened energy conservation measures were specified as leading measures to counter global warming. Japan consequently revised the Energy Conservation Law in April 1999 with the goal of strengthening the legal underpinnings of various energy conservation measures. As a staple energy conservation measure for the residential and commercial sector and the transportation sector, the Top Runner Program was introduced to advance energy efficiency of machinery and equipment.

At first, 11 product items (including automobiles and air conditioners) were covered by this program, with the addition of seven more in 2002. Three more were further added in 2005, followed by the addition of two more in 2009, resulting in the present coverage of 23 product

[3] Material drawn from: *Top Runner Program: Developing the Worlds Most Efficient Appliances* (Revised Edition March, 2010), Available at http://www.enecho.meti.go.jp/policy/saveenergy/toprunner2011.03en-1103.pdf

items. In the future, the coverage in terms of the number of product items will be further expanded, and the Top Runner standards will be reviewed.

3.1.1 Distinctive Features of the Top Runner Program

There are three main methods for determining machinery and equipment energy consumption efficiency standards. The first is a minimum standard value system, under which all the machinery and equipment products covered by this system should exceed standard values. The second is an average standard value system, under which the average values of all machinery and equipment products covered by this system should exceed standard values. The third is called a maximum standard value system (Top Runner Program). Under this system, targets are set based on the value of the most energy-efficient products on the market at the time of the value setting process. Currently, the most popular minimum standard value system in the world is the Minimum Energy Performance Standard (MEPS). Under the standard, a minimum value that all the targeted machinery and equipment products must exceed is established and in the event a product does not exceed the value, actions such as suspension of product shipments can be taken. At first glance, the system appears extremely easy to understand, however, to establish efficiency standard values that all products must exceed, evaluations of the economic validity of the standard values must be conducted carefully. In the US which employs the minimum standard value system, several different points of view regarding economic fairness are evaluated including life cycle assessments (LCA) before standard values are established. In spite of these logical processes, it requires long periods of time to establish standards finally, including substantial coordination with manufacturers.

The second system, the average standard value system, was introduced to Japan when the Energy Conservation Law was enacted as an equipment energy consumption efficiency value system. The target values are arbitrarily determined after consideration of a number of factors, such as potential technical improvements and potential impact of categorical improvements that may contribute to overall improvements, based on information provided by manufacturers (through hearings, supplemental materials, and other methods). Under this system, designated machinery and equipment products are required to achieve a weighted average value by the target fiscal year, using each manufacturer's shipment volumes by category. Under this method, if demand is high for a product whose manufacturer emphasizes other functionalities over energy consumption efficiency, the manufacturer can ship the equipment even if the energy consumption efficiency is lower than the target value. That is, the manufacturer can achieve the target value on average basis by shipping a product with higher efficiency in the same category.

The system functions well to facilitate manufacturers' voluntary activities. However, energy conservation effects may have less impact than expected as the establishment of standard values is left to manufacturers' discretion.

Expectations regarding the role of energy conservation are increasing due to mounting global environmental problems. As a result, demands that machinery and equipment's energy consumption efficiency be increased to the greatest extent possible are now a reality.

The Top Runner Program has come into existence in light of this situation. This Top Runner Program uses, as a base value, the value of the product with the highest energy consumption efficiency on the market at the time of the standard establishment process and sets standard values by considering potential technological improvements added as efficiency improvements. Naturally, target standard values are extremely high. For achievement evaluation, manufacturers can achieve target values by exceeding target values by weighted average values using shipment volume, the same as the average standard value system. The implication of using weighted average values is the same as the average standard value system, that is, the system is meant to give manufacturers incentives for developing more energy-efficient equipment. Above all, deliberation studies during the value establishment process in this system can proceed smoothly in a shorter period from the start to the final standard determination. While this system gives manufacturers substantial technological and economic burdens, the industry should conduct substantial prior negotiations on possibility of achieving standard values and adopt sales promotion measures for products that have achieved target values.

3.2 Policy Concerning Popularization of Top Runner Target Machinery and Equipment

3.2.1 Display Obligations

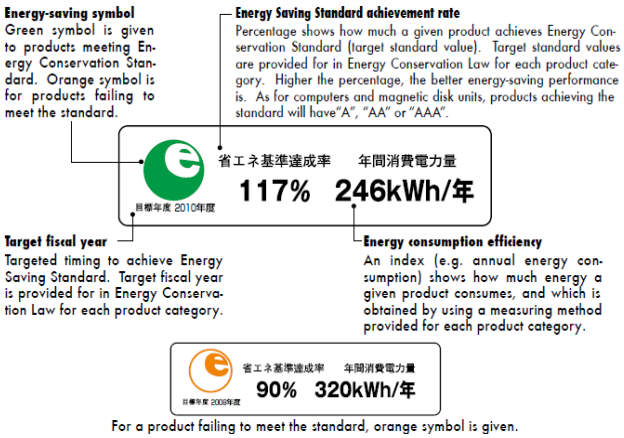
The Energy Conservation Law has established a display program for Top Runner target machinery and equipment, so that buyers can obtain information concerning such as the energy consumption efficiency of machinery and equipment at the time of purchase. Under the display program, manufacturers of Top Runner target machinery and equipment are required to display regulated under the “Notifications” and penalties will apply when a manufacturer does not comply to display requirements. Intentions of these requirements are, in addition to requiring manufacturers to work to improve energy consumption efficiency, providing buyers correct information concerning such as the energy consumption efficiency of individual machinery and equipment products to facilitate the popularization of energy efficient products, which may achieve the secondary effect such as encouraging manufacturers’ motivation regarding technical development. Display and compliance items are described in a “Notification” for each piece of machinery and equipment. Display items generally include: 1) energy consumption efficiency and closely related items; 2) product name and type, which specifies the product; 3) name of the manufacturer responsible for the display. Compliance items are items that must be included specifically at the time of the display on the machinery and equipment, such as the location of the display, the size of the display characters, units, and so forth. To avoid duplication of laws, machinery and equipment for which the displays are already stipulated under the Household Goods Quality Labeling Law should follow this law.

3.2.2 Labeling Program

To promote the popularization of highly efficient machinery and equipment that have achieved Top Runner Standard values through manufacturers' efforts, providing consumers with information is essential.

For this end, to further facilitate the popularization of energy-efficient equipment, the Energy Efficiency Standards Subcommittee under the Advisory Committee for Energy (name changed to the Advisory Committee for Natural Resources and Energy in 2001) held discussions toward the establishment of the best labeling program (Energy saving Labeling Program) in Japan. These discussions resulted in a decision to have four items shown on the label, including a symbol used to show the degree that energy saving standards had been achieved, energy saving standard achievement rate, energy

consumption efficiency, and the target fiscal year. The discussions also led to a decision that the JIS should devise the energy saving labeling program. Following this, the "JIS Energy Saving Labeling Committee" assembled a first draft and the Japanese Industrial Standards Committee's Committee on Electricity and Electronics approved the draft. Subsequently, in August 2000, the labeling program was established as a JIS standard and the energy saving labeling program was launched. During initial phases, the energy saving labeling program targeted five product categories, including air conditioners, fluorescent lights, TV sets, electric refrigerators, and electric freezers, but in 2003, five additional product items were added, including space heaters, gas cooking appliances, gas water heaters, oil water heaters, and electric toilet seats. Additional product items, including computers, magnetic disk units, and transformers later followed. With the subsequent addition of three more including microwave ovens, jar rice cookers and DVD recorders in 2007, resulting in a coverage of 16 items by the energy saving labeling program by March 2010. Further addition of two more items, routers and switching units, within 2010 is scheduled. Participation in the energy saving labeling program is a voluntary scheme based on the JIS system, and labeling is required to be indicated on the participants' catalogues and products themselves. The system is now actively utilized in manufacturers' catalogues among other things. Such labeling is also permitted on packaging, products themselves, tags and so forth other than catalogues.



For a product failing to meet the standard, orange symbol is given.

3.2.3 Label Display Program for Retailers

Efficient machinery and equipment had so far been promoted with the labelling program described in 3.2.2 However, taking into consideration the importance of retailers' role as an interface to consumers, obligation of retailers to make efforts for information provision was included in the revised Law Concerning the Rational Use of Energy that went into effect in April 2006. Retailer Evaluation Standard Subcommittee established under Energy Efficiency Standards Subcommittee of Advisory Committee for Natural Resources and Energy discussed the concept of display of energy-saving information and asked for comments from various levels of Japanese society. Thus, a guideline was finally developed.

To be specific, it stipulates that retailers provide information of products displayed at their shops with the use of "Uniform Energy-Saving Label" which presents multistage rating, expected electricity bill and other information. The multistage rating uses 5-starmark to represent a relative position of a given product in the market with respect to energy-saving performance.

Since October 2006, the "Uniform Energy-Saving Label" has been applied to air conditioners, electric refrigerators (freezers) and TV sets, whose large energy consumption per unit results a wide variation in energy-saving performance. As for other designated products, Energy-Saving Label as in 3.2.2 and expected annual electricity bill (expected annual fuel usage for gas/oil equipments) are required to be displayed on the product body or nearby (Simplified label or retailer's own format).

3.3 Specific Requirements for Electric Refrigerators

3.3.1 Target Scope

Electric refrigerators including ones combined with a freezer, except the followings ones using thermo-elements, 2) ones produced for industrial use, and 3) ones of absorption type.

3.3.2 Energy Consumption Efficiency

1 Electric refrigerators whose target fiscal year is FY 2004 and each subsequent fiscal year (until FY 2009) Energy consumption efficiency is annual energy consumption (kWh/year) measured as specified in JIS C9801 (1999), 15. Energy Consumption Measurement.

2 Electric refrigerators whose target fiscal year is FY 2010 and each subsequent fiscal year Energy consumption efficiency is annual energy consumption (kWh/year) measured as specified in JIS C9801 (2006), 15. Energy Consumption Measurement.

3.3.3 Category, Target Values

In the target fiscal year and each subsequent fiscal year, energy consumption efficiency in each category shall be at or lower than the target standard value.

1 Electric refrigerators whose target fiscal year is FY 2004 and each subsequent fiscal year (until FY 2009)

Category				Calculation formula of standard energy consumption efficiency
Product type	Cooling type	Use of specified technology	Category name	
Refrigerator	Cold air-natural convection type *1		a	$E_1=0.427V_1+178$
	Cold air-forced convection type *2		b	$E_1=0.427V_1+178$
Refrigerator-Freezer	Cold air-natural convection type		c	$E_1=0.433V_1+320$
	Cold air-forced convection type	With specified technology	d	$E_1=0.507V_1+147$
		Without specified technology	e	$E_1=0.433V_1+340$

*1 The walls of the freezing room function as an evaporator, and foods are refrigerated by direct freezing. In the case of the two-door type, however, another evaporator is needed for the refrigeration room in addition to that for the freezing room.

*2 An evaporator is installed in the rear of the freezing room, and with use of a fan cold air is generated and distributed to the freezing room and refrigeration room.

Note : 1. E1 and V1 express the following numerical values:

E1: Standard energy consumption efficiency (unit: kWh per year)

V1: Adjusted internal volume (The figure is acquired first by multiplying rated internal volume of freezing compartment by either 2.15 for three-star type, 1.85 for two-star type, or 1.55 for one-star type, and then by adding the result to the rated internal storage volume excluding the freezing compartment. The obtained figure shall be rounded to the nearest whole number.) (unit: liter)

2. "Specified technology" refers to inverter or vacuum insulation technology.

2 FY 2010 and each fiscal after that

Category					Calculation formula of standard energy consumption efficiency
Product type	Cooling type	Rated internal volume	Number of doors in fresh food section	Category name	
Refrigerator or Refrigerator-freezer	Cold air-natural convection type			A	$E_2=0.844V_2+155$
	Cold air-forced convection type	Up to 300 liter		B	$E_2=0.774V_2+220$
		Over 300 liter	One	C	$E_2=0.302V_2+343$
			2 or more	D	$E_2=0.296V_2+374$

Note : E2 and V2 express the following numerical values.
E2 : Standard energy consumption efficiency (unit: kWh per year)
V2 : Adjusted internal volume (The figure is acquired first by multiplying rated internal volume of freezing compartment by either 2.20 for three-star type, 1.87 for two-star type, or 1.54 for one-star type, and then by adding the result to the rated internal storage volume excluding the freezing compartment. The obtained figure shall be rounded to the nearest whole number.) (unit: liter)

3.3.4 Target Fiscal Year

1 FY 2004 and each subsequent fiscal year (until FY 2009)

2 FY 2010 and each subsequent fiscal year

3.3.5 Energy Saving Effects

1 Efficiency was improved by about 55.2% over the FY 1998 level by the target year (FY 2004) (initially about 30.5% improvement had been expected).

2 Efficiency is expected to be improved by about 21.0% over the FY 2005 level by the target year (FY 2010).

3.3.6 Display Items

Rated internal volume, annual energy consumption＊, external dimensions, precautions for use, manufacturer's name.

＊ Annual energy consumption measured by the method stipulated in JIS C9801 (2006), 15. Energy Consumption Measurement.

3.3.7 Place of Display

Location that can be readily seen by the consumer. Precautions for use shall be indicated on the body of he product and also in the instruction manual.

＊ Indications on electric refrigerators are based on the stipulations of the Household Goods Quality Labeling Law (Law No. 104 enacted in 1962), and are not covered by the Energy Conservation Law.

3.3.8 Exemption

Manufacturers or importers that manufacture or import fewer than 2,000 units in total are exempted. Note, however, that the display obligations must be met regardless of the number of units shipped.

3.4 Specific Requirements for Freezers

Similar requirements are in effect for freezers, please refer to the source document[4].

[4] Material drawn from: Top Runner Program: Developing the Worlds Most Efficient Appliances (Revised Edition March, 2010), Available at http://www.enecho.meti.go.jp/policy/saveenergy/toprunner2011.03en-1103.pdf

4 Cultural Issues

Japanese consumers consume large amounts of fresh food (vegetables, fruit and fish) all of which needs refrigeration. The average household (3.2 persons) has a 400 litre refrigerator and opens the door an average of:

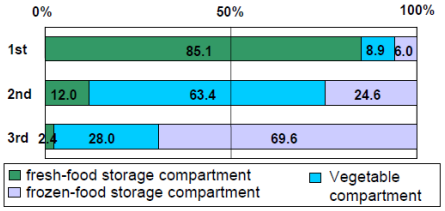
- Refrigerator – 37 times per day
- Freezer – 8 times per day

Doors are opened more often in summer (to retrieve cool drinks) and in the evenings. However, recently refrigerators have more compartments specific to user needs and therefore there is less heat rise when doors are opened. The following graphics summarise the types of food purchased and their storage[5].

Food procurement patterns (1)

curement patterns (2)

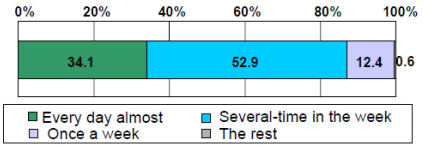
· Form of bought food (In which compartment is the bought food put?)



·The purchase of fresh-food is the main.

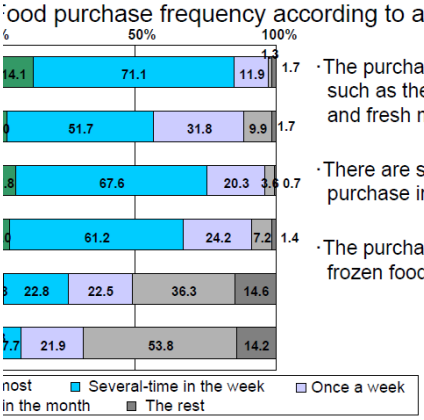
·The frozen-food is a little.

·Food purchase frequency



·There are several time a lot of purchase in the week.

urchasing of food
ood purchase frequency according to article)



·The purchase of the fresh-foods such as the vegetable, fresh fishes, and fresh meats is the main.

·There are several times a lot of purchase in the week.

·The purchase frequency of the frozen food is a little.

※The Ministry of Agriculture and Forestry examination in 2003

[5] Presentation – "Lessons learned in Japan with Checking Performance" given at the IEA 26th February 2008, Kiyoshi SAITO(JEMA: The Japan Electrical Manufacturers' Association)