What role do industry sector initiatives play in Energy Efficient policy development ?
-"Monitoring, Verification and Enforcement" and "Another M (Measurement) "

Lesson Learnt in Japan with case study for Development the New Measurement Methodology Concerning Actual Energy Consumption of Household Refrigerator

Session 3, Workshop 1
International Monitoring, Verification and Enforcement Conference

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JP Top runner standard & Labeling Program
"Current status of Monitoring & Verification"

Discrepancy problem on energy consumption value in Japan "Case of Household Refrigerator"

"Monitoring, Verification and Enforcement" and "Another M (Measurement) "

Future issues
- What role do industry sector initiatives play?

JP Top runner standard & Labeling Program

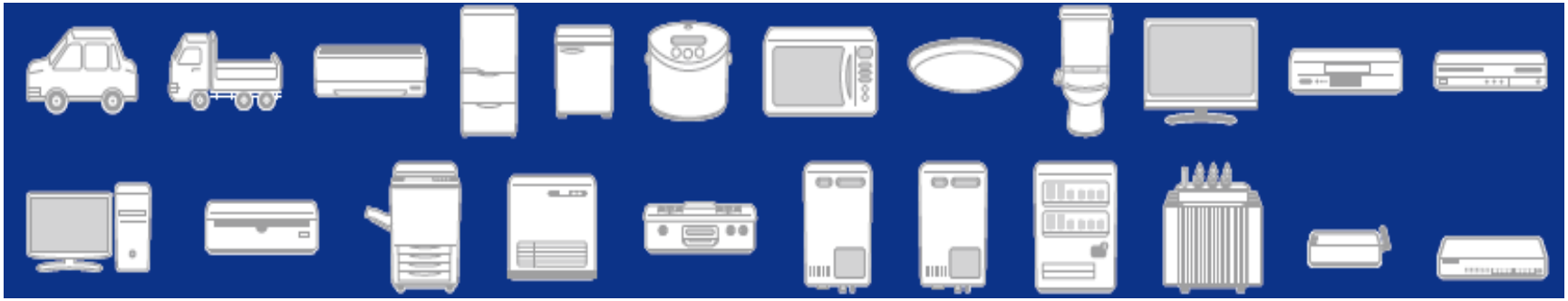
"Current status of Monitoring & Verification"

JP Top runner standard

- Top Runner standard 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.

Target product standards (23 category)

At the time of March, 2010



Passenger Vehicles	**Lighting equipment**	**Copying Machines**	**Routers**
Freight Vehicles	**TV sets**	**Space Heaters**	**Switching Units**
Air conditioners	**DVD Recorders**	**Gas Cooking Appliances**	
Electric Refrigerators	**Electric Toilet Seats**	**Gas Water Heaters**	
Electric Freezers	**Video Cassette Recorders**	**Oil Water Heaters**	
Electric Rice Cookers	**Computers (PC)**	**Vending Machines**	
Microwave ovens	**Magnetic Disk Units**	**Transformers**	

Specific Details of standard e.g. Refrigerator/Freezer

Target Scope

Electric refrigerators including ones combined with a freezer, except the followings: 1) ones using thermo-elements, 2) ones produced for industrial use, and 3) ones of absorption type

Category, Target Values & Energy consumption Efficiency

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

- Annual energy consumption (kWh/year) measured as specified in JIS C9801 (1999), Energy consumption Measurement.

Current Target Standard

FY 2010 and each subsequent fiscal year

- Annual energy consumption (kWh/year) measured as specified in JIS C9801 (2006), Energy consumption Measurement.

Category					Calculation formula of standard energy consumption efficiency
Product type	Cooling type	Rated internal volume	Number of doors in chiller section	Category name	
Refrigerator or refrigerator-freezer	Cold air-natural convection type			A	$E_2=0.844V_2+155$
	Cold air-forced circulation 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	$E_2=0.296V_2+374$

* E_2:Standard energy consumption efficiency (kWh/y)
* V_2:Adjusted internal volume (L)

Energy Saving Effects

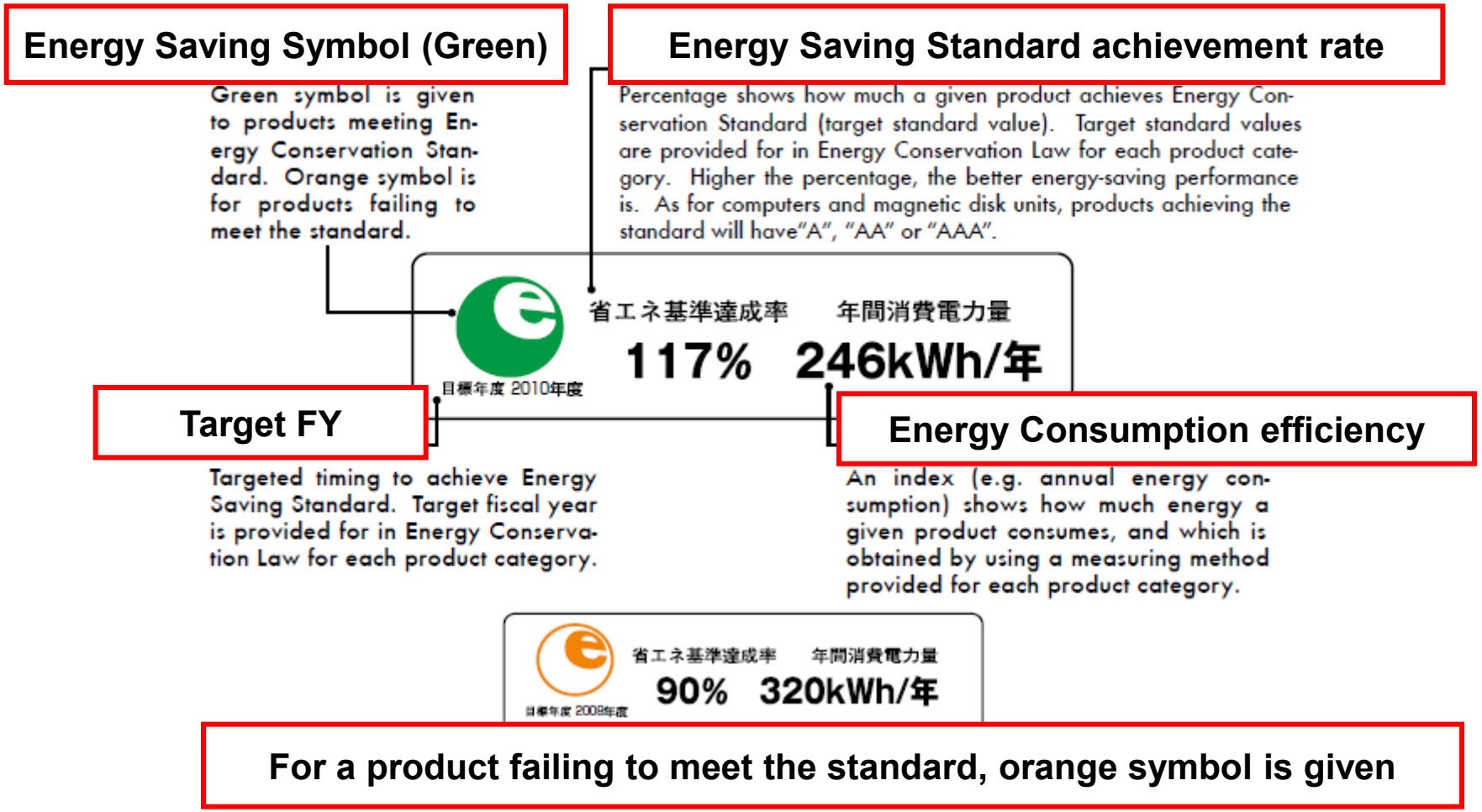
Expected to be improved by about 21.0% over the FY 2005 level by the FY 2010

Behind the Achievement Evaluation

Whether the result achieves the target standard value in the target FY is determined by a weighted average method per manufacturer and category

Top runner standard & Labeling Program

- 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.



Label Display Program for Retailers

(Obligation of retailers to make efforts for information provision)

- Since October 2006, the "Uniform Energy-Saving Label" has been applied to air conditioners, electric refrigerators (freezers) and TV sets.

FY when criteria of the 5 star multistage rating is set

For non-CFC electric refrigerators, non-CFC sign is displayed

Energy Saving Labeling

Multistage rating system (five levels) symbolized by the number of stars; the superior the energy saving performance of a marketed product, the greater the number of stars.

***In order to clarify the number of Stars given to products meeting the Top Runner Program, a border line of 100% target achievement is Shown under the stars.**

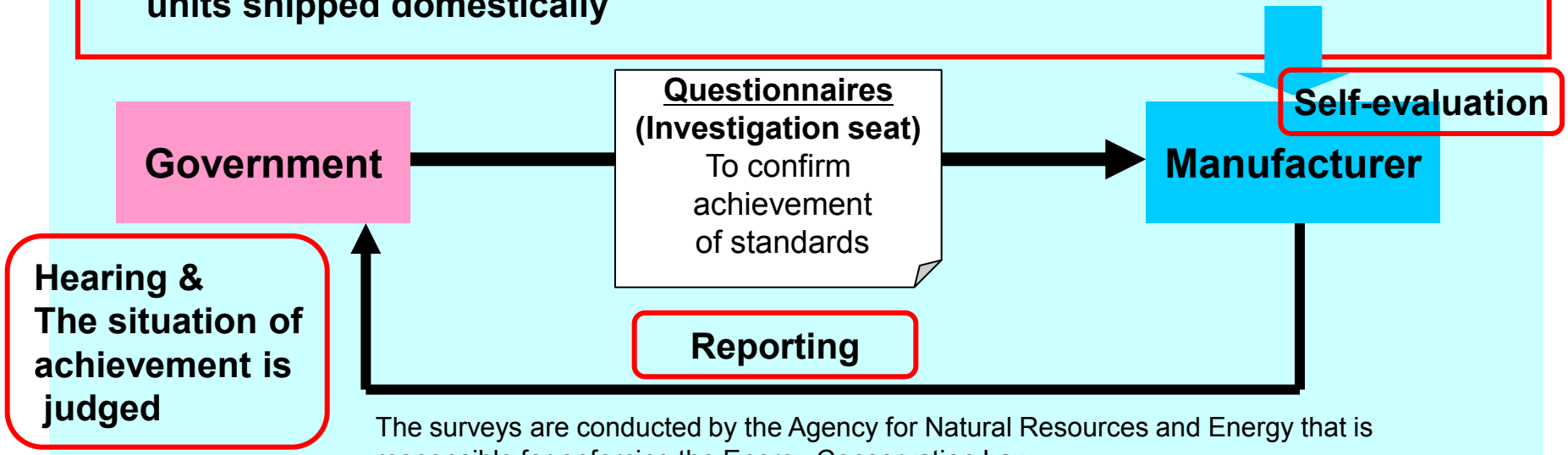
Manufacturers' name & model name

Expected annual electricity bill

Target Achievement Evaluation

- Target Achievement Verification Method

【Weighted average energy efficiency】
= the sum of {(the number of units shipped domestically for each product name and type) × (energy consumption efficiency per unit)} / the total number of units shipped domestically



The surveys are conducted by the Agency for Natural Resources and Energy that is responsible for enforcing the Energy Conservation Law.

- Measures Implemented When Target Values Are Not Achieved

✓**The Minister of Economy, Trade and Industry offer recommendations about improvement action to the manufacturer as required. Further, if this advice is not followed, the recommendations are made public and the manufacturer may be ordered to follow the recommendations.**

Market surveillance scheme

Government

- Periodically and continuously collected of Product catalogue
- Conducted to confirm the name plates, and retail store surveys

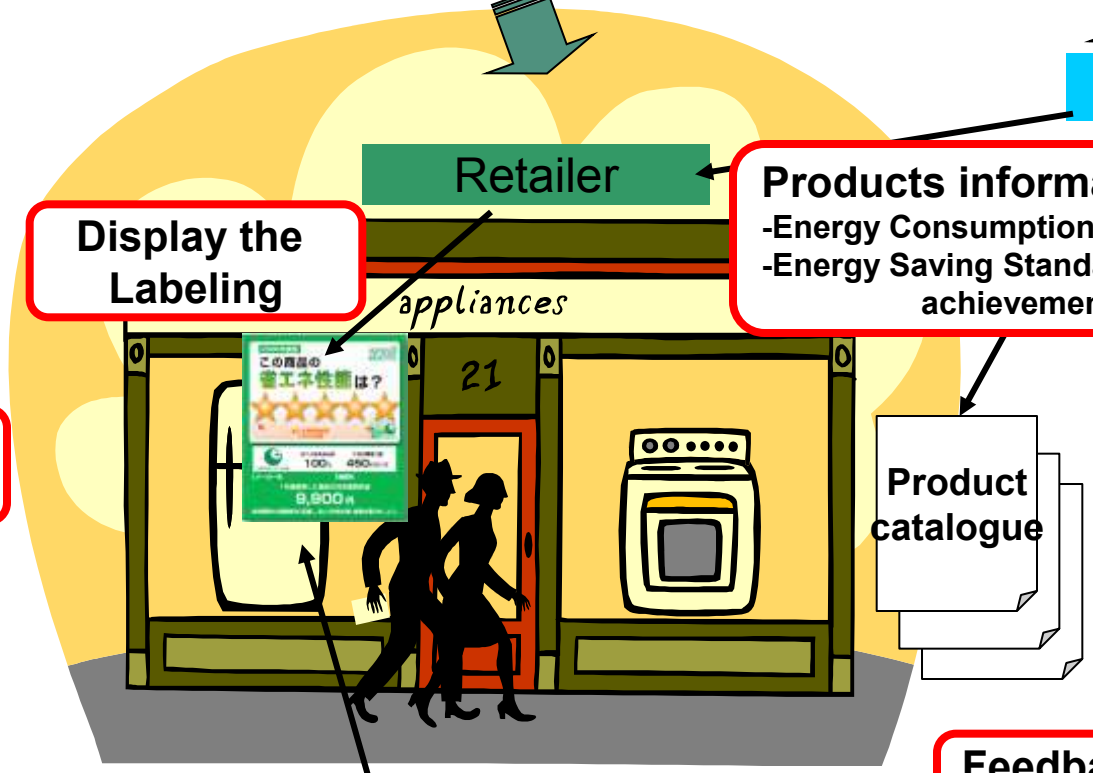
Feedback, Attention is recommended

Manufacturer

Retailer

Products information
-Energy Consumption efficiency
-Energy Saving Standard achievement rate ・・・ etc

Display the Labeling



Product catalogue

Instruction and request

Feedback, Attention is recommended

Strengthening of Voluntary approach

Industry Association

- Cause investigation of mis-display
- Confirmation of regularity self-checking by manufacturer
- Purchase and Consignment of testing (to the third-party Laboratory)

Monitoring for performance e.g. Household Refrigerator

- Case study by Industry Association (JEMA)
  【Specification of Monitoring; Household Refrigerator】
  - Measurement period (October – December, 2008 FY)
  - Monitor Household (30 Households)
  - Record items (Energy Consumption efficiency : kWh/day, Door open/close, Ambient temperature)
  - Measurement products


Electric power meter


Door open/close frequency counter

Old (Using) products (for 12 days)				New products (for 12 days)			
Manufacturing year	Internal Volume	Number of Door	Energy Consumption efficiency (Estimate)※	Manufacturing year	Internal Volume	Number of Door	Energy Consumption efficiency (Estimate)※
1993 - 2001	340L - 480L	3 - 6	480kWh/y -1,301kwh/y	2008	400L - 560L	5 - 6	322kWh/y - 666kwh/y

※Energy Consumption efficiency (Estimate) :
Average of 27 households (3 households are suitable cases)
Ambient temperature is 22.4℃ (National average at standard household)

Monitoring for performance

- Results of Monitoring (Average of 30 households)

	Old (Using) products (for 12 days)	New products (for 12 days)
Average of Door Open/Close frequency time each day	**51**	**57**
Average of Number of Door	**4**	**6**
Average of Internal Volume	**413 L**	**479 L**
Average of Energy Consumption efficiency (Estimate)	**819 kWh/y**	**462 kWh/y**

Two piece increase

About 16%up

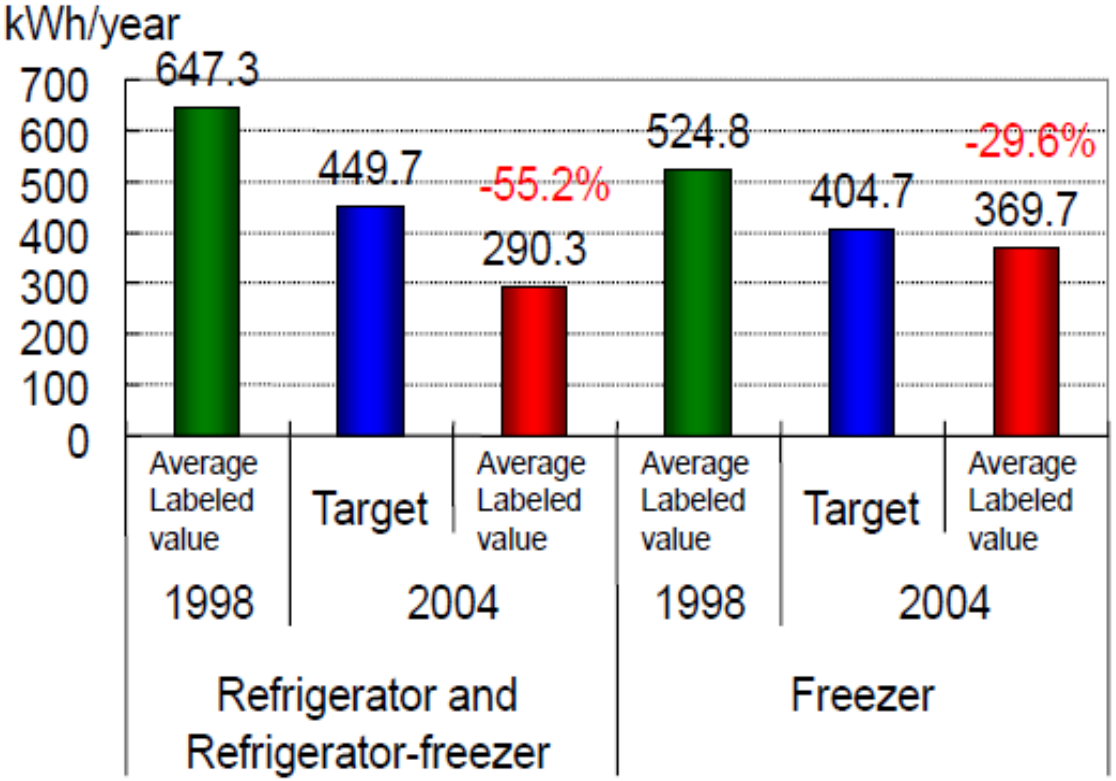
About 43% Reduce

Challenges of the future issues;
Continuous, systematic monitoring
-Establishment of Methodology of standard Monitoring scheme
-Select of monitor households, and incentive scheme ・・・ etc

Discrepancy problem on energy consumption value in Japan "Case of Household Refrigerator"

Introduction

- The Japanese government started to revise or set energy efficiency standards for equipments by using “Top-Runner” approach in 1998.
- Household Refrigerators and freezers account for 17% of electricity use in the residential sector in Japan.
- Standards for refrigerators and freezers were set in 1999 and the target year was 2004.



Energy efficiency improvement;
Weighted average labeled energy use of shipped products

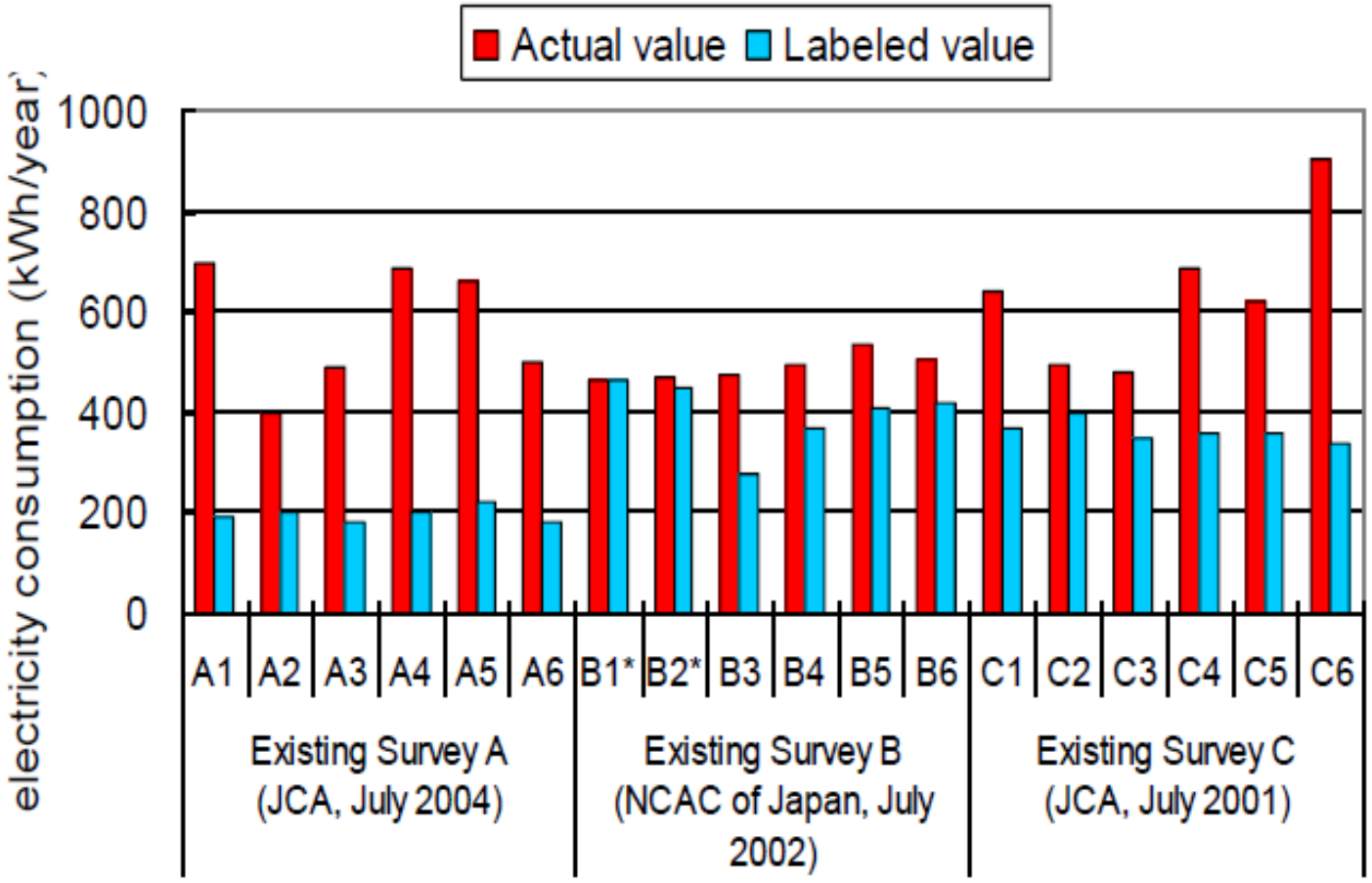
- Manufacturers are required to label their products with an annual electricity consumption value that is measured by JIS test procedures based on ISO.
- In fact, Energy efficiency has greatly improved by introducing energy conservation technology and making an effort.

Clarifying problems

Comparison of actual and labeled energy use

■Some consumers have purchased the refrigerator after checking the displayed on the label and they made a survey of energy use.
(and then they pointed out the difference between actual and labeled energy use)

■Laboratory tests show significant difference between actual and labeled energy use.



Characteristics of the JIS Test procedures before revision

- Test is consistent with the global standard (ISO Standard). Global standard is based on the **"Natural convention cooling system" that is mainly used in Europe**.
- The **"Forced convection cooling - frost-free system" that is common in Japan, Australia, New Zealand and U.S.** receive little consideration.
- Recently "highly-functional refrigerators" are becoming popular rapidly in Japan. However, these highly functions are not taking into consideration in the standard.

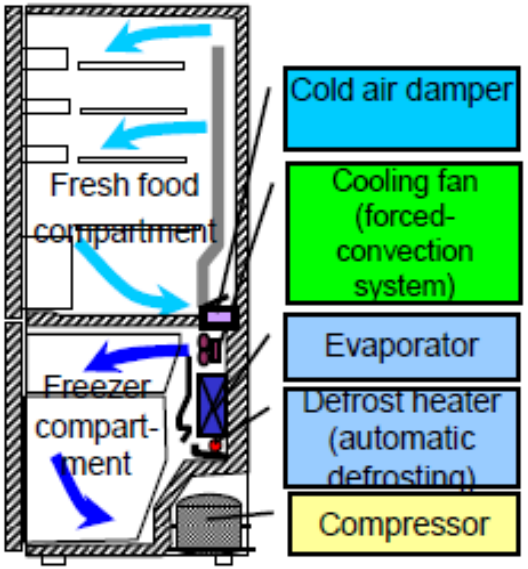
(Example)

2-door refrigerator-freezer

Upper : Fresh food compartment

Lower : Food freezer compartment

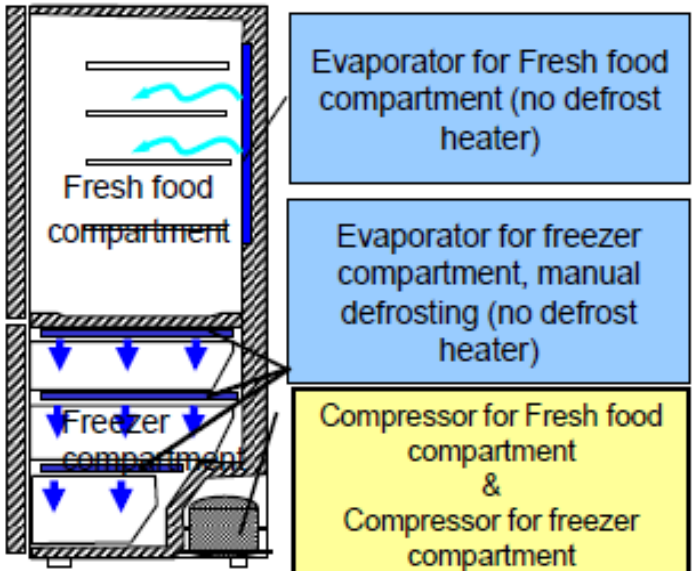
Forced convection cooling system (Japan)



Large (300-500 liters)

- **Automatic defrosting (defrost heater)**
- **With fan for circulation of cold air in compartments**
- **Inverter control (compressor & fan motor)**

Natural convection cooling system (Europe)



Relatively small (100-300 liters)

- **Manual defrosting**
- **Heat conduction (no fan)**
- **Less usage of electric parts**

Capacity

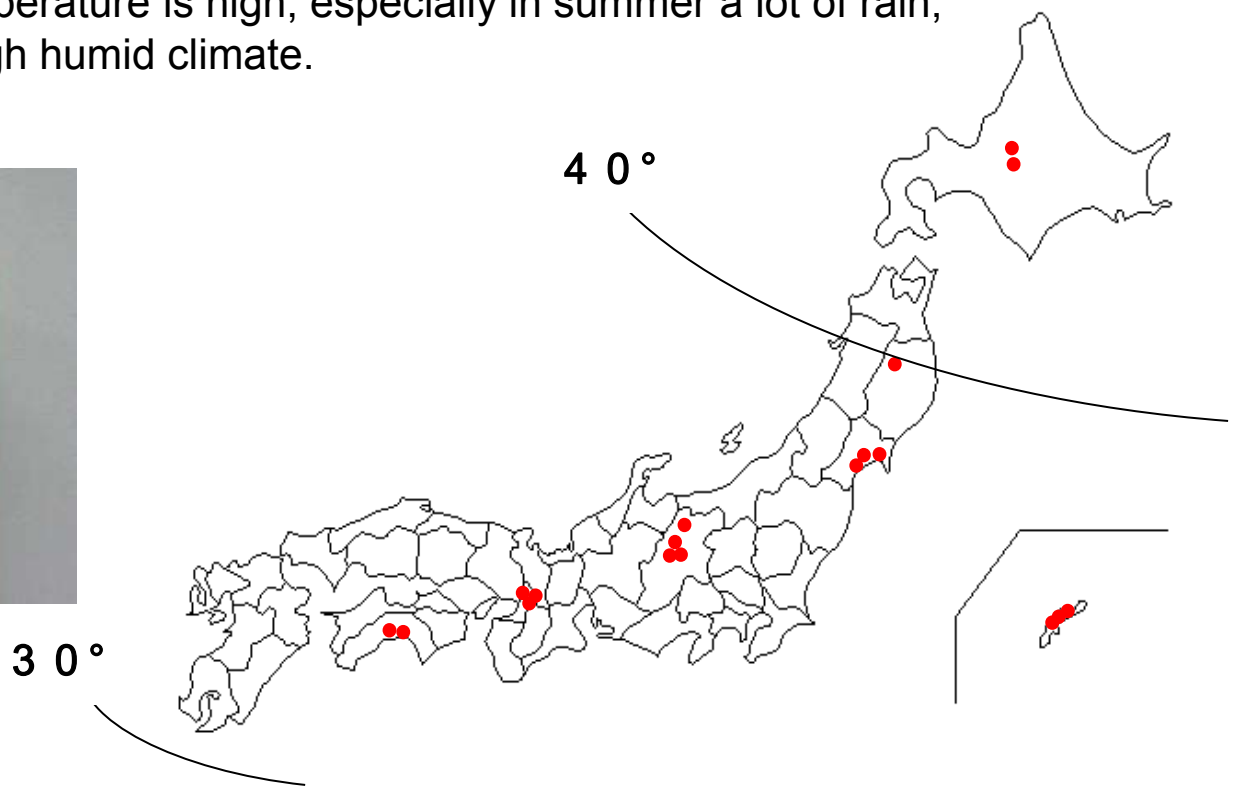
- **Defrosting method**
- **Cooling system**
- **Energy-saving**

Monitoring & Survey of actual use

- 18 location in Japan, one year surveyed actual use
- Ambient temperature, inner temperature, energy consumption, door open/close, ice making were measured

・ Japan located at latitude from 26 to 45˚.
・ In summer every area exceed 20˚C of average temperature in a month.
・ The temperature is high, especially in summer a lot of rain, hot and high humid climate.

instrument



Test conditions of revised JIS C9801

		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	

Example of Test Results

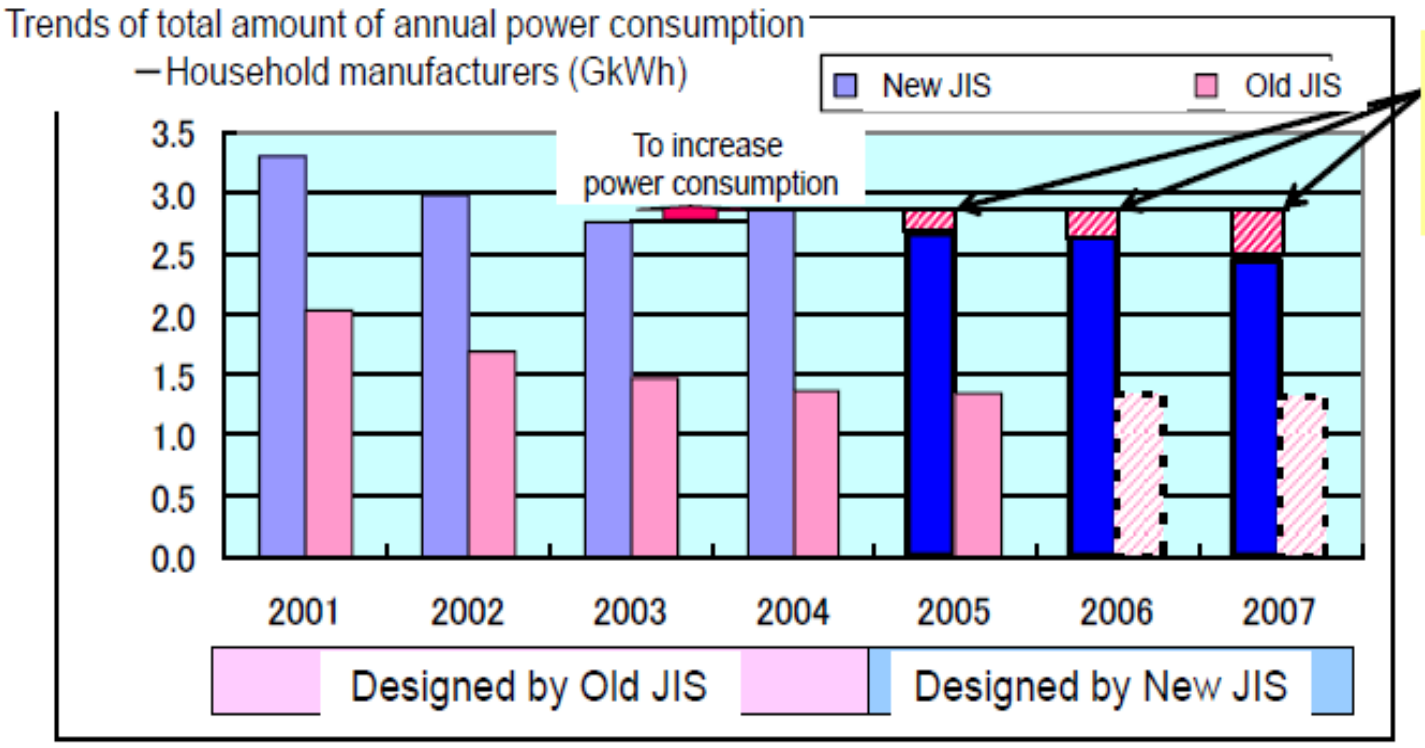
- More than 3 times maximum, old JIS marked value against actual, now new JIS value is very similar to actual value.

kWh/y

Manufacturers	A	B	C	D
Number of doors/ capacity	3 doors/ 384 liters	4 doors/ 357 liters	5 doors/ 457 liters	4 doors/ 425 liters
Inverter	None	None	Equipped	Equipped
Old JIS indicated values	**380**	**380**	**180**	**270**
Actual measurement values	**725**	**581**	**522**	**793**
Revised JIS measurement values	**724**	**522**	**463**	**733**

Evaluating the potential of energy saving

- Based on the new test procedures has evaluated the annual power consumptions of refrigerators manufactured in the past.
- Indication figures could be decreased but the actual power consumption could not be decreased if tested under the unrealistic conditions.
- By using the test procedures based on actual condition of use, and always developing products in the basis of the method will make the practical potential of energy saving even clearer. It could be said that the potential had been hidden, or overlooked.



Practical potential of energy saving about 0.8～0.9GkWh

“Monitoring, Verification and Enforcement” and “Another M (Measurement) ”

The refrigerator energy efficiency has not been harmonized in the world

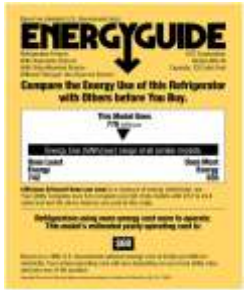
- Direct cool type is IEC62552 harmonized, but there are many countries no using the latest standard.
- Forced cool type, there is no harmonized test method and each country use its own standard.
- Only Japan use the standard which reflect actual usage.
- It is not possible to evaluate the refrigerator energy saving performance and technology.

Many energy labels for energy saving performance

EU

China

US



Japan

Australia

Korea

India

Problems on IEC energy consumption test method

old problems;
difference of
- market, specifications
- technical feasibility, functions
- climate, area, life style

New problem

Discrepancy of test results and actual use

Physically available
Reasonable test method
+
variable different conditions

Pay attention on repeatability on product basic performance and characteristic

Need marked value reflecting actual use of products, functions, operations

Problems for amendment of energy consumption test method

1. Avoid discrepancy of actual used energy consumption and efficiency
2. Set up conditions of different climate, area, life style
3. Need “methodology” on test condition etc reflect product functions

APP refrigerator project established

IEC amendment activity on energy consumption test method

G8 summit
(Energy Efficient & Climate Policy)

APEC EGEE&C

IEA
Policy recommendation to member countries on energy efficiency improvement best Practice and energy saving potential evaluation

G 8 Toyako summit
Policy recommendation on energy efficiency improvement

IEA Efficient Electrical End-use Equipment (4E) Project

APP BATF

Harmonization of energy saving evaluation & test method of electrical appliances

Harmonization of Test Procedures for Household Refrigerators PJ (Lead operator ; JEMA)

*IEA – IEC agreement

Top down approach

IEC SMB

SG1 recommendation→TC59 / related SC's
-International standard test method
* reflect actual use condition
-harmonization of energy labeling classification/category

SC59M established (2008.12)
-performance of electric refrigerators/freezers

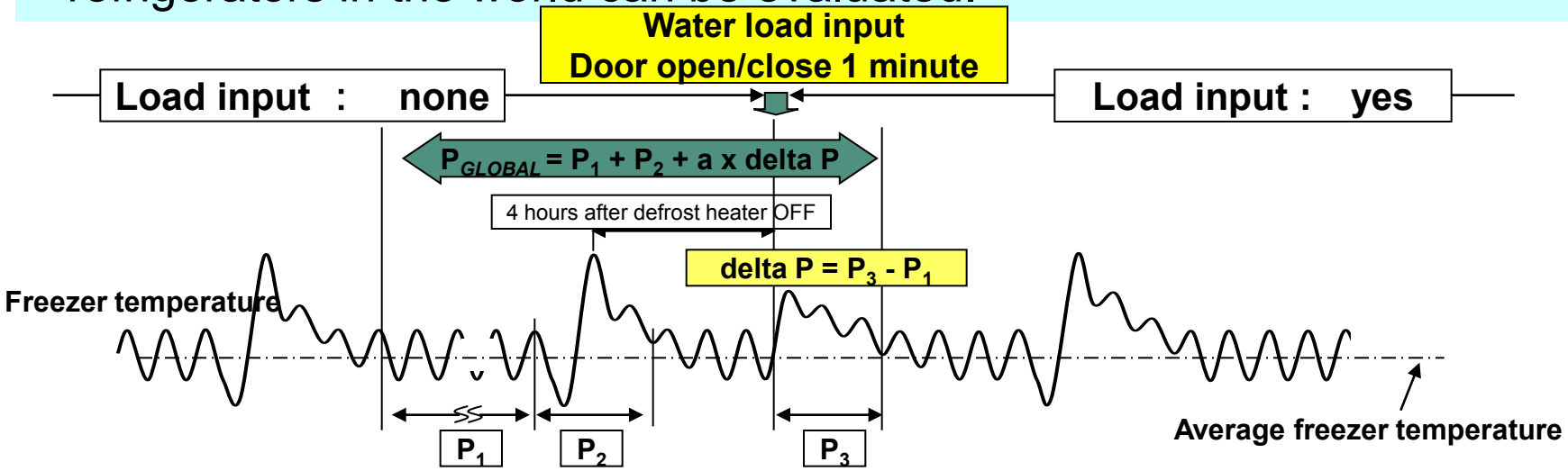
*review current standards and New proposal (amendment)

Bottom up approach

Concept of Proposed method

Proposal to IEC SC59M and amendment activity

- The method is to make only once door open, and put the water load in so that the frost accumulation to the evaporator has been created.
- The present test method of stable and defrost has been unchanged, but the test of load input has been added. By this method any kind of refrigerators in the world can be evaluated.



	Operated condition	Load input
P_1	Stable	no
P_2	Pre-cool, defrost, recovery	no
P_3	Load input, temperature recovery	yes

Direct cool $P_{IEC}=P_1$ Forced cool $P_{IEC}=P_1 + P_2$	Same test method as current IEC62552
Direct cool $P_{GLOBAL}=P_1 + a \times (P_3 - P_1)$ Forced cool $P_{GLOBAL}=P_1 + P_2 + a \times (P_3 - P_1)$	Load input test method which reflect actual use a: variable by each country

IEC TC59/SC59M results and future plan

- SC59M agreed to revise energy consumption test method
- Consists of three parts but publish as one contains three parts
- Pay attention to energy consumption and other performance test

  IEC62552 Part1 definition and test conditions

  IEC62552 Part2 other performance

  IEC62552 Part3 inner volume and energy consumption

- To evaluate forced convention type refrigerator correctly, and Take into account actual use for energy consumption test method
- Consider the amendment taken into account different conditions, such as climate, actual usage, etc

Schedule of standard making

2010 March, prepared Draft Working Document

2010 May, held WG - Brazil Sao Paulo -

2010 October, Seattle, discuss and issue CD

2011 April, hold WG and discuss comments of country

2011, issue FDIS

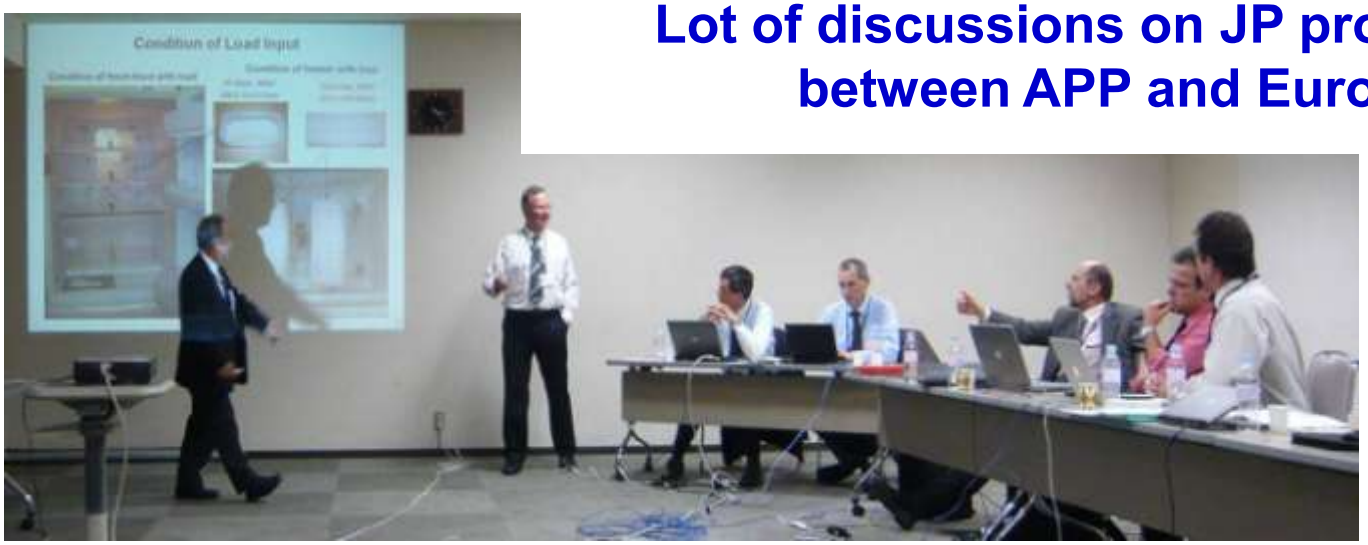
APP refrigerator PJ Kyoto meeting (2009.12.7)

Meeting view

Discussion on JP proposal and to make APP proposal

IEC TC59/SC59M Kyoto meeting (2009.12.8-10)

Meeting view



Lot of discussions on JP proposal between APP and Europe

Future issues
- What role do industry sector initiatives play?

What role do industry sector initiatives play?

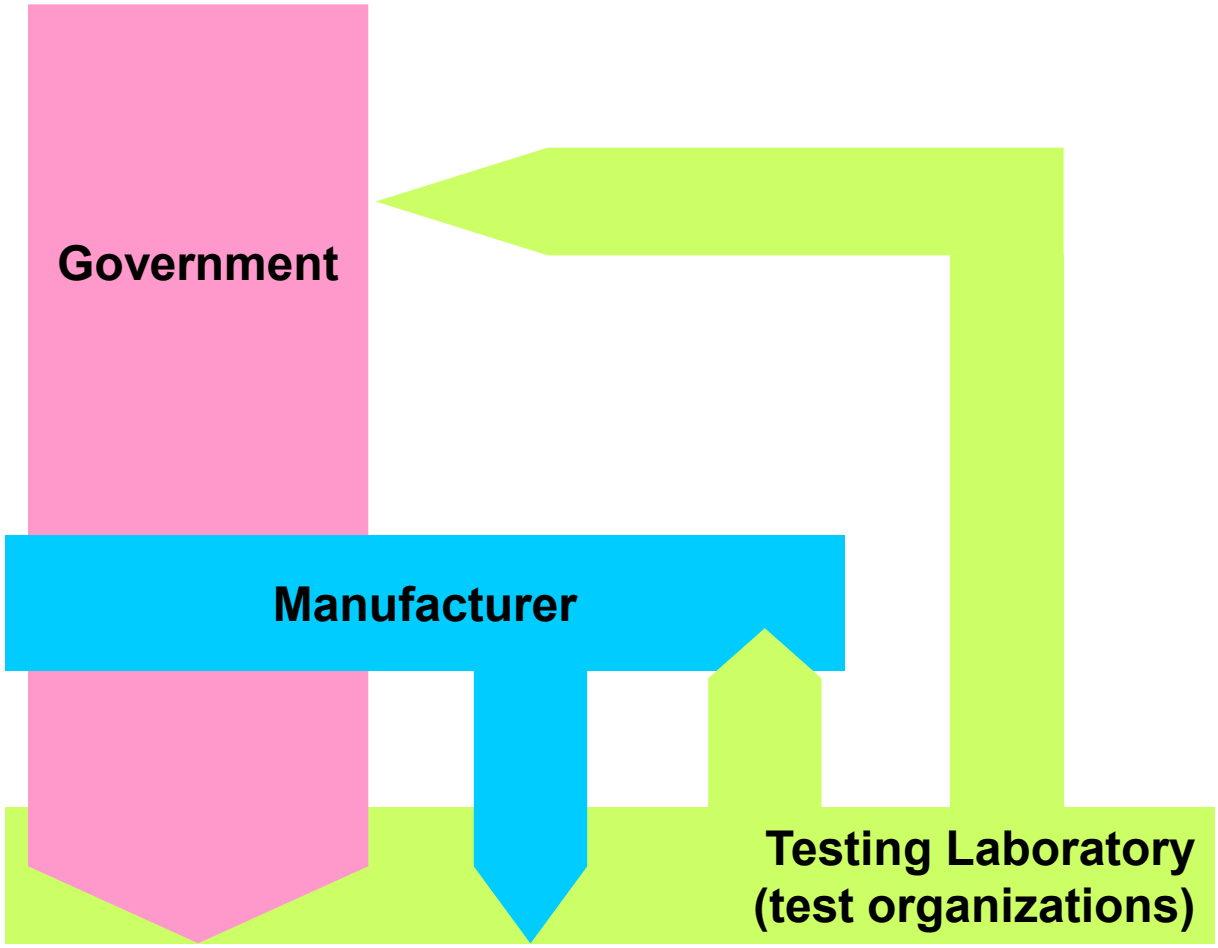
Expected role for Manufacturer / Industrial sector
- Distribution of energy-efficient products to global market
- Development of test procedures regarding energy efficiency, consider the International Harmonization, such as climate, actual usage, etc

Standard of energy efficiency

Energy Labeling

Measurement Methodology of Test Procedures

Monitoring, Verification & Enforcement



Lesson Learnt in JP case and recommendation

A) The refrigerator case might be typical example, but potentially it might happen on any kinds of products.

B) It is necessary for representatives of policies in each country to evaluate potential of practical energy saving by proper operation of Standard & Labeling. The standards without actual usage were kept, the more the chances of the technical development for real energy saving will be overlooked.

C) The measuring method that is appreciable of conservation of energy is important. Consequently, the monitoring and verification can be helped, and a social cost be decreased.

D) The government authorities (test organizations), manufactures and consumer organization should cooperated together paying the following attention on monitoring;

- Identify the parameter of the actual usage condition，Evaluate the adaptability of the monitoring items to the standards.

E) JEMA has been appealing at IEC or APP to adopt practical condition as a methodology of testing based on their experience. To develop internationally balanced test procedures and global harmonization, coalition between policies in each country (adopted in S&L) and test organizations/standardization activities, or global consensus will be necessary.