Japan's Experience:

How Public Sector Promotes Raising Awareness and Encourages Consumer Behavior

-The effects of the Japanese S & L system and the impact on consumers-

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Summary





Overview of ECCJ

Core organization responsible for promotion of energy efficiency & conservation (EE&C) mainly in Japan. Its activities were authorized by the Diet when the EE&C Law was enacted.

Legal status	General Incorporated Foundation			
Establishment	1978			
Office location	Tokyo Head office & 8 branches			
Supporting membe	er 2,200 companies			
Staff	90 persons (as of May 2018)			
Business size	20 million US\$ in 2016 FY (2.066 billion yen)			
Main Activities				
EE&C Promotion (Factories, Building, etc.)	 Audit services/Factory Investigation Provision of information on EC case examples Support for countermeasures for CO2 reduction 			

Provision of EE&C Information	 Dissemination of EE&C practices/activities in local communities Provision of Information on energy efficient equipment/energy saving label Provision of information on EE&C through publications
Capacity Building, Raising Awareness, EE&C Solution	 Educational seminars and qualification system of professional auditors etc. Energy Grand Prize Award EE&C technical support tool
International Cooperation	 Experts dispatch and training program in Japan Collaboration with JASE-World (Japanese Business Alliance for Smart Energy Worldwide) International collaboration activities (SEforALL, IPEEC, AEEC etc.)
Qualification of Energy Manager	① Implementation of National Examination and training for energy managers



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Review of the AJEEP Program

2000-2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022-	
	AJEEP Scheme 2: EE&C technology promotion and private sector involvement											
PROMEEC Main industry Buildings	Energy techno sector	y Audit ologies [.] involv	+ EC for priv ement	vate	тот о	of Ener	New Scheme (Scheme 4)					
Energy Management	AJEEP regula	Schem tory sy	<mark>e 3</mark> : nai stem (S	row th	e gap b AC & ei	oetweei nergy m	n AMSs nanagei	on EE& ment sy	kC /stem)			
	Caml an	bodia, La Id Myan	ao PDR mar		Ca	mbodia						
	AJEEP	ECAP :	Works	hops in	Japan	for EE&	C in AN	ЛS				
	S&L on	AC	FCAP 6		TOT of	ASEAN ei	nergy ma	nagers	г			
MTPEC		EE&C reg	gulatory s	ystem ECAP 8	ECAP 10 ECAP 11	ECAP 12 ECAP 13	ECAP 15 ECAP 16	ECAP 18 ECAP19]	Ne	AA7	
	EE&C and Green building : Enhancement of evaluation criteria of AEA & procedures and green building code in AMS ⇒Zero Energy Buildings ECAP 4 ECAP 7 ECAP 9 SE4ALL ECAP 14 ECAP 17 ECAP 20						Sche	me				
	ΑΡΑ	EC 2011-1	15			APAEC	2016-20	z		APAEC 2	021-25	





1 How energy-saving products spread in Japan

(1) Trends in personal consumption, number of households and household energy consumption





Japan's Final Energy Consumption in past 40 years

Until 2017 the GDP continued increasing to about 2.6 times the 1973 level and the consumption of energy for individual sectors significantly increased with the Consumer sector (Residential + Commercial) increasing to about 1.7 times, while the transportation sector increased to about 1.7 times, whereas the industrial sector decreased to about 0.9 times.



Sources: "Comprehensive Energy Statistics" and "Annual Report on National Accounts."



Trends in personal consumption, number of households and household energy consumption

The energy consumption in households increased until fiscal 2010 due to changes in the national lifestyle and an increase in the number of households. Then it almost leveled off by the aid of energy-saving policy like the top runner program and the heightened public awareness of environmental protection. Furthermore, strengthened energy-saving efforts after the Great East Japan Earthquake contributed to keep the trend.



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Progress in RAC's energy efficiency -In terms of energy efficiency performance index-

- The energy efficiency of RAC (room air conditioners) has improved rapidly up to 2011 thanks to improvement of compressor motor and pressure loss and better design of the shape of the heat exchanger etc.
- > Since 2011 efficiency improvement has slowed, while steady improvements were made to the various parts of the air conditioner.
- Recently we are aiming to promote further energy savings by optimizing equipment control using weather forecasts via HEMS, using human sensors, etc.



> COP: Coefficient of Performance

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the rated cooling capacity (kW) divided by the rated power consumption (kW) in the case of operating the air conditioner under a certain temperature condition

> APF: Annual Performance Factor

A value obtained by dividing the cooling capacity (kWh) required for one year when using an air conditioner throughout the year under a certain modeled condition by the amount of power consumed (kWh) in that year.



How energy-saving products spread in Japan

(2) Institutional support for dissemination of energy efficient products -Top Runner Program and relevant labeling program





Overview of the Act on Rational Use of Energy

- > Business operators with certain size or more i.e. Designated business operators are requested to report the energy consumption status regularly. Then guidance, advice and instruction to make plans of rational use of energy is given to the operators whose effort appear to be insufficient.
- > Caution is given to them regarding specified energy consuming equipment etc. (automobiles, home appliances etc.) if efficiency improvement is insufficient along with the target of energy efficiency indicated by them and request for the achievement.



*Building energy efficiency is regulated under the building energy conservation law since 2019.





Concept of the Japan's S & L system

Energy efficiency S&L system is intended to contribute to the energy saving at home by letting manufacturers improve the performance of their products and displaying it to the users.



Top Runner Program

- Manufacturers, etc. shall make best effort to improve energy efficiency performance of their products as well as contribute to the rational use of energy by machineries and equipment. (Ref. Article 77, 78, 79)
- Manufacturers, etc. shall display energy efficiency performance of their products. (Ref. Article 80, 81)

Retailers' Labeling Program

• Retailers shall make best effort to display energy efficiency performance of their goods on sale as well as contribute information provision to help the rational use of energy by general consumers. (Ref. Article 86)





Means of raising awareness & encouraging consumer behavior



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History of Top Runner Program

Prehistory of the Top Runner Program is as follows.

1979- Beginning of the 1st regulations on energy efficiency of equipment efficiency standards, target: air conditioners and electric refrigerators 1993- Same as above 2nd regulation start, target: air conditioner, fluorescent lighting, TV, electronic computer, magnetic disk, VTR (Refrigerators are excluded from the scope due to technical difficulties.)

> After the introduction of the program, three principles are applied to the added items i.e.(1) massive use, (2) large energy consumption amount, and (3) potential technical improvement.

FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
 Top runner Program started Mandatory Manufacturer 	 Start Energy Efficiency Labeling Program Voluntary Manufacturer 						 Start Energy Efficiency Labeling Program for retailers Mandatory Retailers 										
Introduction of Top Runner Program【9 items】			Add equipment [7 items]				 Add equipment (3 items) 			> Add equipment [2 items]			 > Add equipment (3 items) 		➢ Add equipment 【2 items】		Add equipment [1 item]
1. Passenger vehicles			12. Gas heating stoves				19. Rice cookers			22. Routers			24. Multifunctional machines		30.Sashes		32.Showca ses
2.Air conditioners			13. Gas cooking equipment				20.Microwave ovens			23. Switching units			25.Printers		31.insulate d glazing		
3. Lighting equipment for fluorescent lamp			14. Gas water heaters				21.DVD recorders						26.Electric water heaters				
4.TV receivers			15. Oil water heaters										 Add equipment 2 items 1 material 				
5.Copying machines			16. Electronic toilet seats										27. AC motors				
6.computers			17.Vending machines										28.LED lumps				
7.Magnetic disk units			18.Transfor mers										29.Insulations				
8. Freight vehicles																	
9.Video tape recorders																	
Add equipment (2 items)																	
10.Electric refrigerators																	
1.Electric refrigerators																	

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Item-wise effect of the Top Runner Program

Around nineteen years have passed since the introduction of the Top Runner Program in 1998. Up to this point, various machineries and equipment have reached the target fiscal year. Due to the efforts by manufacturers and others, each product category attained efficiency improvement that exceeds our initial expectations.

Product category Possenger vehicles* Freight vehicles*		Energy efficiency improvement (result)	Energy efficiency improvement (initial expectation)	Product category	Energy efficiency improvement (result)	Energy efficiency improvement (initial expectation)
		48,8% (FY 1995 → FY 2010) 22.8%		TV sets (liquid crystal / plasma)	60.6% (FY 2008 → FY 2012)	37.0%
		13.2% (FY 1995 → FY 2010)	13.2%	VCRs	73.6% (FY 1997 → FY 2003)	58.7%
	Non-ducted/wall-mounted AC units, 4 kW or less	16.3% (FY 2005 → FY 2010)	22.4%	Computers	85.0% (FY 2007 → FY 2011)	77.9%
Air conditioners *	Non-ducted/wall-mounted AC units, over 4 kW	15.6% (FY 2006 → FY 2010)	17.8%	Magnetic disk units	75.9% (FY 2007 → FY 2011)	75.8%
	Other than non-ducted/ wall-mounted AC units	15.9% (FY 2001 → FY 2012)	13.6%	Copying machines	72.5% (FY 1997 → FY 2006)	30.9%
Electric refrigerators (for residential use)		43.0% (FY 2005 → FY 2010)	21.0%	Space heaters (ail)*	5.3% (FY 2000 → FY 2006)	3.8%
Electric freezers (for residential use)		24.9% (FY 2005 → FY 2010)	12.7%	Gas cooking appliances (oven area)	25.8% (FY 2002 → FY 2008)	20.3%
Mia	owave overs	10.5% (FY 2004 → FY 2008)	8.5%	Gas water heaters (gas space heaters (with water heater))*	7.9% (FY 2002 → FY 2008)	1,1%
Bectr	c rice cookers	16.7% (FY 2003 → FY 2008)	11.1%	Oil water heaters*	4.0% (FY 2000 → FY 2006)	3.5%
Lighting equipme using only fluoreso	t Lighting equipment for fluorescent lamp(s)	14.5% (FY 2006 → FY 2012)	7.7%	Vending machines	48.8% (FY 2005 → FY 2012)	33.9%
lamp(s) as main light source*	ht Selfballasted Ruorescentlamp(s)	6.6% (FY 2006 → FY 2012)	3.2%	DVD recorders (terrestrial digital broadcasting compatible)	45.2% (FY 2006 → FY 2010)	20.5%
Electric toilet seats		18.8% (FY 2006 → FY 2012)	9.7%	Routers	40.9% (FY 2006 → FY 2010)	16.3%
7				Switching units	53.8% (FY 2006 → FY 2011)	37.7%

Transformers





30.3%

13.1%

(FY 1999 → FY 2006/2007)

Basic concept and methodology of Top Runner Program-(1) concept

Top Runner Program intends to improve energy efficiency performance of appliances, etc. The standard values are set based on the most efficient product with consideration for technological future development.





Basic concept and methodology of Top Runner Program-(2) methodology

With using the shipment volume weighted average energy consumption efficiency to judge the standard achievement status, Top Runner Program can encourage energy efficient products to increase the number of shipment volume while keeping the diversity of product models in the market.





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Basic concept and methodology of Top Runner Program-(3) Selection Process



*World Trade Organization / Technical Barrier to Trade Agreement



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Labelling program in Japan in co-operation with Top Runner Program

To promote highly energy efficient goods that have achieved Top Runner Standard providing consumers with effective information is essential. For this end discussion was made to work out the best labelling program. ECCJ was involved in the discussion as a member of governmental panel.



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Retailers' role in promotion of energy efficient products

Retailers' Labeling Program

Article, which requires retailers to make best effort to provide information about energy efficiency performance of appliances and others to consumers, was added in the EC Act (enforced in April 2006). (Ref. Article 86) Based on the Article, Retailers' Labeling Program was stared in October 2006 as a program with no penalty.

Contents

[Relative Evaluation] It shows the relative position of the product in the market in terms of energy consumption efficiency. The more the stars, the better the energy consumption efficiency.

[Energy Saving Label]

[Manufacturer's name & Model Name]

[Estimated annual electricity bill] Energy consumption efficiency is converted to electricity bill, which is more familiar for general consumers. (For gas / oil appliances, fuel amount is used for the sake of uncertainty nature of fuel charge.)



Feature □It is displayed by retailers.

> It indicates the relative position of the product in the market in terms of energy consumption efficiency.

<Example: TV> Relative evaluation standard and distribution of models as of Oct 2013

Star Rating	EE standard achievement rate
****	246% and above
****	198% \sim below 246%
***	149% \sim below 198%
**	100% \sim below 149%
*	Below 100%





Overview of consumer labeling programs in major countries

Country	United States	EU	Japan	Brazil	United States
Program Name	ENERGYGUIDE Label	EU Energy Label	The Act on the Rational Use of Energy	Programa Brasileiro de Etiquetagem – PBE	ENERGY STAR
Participation Category	Mandatory	Mandatory	Mandatory	Mandatory	Voluntary
Label type	Comparative	Comparative	Comparative	Comparative Label	Endorsement
Implementing Agency	FTC (Federal Trade Commission) is responsible for the operation of labeling for household equipment. The US Department of Energy has developed test methods and minimum energy efficiency standards. Also responsible for the performance display for business equipment.	The European Commission	Ministry of Economy, Trade and Industry (METI)	Instituto Nacional de Metrologia, Qualidade e Tecnologia (INMETRO) (National Institute of Metrology, Quality and Technology)	United States Environmental Protection Agency and the US Department of Energy is responsible for developing test methods.
Law or orders	United States Code Title 42 – The Public Health and Welfare Chapter 77 – Energy Conservation Subchapter III – Improving Energy Efficiency Part A – Energy Conservation Program for Consumer Products Other Than Automobiles Section 6294: Labeling	Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products	The Act on the Rational use of Energy	the Energy Efficiency Act, Energy Performance Standards	United States Code Title 42 – The Public Health and Welfare Chapter 77 – Energy Conservation Subchapter III – Improving Energy Efficiency Part A – Energy Conservation Program for Consumer Products Other Than Automobiles Section 6294a: Energy Star program
Features	 Istarted from 1980 Label information(main items) producers' name model number specification estimated annual electricity charges for other models of the same item (maximum & minimum) estimated annual electricity charges for other models of the same item 	1.Started from 1994 2.Label information(main items) -producers' name -model number -specification -energy efficiency grade(~10) -estimated annual electricity consumption	Image: Constraint of the second se	<complex-block></complex-block>	 The base color is 100 cyan. Black or white inversion is alsao possible. Energy star Energy star Energy star

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Key Success Factors

Factor	Description
1. Cooperation among related parties	Cooperation among the government, companies and associations, absorbing the view of various stakeholders, openness and transparency, understanding the future technologies and the market trend for establishing the standards
2. Corporate culture and vision	The highest priority issue for Japanese companies is to achieve the greatest energy efficiency for their products, which matched the concept of the Top Runner Program.
3. Development stage of the market and the industrial structure	The number of major manufacturers is 10 at the maximum. They have experience and the same level of technical capabilities. It was possible to promote competition using the Top Runner Program.
4. Pressure from consumers	Consumer confidence in a manufacturer deteriorates if a company fails to achieve the standards or reports false data, negatively affecting the company's business. Therefore, manufacturers are required to be compliant with the standards.
5. High energy prices	Another factor is high energy prices and a relatively short period required to recover the investment.





1 How energy-saving products spread in Japan

(3) Some points of discussion
 -Difference in between TRP and MEPS
 -Future tasks of the TRP to be streamlined





Top Runner Method (TR) and Minimum Energy Performance Standard Method (MEPS)

Thanks to using the shipment volume weighted average energy consumption efficiency to judge the standard achievement status, Top Runner Program can encourage energy efficient products to increase the number of shipment volume while keeping the diversity of product models in the market.

	Top Runner Program	MEPS Program
Feature	Fostering an energy efficient market	Protecting the market from inefficient products
Evaluation method	Judging the achievement status category by category for each business operator using weighted average energy consumption efficiency value.	Judging the achievement status model by model using energy efficiency value of each model.
Effect / Mechanism	 Encouraging energy efficient models to increase the shipment in the market. Accommodating the various market needs, which value features other than energy efficiency. 	 Inefficient models are ruled out of the market, whose energy efficiency values do not meet the MEPS. Models sold in the market are all meeting the standard.
Concerns / Difficulties	 Difficult to develop / revise the standard for assessing the future technological development. Since achievement status is judged only after the target fiscal year, it may interfere active development of further energy efficient technologies. 	 Difficult to revise the standard for, e.g. protecting domestic manufacturers in stage of growth keeping the availability of lower-price models Tendency to increase the models just slightly better than the standard.



Future Direction of Top Runner Program and Labeling Program

In 2017, studies are under way to enhance the effect of Top Runner Program and Labeling Programs, while considering the energy usage at home, the market status & trends, and issues & difficulties of the programs.

Agenda

The current measuring methods are not good at evaluating new technologies (e.g. IoT), with which energy conscious operations according to the usage environment can be realized. Thus, such incongruity may not promote these technological developments sufficiently.

Direction of Study

Studies shall be carried out to review measuring methods reflecting the actual usage, which is able to evaluate new energy efficient technologies properly.

- Not enough incentives for an early or substantial level of standard achievement may interfere with the acceleration of technological development.
- The current labeling programs are not well coping with the recent diversified forms of distribution including internet retailing. Thus, it is possible that they do not appeal energy efficiency performance of products sufficiently to consumers.

- Countermeasures shall be reviewed, such as calling for the report submission in advance of target fiscal years, incentives for early achievement, etc.
- Studies shall be carried out to review the possibilities of labeling systems flexible to the various forms of distributions. Also, the study shall review various labeling styles with a higher appealing power to consumers, etc.





2 Findings from surveys on S & L system in Japan

(1) Label display information that may lead to purchase motivation (ECCJ)

- (2) The effects of behavioral changes through information provision in the label esp. effect of annual electricity charges(MURC)
- (3) Cost-benefit analysis of Top Runner Program(RIETI)





Outcome of the researches

1. Label display information that may lead to purchase motivation (ECCJ)

- (1) Some cases were compared from the viewpoint of nudge effect.
- (2) Outcome was estimated annual electricity charges showed most realistic and effective nudge effect.

2. The effects of behavioral changes through information provision in the label esp. effect of annual electricity charges(MURC)

- (1) Experience of purchasing air conditioners and female consumers tend to increase the selection rate of energy-saving products by referring to the electricity cost information.
- (2) Even when comparing annual income of less than 3 million yen and annual income of 8 million yen or more, there was no significant difference in improving the purchasing rate of energy-saving products by providing energy-saving information

3. Cost-benefit analysis of Top Runner Program (RIETI)

- (1) Benefits outweighed the costs to find that annual merit of the policy is about 180 billion yen and a CO2 reduction effect of about 25 million tons.
- (2) Electric refrigerators, lighting equipment, air conditioners, VTRs, etc. have a relatively long usage time, and there is a lot of room for energy savings due to technically improved energy efficiency. For these devices, the direct benefits of electricity savings outweigh the additional costs of complying with regulations and have the benefit of reducing CO2, for that the "Top Runner Program" is evaluated to be a cost-effective policy measure.





Summary

1. The background of energy-saving products dissemination in Japan

- (1) In Japan, both personal consumption and the number of households have consistently increased over the years, but energy consumption in the household sector has been on the decline since around 2000 due to the energy efficient home appliances backed up by the S & L systems.
- (2) Japan's S & L System consists of the Top Runner Program and the relevant labeling program under the umbrella of the ACT on the Rational Use of Energy.
- (3) The Top Runner Program is unique in that the calculation of performance index values is a weighted average for each relevant product shipped. Furthermore it's success can be attributable to the public and private efforts to foster consumers' mindset focusing on raising energy-saving consciousness throughout the society.

2. Findings from surveys on S & L system in Japan

- (1) Japan's energy saving label is a comparable labelling like the ones in Europe and the United States, but it could be characterized by the comprehensive capabilities combined with the Top Runner Program.
- (2) In Japan, it is estimated that the higher a person has an energy consciousness by some background, he/she tends to purchase the more energy-efficient products by a nudge effect shown by the label information such as annual electricity charges on the label. This tendency is higher in the case of women and people who have experience to buy energy effective products in the past.
- (3) According to the simulation, it is estimated that the Top Runner Program has an economic merit of about 180 billion yen per year and a CO2 reduction effect of about 25 million tons per annum due to energy saving realized by it.





Thank You Very Much



For More Information;

The Energy Conservation Center, Japan <from 1996> https://www.eccj.or.jp

Asia Energy Efficiency and Conservation Collaboration Center (Established in April 2007)

https://www.asiaeec-col.eccj.or.jp

Japanese Business alliance for Smart Energy-Worldwide (Established in October 2008)

https://www.jase-w.org/

SEforALL (Sustainable Energy for All) (Established in September 2015) https://seforallateccj.org/



The Symbol of Energy Conservation Since 2005ECCJ has been spread the symbol mark with the visual image of a flour-leaf clover which is thought to bring happiness named as "SMART CLOVER", representing everyone's energy conservation activities.

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