

Japan's Energy Management Policy Experiences and Their Implications for Developing Countries[♦]

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Summary

Japan recognized the importance of energy conservation promotion for energy security through two oil crises and has aggressively proceeded with energy conservation measures. Meanwhile, as global warming fears have recently grown worldwide, the role of energy conservation as a global warming prevention means has attracted attention.

Particularly, energy conservation effects of energy consumption management have been internationally recognized. For example, the importance of these effects was discussed in the International Energy Agency's 25 recommendations announced toward the Group of Eight Toyako Summit in 2008.

Energy management systems have existed in Japan since before World War II. For more than the past half century, Japan has flexibly modified and gradually improved these systems in response to situational changes. For example, the initial energy management policy indirectly called for energy conservation promotion by encouraging business operators to make voluntary energy-saving efforts and become more conscious about energy conservation. In response to the two oil crises in the 1970s and the growing needs for global warming prevention measures in the 1990s, however, the present policy more directly calls for energy conservation by emphasizing the improvement of energy efficiency and the reduction of energy consumption. Japan has thus improved its energy management policy in response to situational changes over more than half of the past century.

But developing countries can build on Japan's policy changes and create energy conservation promotion systems without consuming as much time as Japan. Of course, developing countries have various social, economic and political situations and various energy supply/demand characteristics. Japanese systems can not necessarily be transferred to all developing countries without modifications. From the viewpoint of "the advantage of backwardness¹," however, it may

♦ This study is a part of energy conservation policy assessment surveys under a project for supporting the creation of energy conservation systems, as financed by FY 2008 subsidies from the Ministry of Economy, Trade and Industry for international energy use rationalization measures and the like. We have recently received a METI permit to publish this study. In implementing this study, we interviewed a total of 50 experts (from private enterprises, local governments, industry groups and the academia) who have been deeply involved in Japan's energy management policy. METI officials' understanding and these experts' cooperation have been indispensable for our creation and publication of this report. We here would like to thank the METI officials and experts.

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¹ The advantage of backwardness theory is an economic growth theory proposed by British economist Alexander Gershenkron, meaning that developing countries can take advantage of technologies and knowledge developed by industrial countries and their development policy experiences from early stages to achieve rapid economic development.

be useful for future energy conservation policy to create systems meeting specific national conditions based on Japan's experiences.

In this report that focuses on Japan's energy management policy, Chapter 1 systematically puts in order historical changes of the policy and reports surveys about the actual implementation of relevant systems. Chapter 2 sets up a theoretical hypothesis on the implementation of the designated energy management factory system based on research and analysis results given in Chapter 1 and puts in order findings through interviews and other case study analyses to reach a conclusion. Using such traditional policy science research method, the chapter assesses the system. Finally, Chapter 3, based on analyses in Chapters 1 and 2, compiles implications for policy planning in developing countries where energy demand is expected to increase.

1. Japan's Designated Energy Management Factory System

Japan has continued efforts to rationalize energy consumption through the two oil crises in the 1970s. Specifically, Japan established the Act concerning the Rational Use of Energy (hereinafter referred to as the "Energy Conservation Act") in 1979 in order to "secure the effective utilization of fuel resources according to the economic and social environment concerning energy in and outside Japan" and "take the measures required for comprehensively promoting the rational use of energy with regard to factories, buildings, and machinery and equipment." The Energy Conservation Act features basic principles calling for efforts to promote the rational use of energy (conserve energy). Particularly, the Act requires factories and other workplaces with energy consumption above a certain level to make regular energy consumption reports and appoint energy management experts and provides incentives and penalties to encourage them to meet the requirements. Between the second half of the 1960s and the beginning of the 1970s before the first oil crisis, the industry sector accounted for more than 60% of final energy consumption in Japan. Therefore, the energy consumption management at these factories and other workplaces has had to play a very great role in promoting energy conservation measures in Japan.

Chapter 1 reviews the historical development of factory-related measures (hereinafter referred to as the designated energy management factory system) under the Energy Conservation Act and explains details of the system.

1-1 Historical Development of Japan's Designated Energy Management Factory System

1-1-1 Creation of Designated Energy Management Factory System

The present designated energy management factory system originated from the designated heat management factory system under the Heat Management Regulations (1947), the predecessor of the Heat Management Act. Under the regulations, 2,533 factories with annual fuel consumption at not less than 500 tons coal equivalent were designated as heat management factories. Generally, the establishment of the Heat Management Regulations has been interpreted as the start of Japan's energy conservation measures.

Fig. 1-1 indicates the chronology of Japan's energy conservation.

Fig. 1-1 Chronology of Japan's Energy Conservation

Japan has taken the global initiative in energy conservation against the backdrop of petroleum product price hikes through oil crises and the intensifying global competition.

< Chronology of Energy Conservation -- Japan has a 60-year history of energy conservation >

- 1947 **Heat Management Regulations created** Kinki Heat Management Association established
(Regional heat management associations founded in the next year)
- 1951 **Heat Management Act put into force** Central Heat Management Council established
- 1972 Rome Club publishes “the Limit of Growth”
Japan Thermal Energy Technology Association founded
- 1973 First Oil Crisis
- 1978 Energy Conservation Center of Japan created
- 1979 **Energy Conservation Act enacted and put into force** (electric utilities' efforts, judgment standards, creation of the factory designation system, manager appointment and recording requirements)
- 1979-80 Second Oil Crisis
- 1980 New Sunshine Plan launched
- 1992 **Earth Summit (Brazil, U.N. Framework Convention on Climate Change)**
- 1993 **Revised Energy Conservation Act enacted and put into force** (to establish the basic policy and regular reporting requirements)
- 1996 Environment management system established (JIS Q 1400) (ISO14001)
- 1997 **COP3 (Third Conference of Parties to UNFCCC, Kyoto Protocol)**
- 1998 **Revised Energy Conservation Act enacted (for implementation in April 1999)**
(to require presentation of medium to long-term plans and designate Type 2 energy management factories with energy manager appointment and recording requirements)
- 2002 **COP8 (New Delhi, India) 2001: IPCC TAR**
Revised Energy Conservation Act enacted (for implementation in April 2003)
(to repeal restrictions on sectors for Type 1 designated energy management factories, subject all sectors to the designation and require Type 2 factories' regular reporting, Type 1 factories' medium to long-term plan presentation and participation of their energy managers)
- 2005 **Kyoto Protocol put into force (February 16)**
Revised Energy Conservation Act enacted (for implementation in April 2006)
(to integrally manage heat and electricity)

- 2008 Kyoto Protocol commitment period begins
 Revised Energy Conservation Act enacted (for implementation in April 2010)
 (enterprise-by-enterprise energy management, sector-by-sector benchmark
 establishment)
 Energy management system development launched (PC242 establishment)
 (ISO50001)

Sources : METI (2008), IEEJ additions to data given at the 11th meeting of the Energy Efficiency Standards
Subcommittee under the Advisory Committee for Natural Resources and Energy

1-1-2 Establishment of Heat Management Act

The Heat Management Regulations were based on the Temporary Materials Supply and Demand Control Act that was to expire in March 1950 and developed into the Heat Management Act for the implementation in 1951. Although there were Type A designated heat management factories (with annual fuel consumption at not less than 1,000 tons coal equivalent) and Type B (at between 500 and 1,000 tons) under the Heat Management Regulations, the Heat Management Act required the minister of international trade and industry to designate factories and other workplaces with annual fuel consumption at not less than 1,000 tons² as heat management factories. The number of designated heat management factories increased from 1,691 upon the establishment of the Act in 1951 to 3,086 at the end of FY 1974.

1-1-3 Establishment of Energy Conservation Act (Act Concerning the Rational Use of Energy)

The Energy Conservation Act was established in 1979 as a comprehensive energy conservation policy act that added fiscal, financial and tax measures for factories, buildings and equipment to the Heat Management Act. The purpose of the Energy Conservation Act is “to contribute to the sound development of the national economy by setting up necessary measures for the rational use of energy by factories, buildings, machinery and equipment, and other necessary measures, etc. for promoting comprehensively the rational use of energy in order to ensure the effective use of fuel resources which will meet the economic and social environment of energy at home and abroad, in consideration of the energy situation for Japan that has no choice but to depend on imports for most of its fuel resources.”

The Energy Conservation Act was established amid an oil crisis³. Japan had to take emergency measures in response to the oil crises. Oil and electricity consumption conservation and regulations were implemented under two oil acts (the Petroleum Supply and Demand Optimization Act⁴ and

² Under the Heat Management Act, the calorific value of standard coal was set at 6,000 kilocalories per kilogram. Under the Energy Conservation Act established in 1979, the calorific value of 10 million kilocalories was equivalent to 1.06 kiloliters in crude oil. Therefore, 1,000 tons coal equivalent amounts to 636 kiloliters oil equivalent.

³ The fourth Middle East War outbreak in October 1973 triggered the first oil crisis. The second oil crisis came on the 1978 Iranian revolution and the Iran-Iraq War outbreak in 1980.

⁴ The Petroleum Supply and Demand Optimization Act was established in 1973 to optimize oil supply and demand by taking measures to secure optimum oil supply and save oil consumption for the stabilization of people's lives and the smooth management of the national economy when Japan's oil supply is substantially short.

the Act on Emergency Measures for National Life Stabilization⁵), the Electric Business Act⁶, etc. The Ministry of International Trade and Industry (hereinafter referred to as MITI) had put forward a resources and energy conservation policy in “Trade and Industry Policy for the 1970s – Industry Structure Council.” But the policy’s materialization came after the first oil crisis. MITI then tackled energy conservation measures as part of emergency oil-related measures under the oil crisis and the industrial structure policy. Table 1-1 indicates a process from the first oil crisis to the establishment of the Energy Conservation Act. The process for the development of the energy conservation policy and act to the second oil crisis can be divided into three periods: (1) energy conservation policy preparation period, (2) energy conservation policy promotion period and (3) energy conservation policy implementation period.

(a) Energy conservation policy preparation period (1971-1976)

In its “trade and industry policy for the 1970s” released in 1971, MITI stated that Japan should shift to a knowledge-intensive industrial structure as energy resources consumption was expected to increase rapidly in the 1970s. In response to the first oil crisis, the government tackled oil and electricity consumption cuts for the immediate future and decided to work out and implement an energy conservation policy as a fundamental measure.

The “trade and industry policy for the 1970s” called for the necessity of promoting a resources and energy conservation policy in a pioneering manner in 1971. But the policy itself was put into practice after the oil crisis. In response to the first oil crisis, emergency measures including administrative guidance were implemented under the “outline of emergency oil measures” and the “two oil acts.” Although the first oil crisis came as a surprise, administrative guidance on oil crisis responses was implemented with specific quantitative targets given within a relatively short period of time.

The following discusses the then energy conservation policy developments:

⁵ The Act on Emergency Measures for National Life Stabilization was established in 1973 to provide for emergency measures for adjusting prices and supply/demand of materials related closely to people’s lives and those important for the national economy in response to sharp price hikes and other abnormal developments in Japan’s economy in order to secure the management of the national economy.

⁶ The Electric Business Act was established in 1964 to protect interests of electricity users and secure the sound development of the electric business through the rational management of the electric business and to secure public safety and environmental conservation by regulating the construction, maintenance and operation of electric facilities. Under the act’s Article 27 (restrictions on electricity consumption), the minister of international trade and industry (then) can restrict consumption of electricity supplied by general electric utilities by setting ceilings on electricity consumption and maximum electricity consumption, electricity uses and dates for suspension of electricity consumption, and can regulate electricity receipts from general electric utilities by setting electricity-receiving capacity ceilings, as far as necessary, when electricity supply shortages are identified as likely to affect the national economy and hurt public interests without electricity supply/demand adjustments.

**Table 1-1 Process from the First Oil Crisis to the Establishment
of the Energy Conservation Act**

Date		Policy	Development (or decision-making body)
1971	May	Trade and industry policy for the 1970s -- an interim report by the Industrial Structure Council	Industrial Structure Council
1973	Nov 16	Outline of emergency oil measures	Cabinet decision
	Dec 12	Petroleum Supply and Demand Optimization Act, Act on Emergency Measures for National Life Stabilization	Promulgation and implementation
1974	Apr 16	Immediate emergency measures	Headquarters for Emergency Measures for Stabilization of National Life (Cabinet approval)
		Interim report on promotion of resources and energy conservation policy	MITI planning committee, rational use committee, waste recycling committee
	May	Basic direction of energy conservation policy	MITI research panel on resources and energy conservation policy
	Jun	Policy for establishing the act promoting the rational use of energy (tentative name)	MITI
	Jul 25	Interim report by Coordination Subcommittee, Advisory Committee for Natural Resources and Energy	Coordination Subcommittee, Advisory Committee for Natural Resources and Energy
	Sep 3	Key points of immediate resources/energy conservation measures	Decision by the headquarters for movements to value resources and energy
Details for implementation of "key points of immediate resources/energy conservation measures"		Decision by the headquarters for movements to value resources and energy	
1975	Jan	Outline of the act promoting the rational use of energy (tentative name)	General Affairs Division, Agency for Natural Resources and Energy
	Jan	Preparation of the bill for the act promoting the rational use of energy	MITI
	Aug 15	1975-1984 energy stabilization policy – choices for stable supply	Advisory Committee for Natural Resources and Energy
	Nov 10	Energy conservation policy	MITI
1976	Dec 19	Basic direction of comprehensive energy policy	Approval at a ministerial conference on comprehensive energy measures
	Mar 29	Future energy conservation policy implementation	Decision by the headquarters for movements to value resources and energy
1977	Nov	Energy Conservation Act (tentative name) consideration started	MITI
	Feb 14	MITI creates the "headquarters for promoting comprehensive energy measures"	MITI decision
		Creation of the ministerial conference on the promotion of comprehensive energy measures	Oral Cabinet approval
	May 30	Policy on establishment of an energy conservation promotion act (tentative name)	MITI
	Jun 6	Long-term energy supply/demand outlook	Planning Committee, Energy Supply and Demand Subcommittee, Advisory Committee for Natural Resources and Energy
		Decision on establishment of an energy conservation promotion act	Ministerial conference on the promotion of comprehensive energy measures
	Jun 7	Creation of the Energy Efficiency and Conservation Subcommittee at the Advisory Committee for Natural Resources and Energy	MITI
		Interim report on the "basic direction of the energy conservation policy"	Energy Efficiency and Conservation Subcommittee at the Advisory Committee for Natural Resources and Energy
Nov 25	Report on "energy conservation policy necessity and problems"	Energy Efficiency and Conservation Subcommittee at the Advisory Committee for Natural Resources and Energy	
	Creation of the "committee for promotion of energy/resources conservation measures"	Cabinet decision	
1978	Jan 23	Immediate policy	Approval at the committee for promotion of energy/resources conservation measures
	Feb 20	"Act concerning the Rational Use of Energy" (initial draft)	Agency for Natural Resources and Energy
	May 12	"Act concerning the Rational Use of Energy"	Cabinet decision
1979	Jun 22	"Act concerning the Rational Use of Energy"	Promulgation
	Oct 1	"Act concerning the Rational Use of Energy"	Implementation

Source : Prepared by IEEJ from History of Trade and Industry Policy (1991)

- Industry sector's energy conservation measures in the "trade and industry policy for the 1970s" (1971)
 - Promoting the improvement of energy consumption efficiency through technology development, etc.
 - Promoting the rational use of energy
 - Enhancing the management system for energy conservation
- "Outline of the Act Promoting the Rational Use of Energy (tentative name)" (1974)
 - Basic objectives
 - Implementation plan
 - Energy consumption reports, etc.
 - Energy manager
 - Joint energy use plans
- Industry sector's energy conservation measures in the "1975-1984 energy stabilization policy – choices for stable supply" (1975)
 - Energy management improvement measures taken at factories without money
 - Improvement of equipment for energy conservation purposes
 - Adoption of larger and more sophisticated equipment
 - Others (including collection and recycling of scrap metal, used paper and other wastes, and correction of excessive quality)
- "Basic direction of comprehensive energy policy: 5. Promotion of energy conservation policy (excerpts)" (1975)

The government should enhance and expand its ongoing energy conservation guidance and promote the development of an energy-saving industrial structure/lifestyle through the construction of relevant infrastructure from a long-term viewpoint.

 - (i) The industry sector should promote the improvement of energy management and the introduction of energy-saving equipment
 - (ii) Consumer and commercial sectors (skipped)
 - (iii) Transportation sector (skipped)
 - (iv) Promoting effective utilization of untapped energy sources including waste heat at factories
- Industry sector's energy conservation measures in the "future energy conservation policy implementation" (1976)

"The headquarters for movements to value resources and energy" implemented energy conservation measures based on the "key points of immediate resources/energy conservation measures," the "details for the implementation of the key points of immediate resources/energy conservation measures" and the "immediate conservation of oil, electricity and other energy consumption in industry, government and consumer sectors" in 1974, and the "supplement to how to proceed with the immediate conservation of oil, electricity and other energy consumption in industry, government and consumer sectors" in 1975. As the world energy situation eased later, the headquarters decided on "how to proceed with energy conservation policy in the future" from a long-term viewpoint.

- Entire production sector
 - Base energy intensity improvement and other targets on the industry sector's category-by-category energy conservation targets in the "1975-1984 energy stabilization policy – choices for stable supply," a recommendation by the Advisory Committee for Natural Resources and Energy (Table 1-2)
- Large-lot users: Traditional measures should be continued in and after 1976.
 - Advanced submission of energy consumption conservation plans and ex-post presentation of actual consumption reports (every fiscal year)
 - Guidance regarding the above should be given as necessary
- Improvement of heat management equipment and technology (explained later)
- Technology development for resources/energy conservation (skipped)
- Diffusion of resources/energy-saving equipment and production processes (skipped)
- Common measures for all sectors: Establishment of "Energy Conservation Month" (February) and "Energy Conservation Day" (February 1)

Moves then intensified to enact Act Promoting the Rational Use of Energy. But a bill for the act failed to be submitted to the Diet as the reconsideration of comprehensive energy policy⁷ gained momentum and covered energy conservation.

Table 1-2 Industry Sector's Category-by-Category Energy Conservation Targets

		Demand (Unit:10 ¹³ kcal)			
		FY 1973	FY 1985		Energy conservation rate (%)
			(Before conservation)	(After conservation)	
Industrial category	Paper/pulp	9.9	21.1	20.0	4.9
	Chemicals	52.3	101.9	94.0	7.8
	Ceramics, clay and stone products	15.1	32.5	28.6	12.2
	Iron and steel	75.5	129.1	114.8	11.1
	Nonferrous metals	6.4	12.2	11.5	6.6
	Total for energy-intensive categories	159.3	296.9	268.9	9.4
	Other categories	64.0	137.7	135.8	1.4
Total for industry sector		223.3	434.6	404.6	6.9
Measures	Energy management improvement				2.6
	Equipment improvement for energy-saving purposes				2.5
	Introduction of larger/sophisticated production equipment				1.7
	Others				0.1

Source : Prepared by IEEJ from MITI (1975)

⁷ The comprehensive energy policy reconsideration means the creation of the system of oil dependence reduction measures including (1) securing stable oil supply (2) promoting development and introduction of alternative energy sources and (3) promoting energy conservation to establish energy security in response to the oil crisis.

(b) Energy conservation policy promotion period (1975-1978)

The government made efforts to enact the act promoting the rational use of energy in 1974. But it fell short of having the act enacted in the year. Nevertheless, some part of the proposed act was realized to implement tax and loan systems for energy conservation in 1975. In 1978, the government launched the Moonlight Program and created the Energy Conservation Center of Japan.

The energy conservation tax and loan systems included “the special depreciation system for equipment for the effective use of energy resources” that started in 1975. This system has developed into the present “Tax System for Promotion of Investment in Improvement of Energy Supply and Demand Structure.” These energy conservation tax and loan systems have triggered the industry sector’s large-scale investment in energy-saving equipment and served as the driver of the sector’s energy conservation promotion.

The following discusses the then energy conservation policy developments:

➤ Launching energy conservation policy (1975)

After the energy conservation policy preparation period, the energy conservation policy system was divided into the following three:

- Promoting the rational use of energy
- Promoting the development of energy conservation technologies
- Promoting public relations operations

The following policy measures were implemented:

- Loans and tax incentives for investment in energy-saving equipment
- Information

Based on the above “future energy conservation policy implementation,” the policy priority shifted from consumption conservation to the efficient use of energy.

➤ Creation of the committee for promotion of energy/resources conservation measures (1977)

In order to promote and implement energy/resources conservation measures comprehensively and effectively, the government made a Cabinet decision to reorganize the “headquarters for movements to value resources and energy” into the “committee for promotion of energy/resources conservation measures.” In 1978, the committee approved the “immediate policy” to continue traditional policy measures.

(c) Energy conservation policy implementation period under 2nd oil crisis (1978-1982)

As the oil situation plunged into turmoil on Iran’s Islamic revolution in the autumn of 1978, the government implemented a 5% oil consumption reduction program (1979) to cut energy consumption by more than 15 million kiloliters oil equivalent, based on an agreement at the International Energy Agency⁸.

⁸ With the objective to establish security for energy including oil and an energy supply/demand structure that is stable and sustainable over a medium to long term in its member countries (OECD countries meeting the oil reserve standard), the International Energy Agency develops measures for emergencies including oil supply cutoffs, collects

The government then took advantage of the first oil crisis experiences to adopt longer-term measures, implementing the 5% oil consumption reduction program (with a reduction target at 15 million kl) in 1979, a 7% oil consumption reduction program (with a target at 20 million kl) in 1980 and another oil consumption reduction program (with a target at 25 million kl) in 1981. The government achieved these oil consumption reduction targets even as Japan's annual real GDP growth stood around 5%. These programs were designed primarily for the consumer and transportation sectors. But the main energy conservation driver was the industry sector, which was apparently supported by the expansion of investment in energy-saving equipment under the above energy conservation tax and loan systems, the guideline for technologically and economically feasible energy conservation measures based on the Energy Conservation Act, and human resources development effects of the energy manager qualification system.

The following discusses the process for planning the Energy Conservation Act, although the process started before the energy conservation policy development period:

➤ “Energy Conservation Act” planning process

In November 1976, MITI began to consider establishing an Energy Conservation Act in anticipation of crude oil price hikes and a tighter electricity supply/demand relationship.

【Policy for considering establishing an Energy Conservation Act】

- A government-private sector energy conservation conference should be created to set energy conservation targets for each industrial category every fiscal year.
- Government guidance and regulations on efficient fuel use should be toughened.
- The act should cover such energy conservation measures as subsidies to promote the development and commercialization of untapped energy sources including waste heat at factories.

【Moves to establish an Energy Conservation Act】 (1977-1978)

- Creation of the ministerial conference on the promotion of comprehensive energy measures
- “Long-term energy supply/demand outlook” compiled by the Energy Supply and Demand Subcommittee of the Advisory Committee for Natural Resources and Energy
- Creation of the Energy Efficiency and Conservation Subcommittee at the Advisory Committee for Natural Resources and Energy and the subcommittee's report on the “necessity of energy conservation policy and problems”
- Preparation of a draft “act concerning the rational use of energy” by the Agency for Natural Resources and Energy⁹
- Cabinet decision on the “bill for the act concerning the rational use of energy”

and analyzes oil market information, promotes energy conservation and alternative energy development and utilization to reduce dependence on imported oil, and steps up cooperation with non-IEA countries through regular meetings of its Executive Board and Standing Committees. The IEA was created as an agency within the OECD framework in response to a proposal by then U.S. Secretary of State Henry Kissinger in 1974 after the first oil crisis.

⁹ This initial draft featured strong regulations. But the draft act was modified later to give priority to guidance on the private sector's voluntary efforts because legal bases and the reasonability of regulations and requirements were doubted. Reports on energy consumption results/plans and equipment, energy managers and reporting requirements with penalties in the initial draft were realized through a series of revisions (see 1-1-4 and 1-1-5).

- Establishment of the “Energy Conservation Act” (1979)
 - 【Major factory-related measures upon the act’s establishment】
 - Proposing specific guidelines for energy conservation measures
 - Designating massive energy-consuming factories as energy management factories (regarding heat and electricity)
 - Energy manager appointment requirement
 - Energy consumption recording requirement
 - Recommending energy conservation measures as necessary
- Enforcement of the “Energy Conservation Act” under the second oil crisis

Through the 7% oil consumption reduction program (with the reduction target of more than 20 million kl) in 1980 and the FY 1981 oil consumption reduction program (with the target of more than 25 million kl), the government enhanced the oil consumption reduction further. While these programs made great achievements, metal machinery manufacturers continued to expand energy demand (Table 1-3). This trend indicated Japan’s industrial structure changes.

Table 1-3 Japan’s Final Energy Consumption Trends (FY 1978-1982)

FY	1978	1979	1980	1981	1982	10 ¹⁰ kcal		
						1980/1979 (%)	1981/1979 (%)	1982/1989 (%)
Industrial materials manufacturers	107,304	110,283	99,240	91,518	85,684	90.0	83.0	77.7
Iron and steel	44,354	46,743	44,766	41,607	38,090	95.8	89.0	81.5
Chemicals	39,717	39,649	32,645	29,460	28,378	82.3	74.3	71.6
Ceramics, clay and stone products	14,210	14,389	13,357	12,466	11,362	92.8	86.6	79.0
Paper/pulp	9,023	9,502	8,472	7,985	7,859	89.2	84.0	82.7
Other manufacturers	34,544	34,268	33,738	34,617	32,618	98.5	101.0	95.2
Food and tobacco	4,608	4,620	4,561	5,075	4,487	98.7	109.8	97.1
Textiles	6,209	5,300	4,891	5,848	5,554	92.3	110.3	104.8
Nonferrous metals	4,279	4,609	4,411	3,562	2,991	95.7	77.3	64.9
Metal machinery	4,409	4,454	4,653	5,789	5,675	104.5	130.0	127.4
Others	15,039	15,288	15,222	14,343	13,911	99.6	93.8	91.0
Total for manufacturers	141,848	144,549	132,978	126,135	118,302	92.0	87.3	81.8
Total for nonmanufacturers	13,218	13,403	13,160	12,656	11,827	98.2	94.4	88.2
Total for industry sector	155,066	157,952	146,139	138,792	130,130	92.5	87.9	82.4
Consumer sector	57,163	58,449	56,482	57,176	57,440	96.6	97.8	98.3
Transportation sector	53,638	55,690	55,003	54,312	54,628	98.8	97.5	98.1
Non-energy demand	7,447	7,487	6,917	6,752	6,638	92.4	90.2	88.7
Total	273,313	279,578	264,541	257,030	248,832	94.6	91.9	89.0

Source : Prepared by IEEJ from EDMC statistics

In FY 1979 and 1980 after the Energy Conservation Act's enactment, energy consumption reports were collected from all designated energy management factories. At the end of May 1981, 2,265 factories were designated for heat management and 2,212 for electricity management.

(d) Significance of the Energy Conservation Act's establishment

The government gave up the establishment of an Energy Conservation Act in the energy conservation policy preparation period (1971-1976), one of the three energy conservation policy and act development periods, and achieved the establishment in the energy conservation policy implementation period (1978-1982). This indicates that a combination of the heat management act and other traditional acts was fully able to meet the energy conservation needs in a limited period of time for responding to the oil crisis. But the establishment of the Energy Conservation Act was significant from the viewpoint of not only the energy conservation policy but also the comprehensive energy policy. Given that Japan has smoothly promoted global warming measures, we can conclude that the establishment of the Energy Conservation Act as a comprehensive energy conservation policy¹⁰ at that time has been useful. In 1975 during the energy conservation policy promotion period, the government implemented fiscal, financial and tax measures on the precondition of the Energy Conservation Act's establishment. In this sense, we can conclude that the establishment of the Energy Conservation Act has been greatly significant.

But no act to define the comprehensive energy policy¹¹ that has been more important had been established before the 2002 Basic Act on Energy Policy was enacted. This act provides for three basic principles, "securing stable energy supply," "harmonizing energy policy with environment policy" and "utilizing market principles," with full considerations given to the first two principles.

1-1-4 Addressing Global Environmental Problems

As the U.N. Conference on Environment and Development, known as the Earth Summit, took place in Rio de Janeiro in June 1992, interests grew further in global environmental problems¹². In June 1994, the U.N. Framework Convention on Climate Change was promulgated. Table 1-4 shows a chronology of developments regarding global environment problems from 1990 to 1998 when the Energy Conservation Act was revised.

¹⁰ The act covered fiscal, financial and tax measures for building, machinery and equipment areas as well as energy management. The act was revised in 2005 to cover the transportation sector as well.

¹¹ Japan's energy policy has adopted the simultaneous achievement of three Es – energy security, economic growth and environmental protection—as the basic principle since the global environment issue emerged.

¹² In June 1990, Japan already decided to propose an Earth rehabilitation program to the world. In October 1990, it released the Global Warming Prevention Plan. In 1994, Japan offered the Basic Environment Plan, forming a sequence of the Basic Environment Act, the Basic Environment Plan and the Global Warming Prevention Plan.

Table 1-4 Chronology of Developments Regarding Responses to Global Environmental Problems

Year/month	Development
1990 July	An Earth rehabilitation plan proposed (at the Houston Summit)
January	Challenges to new energy trends (Interim report by the Advisory Committee for Natural Resources and Energy)
	Action Program to Arrest Global Warming
	Cabinet decision on alternative energy supply targets
1991 April	Keidanren Global Environment Charter
1992 June	U.N. Conference on Environment and Development (Earth Summit)
October	Request for cooperation in preparing voluntary plans on environment (made by the MITI minister to 87 major trade organizations)
January	Future energy and environment measures – 14 proposals for Earth rehabilitation pursuing an environment-economy-energy harmony
1993 June	Energy supply/demand structure enhancement act (revised Energy Conservation Act, revised alternative energy act, revised petroleum special account act)
	Energy conservation and recycling support act
July	Establishment of basic policy on Energy Conservation Act
1994 March	Effectuation of U.N. Framework Convention on Climate Change
June	Long-term energy supply/demand outlook
1995 April	COPI (Berlin mandate)
1996 July	Keidanren Environment Appeal
September	Establishment of environmental management system (ISO14001)
November	Joint Statement on Global Warming Prevention (Keidanren, Federation of German Industries)
December	Voluntary environmental action plan for each industrial category
1997 February	Revised Energy Conservation Act notice to set an annual average improvement target of 1% for energy intensity at factories
	Implementation of factory overhaul (1997~2000)
June	Keidanren Voluntary Action Plan on the Environment
July	Comprehensive Energy Saving Measures for 2000
December	COP3 (Kyoto Protocol)
1998 June	Climate Change Policy Program (adopted by the Global Warming Prevention Headquarters)
October	Revised Energy Conservation Act
	Establishment of Climate Change Policy Act

Source : Prepared by IEEJ from various materials

At their joint meeting in November 1992, three advisory panels – the Industrial Structure Council¹³, the Advisory Committee for Energy¹⁴ and the energy and environment subcommittee of

¹³ The Industrial Structure Council was created in 1964, based on the Ministry of International Trade and Industry Establishment Act and the MITI organization order. Upon a central government reorganization, it was reestablished with the same name maintained under Article 6 of the Ministry of Economy, Trade and Industry Establishment Act in January 2001 and has been overseen by the Industrial Structure Policy Division, Economic and Industrial Policy Bureau, METI. The council has 20 committees. Among them is the Environment Committee considering global warming.

¹⁴ The Advisory Committee for Energy was created in 1965, based on the Advisory Committee for Natural Resources and Energy Establishment Act. Upon the central government reorganization, the Advisory Committee for Natural Resources and Energy was established at the Agency for Natural Resources and Energy under Article 18 of the METI Establishment Act and has been overseen by the agency's General Policy Division. Regarding energy conservation, the committee has the Energy Efficiency and Conservation Subcommittee and the Energy Efficiency Standards Subcommittee.

the Industrial Technology Council¹⁵ -- adopted a report titled “future energy and environment measures -- 14 proposals for Earth rehabilitation pursuing an environment-economy-energy harmony.” The report touched on the need to combine the three key policies of environmental conservation, economic growth and energy supply/demand stabilization and concluded that Japan should take advantage of subsidization (including low-interest loans, tax incentives and subsidies) for a comprehensive approach¹⁶. It also noted that Japan for the immediate future had no choice but to tackle an energy supply/demand structure reform including (1) the promotion of energy conservation and (2) the promotion of non-fossil energy supply in order to secure harmony between the three Es -- environmental conservation, economic growth and energy supply/demand stabilization. The report urged the industry sector to take the following specific measures¹⁷.

- Improve energy intensity through such measures as energy conservation investment promotion and energy management enhancement at factories and the like
- Promote replacement of outdated general-purpose energy-consuming equipment
- Develop high-performance industrial furnaces and boilers

In line with the report, the energy supply/demand structure enhancement act¹⁸ and the energy conservation and recycling support act¹⁹ were established. The energy supply/demand enhancement act revised the Energy Conservation Act, the alternative energy act²⁰ and the petroleum special account act²¹.

¹⁵ The Industrial Technology Council was created in 1973, based on the MITI Establishment Act and the MITI organization order. It was overseen by the Planning and Research Division, General Coordination Department, Agency of Industrial Science and Technology. But the council was abolished upon the central government reorganization. At present, the Industrial Science Technology Policy Committee of the Industrial Structure Council studies and considers key points regarding industrial science and technology.

¹⁶ This report analyzed advantages and disadvantages of (1) the numerical regulation approach, (2) the tax and surtax approach and (3) the subsidization approach. Concluding that the first and second approaches were expected to seriously affect the economic society and trigger international industrial migration to cause an industrial hollowing-out in Japan and were not available for any immediate introduction in the absence of national consensus, the report selected the third approach.

¹⁷ On a basic concept of energy demand measures, the report called for promoting the rational use of energy in accordance with the three principles – (1) measures for all sectors, (2) from equipment to systems and (3) support for voluntary efforts.

¹⁸ The act concerning the development of relevant acts for enhancing energy supply/demand structure was not a new act. In response to the report by the Industrial Structure Council and two other advisory panels on future energy and environment measures, which recommended the promotion of environmentally harmonized business operations, the act was established to develop acts for enhancing energy supply/demand structure (through the revision of the three relevant acts).

¹⁹ The act on temporary measures for promoting business operations regarding the rational use of energy and the use of recyclable resources aims to promote the rational and appropriate use of resources and energy meeting new economic environments and contribute to the sound development of the national economy by taking measures required for promoting business operations regarding entities’ rational use of energy and certain materials and the use of recyclable resources in consideration of recent changes in resources and energy, environmental conservation and other conditions involving the Japanese economy. The act’s duration was first limited to 10 years and has been extended to last until the end of FY 2013 with support expanded substantially.

²⁰ The Act Concerning Promotion of the Development and Introduction of Alternative Energy was established in 1980 with the objective to ease the Japanese economy’s dependence on oil and contribute to the sound development of the national economy and the stability of the people’s lives by taking measures required for the comprehensive development and introduction of alternative energy sources for the purpose of reducing the dependence on oil in response to international energy situation changes including oil crises. Under the act, the government decided on alternative energy supply targets (for the Cabinet decision) and created the New Energy Development Organization (which has developed into the New Energy and Industrial Technology Development Organization, known as NEDO).

²¹ The act for the special account for coal, petroleum and alternative energy measures was revised and renamed the act for the special account for coal, petroleum and energy supply/demand structure enhancement. The original act was

The Energy Conservation Act was revised in March 1993 to improve energy intensity through the promotion of energy conservation investment and the enhanced management of energy at factories and other workplaces. The revised Energy Conservation Act created the requirements for advanced reports on factories subject to designation for energy management and regular energy management reports and toughened relevant penalties to secure the improvement. These measures encouraged enterprises and the industrial world to undertake voluntary and systematic efforts. At the same time, individual enterprises growingly prepared and submitted voluntary environmental action plans and acquired environmental management system (ISO 14001)²² certifications. These individual voluntary environmental action plans led to the preparation of a voluntary environmental action plan for each industrial category.

(a) 1993 revised Energy Conservation Act²³

The revision modified the purpose of the Energy Conservation Act and called for preparing a basic policy.

➤ Modification of purpose

- The act shifted from the Japanese energy security viewpoint to the three Es covering the global warming problem. Modification of purpose: from “in consideration of Japan’s energy situation where the nation has no choice but to depend on imports for most fuel resources” to “according to the economic and social environment concerning energy in and outside Japan.”
- From individual measures to comprehensive measures

➤ Preparation of basic policy: Energy consumers in all sectors should be encouraged thoroughly to make voluntary energy conservation efforts. The government should publish a basic policy to specify the direction of government measures. The basic policy may be a Cabinet decision or a MITI notice²⁴.

【Revision of measures involving factories】

➤ Factories were urged to prepare basic policies, to introduce equipment with excellent energy consumption efficiency, to establish management standards for operation,

established in 1967 to specifically separate a government account for fiscal steps regarding comprehensive measures taken for the coal mining industry’s restructuring, the relevant employment stabilization, the promotion of coal-producing regions and the restoration from coal mining damage. As the coal measures were abolished in 2000, the act was renamed the act for the special account for petroleum and energy supply/demand structure enhancement. In 2007, the special account and the electric power source development tax were integrated into the special account for energy measures.

²² The ISO 14001 standards are required for an environmental management system to continuously operate a mechanism to implement environmental performance improvements including reduced environmental loads of organized operations, goods and services. The standards are designed to allow entities to reduce environmental loads and prevent accidents by taking measures based on the concept of the PDCA (plan, do, check and act) cycle under TQM (total quality management) which is an older environmental management system than the ISO system.

²³ The revised act added the promotion of energy conservation technology development and introduction projects to the duties of NEDO.

²⁴ Since the basic policy was to be provided from the comprehensive energy viewpoint, the then MITI Minister who oversaw procedures to make a comprehensive energy policy and plan was destined to determine the basic policy. The basic policy was subjected to a Cabinet decision as various measures to be taken at various government agencies had to be integrated to promote energy conservation.

maintenance and inspection of equipment, to implement operations based on these standards and to expand comprehensive energy management arrangements.

- Revising judgment standards
 - Business entities were urged to set quantitative standards and a nonbinding target of cutting energy intensity by an annual average of 1% or more.
 - Calling for standards and targets
- Enhancing measures to secure effects of energy conservation efforts
 - Business entities' reports: Advanced reports on factories subject to designation for energy management
 - Requirement for regular reports
 - Tougher penalties: Instructions and orders regarding plans for the rational use of energy

1-1-5 Enhancing Responses to Global Warming

As the importance of efforts to address the global warming problem began to be recognized internationally in the 1990s, the U.N. Framework Convention on Climate Change was adopted at the United Nations in 1992 and took effect in 1994. In Japan, particularly, energy conservation was positioned as one of major global warming prevention measures. Since the 1990s, global warming prevention measures have been greatly influencing the energy conservation policy.

In an international development regarding the global warming problem, the third Conference of Parties to the UNFCCC in Kyoto in December 1997 reached an agreement, requiring Japan to reduce annual average greenhouse gas emissions between 2008 and 2012 by 6% from the standard year level. In response, Japan prepared the Climate Change Policy Program (old version)²⁵ in June 1998 and established the Act Concerning the Promotion of the Measures to Cope with Global Warming (hereinafter referred to as the Global Warming Prevention Act) in October 1998.

Meanwhile, Japan's final energy consumption in all sectors continued to increase in the 1980s and 1990s as Japanese lifestyles changed on the stability of energy prices at low levels and citizens' pursuit of affluence. Japan including its industry sector has promoted efforts to increase energy efficiency, achieving one of the world's highest efficiency levels. Nevertheless, energy

²⁵ This old-version program included the following measures regarding the promotion of carbon dioxide emission reduction on the energy demand side: (2) Tougher energy conservation standards – 4. Rational use of energy at factories and other workplaces: “By FY 2000, the government will thoroughly check whether or how energy conservation standards are observed at about 3,500 factories designated for massive energy consumption under the Energy Conservation Act. The government will also provide factories and other workplaces with instructions and advice on the rational use of energy. Factories and other workplaces whose efforts to promote the rational use of energy are insufficient will be instructed to prepare plans for the rationalization of energy consumption. Those failing to comply with such instruction will be subject to measures under the Energy Conservation Act.” (4) ex post facto review of action plans in the industrial world and the like: “The Japan Business Federation (Keidanren) and other industrial organizations, and individual companies have prepared voluntary environmental action plans, calling for energy conservation efforts such as the improvement of manufacturing processes, the enhancement of factory operation management, greater equipment efficiency, the collection of waste heat and the introduction of new technologies, as well as fuel shifts, waste recycling and other efforts to reduce carbon dioxide emissions. Relevant advisory panels will check the progress of these plans to secure their effectiveness. Industries that have not prepared such action plans may be encouraged to swiftly prepare and publish specific action plans including numerical targets within FY 1998.”

conservation stagnation grew remarkable as final energy consumption per GDP unit increased for four years to FY 1995. Since the 1990s, Japan has conspicuously been required to simultaneously address the burgeoning global warming problem and rising energy consumption.

(a) 1998 revised Energy Conservation Act

In February 1997, the Agency for Natural Resources and Energy issued a revised Energy Conservation Act notice to set an annual average improvement target of 1% for energy intensity at factories. In April 1997, the Council of Ministers for Promotion of Comprehensive Measures for Energy decided on the Comprehensive Energy Saving Measures for 2000, including the following measures for the industry sector:

- Introduction of a nonbinding quantitative target at each factory (to improve energy efficiency by 1% or more every year)
- Based on the decision, energy management was enhanced at factories designated under the Energy Conservation Act and an overhaul at Type 1 designated energy management factories was implemented over four years from FY 1997.

Under the Energy Conservation Act revised in October 1998, the designated energy management factory system, which had been limited to five categories of manufacturers, was expanded to designate factories and other workplaces (including large offices) with annual energy consumption at not less than 1,500 kl in terms of crude oil for heat or at not less than 6 million kWh as Type 2 energy management factories. As a result, about 6,400 workplaces including factories were newly designated for energy management under government supervision. Traditional designated energy management factories were called Type 1 designated energy management factories and required to prepare and submit medium to long-term plans, allowing the Japan Business Federation, or Keidanren, to securely follow up on voluntary environmental action plans.

● Outline of 1998 revised Energy Conservation Act²⁶

【Major revisions to factory-related measures】

- Revisions to judgment standards: equipment-by-equipment management, enhanced management of commercial building equipment (including air-conditioners, hot-water supply and lighting equipment, elevators and office machines), and introduction of a nonbinding target to reduce energy intensity by an average of 1% or more every year at each factory or establishment over a medium to long term.
- Creation of Type 2 designated energy management factories
 - Designation in all industrial categories
 - Requirement for energy managers to be appointed
 - Requirement for energy consumption to be recorded
- Requirement for Type 1 designated energy management factories to submit medium to long-term plans

²⁶ The so-called top-runner system was adopted for machines and instruments.

(b) 2002 revised Energy Conservation Act

Despite the implementation of these measures, energy consumption in the consumer and transportation sectors continued to increase due to changes in the lifestyles of affluence-pursuing citizens. At the same time, planning of nuclear plant construction was prolonged. Then, additional measures were required to achieve the greenhouse gas emission reduction target.

Over one year from July 2000, the Energy Efficiency and Conservation Subcommittee of the Advisory Committee for Natural Resources and Energy assessed energy conservation measures and compiled additional measures, revising the long-term energy supply/demand outlook. Existing energy conservation measures were estimated to save energy consumption by 50 million kl in terms of crude oil and additional measures by 7 million kl. The Climate Change Policy Program was revised (into a New Climate Policy Program)²⁷ in March 2002. The industry sector was then urged to take measures for achieving targets in voluntary environmental action plans, enhancing measures at Type 1 designated energy management factories (start a 2001 factory survey scheme), and following up on and assessing existing measures for Type 2 designated energy management factories. The program called for enhancing regulations under the Energy Conservation Act if these measures were not expected to produce sufficient results. Overall, the industry sector was projected to save energy consumption by 20.1 million kl²⁸.

Meanwhile, various changes were seen in the domestic and overseas situations for energy and environment problems. In June 2002, Japan established the Basic Act on Energy Policy²⁹. Under the act, the government reported the Basic Energy Plan to the Diet in October 2003.

The Energy Conservation Act was revised in June 2002 to enhance energy conservation in the consumer and commercial sectors. The revised act eliminated the limit on industrial categories for Type 1 designated energy management factories and led large office buildings and the like to introduce the same energy management system as large factories depending on their energy demand. As a result, the number of Type 1 designated energy management factories increased by about 1,000. In addition, Type 2 designated energy management factories were required to submit regular energy management reports, allowing the government to grasp energy consumption conditions more appropriately and take necessary measures. Before the revision, these factories had been required only to record energy consumption.

²⁷ The new program adopted a step-by-step approach, under which the period between 2002 and the end of the first commitment period was divided into three steps – the first step between 2002 and 2004, the second step between 2005 and 2007, and the third step for the first commitment period between 2008 and 2012. The approach is designed to qualitatively project the achievement of the 6% greenhouse gas emission reduction target in the first commitment period under the Kyoto Protocol through measures taken in the first step. The government was set to assess the progress in existing measures and actual emissions before the second and third steps and take additional measures required to achieve the target.

²⁸ As a new measure, the introduction of high-performance industrial furnaces (for small and medium-sized enterprises) was implemented to save energy consumption by 0.4 million kl, boosting the total savings to 2.05 million kl. In the technology development area, high-performance boilers were estimated to save energy consumption by 0.4 million kl and highly efficient laser systems by 0.1 million kl.

²⁹ This act's purpose is to promote energy supply/demand policy measures on a long-term, comprehensive and systematic basis through "secured stable energy supply," "environmental compliance" and "the utilization of market principles" with full considerations given to the secured stable energy supply and environmental compliance.

- Outline of 2002 revised Energy Conservation Act

- **【Major revisions to factory-related measures】**

- Elimination of the limit on industrial categories for Type 1 designated energy management factories
 - Creation of Type 1 designated energy management establishments (in the commercial sector other than five categories of manufacturers)
 - Exception to the requirement for energy managers to be appointed³⁰
- Regular reports for the Type 2 designated energy management factory system
- Revisions to judgment standards
 - Revisions to matters related to office buildings and other workplaces
 - Revisions based on a report by the Energy Efficiency and Conservation Subcommittee of the Advisory Committee for Natural Resources and Energy
 - Revisions based on technological advancement and other developments

(c) 2005 revised Energy Conservation Act

After the Kyoto Protocol for global warming prevention took effect in February 2005, Japan prepared the Kyoto Protocol Target Achievement Plan to take over the Climate Change Policy Program and revised the Act Concerning the Promotion of the Measures to Cope with Global Warming (hereinafter referred to as the Global Warming Prevention Act)³¹ to create a system to calculate, report and publish greenhouse gas emissions.

The Kyoto Protocol Target Achievement Plan projected a reference case in which Japan would save energy consumption by about 11.9 million kl through the steady implementation and follow-up of voluntary action plans. In a case for additional measures, thorough energy management under the Energy Conservation Act was projected to bring about some 0.4 million kl in energy consumption savings for the industry sector and some 0.7 million kl for the commercial sector.

In 2005, the Advisory Committee for Natural Resources and Energy compiled 14 reports, including a report on the “2030 energy supply/demand outlook” from the Energy Supply and Demand Subcommittee and an interim report on “desirable future energy conservation measures” from the Energy Efficiency and Conservation Subcommittee.

The Energy Conservation Act was revised in August 2005. In order to steadily implement measures for achieving Japan’s Kyoto Protocol target in response to the effectuation of the protocol, the government attempted to use the revised act to expand the number of designated energy management factories by unifying regulatory categories of factories and other workplaces (integrating heat and electricity management). Under the revised act, about 2,300 business

³⁰ Although Type 1 designated energy management factories are required to appoint energy managers, commercial workplaces that have less need for advanced expertise for ordinary energy management than factories are allowed to have qualified persons for energy management instead of energy managers. But they are required to have qualified energy managers participate in the preparation of medium to long-term energy management plans.

³¹ The act was revised in 2000 and 2006 as well.

establishments were newly designated as energy management factories. In July 2005, the Agency for Natural Resources and Energy created an energy efficiency and conservation office to enhance the strict enforcement of the Energy Conservation Act. In a bid to positively utilize on-site inspections, the agency's Energy Efficiency and Conservation Division published a document on the strict enforcement of the Energy Conservation Act for factories and other workplaces.

- Outline of 2005 revised Energy Conservation Act³²

【Major revisions to factory-related measures】

- Unification of regulatory categories of factories and other workplaces (integration of heat and electricity management): Effective reduction of the minimum energy consumption standard for the designation (to increase the number of factories and other workplaces for the designation from 11,189 to 13,551)
- Revision to judgment standards: Revision based on integrated heat and electricity management
- Creation of the registered investigation body system
- Deeming a CO₂ emission report under global warming as a relevant part of a regular report under the Energy Conservation Act

(d) 2008 revised Energy Conservation Act

Just before the Kyoto Protocol's first commitment period (2008-2012), the government assessed and reviewed the Kyoto Protocol Target Achievement Plan. As a result of the review, it was reported that greenhouse gas emission reductions under existing measures alone were expected to fall 22 million to 36 million tons CO₂ equivalent short of the target. The plan was completely revised in March 2008 to enhance measures to make up for the shortfall. The revised Kyoto Protocol Target Achievement Plan projected about 18 million kl in energy consumption savings through the promotion and enhancement of voluntary action plans in the industry sector and about 2.1 million kl through tougher energy management at factories and other workplaces.

While reviewing the Kyoto Protocol Target Achievement Plan, the Advisory Committee for Natural Resources and Energy submitted a long-term energy supply/demand outlook from the Energy Supply and Demand Subcommittee and a report on the direction of future energy conservation measures from the Energy Efficiency and Conservation Subcommittee.

In response to these reports, the Energy Conservation Act was revised in June 2008 to introduce energy management regulations for companies in addition to those for factories and other workplaces. As a result, the act's coverage of the commercial sector increased from about 10% to about 50%. The coverage increase is projected to achieve a cut of 3 million tons CO₂ equivalent in greenhouse gas emission as estimated for additional measures in the Kyoto Protocol Target

³² The revision added provisions on the inclusion of the transportation sector into sectors subject to the act, the enhancement of energy conservation measures at residential and other buildings, and consumers' energy-saving efforts.

Achievement Plan.

- Outline of 2005 revised Energy Conservation Act³³
 - 【Major revisions to factory-related measures】
 - Introduction of energy management regulations for companies in addition to those for factories and other workplaces to enhance overall regulations
 - Introduction of energy management control officers
 - Preparation of sectoral benchmarks: energy conservation by industrial category
 - Introduction of joint energy conservation projects
 - Revision of basic policy and judgment standards

1-2 Operation of Designated Energy Management Factory System

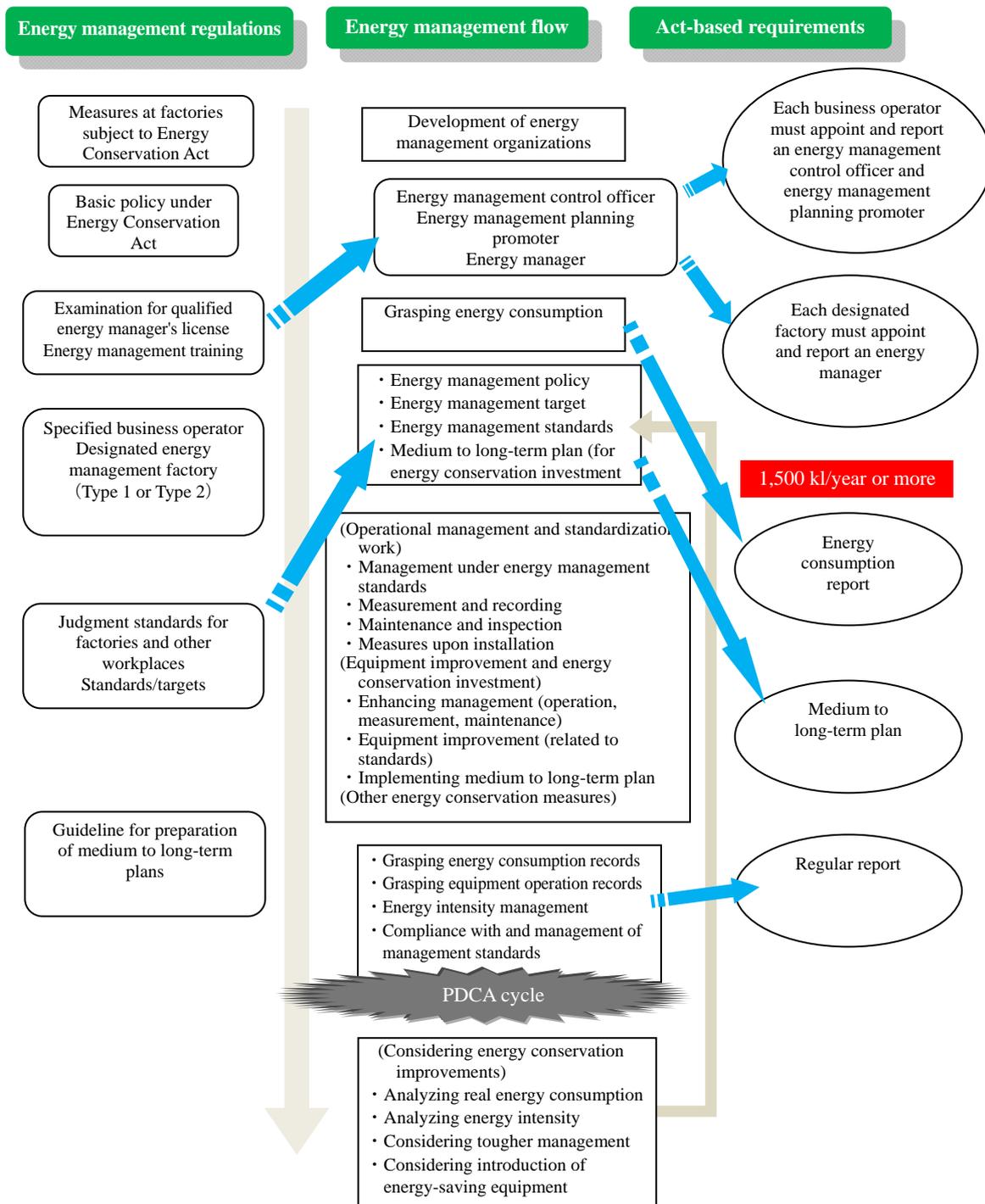
Under the present Energy Conservation Act (revised in 2008), business operators, and factories and other workplaces are required (1) to develop energy management organizations, (2) to grasp energy consumption, (3) to conserve energy through daily management and (4) to grasp annual energy conservation and implement energy conservation measures under medium to long-term plans, based on the act's basic policy and judgment standards (Fig. 1-2).

Business operators must employ necessary resources (people, goods, money, etc.) to implement such energy management. Major management operations follow:

- Arrangements must be developed to grasp real energy consumption as the Energy Conservation Act requires business operators to submit prior notifications. Designated energy management factories are required to appoint Type 1 or 2 energy managers.
- Business operators must select energy managers from among qualified energy managers or energy management training students among employees and notify them to authorities. The Energy Conservation Act defines roles and powers in provisions on duties and obligations of energy managers and the like. Business operators must respect opinions of energy managers and employees must comply with instructions by these managers. These provisions are interpreted as instructing enterprise-wide efforts in addition to duties and powers of Type 1 and Type 2 energy managers.
- Business operators are required to create energy conservation committees, educate employees on energy conservation and implement energy conservation activities covering manufacturing divisions.
- The Energy Conservation Act requires business operators to set management standards based on the act's basic policy and judgment standards and implement energy conservation activities through daily management. This provision standardizes energy conservation activities and obligates business operators to implement measurement and maintenance management. Measuring instruments and other automatic control systems are indispensable for implementing

³³ The revision also enhanced regulations on residential and other buildings.

Fig. 1-2 Management Procedure Flow for Designated Energy Management Factory System



Source : Energy Conservation Act Outline 2008, Energy Conservation Center of Japan (2008)

measurement. The judgment standards require standard energy conservation equipment or facilities to be introduced when new energy-consuming equipment or facilities are purchased. For designated energy management factories where energy conservation activities are implemented continuously, these standards are for maintaining energy efficiency.

- The Energy Conservation Act requires designated energy management factories to annually

report energy management activities (regular reports). These reports include actual energy consumption by category, conditions of energy-consuming equipment and facilities, production amounts, energy intensity, conditions of energy conservation measures and compliance with judgment and management standards.

- Medium to long-term energy conservation equipment investment must be implemented to further promote energy conservation. Energy conservation experts, project teams and spending plans are required for implementing energy conservation measures based on fine-tuned diagnosis of operations of equipment in use as well as the replacement of equipment and facilities with more efficient products.
- Targets among judgment standards in the Energy Conservation Act include a nonbinding target of improving energy intensity by 1% annually over a medium to long term, additional energy-saving equipment and facility introduction targets and medium to long-term measures, and providing guidelines for the preparation of medium to long-term plans for each industrial category. Type 1 designated energy management factories are required to submit medium to long-term plans.

In order to secure the implementation of energy conservation activities at designated energy management factories, the administrative sector checks the implementation of energy conservation based on the collection of reports, on-site inspections and investigations by registered investigation bodies in accordance with factory inspection schemes and examinations of statutory reports (Fig. 1-3).

The following factories and other workplaces are exempted from random sampling for on-site inspections:

- Factories and other workplaces that are newly designated as Type 1 or 2 energy management factories (excluding those subjected to changes in the designation from Type 1 to Type 2 or vice versa).
- Factories and other workplaces that were inspected in the previous year
- Factories and other workplaces that were subjected to random sampling in the previous year
- Factories and other workplaces that were certified by registered investigation bodies as meeting judgment standards in the previous or relevant year
- Factories and other workplaces that were awarded as excellent energy conservation factories in the previous year (by the Minister of Economy, Trade and Industry, the Director-General of the Agency of Natural Resources and Energy, or the Director-General of a Regional Bureau of Economy, Trade and Industry)

Fig. 1-3 Administrative Checks and Penalties

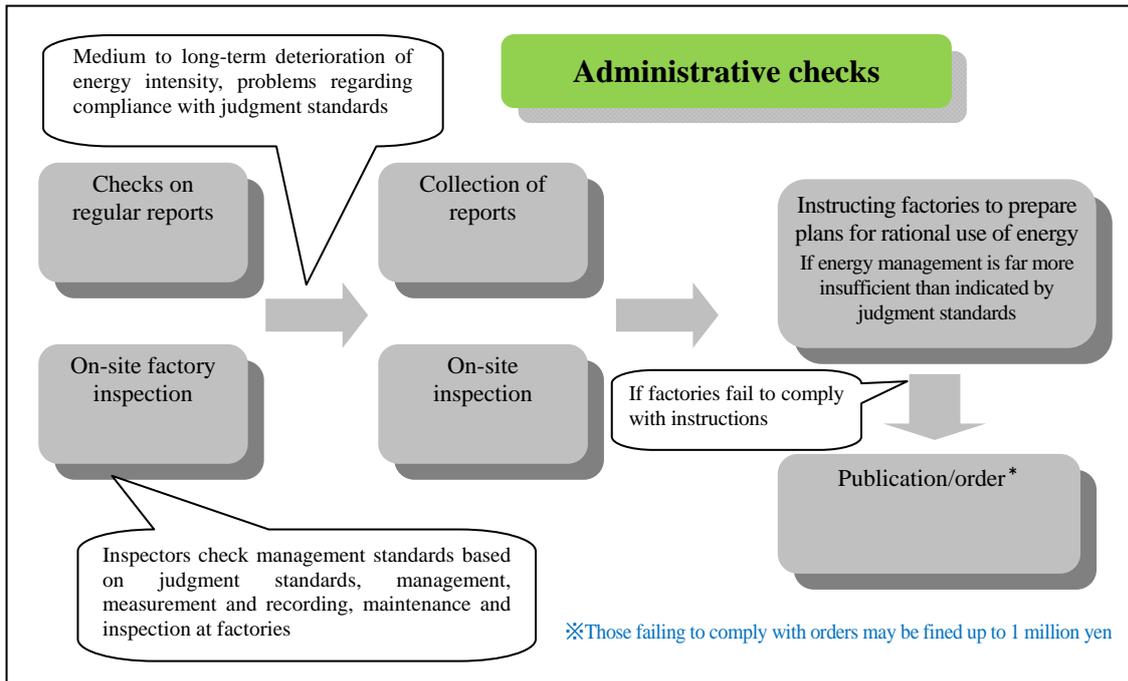
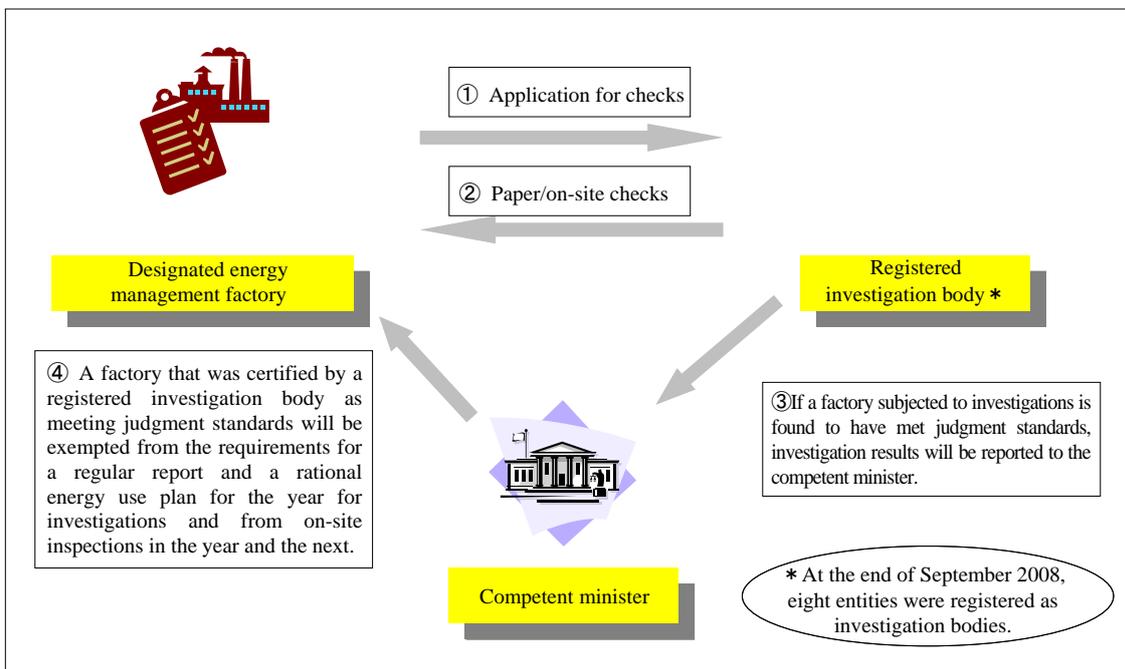


Fig. 1-4 Checks by Registered Investigation Body



Note : At the end of March 2010, nine entities were registered as investigation bodies.

Source : Energy Conservation Act Outline 2008, Energy Conservation Center of Japan (2008)

2. Analysis of Effects of Designated Energy Management Factory System

2-1 Introduction

It is important to specify effects of the designated energy management factory system for the assessment of the system. We interviewed officials at key actors for the designated energy management system – Type 1 designated energy management factories/workplaces (hereinafter referred to as Type 1 designated factories), Type 2 designated energy management factories (hereinafter referred to as Type 2 designated factories), non-designated factories/workplaces, relevant industry bodies, and the Regional Bureaus of Economy, Trade and Industry in charge of administrative management of the designated energy management factory system – to research the actual operation of the designated energy management factory system and assess the system.

We adopted a traditional method for policy science research, under which we set up a theoretical hypothesis on the operation of the designated energy management system, put in order findings from case analyses and reached a conclusion (Sugiyama and Tanabe 2001).

Specifically, we prepared a questionnaire on the actual operation of the designated energy management factory system, interviewed relevant people based on the questionnaire and visited energy-consuming facilities as allowed. We also interviewed officials at Regional Bureaus of Economy, Trade and Industry and two industry bodies. This chapter explains the assessment of the designated energy management system based on the interviews.

2-2 Interviews on Effects of Designated Energy Management Factory System

Before interviews, we had discussions with multiple experts to determine specific questions for interviews. Based on these questions, we conducted interviews and visits to facilities.

We conducted questionnaire-based interviews at six Type 1 designated factories, one Type 2 designated factory and two non-designated factories³⁴. We interviewed working-level officials at these factories. An interview at one factory took two to seven hours including the time consumed for the visit to the facility. We gave priority to the fact-finding purpose in these interviews and set a precondition that the names, affiliations, industrial categories and other details about interviewees would not be published. The prepared questions were the base for interviews. Actually, we received not only answers to these questions but also various other opinions.

(Questions)

Major questions are given in Table 2-1.

³⁴ Under the revised Energy Conservation Act, non-designated factories were to become “specified chain business operators” in FY 2010, being required to submit regular reports.

Table 2-1 Major Questions and Predicted Answers for Interviews

Question	Predicted answer
(1) What changes have you seen in views about energy conservation since the designation for energy management?	1. Top management officials and employees have become more positive about energy conservation measures than earlier.
	2. Top management officials have become more positive about energy conservation measures. But employees' recognition of energy conservation measures is not so high
	3. Top management officials' recognition of energy conservation measures is not so high. But employees have become more positive about energy conservation measures.
	4. No change has been seen since before the designation.
(2) Has the designated energy management factory system promoted energy conservation (improvement in energy intensity)?	1. Energy conservation has made progress.
	2. Energy conservation has made no progress.
(3) Were there any changes in management standards or in management after a factory inspection?	1. Management standards were totally revised.
	2. Management standards were reviewed.
	3. Traditional equipment management manuals were reviewed.
	4. The measurement and recording of energy consumption expanded.
	5. Maintenance and checks have expanded.
(4) Were there any measures that were promoted or improved after a factory inspection? (for multiple answers)	1. Energy-saving equipment investment was implemented.
	2. The energy manager's powers were enhanced.
	3. An energy conservation promotion arrangement was implemented (or reviewed).
	4. The supreme decision-making body (or responsible director) for energy conservation was set up.
	5. An energy conservation policy was prepared (or reviewed).
	6. An energy conservation project team was created.
	7. An energy conservation diagnosis was implemented.
(5) Has the designated energy management factory system brought about any benefits to your enterprise? (for multiple answers)	1. In-house decision-making on energy conservation measures has become smooth.
	2. Our competitiveness against rivals that had promoted energy conservation measures earlier has increased.
	3. Global warming measures have been promoted.
	4. Information and other government support services regarding energy conservation (including energy conservation symposiums, brochures, subsidies, and energy reform tax measures) have expanded.
	5. Other benefits
	6. We find no specific benefits.
(6) What measures for the operation of the designated energy management factory system were effective for promoting energy conservation?	

2-3 Interview Results

The questions cited in Table 2-1 are basic ones. In fact, we received various opinions in addition to answers to these questions. The answers and opinions that we received are compiled below.

2-3-1 What Changes Have You Seen in Views about Energy Conservation since the Designation for Energy Management?

Answers at many factories said that both top management officials and employees became more positive than earlier about energy conservation measures through the energy management factory designation. Answers at some factories said that no change was seen from before the designation. But this does not mean that the consciousness about energy conservation failed to grow. The answers said that the reason for the absence of any change was that both top management officials and employees were positive about energy conservation measures from before the system's introduction.

2-3-2 Has the Designated Energy Management Factory System Promoted Energy Conservation (Improvement in Energy Intensity)?

Answers at many factories said that energy conservation made progress through the energy management factory designation. But we must take note of the fact that factors that promoted energy conservation are not limited to the effects of the designated energy management factory system. For example, a decline in energy intensity resulted from energy conservation measures to reduce costs amid energy price hikes or from a production increase that works to reduce production unit energy consumption. But interviewees said: "As how to increase consciousness about energy conservation at workplaces is important for energy conservation activities, the measures as provided in the Energy Conservation Act have the effect of increasing morale at workplaces." "Under statutory regulations, managers' decision-making on energy conservation investment is prompt." "Energy management mechanisms might have failed to be employed without the Energy Conservation Act." They gave many opinions identifying effects of the designated energy management factory system, indicating that the designated energy management factory system has contributed to reducing energy intensity.

2-3-3 Were There Any Changes in Management Standards or in Management after a Factory Inspection?

Answers at many factories said that management standards and management were improved after inspections. This may be because inspectors thoroughly checked management standards during on-site inspections to promote energy conservation as regulations on the preparation of and compliance with management standards as provided in the judgment standards were toughened every time when the Energy Conservation Act was revised³⁵. At factories that underwent actual inspections, inspectors' audit was strict enough to force factories to review their management standards even if that had been viewed as comprehensive, some interviewees said.

³⁵ When the Energy Conservation Act was created in 1979, no specific provisions existed on what "management standards" should be established. When the Energy Conservation Act was revised in 1993, "management standards" were clearly defined. Every time when the act was revised later, provisions on the standards were modified. A revised Energy Conservation Act notice in 1997 required factories to specify their "compliance with judgment standards" in their regular reports. In this way, checks gradually grew stricter on compliance with management standards.

2-3-4 Were There Any Measures That were Promoted or Improved after a Factory Inspection? (for Multiple Answers)

Answers at factories subjected to inspections said that some energy conservation measures were taken after inspections. These measures ranged wide, indicating that inspectors gave fine-tuned advice meeting the real conditions of factories.

2-3-5 Has the Designated Energy Management Factory System brought about Any Benefits to Your Enterprise? (for Multiple Answers)

Questioned if the designated energy management factory system brought about any benefits to enterprises, interviewees at almost all of the factories subjected to interviews said that in-house decision-making on energy conservation measures became smooth. The second most frequently cited answer was that information through symposiums and brochures about the Energy Conservation Act and subsidies related to energy conservation were effective.

2-3-6 What Measures for the Operation of the Designated Energy Management Factory System were Effective for Promoting Energy Conservation?

The most frequently cited measure was “the grasping of energy consumption.” A representative opinion said: “Energy conservation measures can reduce costs and may be implemented to some extent even without the designated energy management factory system. But the continuous measurement and recording of overall energy consumption may not be done without the system that requires energy consumption to be reported. Needs for medium to long-term energy management are limited without the system. Historical energy consumption records allow us to assess effects of energy conservation measures and are useful for considering future measures. In this sense, the continuous measurement of energy consumption under the designated energy management factory system might have contributed to promoting energy conservation (Type 1 industrial workplace).” The designated energy management factory system has allowed factories to measure overall energy consumption while the grasping of energy consumption has enabled factories to analyze the levels of their energy consumption and the chronological changes in such consumption. This might have contributed to promoting energy conservation measures.

The second most frequently cited measures were “the nonbinding target of reducing energy intensity by an annual average of 1% or more and the management of the intensity” and “the preparation of management standards, the management under the standards and the compliance with judgment standards.” The target of reducing energy intensity by an annual average of 1% or more was viewed as easy to attain at some factories and as difficult at others. The existence of some target for efforts may make it easier for factories to adopt specific measures to achieve it. One interviewee said, “Although the target of reducing energy intensity by an annual average of 1% or more is not binding, some enterprises adopt this target in corporate social responsibility reports and declare the achievement of the target to shareholders (Type 1 industrial workplace).” This means that the nonbinding target can become a binding one in some cases.

As for “the preparation of management standards, the management under the standards and

the compliance with judgment standards,” one opinion said, “The maintenance of energy management consciousness may be an effect of the designated energy management factory system including the management standards (Type 1 industrial workplace)”

“Top management officials’ instructions” and “the introduction of energy-saving equipment as new equipment” were cited as very effective energy conservation promotion measures other than the designated energy management factory system. These measures are not directly included into the designated energy management factory system. But if a act requires energy conservation measures to be promoted, top management officials may become more conscious of energy conservation measures. For example, top managers may give more priority to the introduction of energy-saving equipment when considering buying new equipment than in the absence of such act. In this sense, the designated energy management factory system is expected to indirectly promote energy conservation by leading top management officials to “give priority to energy conservation” and “introduce energy-saving equipment as new equipment.”

2-3-7 Advantages of Japan’s Designated Energy Management Factory System

In addition to the above questions, we made other questions about the effects of the designated energy management factory system and collected the following opinions in the interviews:

(a) Creation of standards comparable with those of other enterprises

- An enterprise can compare its energy conservation performance with that of rivals by measuring energy consumption continuously under the same standards through the designated energy management factory system. The adoption of the same standards allows enterprises to know their energy conservation levels and promote energy-conservation measures. (Type 1 industrial workplace)

(b) Securing energy conservation measures amid economic growth

- An effective way to reduce costs is to expand sales. The sale expansion can cut production unit costs. When the economy expands in this way, incentives increase for the expansion of production equipment rather than energy conservation. Therefore, how to lead enterprises to be conscious of energy conservation measures under a robust economy is important. It is important to lead enterprises to positively introduce energy-saving equipment instead of equipment designed only to expand production. Some statutory systems like the designated energy management factory system that leads enterprises to be conscious about energy conservation are effective for securing energy conservation measures amid economic growth. (Type 1 industrial workplace)

(c) Promoting energy management mechanisms

- Without the Energy Conservation Act, energy management mechanisms might have failed to develop to the current high levels. Energy conservation effects emerge from equipment investment and energy consumption measures. Developing countries can

achieve immediate initial energy conservation effects in a year by conducting investment in energy-saving equipment. In later years, however, energy efficiency may decline soon due to problems with equipment maintenance and energy management. In Japan, fine-tuned maintenance is implemented after the introduction of equipment and high-level workplace skills can achieve great energy management effects. Japan's maintenance of consciousness about energy management might have owed to the effects of the designated energy management factory system including management standards. (Type 1 manufacturer)

- Each enterprise should create an energy conservation organization to consider energy conservation measures in an organized manner. The Energy Conservation Act revision may trigger the creation of energy conservation organizations. (non-designated commercial workplace)

(d) Effects of designation (visualization and improvement of consciousness)

- The designation of specified business operators from FY 2010 will produce effects. As non-designated factories generally have no knowledge about energy conservation, the designation for energy management may heighten consciousness about energy conservation. But information and other support measures are required for these factories that have no knowledge about energy conservation measures. The government should increase the number of factories designated for energy management and raise energy conservation levels well at newly designated factories. (Type 2 commercial workplace)
- Consciousness about the act has led factories to measure energy consumption and other energy conservation indicators to visualize energy savings. (non-designated commercial workplace)

(e) Reforming workplace consciousness

- As how to increase consciousness about energy conservation at workplaces is important for energy conservation activities, the measures as provided in the Energy Conservation Act have the effect of increasing morale at workplaces. (non-designated commercial workplace)

(f) Creating conditions where factories can easily respond to new systems and measures

- The voluntary action plan put forward in 1997 by the Japan Business Federation, or Keidanren, required CO₂ emissions and energy consumption to be reported. The specifications of such reports followed those of the regular energy conservation report. In this way, the Keidanren plan was based on specifications for the Energy Conservation Act, allowing enterprises to flexibly respond to the new plan. Enterprises have also responded to the new challenge of global warming with no additional large burdens. (Keidanren).

(g) Data-based analysis of energy conservation measures

- Energy conservation measures can reduce costs and may be implemented to some extent even without the designated energy management factory system. But the continuous measurement and recording of overall energy consumption may not be done without the system that requires energy consumption to be reported. Needs for medium to long-term energy management are limited without the system. Historical energy consumption records allow us to assess effects of energy conservation measures and are useful for considering future measures. In this sense, the continuous measurement of energy consumption under the designated energy management factory system might have contributed to promoting energy conservation (Type 1 industrial workplace).

(h) Factors other than the designated energy management factory system

- High energy prices
High energy prices, including those during the two oil crises, can provide a strong motive to reduce energy consumption.
- Top managers' instructions
Top enterprise managers' instructions are compulsory.

2-3-8 Recommendable Improvements in Japan's Designated Energy Conservation Factory System

In the interviews, we made questions about improvements that should be made in the designated energy management factory system. Major opinions follow:

(a) Unification of designated energy management factory and other systems

- The Tokyo Metropolitan Government has created its own ordinance requiring factories and other workplaces to submit reports. The Energy Conservation Act separately requires them to present annual reports. They are thus required to report similar contents in different forms, putting extra burdens on them. Reporting requirements should be unified as much as possible. (Type 1 and 2 commercial workplaces)

(b) Priority should be given to results rather than reporting

- The present system gives priority to the reporting requirement. More priority should be given to results. Energy-saving guidance should be increased. Based on results, workplaces should be commended for excellent efforts. (Type 2 commercial workplace)

(c) Simplification of regular reports

- Regular reports cover too many small details and take much time to be made. These reports should be simplified a little more. (Type 1 industrial workplace)

(d) Enhancement of binding power

- The Tokyo Metropolitan Ordinance on Environmental Preservation (ordinance on an environment securing health and safety for citizens) imposes finer and tougher quantitative restrictions on energy consumption than the Energy Conservation Act, fixing specific mandatory reductions. Those failing to comply with the restrictions may face penalties. If the Energy Conservation Act were seriously designed to reduce energy consumption, the act should have a system that is as tough as the Tokyo Metropolitan ordinance. (Type 2 commercial workplace)

(e) Systems to improve workplace motivation – creation of incentive systems

- The promotion of energy conservation in commercial buildings depends heavily on building management workers. As these workers can implement energy conservation by changing energy management settings finely while watching central monitor displays, it is important to maintain their motivation to do so. Unless workplace workers understand energy management targets fixed through a top-down approach, energy conservation cannot be realized. If energy consumption cuts through workplace workers' efforts are specified, they may be motivated to make efforts. Some incentive systems to reward workers for energy conservation efforts may be effective for maintaining such motivation. (Non-designated commercial workplace)
- While “carrots and sticks” are required for energy conservation measures, the present system gives far greater priority to “sticks.” If a “carrot” system is created to give workplaces or workers far greater awards or rewards for energy conservation efforts than offered by the Energy Conservation Center of Japan, energy-saving motivation may be improved substantially. (Type 2 commercial workplace)

(f) Effective utilization of best practices

- The best practice database for the annual national convention on excellent examples of energy conservation³⁶ includes very interesting practices. But the database only lists an overload of practices and may be difficult for individual enterprises or people to utilize. The database should be improved to allow data to be utilized effectively. (Type 1 industrial workplace)

³⁶ The national convention on excellent examples of energy conservation takes place annually to efficiently utilize Japan's energy and resources, to promote the improvement and development of energy conservation technologies and specific energy-saving activities in all areas including manufacturing and to contribute to reducing greenhouse gas emissions as a major global environment problem. The Ministry of Economy, Trade and Industry has commissioned the Energy Conservation Center of Japan to serve as the secretariat for the annual convention to award factories and other workplaces for excellent energy conservation achievements. Relevant engineers from various industrial categories or various sizes of enterprises throughout Japan gather at the convention to give presentations on daily energy conservation (effective energy utilization) achievements and communicate with each other. Participants are thus expected to share tips and ideas about energy conservation technologies that may be utilized at their workplaces or enterprises.

(g) Developing arrangements for cooperation between building tenants and owners

- Although electricity demand can be grasped to some extent, gas demand including LPG is difficult to determine. For a workplace in a tenant building, it is difficult to have the owner of the building provide energy consumption data. For example, our head office is located in a tenant building and has not grasped its energy consumption for which costs are included into building management costs. (Non-designated commercial workplace as tenant)
- The government should abolish systems where energy charges are included into common service charges and should visualize energy consumption. (Type 2 commercial workplace)
- Electricity meters, though differing depending on building types and heat sources, are set up for each building tenant, allowing building owners to bill tenants for energy consumption alone. But it is difficult to set up tenant-by-tenant cold energy and heat meters for energy consumption for air conditioning. It is also difficult for building owners to break down such energy consumption by tenant. In this respect, the Energy Conservation Act should specify how to disclose energy consumption. As far as energy management is concerned, it may be easy for a tenant building owner to manage energy consumption for all tenants en masse. But some problems may emerge, including whether tenants or owners should shoulder costs for installing cold energy and heat meters. Under the present situation, we believe that it is not realistic for owners to shoulder costs for installing meters. (Non-designated commercial workplace as tenant building owner)
- As for the computation of energy consumption for air conditioning, the revised Energy Conservation Act has a vague provision that business operators shall be required to select the most appropriate and rational method according to their conditions. No specific definition or computation method is given. Confusion may be minimized if the act unifies computation methods by, for example, requiring the tenant air conditioning energy estimation tool of the Energy Conservation Center of Japan to be used for estimating air conditioning energy consumption for tenants. (Non-designated commercial workplace as tenant building owner)

(h) Cooperation between government ministries

- We feel that appropriate cooperation is necessary between relevant government ministries (including the Ministry of Economy, Trade and Industry, the Ministry of the Environment, and the Ministry of Land, Infrastructure, Transport and Tourism). These relevant ministries should cooperate well in devising measures that lead energy users well to implement energy conservation measures. (Type 2 commercial workplace)

(i) Dissemination and enlightenment through active workshops and the like

- At a regional liaison meeting for designated energy management factories, an energy

management official in another industrial category gave an opinion that energy management officials take much time to understand definitions in the act that are too complicated or meticulous. Workshops and other meetings should be held frequently for dissemination and enlightening regarding the designated energy management factory system. (Type 1 industrial workplace)

- Building owners respond to inquiries from tenants about the latest revised Energy Conservation Act. Inquiries come from enterprises that seem to be more conscious about energy conservation. We feel that the awareness of the revised Energy Conservation Act is low. We feel that the government should devise more efficient information services. (Non-designated commercial workplace as tenant building owner)

(j) Expansion of subsidy system

- A subsidy budget may be expanded to disseminate energy conservation technologies in a wider range of industrial categories. The present system forces subsidized projects to be suspended at the turn of the fiscal year, requires complicated procedures and is subjected to rigid operation. It should become easier to operate. Through these improvements, the number of factories utilizing subsidies to introduce energy conservation technologies will increase to eventually promote energy conservation in the entire nation. (Type 1 industrial workplace)

(k) How to set targets

- Total energy consumption as well as energy intensity should be assessed. For example, a production drop deteriorates energy intensity while reducing total energy consumption. Such phenomenon tends to emerge during a recession. Instead of checking energy intensity changes alone, the government should assess both energy intensity and total energy consumption integrally. (Type 1 industrial workplace)

(l) Energy intensity indicators

- Wisdom and innovative ideas should be utilized to design energy intensity indicators. Floor spaces are used as the denominator for computing energy intensity at commercial buildings frequently. At hotels, however, the floor space-based energy intensity deteriorates instead of improving as guests increase. Indicators should be developed to assess workplace energy conservation efforts more appropriately. (Type 1 commercial workplace)
- Energy intensity indicators should be reviewed. Although factories and other workplaces designated for energy management design their respective energy intensity indicators on their own, we doubt if this is the right way to design energy intensity indicators. At factories where output is used as the denominator for computing energy intensity, an improvement in energy consumption divided by output does not

necessarily mean any progress in energy conservation. Energy intensity indicators (particularly denominators) should be reviewed strictly to thoroughly secure energy conservation. (Type 2 commercial workplace)

(m) Promoting computerization

- The Kanto Bureau of Economy, Trade and Industry used Microsoft Excel to computerize regular reports from 2007. As a result, the deadline compliance rate has increased remarkably. Before the computerization, about 50% of all designated factories submitted reports by the deadline at the end of June 2006 and 30% did so in July. The remaining 20% presented reports later in response to reminder notices. In FY 2008 after the computerization, 80% submitted reports by the deadline at the end of June 2008. By the end of July, 97% of all designated factories did so. The computerized report sets coefficients and equations for computation of energy consumption, allowing reporters to put data into predetermined columns for automatic computation. When such electronic medium did not exist for regular reports, factories individually conducted computation. The computerization of regular reports to simplify reporting procedures might have prompted factories to comply with the deadline. This has worked to substantially reduce administrative costs. While regular reports have been computerized for e-mail submission, hard copies account for 90% of regular reports submitted. By promoting e-mail submission, we could further reduce administrative costs. (Kanto Bureau of Economy, Trade and Industry)

2-3-9 Promotion of Energy Conservation in Developing Countries

In the interviews, we also made questions on the promotion of energy conservation in developing countries where energy consumption is expected to increase remarkably. The following are major opinions responding to these questions:

(a) Private-sector enterprises' promotion of energy conservation in developing countries

- Through the Energy Conservation Center of Japan, we accepted visitors from ASEAN countries for facility tours and training. Such grass-roots exchange is an area where Japanese private-sector enterprises can take advantage of accumulated know-how. If such activities are recognized as achievements of enterprises (as part of the Clean Development Mechanism), they may be stimulated. (Type 1 industrial workplace)
- We have already been cooperating with the Energy Conservation Center of Japan, the Japan International Cooperation Agency and the Japan International Cooperation Center in international assistance. It is important for us to help developing countries acquire knowledge about Japan's energy conservation policies and systems, and efforts of Japanese enterprises. (Type 1 industrial workplace)
- We have accepted visitors from Vietnam, Indonesia, the Philippines and other countries for factory tours for energy conservation promotion purposes. Japan should follow up

on these visitors' later activities in their respective countries. Such follow-up may work to effectively promote energy conservation activities in Vietnam, Indonesia, the Philippines and other countries. (Type 1 industrial workplace)

- It is important to increase factory tour and other opportunities for introducing best practices. (Type 2 commercial workplace)

(b) Energy data measurement

- Our company has global operations with branches in major developing countries and has decided to globally tackle global warming measures. We have attempted to collect CO₂ emission data in developing countries and found that they had no data. We felt that these countries should first establish data measurement arrangements. (Type 1 industrial workplace)

(c) Utilization of Japanese retirees

- A mechanism for dispatching skilled Japanese engineers to developing countries for long-term support will be effective for energy conservation. Particularly, a mechanism should be promoted for utilizing the know-how of retired engineers well. Such continuous cooperation will contribute to raising Japan's ratings in developing countries and leading them to accept Japan-proposed policies. Long low-key Japanese efforts are required. (Type 2 and non-designated commercial workplaces)

(d) Transferring Japanese energy technologies

- Japanese energy-saving technologies may be transferred to new plants in developing countries. It will be effective for energy conservation for the Japanese side to make detailed plans and provide support regarding such transfers. (Type 2 commercial workplace)

(e) Bird's eye viewpoint

- Excessively tough regulations can become impediments to business operations at factories and other workplaces. But excessively loose regulations make no contribution to the promotion of energy conservation. Japan should try to create appropriate regulations while watching their impacts on society and economy from a bird's eye viewpoint, instead of focusing on energy conservation alone.

2-4 Analysis

As the number of enterprises subject to this study has been limited, this study's findings do not necessarily reflect conditions at all factories subject to Japan's designated energy management factory system. But we found some common opinions through interviews. These opinions are helpful for considering the effects of Japan's designated energy management factory system. First, almost all factories and other workplaces subject to our interviews answered that the designated

energy management factory system had been generally effective. Even if energy efficiency improves at factories and other workplaces, it may be difficult to decide whether the improvements should be attributed to the effects of the designated energy management factory system or other factors. But interviewees commonly said that the existence of the system worked to accelerate in-house decision-making on energy conservation measures and that the measurement, management and reporting of energy consumption required for regular reports contributed to heightening workplace consciousness about energy conservation. Furthermore, we found implications about the direction of institutional improvements required for promoting energy management in Japan.

We can conclude that Japan can develop a system meeting realities better by paying heed to opinions given through this study when the designated energy management factory system is revised.

3. Proposals to Developing Countries – Implications Gained from Japan’s Experiences –

Energy management systems have existed in Japan since before World War II. Over a long term to the present, Japan has gradually improved these systems and reached the present framework. Chapter 1 detailed the past institutional reforms and the social and economic background. History shows that the Japanese systems’ feature is that Japan has flexibly modified the systems in response to situational changes. The initial energy management policy indirectly called for energy conservation promotion by encouraging business operators to make voluntary energy-saving efforts and become more conscious about energy conservation. In response to the two oil crises in the 1970s and the growing needs for global warming prevention measures in the 1990s, however, the present policy more directly calls for energy conservation by emphasizing the improvement of energy efficiency and the reduction of energy consumption. Japan has thus improved its energy management policy in response to situational changes over more than half of the past century. Meanwhile, twists and turns emerged during the long institutional reform period. In our interviews, proposals still emerged for improvements in the Japanese system.

But developing countries can build on Japan’s policy changes and create energy conservation promotion systems without consuming as much time as Japan. Of course, developing countries have various social, economic and political situations and various energy supply/demand characteristics. Japanese systems can not necessarily be transferred to all developing countries without modifications. From the viewpoint of “the advantage of backwardness,” however, it may be useful for future energy conservation policy to create systems meeting specific national conditions based on Japan’s experiences.

Given Japan’s experiences, for example, we believe that the following institutional proposals may be useful for any country:

3-1 Securing Energy Conservation Measures during Economic Growth

It is important to lead enterprises to positively introduce energy-saving equipment rather than equipment for production expansion purposes alone during economic growth. In developing countries where rapid economic growth is expected for the future, particularly, subsidy systems for promoting energy-saving equipment investment for production expansion purposes and systems for giving priority to the introduction of energy-saving equipment can be concluded as effective.

3-2 Designing Various Systems to Produce Synergy Effects

Japan has established the designated energy management factory system and multiple similar systems (including the Act Concerning the Promotion of the Measures to Cope with Global Warming³⁷, the Keidanren voluntary environmental action plan³⁸ and the Tokyo Metropolitan global warming action plan system³⁹), requiring factories and other workplaces to report energy consumption and greenhouse gas emissions. These systems are not necessarily designed to cooperate efficiently while avoiding overlaps. They force factories and other workplaces to make similar reports in forms meeting these different systems for their submission to different competent administrative agencies. The submission of similar reports in different forms has led to an extra increase in work man-hours.

The present international situation indicates that developing countries will create energy, global warming and regional pollution measures. We hope that they will take into account cooperation between multiple systems in designing these systems and realize their efficient operation.

3-3 How to Set Targets – Creation of Indicators Comparable with Other Companies’

Japan’s designated energy management factory system has been designed to increase consciousness about energy conservation at factories and other workplaces and imposes a nonbinding target of improving energy intensity. But factories are left to devise their respective energy intensity indicators. This means that there are energy intensity indicators that have not been unified. We can avoid this problem by adopting the assessment of “total energy consumption volume” of which uniform data are available at all factories, in addition to energy intensity indicators. In some cases, a production decline deteriorates energy intensity while reducing total

³⁷ Article 21-2-1 of the revised Act Concerning the Promotion of the Measures to Cope with Global Warming requires “parties specified by Cabinet Order as producing considerably high greenhouse gas emissions in conjunction with their business activities (specified emitters)” to report greenhouse gas emissions to the government on a workplace-by-workplace basis every fiscal year in principle.

³⁸ The Japan Business Federation, or Keidanren, released a “voluntary environmental action plan” in 1997, declaring “efforts to reduce CO₂ emissions in industry and energy conversion sectors in FY 2010 to the FY 1990 or lower level.” As of November 2009, 34 industrial categories had made their respective voluntary environmental action plans including quantitative targets, covering about 80% of the industry and energy conversion sectors. The Keidanren voluntary environmental action plan, though described as the industry sector’s voluntary efforts, is positioned as an important measure in the Kyoto Protocol Target Achievement Plan that accumulates plans to secure the achievement of the Kyoto Protocol target.

³⁹ The system of a local government (the Tokyo Metropolitan government) aims to reduce carbon dioxide and other greenhouse gas emissions accompanying business operations and to prevent global warming through the submission, assessment and publication of global warming measure plans at workplaces with considerable greenhouse gas emissions (annual fuel, heat and electricity consumption at 1,500 kl oil equivalent or more).

energy consumption volume. This phenomenon tends to emerge amid a recession. Therefore, we can say that it is important to make a comprehensive judgment by assessing energy intensity changes and total energy consumption volume integrally, instead of checking energy intensity changes alone.

Japan's designated energy management factory system has thus allowed enterprises to collect data comparable with others' by measuring and assessing energy consumption continuously under the same standards. This is an advantage of the Japanese system. Based on such data, enterprises can acquire knowledge about their factories' energy conservation levels that would be useful for promoting energy conservation measures. Factory-by-factory energy consumption data should be published unless the publication affects competitive advantages or price negotiations with buyers. This is also a useful means⁴⁰.

3-4 Frequent Dissemination and Enlightenment

Any system must be disseminated and understood widely and thoroughly while measures under the system are implemented. When any system is launched, particularly, information about the system should be given to as many relevant people as possible. In this sense, frequent workshops and other dissemination and enlightenment opportunities regarding the designated energy management factory system would be effective.

3-5 Systems to Improve Workplace Motivation – Creation of Incentive Systems

Although energy-saving equipment investment is the most effective among energy conservation measures, it may be unrealistic to implement equipment investment over a short to medium term in some cases. In such cases, the maintenance of equipment after investment and appropriate daily energy management play a great role in promoting energy conservation. Therefore, the introduction of incentive systems to directly reward workplace energy managers for energy conservation achievements is expected to lead to the promotion of energy conservation.

3-6 Electronic Reporting System

While Japan has computerized regular reports, a shift from hardcopies to electronic reporting is taking much time. Developing countries could effectively save administrative and workplace man-hours by ensuring electronic reporting when reporting systems are designed.

The above are the key points that developing countries should take note of when building new energy conservation systems. As noted earlier, however, developing countries have various social, economic and political situations and various energy supply/demand characteristics, making it

⁴⁰ Energy intensity indicators under the Energy Conservation Act were introduced to grasp "chronological changes at each factory." In addition to the assessment of chronological changes at each factory, the 2008 revised Energy Conservation Act introduced "category-by-category benchmarks" for comparing the degrees of energy-conservation promotion between enterprises. "A category-by-category benchmark" is designed to allow the rationalization of energy use to be compared within a specific category in which enterprises consume energy in the same or a similar way (as far as enterprises are classified into categories by product, production method, service or service provision method). By 2010, benchmarks were set up for six categories (steel, electric power, cement, paper, petroleum products and chemicals).

difficult to transfer Japan's designated energy management factory system to developing countries without modifications. Rather, developing countries' building of energy conservation measures based on considerations to their respective conditions as well as the Japanese experiences cited in this study will be one of the effective means for promoting energy conservation measures.

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