

The Networks for Energy Management Activity around the World

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Summary

In its 25 Energy Efficiency Policy Recommendations, the International Energy Agency (IEA) cites improvements to energy management capability in the industrial sector as one of its recommendations. The International Partnership for Energy Efficiency Cooperation (IPEEC) was established as an international cooperative framework to support energy efficiency initiatives by the main energy consuming countries, including China, India and other emerging nations. Under its auspices, EMAK and GSEP were launched as initiatives for energy management activities in the industrial sector. In terms of energy management activities, EMAK builds networks of national policymakers and people responsible for energy management in industry, and implements activities to share best practices of Industrial Energy Efficiency (IEE) policies and energy efficiency measures in the industrial sectors in every country.

Meanwhile, cases of cooperative activities for energy efficiency in various countries include LEEN (Germany), ENIG (Sweden), Energy Conservation Neighborhood Associations (Japan), and Energy Saving Patrol Teams (EPSON).

This paper outlines the characteristics of these cooperative activities for energy efficiency, and investigates the driving forces and barriers of energy efficiency.

1. Introduction

In its 25 Energy Efficiency Policy Recommendations, the International Energy Agency (IEA) cites improvements to energy management capability in the industrial sector as one of its recommendations ¹⁾. The International Partnership for Energy Efficiency Cooperation (IPEEC) was established as an international cooperative framework to support energy efficiency initiatives by the main energy consuming countries, including China, India and other emerging nations. As one of its principal initiatives, IPEEC set up the Energy Management Action Network (EMAK) for promoting the improvement of industrial energy efficiency. Other related frameworks include the Global Superior Energy Partnership (GSEP) for energy efficiency, and international standardization initiatives represented by the ISO50001 Energy Management System (EnMS).

In terms of energy management activities, EMAK builds networks of national policy makers and people responsible for energy management in industry, and implements activities to share best practices of Industrial Energy Efficiency (IEE) policies and energy efficiency measures in the

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industrial sectors in every country ²⁾. Via its two networks, EMAK implements the three activities outlined below as initiatives to improve capability for energy management in the industrial sector.

- (1) Information sharing
- (2) Network building
- (3) Supporting Implementation

Why information sharing? In actual fact, there is no shortage of energy efficiency technologies, information about countermeasures, or IT technologies. However, the information and technologies are not necessarily viable, effective and valid. In addition, sharing information about knowhow, experience or other advanced levels of information has not made much progress. The energy efficiency barriers discussed below is one explanation for the lag in information-sharing. Cooperative activities for energy efficiency are attracting attention as a method for removing the energy efficiency barriers and promoting the improvement of energy efficiency.

Some cases of cooperative activities for energy efficiency at various levels include LEEN (Germany), ENIG (Sweden), Energy Conservation Neighborhood Associations (Japan), and Energy Saving Patrol Teams (EPSON).

After outlining the Energy Management Programs (EnMP) in the industrial sector, this paper will verify the positioning of cooperative support. Next, the paper will outline the characteristics of some cases of cooperative activities for energy efficiency abroad and in Japan, and investigate the driving forces and barriers of energy efficiency.

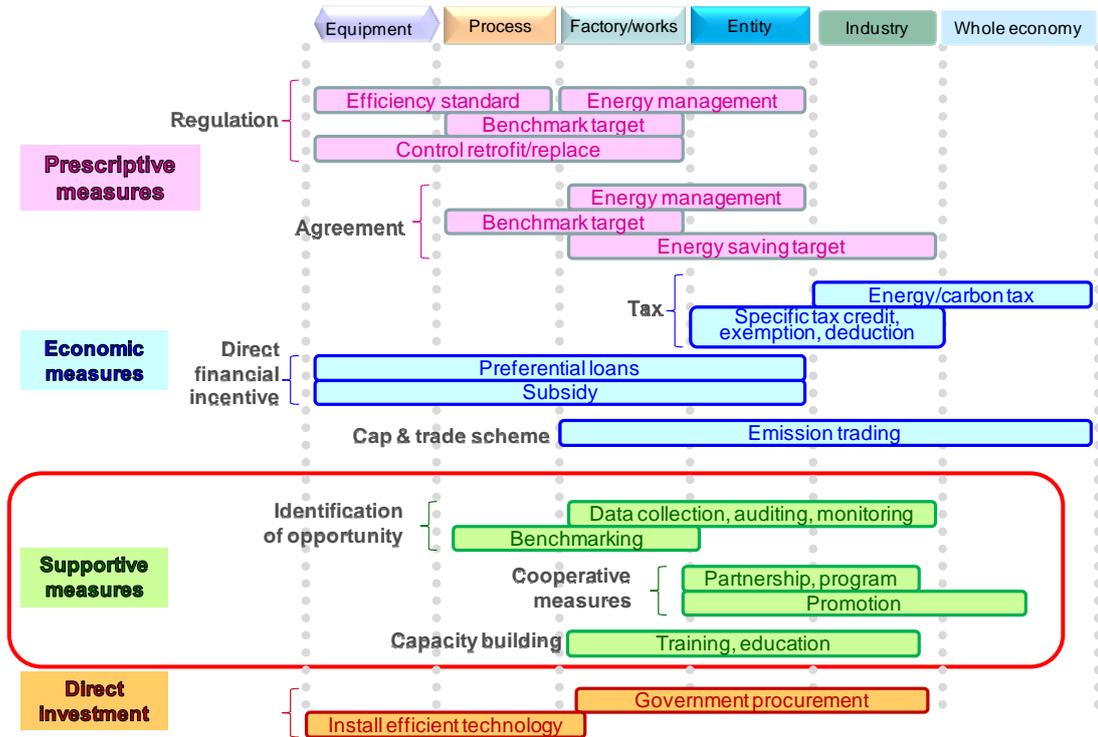
2. Position of Cooperative Activities for Energy Efficiency in IEE Policies

2-1 Types and Structures of EnMP in IEE Policies

The goal of Industrial Energy Efficiency (IEE) policies is to improve the capability for energy management in the industrial sector, to minimize the environmental impact domestically and abroad, and to contribute to internal economic development.

To achieve these goals, the IEE policies in various countries combine and implement a range of Energy Management Programs (EnMP). As a result of studying IEE policies and EnMP in various countries, Fig. 2-1 classifies EnMP according to IEE policy including prescriptive measures, economic measures and supportive measures, and describes to which segment in the country EnMP contributes, the whole economy, industry, entity, factory or works, process, or equipment ³⁾. This classification shows reinforcing energy management involves various forms of EnMP to achieve it. Supportive measures are categorized as the ones to identify opportunities for energy efficiency such as energy-saving audit programs, benchmarking, as well as the ones to share best practices of energy efficiency measures including workshops.

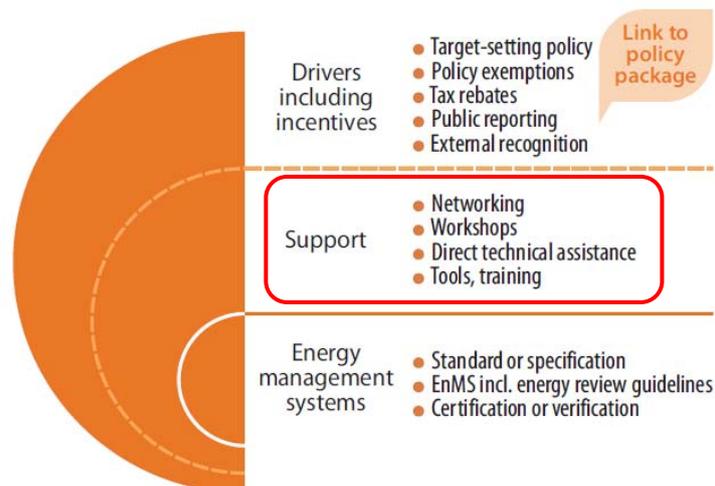
Fig. 2-1 Type of EnMP



Source : K. Tanaka³⁾

Fig. 2-2 structures the roles of EnMP from a different perspective⁴⁾. The idea is that EnMS are standardized and systematized with a focus on promoting energy management, and supported by providing drivers including incentives since improved energy management capability in the

Fig. 2-2 Role & Structure of EnMP



Source : IEA & IIP⁴⁾

industrial sector implies improved energy management capability at corporations and factories. The structure in Fig. 2-3 illustrates the Superior Energy Performance (SEP) in the United States, the Energy Efficiency Opportunity (EEO) in Australia, and the Program for Energy Efficiency (PFE) in Sweden based on this idea. Furthermore, section 2-3 discusses the systems for information-sharing in Japan.

Table 2-1 Example : U.S.A, Australia, & Sweden

Nation	USA	Australia	Sweden
EnMP	Superior Energy Performance Program (SEP)	Energy Efficiency Opportunities (EEO)	Program for energy efficiency in energy intensive industry (PFE)
Drivers & Incentives	<ul style="list-style-type: none"> · External recognition – Platinum, Gold and Silver according to “energy pathways” demonstrating performance improvement 	<ul style="list-style-type: none"> · EEO mandatory · Public and government reporting · External recognition (case studies) 	<ul style="list-style-type: none"> · Rebate from carbon tax · External recognition (case studies)
Support	<ul style="list-style-type: none"> · ISO 50001 e-guide · Training · Software Tools · M&V guide and protocol · Best Practice Scorecard · Pilots and case studies 	<ul style="list-style-type: none"> · Industry Guideline · Industry Support Officers · Networking and workshops 	<ul style="list-style-type: none"> · Manuals on energy reviews, LCC and procurement · Networking and workshops · Direct technical assistance
EnMS	<ul style="list-style-type: none"> · ISO 50001 · MSE 50021 standard 	<ul style="list-style-type: none"> · Assessment Framework (no EnMS standard) · Government verification · Energy review 	<ul style="list-style-type: none"> · ISO 50001 · EnMS Certification · Energy review

Source : IIP⁵⁾

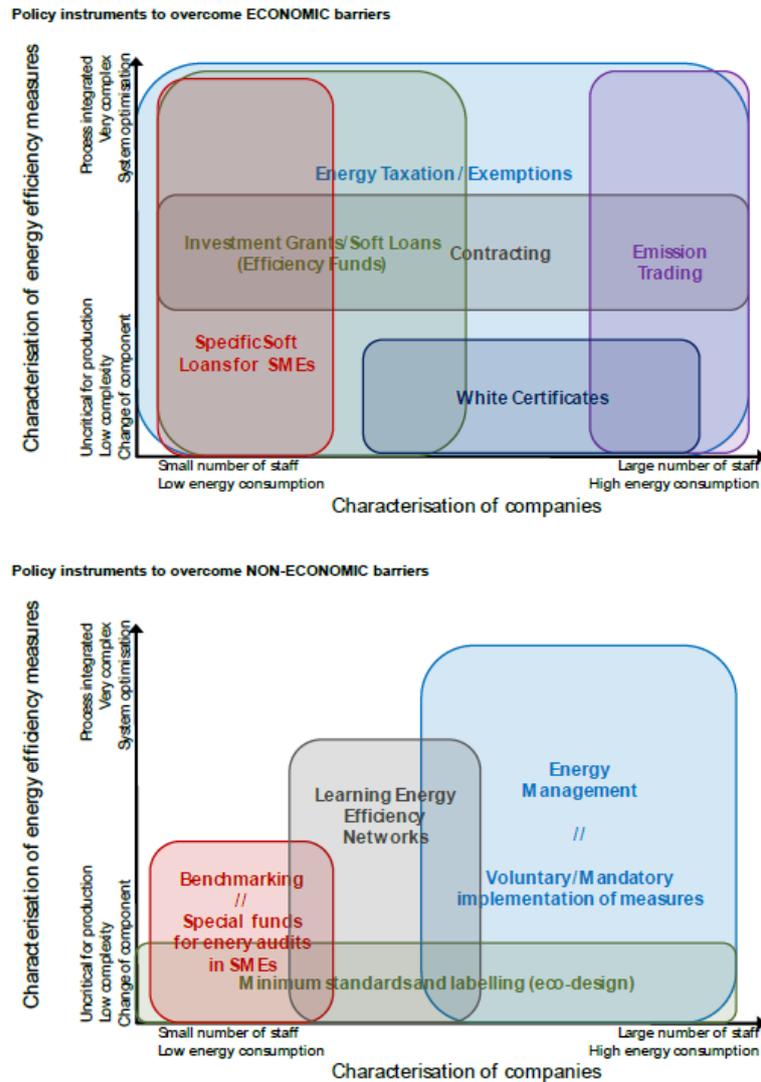
2-2 Positioning IEE Policies

Despite the economic advantages of energy efficiency measures, we know that there are phenomena that prevent the energy efficiency gap from closing and the energy efficiency barriers⁶⁾⁷⁾. Energy efficiency barriers are broadly divided into economic barriers and non-economic barriers. In addition to direct shortages of people, goods, finances or information, observations suggest that energy efficiency barriers are associated with risk, or organizational behavior such as bounded rationality, split incentives, and transaction costs.

Fig. 2-3 organizes industrial sector EnMP for Effort Sharing Decisions (EU-ESD) in the field of non-EU Emissions Trading Systems (ETS) from the perspective of economic barriers and non-economic barriers⁸⁾. EnMPs are organized according to corporate characteristics, such as corporate scale, energy consumption scale, and the characteristics of energy efficiency measures, such as the degree of complexity of the processes. For example, energy taxes are drivers for promoting energy efficiency unrelated to corporate characteristics, but observations suggest that in terms of structuring energy management systems, the smaller the corporate scale, the more difficult it is to contribute to promoting energy efficiency.

LEEN, the case of cooperative activities for energy efficiency discussed below, is positioned as a countermeasure to non-economic barriers, mainly targeting basic energy efficiency measures at medium-sized corporations and factories.

Fig. 2-3 IEE Policy Map



Source : AEA⁸⁾

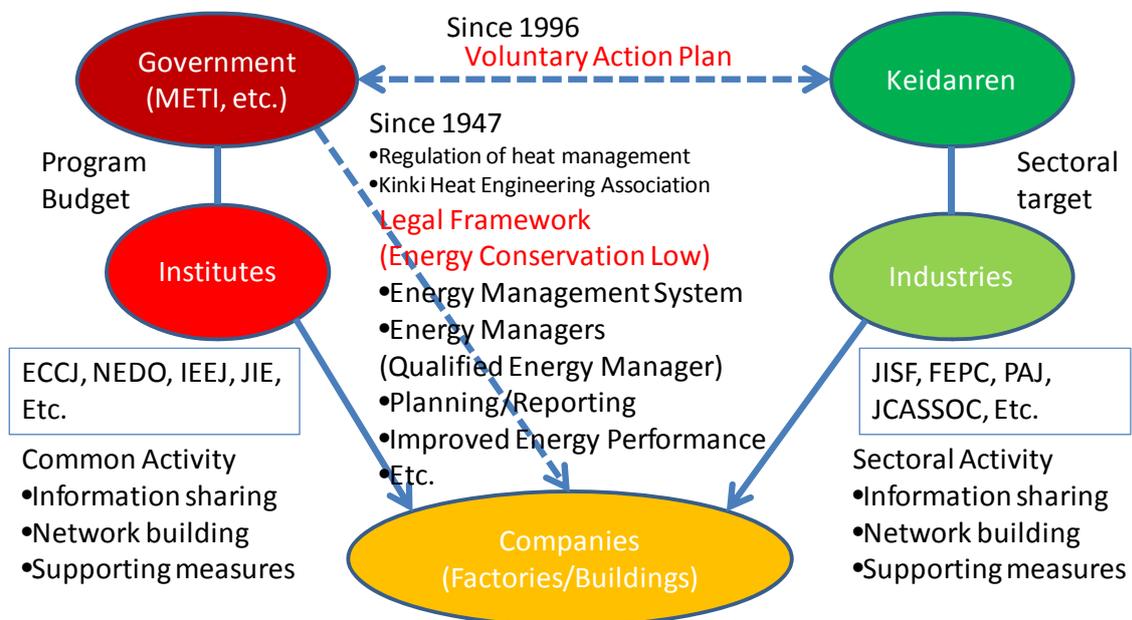
2-3 Supportive Measures and Energy Efficiency Collaboration in IEE Policies

Cases in Japan include the obligations at corporations, factories and places of business above a certain scale to appoint energy managers, submit regular reports and energy efficiency plans, and to structure management systems based on evaluation criteria (Standards of Judgment for Factories etc. on the Rational Use of Energy) due to the system of designated energy management factories based on the Act Concerning the Rational Use of Energy (Energy Conservation Law). Efforts to reduce energy consumption per unit by 1% annually in the medium to long term are presented, and supportive measures (pamphlets, factory surveys, award systems, presentation of successful cases, symposiums etc.) and financial measures (subsidies, tax breaks etc.) are implemented based on guidance and advice in the Energy Conservation Law. Meanwhile, government and industry have set targets between them for each industry based on voluntary action plans on the environment. The

Energy Conservation Center, Japan (ECCJ) and the New Energy and Industrial Technology Development Organization (NEDO) are two of the organizations supporting these structures, with various industrial bodies (JISF, FEPC, PAJ, JCASSOC etc.) carrying out supportive activities (Fig. 2-4).

Energy-saving audit programs are also carried out for small and medium enterprises. The Energy Service Company (ESCO) program has been introduced and Japan’s IEE policy is highly respected even in the international energy efficiency rankings of the American Council for Energy Efficient Economy (ACEEE)⁹⁾. However, even though energy management has become embedded in energy-intensive industries and large corporations, it has been pointed out that economically beneficial energy efficiency measures have not been implemented at small and medium-sized corporations, factories and workplaces⁷⁾.

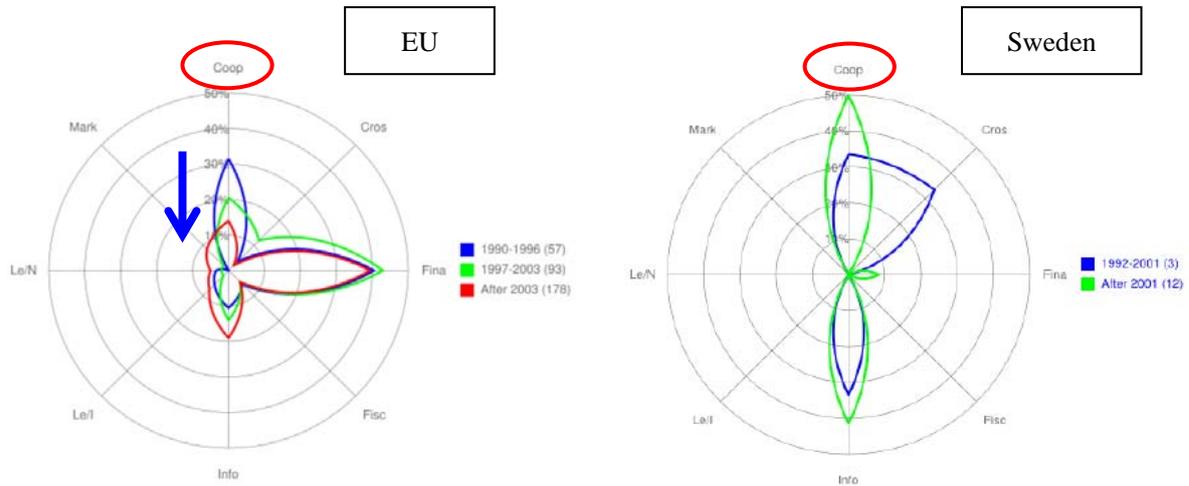
Fig. 2-4 Information Sharing Structures & Policy Package – Experience of Japan



The diagram on the right in Fig. 2-5 shows temporal changes in IEE policy mixes in the EU. The core responses are financial measures. In terms of supportive measures, cooperative measures such as voluntary agreements have decreased, and information measures have increased. It is inferred that EU-ETS classified into new market mechanism have an influence on these trends.

With regard to cooperative measures, there is a comment in the Odyssee-MURE report¹⁰⁾ to the effect that “Cooperative measures appear to be effective but are preferred by limited number of countries.” Few countries in the EU implement such measures. The diagram on the left in Fig. 2-5 shows the situation for the IEE policy mix in Sweden. The main policy is supportive measures and go-ahead initiatives for cooperative measures are implemented. The countries with a high ratio, or a large number of cooperative measures are Germany, Finland, France, Sweden and Denmark (Fig. 2-6).

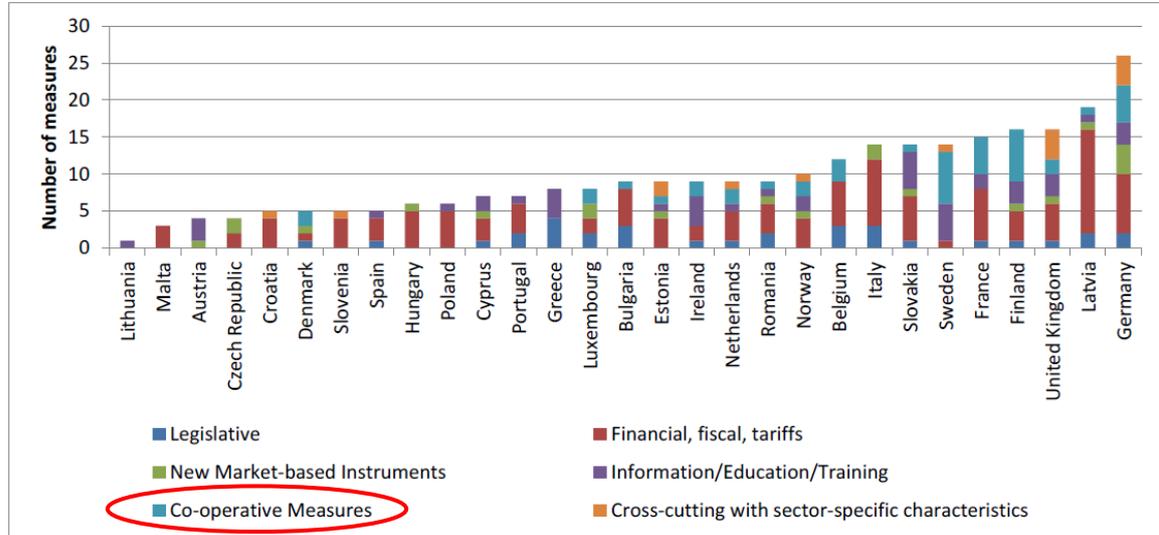
Fig. 2-5 Type of EnMP for EU & Sweden and by Blocks of Time



Coop = Co-operative measures, Cros = Cross-sectoral measures, Fina = Financial measures, Fisc = Fiscal measures, Info = Information/education/training, Le/I = Legislative/Informative, Le/N = Legislative/Normative, Mark = New market-based instruments

Source : Odyssee-Mure database¹⁰⁾

Fig. 2-6 Type of EnMP by EU Countries (Current Situation)



Source : Odyssee-Mure database¹⁰⁾

It has been inferred that the smaller the corporate scale, the more difficult it is to operate energy management systems. Cooperative activities for energy efficiency are expected to provide one solution for breaking free of this state of affairs. Next, this paper will look at some actual cases of cooperative activities for energy efficiency.

3. Cases of Cooperative Activities for Energy Efficiency

3-1 Cases from Abroad

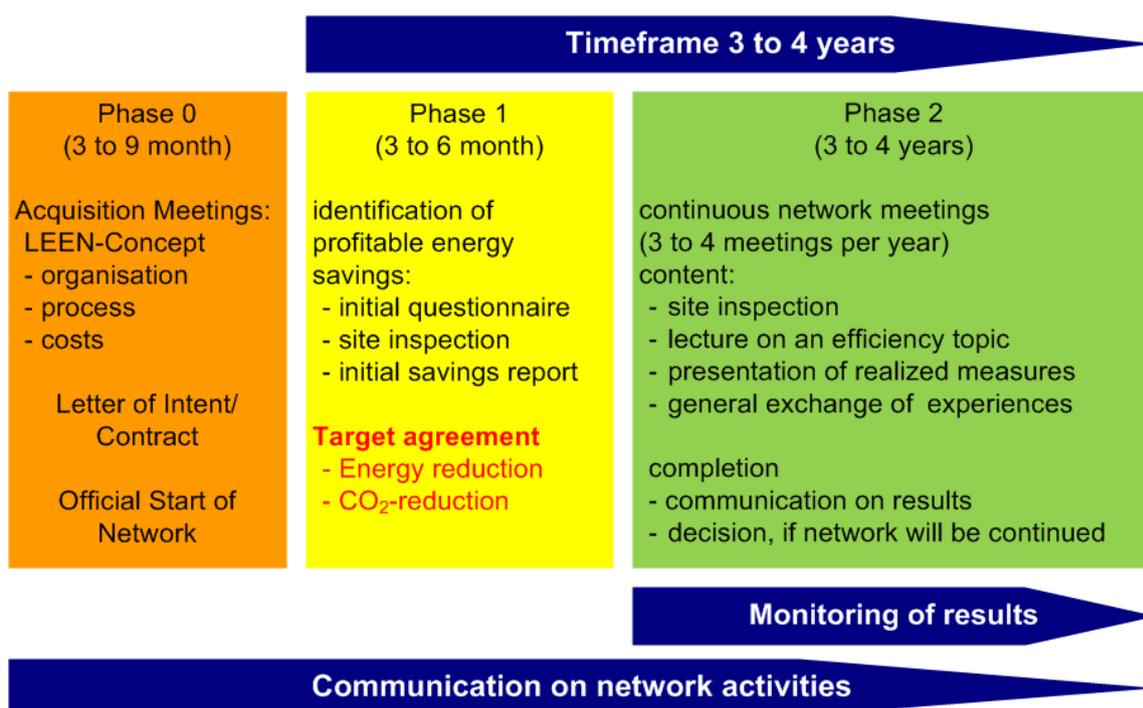
3-1-1 Germany : LEEN (Learning Energy Efficiency Network) ¹¹⁾¹²⁾

The German federal government supports a range of projects and programs based on the National Climate Initiative, including the 30 Climate Network pilot program for the industrial sector. Initiatives implemented under this program are called LEEN, and were first launched in Switzerland in 1987, and then introduced to Germany's Hohenlohe district in 2002. Approximately 400 companies participate in the pilot programs with 10 to 15 medium-sized companies in separate networks. Surveys indicate that energy efficiency improvements at corporations participating in LEEN are two to three times above the average for the industrial sector in Germany.

LEEN is a framework for autonomously improving energy efficiency by sharing and studying experiences of energy efficiency at your own company and other companies, while receiving guidance from a LEEN moderator and a consultant engineer. It is a regional version of EnMS implemented as one cycle over three to four years (Fig. 3-1). The goals for introducing LEEN are to reduce transaction costs, to overcome barriers to implementing energy efficiency measures, and to raise the priority of matters involving energy efficiency. Lower energy costs are, of course, also included. The outcome of this pilot program has been standardized as the @LEEN Network Management System (ISO50001 compliant), which is offered by LEEN GmbH.

Setting a goal of establishing more than 600 networks by 2020, the federal government aims to simultaneously boost corporate competitiveness and reduce CO₂ emissions by approximately 10 million tons even if production in the German industrial sector increases.

Fig. 3-1 LEEN Scheme



3-1-2 Sweden : ENIG (Energy Efficiency in Group)¹³⁾¹⁴⁾

A network for energy efficiency, ENIG was established in June 2009 and consists of experts in energy efficiency improvement, industry, energy agencies, and energy and climate change consultants. Focused on the casting, surface treatment, heat treatment, sheet metal forming and plastics processing industries, approximately 200 companies, mainly composed of energy-intensive small and medium enterprises, are participating in ENIG activities. The goal of the project is a 30% reduction in energy usage at the participating companies by 2015.

With financial support from the Swedish Energy Agency, the project is organized by Swerea SWECAST, Sweria IVF and FSEK (Energy Agencies of Sweden) (Fig. 3-2).

In addition to information provision, education and training to promote energy efficiency, ENIG is developing a database for benchmarking, “Light”, an energy management system for small and medium enterprises, and other tools to promote energy efficiency.

Fig. 3-2 Logo and Institutions of ENIG



Source : ENIG Web <http://www.swerea.se/enig/>

3-2 Cases in Japan

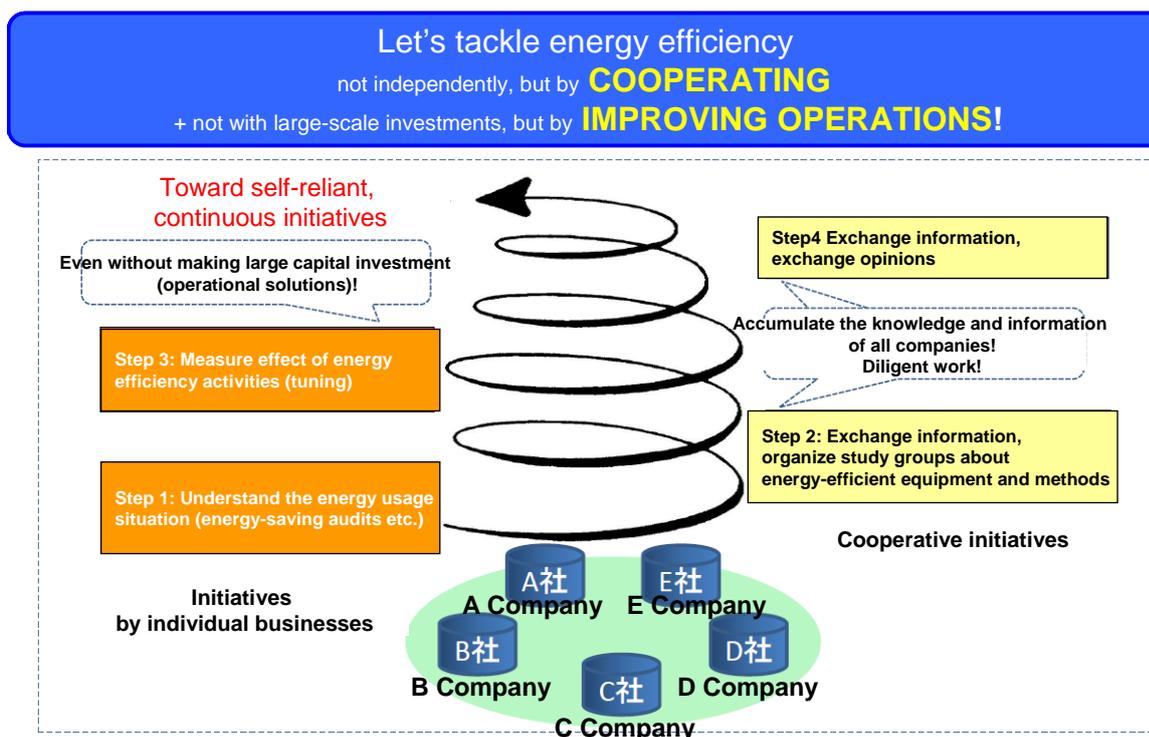
3-2-1 Energy Conservation Neighborhood Associations¹⁵⁾¹⁶⁾

The Hokkaido and Kanto Bureaus of Economy, Trade and Industry are leading on the implementation of the energy conservation neighborhood association model (Fig. 3-3).

It is a method of promoting energy efficiency measures whereby multiple businesses in the same industry, or located in the same area, form groups to share issues, ideas, information and knowhow, to study energy-efficient equipment and methods, and to exchange opinions about

activities to improve operations (sometimes referred to as energy efficiency tuning¹⁷⁾). Among practical activities carried out by each company that has participated in the cooperative activities for energy efficiency, those being effective with little expense and basic energy efficiency methods that many companies have employed are putting to good use.

Fig. 3-3 The Energy Conservation Neighborhood Association of the Hokkaido Bureau of Economy, Trade and Industry



Source : METI-Hokkaido¹⁵⁾

3-2-2 Energy-Saving Patrol Teams¹⁸⁾

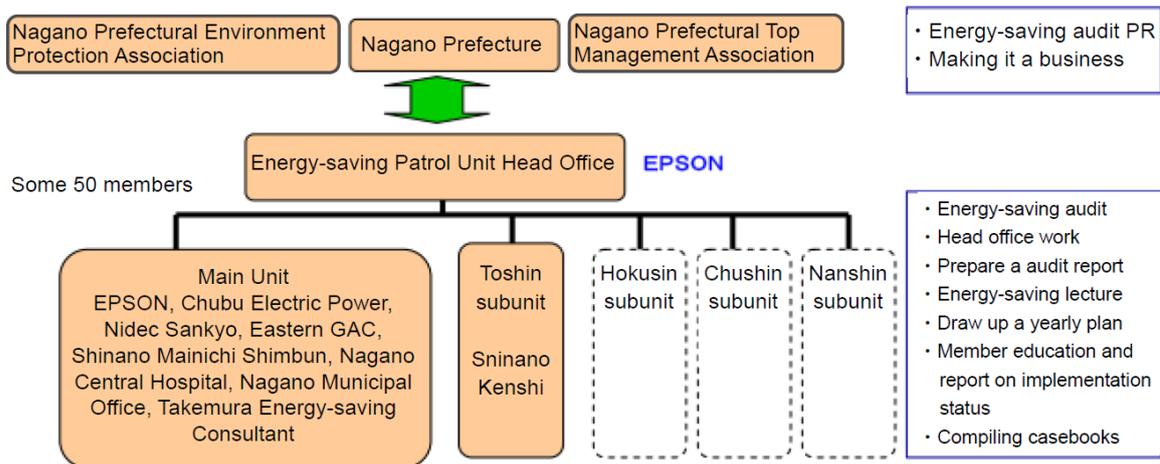
A case from the private sector is the Suwa region Energy-Saving Patrol Teams Epson started in 2000 as part of its CSR activities. In 2005, the company launched a new activity, the Shinshu Energy Conservation Patrol Team, which targets corporations and facilities in the whole of Nagano Prefecture. To promote in-depth energy-saving audits, an organizational structure has been set up with the participation of numerous corporations in the prefecture, and the cooperation and support of environmental protection associations, business associations and Nagano Prefecture, making the system of activities sustainable. The prefecture has also been divided into several areas and a supervising corporation has been recruited for each area. Centered on the supervising corporations, sub-units have been set up to promote activities that take advantage of regional characteristics (Fig. 3-4).

The energy-saving audit with an emphasis on basic measures clarifies what can be done immediately with little expense according to company's situation, what could have a big effect, but would require some investment, aiming to provide effective advice. In the nine years from 2000

when the energy-saving audits started to 2009, more than 200 energy-saving audits have been carried out, making a huge difference in the prefecture.

This method is also being rolled out overseas with the first energy-saving patrol team set up in Taiwan in 2010¹⁹⁾.

Fig. 3-4 Organization of Shinshu Energy-Saving Patrol Unit



Source : Shinshu Energy-saving Patrol Unit¹⁸⁾

4. Study : Characteristics of Cooperative Activities for Energy Efficiency

Extracting the characteristics (including the driving forces) of cooperative activities for energy efficiency produces the following list.

- (1) Relatively large energy efficiency effect
- (2) Build supporting organizations (secure funds, staff etc.)
- (3) Government participation
- (4) Basic energy efficiency measures
- (5) Accumulate and share energy efficiency knowhow
- (6) Implement follow-up
- (7) Target small and medium enterprises
- (8) Organize seminars etc.

Cooperative activities for energy efficiency have a better synergy effect than implementation of energy-saving audits or single seminars, and it can be surmised that the effect on energy efficiency is higher. It is also conceivable that the cooperative/joint activities complement deficiencies in energy management systems at medium-sized companies and factories.

In terms of barriers of energy efficiency, there is the difficulty of providing incentives to entrepreneurs and supervising staff. For example, even if the energy-saving effect is large, the energy efficiency effect may be diminished if the cooperative activities for energy efficiency

involve proportionate costs. In the cases, governments participate, coordinate, and subsidize the cost of the activities.

5. Conclusion : Suggestions for Future International Frameworks

There already exists a reservoir of best practice in the industrialized nations. Developing countries has caught up with technologies of developed nations by means of sharing information and technology transfer to achieve a certain result. However, it is difficult to improve energy management at medium-sized and smaller corporations and factories even in the developed nations. Sharing the latest energy-efficient technologies and methods would be effective if the developing nations were equipped with the capacity to master the technologies, but this is not necessarily the case. A gestation period for capacity building and other training is also required.

The cases of cooperative activities for energy efficiency considered in this paper are basic energy efficiency measures and their operational knowhow. It is conceivable that they would function effectively in developing countries as well. These types of cooperative activities for energy efficiency require some means of securing the personnel to implement them, sharing knowhow of energy efficiency, and the participation of governments. Building supporting systems is conceivable.

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