Current state of ESCO activities in Asia: ESCO industry development programs and future tasks in Asian countries

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Abstract

In Japan and other Asian countries, ESCO markets are under formation. Introduction of ESCOs to Asia took place in the 1990s. A vigorous ESCO market is already forming in Japan, South Korea, China, and Thailand. Also, in Malaysia, and the Philippines, ESCO market development is proceeding. How did these countries introduce ESCO industries? What kind of activities are being carried out, and what are future tasks? As a first step in implementing ESCO development programs, developed countries have used government support, while emerging countries have co-operated with international organisations. By classifying the types of programs and examining activities currently under way, we can understand necessary conditions for developing an ESCO industry.

When we classify programs of various countries, we see that most countries implement the same kinds of measures. However, the results vary. Some countries are progressing with market development, while others have not reached the point of market formation. Analysis of factors leading to these variations is important to the future development of ESCO industries.

In this paper, we describe the current state of ESCO activities in Japan and emerging countries, and we examine ESCO development programs of each country. In particular, by comparing measures taken in countries with successful ESCO market development, such as Japan, China, Thailand and India with those still trying to develop ESCO markets, such as Malaysia, and the Philippines, we analyse factors leading to success, and we illuminate future tasks for each country.

Introduction

Due to recent jumps in oil prices and recognition of the need for global warming countermeasures, Asian countries have major expectations for ESCOs. The definition of an ESCO in this paper is simple. ESCOs provide energy efficient retrofit projects with performance contracts that guarantee energy savings. Introduction of ESCOs to Asia took place in the 1990s. Almost all countries learned the ESCO concept from USA. Thus the definition of an ESCO in Asian countries is similar to the traditional ESCO concept in USA.

A vigorous ESCO market is already forming in Japan, South Korea, China, Thailand and India. Also, in Taiwan, Malaysia, and the Philippines, ESCO market development is proceeding. How did these countries introduce ESCO industries? What kind of activities are being carried out, and what are future tasks? As a first step in implementing ESCO development programs, all countries have used government support, while emerging countries have co-operated with international organisations. By classifying the types of programs and examining activities currently under way, we can understand necessary conditions for developing an ESCO industry.

By classifying programs of various countries, we see that most countries implement the same kinds of measures. However, the results vary. Some countries are progressing with market development, while others have not reached the point of market formation. Analysis of factors leading to these variations is important to the future development of ESCO industries.

In this paper, besides describing the current state of ESCO activities in Japan and emerging countries, we examine ESCO development programs of each country. In particular, by comparing measures taken in countries with successful ESCO market development, such as Japan, China, and Thailand and India, we analyse factors leading to success, and we illuminate future tasks for each country.

Research Methodology

The Japanese government started to develop the ESCO market in 1996. We have been involved from the beginning, having been charged with many programs, such as a feasibility study, development of guidelines for M&V (Measurement & Verification), development of a standard contract, and studying how to use ESCOs for public facilities. We supported the establishment of JAESCO (Japan Association of Energy Service Companies) in 1999. And we continue to support JAESCO as staff (Nakagami is vice president and Murakoshi is secretary general of JAESCO). JAESCO started market survey in Japan from 2000. And JAESCO carried many promotion programs such as conferences, seminars, exhibitions, case studies, and a newsletter.

From 2003, we started to survey the activities of the ESCO industry in Asian countries, because the Japanese government was interested in support to promote the ESCO industry in Asian countries, especially emerging countries. Our surveys were sponsored by JBIC (Japan Bank for International Cooperation) in 2003 and 2007 and by JAICA (Japan International Cooperation Agency) in 2006. Also, JAESCO held two Asia ESCO Conferences, in Bangkok (2005) and Beijing (2007), sponsored by Japan's METI (Ministry of Economy, Trade and Industry). JAESCO also held the Asia ESCO Symposium in Tokyo (2006). In addition, in 2008, we held an ESCO Capacity Building Seminar in Bangkok, sponsored by Japan's NEDO (New Energy and Industrial Technology Development Organization). We were in charge of all these projects as planners, organizers and researchers. In this paper, our analysis is based on interview surveys of many ESCOs and governmental staff, and discussions with many experts and stake holders.

Finally, we focus on four Asian countries in this paper. First is Japan because its ESCO market is the most developed in Asia. Others are China, Thailand and India, because these are emerging countries and need support from developed countries. In addition, ESCO markets already exist in these three countries. In other Asian emerging countries such as Malaysia and Philippines, ESCO markets are not so active. On the other hand, there are many active ESCOs in South Korea. But as a developed country, South Korea can promote its own ESCO industry.

ESCO Industry Trends in Japan

CURRENT SITUATION IN JAPAN

Orders for energy efficiency improvement work in Japan reached a record 554 million USD in FY 2007, an increase of 30% over the previous year's total. Of this total, if we consider projects that include performance contracts, Energy Service Providers (ESP), or on-site energy generation, as ESCO business, then orders for ESCO business in FY 2007 set a record of 353 million USD, a 53% increase over the 231 million USD total from FY 2006. By sector, the commercial sector had 54% of the total amount, with 192 million USD, and the industrial sector had 46%, with 162 million USD. That was an increase of 1.3 or 2.0 times the previous year totals, for the commercial and industrial sectors, respectively. From 2002 on, the core of the market had been the industrial sector, but since last year, the focus has shifted to the commercial sector with its remarkable expansion (Fig. 1).

Considering the number of contracts, recently the trend was for around 200, but in FY 2007 there were 176, 107 commercial sector and 69 industrial sector contracts. The average amount per contract greatly exceeded that of the previous year, with 1.8 million USD (71% increase) and 2.3 million USD (81% increase) for the commercial and industrial sectors, respectively (Fig. 2).

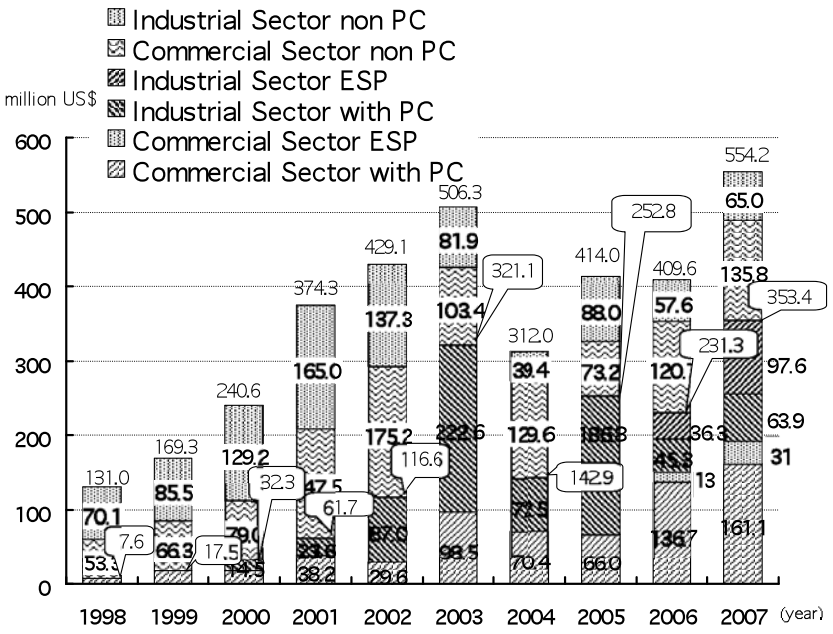
Considering the breakdown by contract type, if we take Energy Service Provider (ESP) to be one form of shared savings contract, then shared savings contracts had a 90% share, with a 95% share for industrial use. ESP for total commercial and industrial sector had a 36% share, an increase of 21% from the previous year.

As was shown above, ESCO business in FY 2007 broke all previous records. In particular, the trend of the commercial sector recently increasing continued, and is expected to keep expanding. Also, we have seen trends toward growth in the share of ESP and on-site energy generation, diversification, and a move to larger scale for commercial sector projects. The contract type, as before, has become mainly shared savings contracts.

Greenhouse gas reductions due to Japan's ESCO business have been documented at no less than 1.095 million tons CO_2/year for FY 2007. This value is the sum of effects of ESCO business to reduce greenhouse gas emissions, by members of JAESCO, implemented over as long as the past seven years. This corresponds to 15 to 17% of the 6.42 to 7.20 million tons CO_2/year greenhouse gas reductions due to diffusion of high efficiency equipment (for water heating, space heating, and lighting) expected in the plan to reach the Kyoto Protocol target. This rivals the 1 million tons CO_2/year emission reductions effect of Cool Biz and Warm Biz, the government's plan to reduce space conditioning energy use by encouraging acceptance of seasonal business clothing.

The Japanese ESCO business market size was a record 353 million USD in FY 2007. Besides a growing recognition of the need for energy efficiency due to jumps in the price of crude oil, this is due to the influence of stronger regulations for commercial sector facilities in the revised Energy Conservation Law (ECL), which has caused an increase in energy efficiency improvement activity. ECL is basic energy efficiency regulation and standard in Japan.

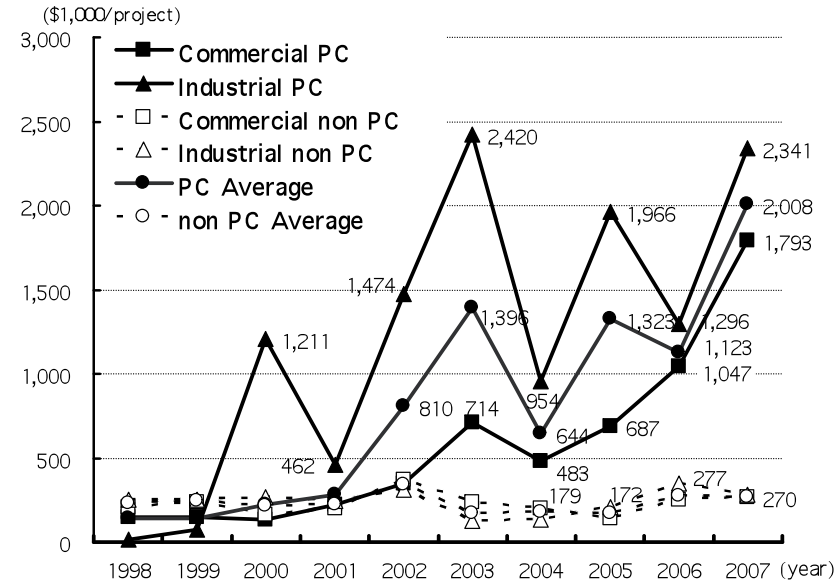
Crude oil price was jumped and down. But, we expect that energy prices will continue to jump in the future. Price increases have already been announced for next fiscal year for electricity and city gas in Japan. Also, particularly for the commercial sector, the ECL regulations will further expand their applicable range. We expect that the ESCO industry will continue to develop in the future, as its role in bringing about greenhouse gas emissions reductions becomes even more important.



(data: JAESCO 2007)

Figure 1. Change in the market scale of ESCO business.

Note: 1. For contracts begun in FY 2007, for a multiyear contract, the total over the whole contract period is counted in the FY 2007 total orders.
2. PC is performance contract.
3. ESP is energy service provider.



(data: JAESCO 2007)

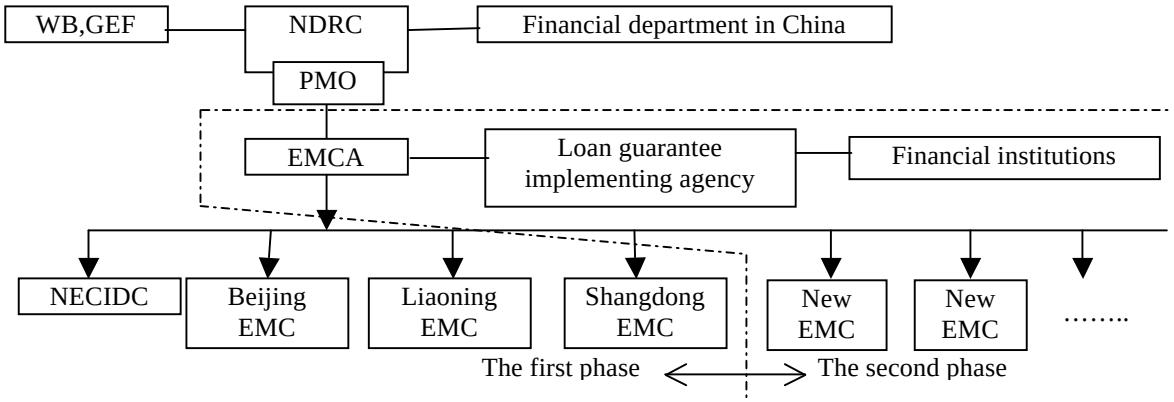
Figure 2. Per contract investment in ESCO business.

MEASURES TO PROMOTE AND EXPAND ESCO IN JAPAN

Characteristics of the Japanese ESCO market are as follows: a focus on private sector facilities, especially for the industrial sector, also with firm growth in the commercial sector; dominance of shared savings contracts; long payback periods for many projects; and both ESCO and customers are large scale, blue-chip companies. Issues include lack of progress in government facilities, and absence of the right financial environment for small and medium companies.

Regulations for commercial sector energy efficiency apply to Type 1 and Type 2 Designated Energy Management Facilities. Revisions of 2003, 2005 and 2008 expanded the range of targeted facilities. There is a time lag of several years before the energy efficiency improvements accompanying the increased investment from these regulations will be seen, so we consider the influence of stronger regulation to be realized from now on. Current focus for strengthening regulation is on the government, being studied by some local public organizations, which would further support market expansion.

With respect to starting ESCO projects at public facilities, while local public bodies are proceeding, introduction at national facilities lags behind. But for local public organizations



Note: NDRC: National Development and Reform Commission / PMO: Project Management Office / NECIDC: NDRC Energy Conservation Information Dissemination Center

Figure 3. World Bank/GEF China Energy Efficiency Project organization chart.

there is also the issue of bidding conditions being strictly set, so we are not seeing accelerated expansion here. Also, because small scale facilities are not such attractive projects, there are many cases that do not become projects. Therefore, flexible responses are needed, such as simplifying bidding procedures and bundling of many small projects. As for national facilities, procurement regulations are an extremely large barrier, and major systemic reform is needed, as was done in the USA.

A good financial environment is important for overall energy efficiency business, not just ESCO, but because in ESCO business the ESCO clearly bear the performance risk by guaranteeing energy savings, the risk borne by the financier is limited to credit risk. This shows that, compared to general energy efficiency improvement projects, ESCO projects have an advantage in procuring financing. However, credit risk is still a major issue for financiers. The loan guarantee system introduced in China is a way to decrease credit risk borne by financiers. It is necessary for Japan to adopt such a program, so that financiers will positively participate in the ESCO market. At the same time, economic supports, such as low interest financing and favourable tax treatment, should focus on small and medium enterprises, providing a good investment environment.

Trends for the ESCO Industry in China

HISTORY OF ESCO ACTIVITY AND OVERVIEW OF ENERGY EFFICIENCY IN CHINA

The Chinese ESCO industry began through the support of the Global Environment Facility[1] (GEF) and the World Bank. Their program to develop a full-fledged ESCO industry is now in its final stage.

From 1992 to 1994 the GEF and World Bank carried out the China Issues and Options in Greenhouse Gas Emissions Control survey verifying that, in spite of the large potential possibilities for energy efficiency, due to market barriers such as financial, technical and commercial practice barriers, energy efficiency projects were not being carried out. A significant program to introduce and develop an ESCO industry began in December 1998. The China Energy Efficiency Project (CEEP) consisted of two phases. Phase 1 and Phase 2 were implemented from 1998 to 2003 and 2003 to 2008, respectively. Phase 1 involved creation of three pilot ESCOs, provision of information, and the founding of the NECIDC (NDRC[2] Energy Conservation Information Dissemination Centre). Phase 2 involved setting up the Loan Guarantee system that guarantees liabilities, and founding of the ESCO association, China Energy Conservation Service Industry Association (EMCA). In China, ESCOs are called EMC (energy management companies). This is because ESCO was a registered trademark in China and thus could not be used. Below, we use the customary Chinese name, EMC.

China Energy Efficiency Project Phase 1

The CEEP Phase 1 involved setting up three pilot EMCs in Beijing, Liaoning, and Shandong Provinces, and conducting a public information campaign about energy efficiency, along with measures to increase the spread of ESCO business. The three pilot EMC were founded in 1996 and began operation in 1997 (Fig. 3).

China's EMC take the performance contract as a basic principle, defined as "of the overall project profit, profit from energy efficiency should exceed 50%." The EMC offer a series of services comprehensively: (1) energy audit, (2) planning, (3) choosing energy efficiency technology, (4) project finance, (5) procurement and installation of equipment, (6) testing, (7) operation, and finally, (8) maintenance. Further, the pilot EMCs are all for-profit corporations that implement energy efficiency projects using performance contracts. During the contract period, the EMC and the client share profits, and at the contract's conclusion, the equipment belongs to the client.

Support from the World Bank, GEF, and other international agencies were expected to help set up and operate the pilot EMC and form the Chinese ESCO market. The financial framework to set up the pilot EMC consisted of a 21 million USD loan from the World Bank to each company, with 5 million USD to each company from the GEF's 22 million USD, and 1 million Euro to each company from the EC's 4 million Euro, provided as reserve funds, not to be invested as capital. The interest rate was based on the London Inter-Bank Offered Rate (LIBOR). Each pilot EMC received investment of 26.8 million USD at 1996 exchange rates, for a total amount of 89.4 million USD (Table 1).

Table 1. Overview of International Financial Support

Funding Organization	Type of Support	Amount	Allocation to each EMC
World Bank IBRD	loan	63 million USD	21 million USD
GEF	subsidy	22 million USD	5 million USD
EC	subsidy	4 million Euro	1 million Euro
UK Government	subsidy	1.911 million Pound	--
Total		89.4 million USD	26.8 million USD

Note: Using 1996 exchange rates: 1.269 USD/Euro, 1.578 USD/Pound

The scale of pilot EMC business increased quickly until 2001, when it reached 170 million RMB (about 20.5 million USD) (Fei 2005). After that it hardly grew through 2004, but in 2005 it increased to 270 million RMB (about 32.6 million USD) (Ming 2007).

Essentially all the projects have short payback periods, with an average simple payback period of 1.3 years. Ninety percent of all projects have a simple payback period of two years or less. However, as the average contract length for shared savings contracts is 4.5 years, with the longest said to be ten years, it seems that there remain questions regarding the contracts. Specifically, we wonder if it is rational to have a long-term contract for a project with a short payback period. If, ESCO charge same amount of service fee to customer during long contract period after recovered investment by ESCO as short period, it seams like usury or loan shark.

In Phase 1, 475 projects were carried out, with a total cumulative investment of 1.33 billion RMB (about 160 million USD). The resulting cumulative energy savings has been, as coal equivalent, 1.51 Mtce per year, with an effective CO_2 reduction of 1.45 Mt-C/year.

China Energy Efficiency Project Phase 2

Phase 2 of the CEEP began with a 5-year plan, from 2003. The main theme for Phase 2 is the cultivation of the start-up EMC. In Phase 2, EMCA was established supported by GEF in 2003. And a loan guarantee system was implemented, with the goal of encouraging market participation of the start-up EMC, and expanding the market. The China National Investment & Guaranty Co., Ltd (CNI&G) manages the loan guarantee program, with 22 million USD provided by the GEF.

The loan guarantee program is a measure to let financial organizations avoid credit risk. By receiving this guarantee, financiers are encouraged to participate, thus expanding the market. According to a calculation by the World Bank, five times the financing has been induced due to the guarantee program (Fig. 4) (World Bank 2002).

CURRENT SITUATION IN CHINA

According to a survey by the EMCA, investment in ESCO business and in energy efficiency as a whole rose sharply from 2003 on. In 2006 it expanded to 6.33 billion RMB (795 million USD), with 1.89 billion RMB (237 million USD) of that for projects with performance contracts (Figure 5). This is about the same level as Japanese ESCO business.

The resulting energy savings for the single year of 2006 were, as coal equivalent, 4.16 Mtce/year for the overall investment in energy efficiency, with 2.69 Mtce from projects with performance contracts. Looking at cumulative savings from 2003 to 2006, there are 8.33 Mtce/year overall and 5.38 Mtce/year for performance contracts. Considering the change from year to year, the energy efficiency savings for 2006 are about the same scale as the cumulative savings from 2003 to 2005.

To show the breakdown by investment type, we refer to survey results for 2005 (J Power 2006). In 2005, industrial sector investment was 76% of the total, at 2.22 billion RMB (271 million USD), while commercial sector investment was 0.67 billion RMB (82 million USD). By number of projects, there were 189 industrial sector projects and a higher number of 294 commercial sector projects. The investment per project was 11.7 million RMB (1.43 million USD) for the industrial sector, and nearly five times smaller for the commercial sector, at 2.3 million RMB (280 thousand USD). (Fig. 6)

In 2005, there were said to be around 150 EMC in existence in China, with the most in Northern China, followed by a concentration in Eastern China. This is due to the pilot EMC being located in these regions, and also many industrial regions being situated there. However, of these 150 enterprises, only several tens of companies can be said to carry out full-fledged ESCO business.

The basic groundwork for growth of the Chinese ESCO industry is being laid: participation of many start-up EMC, founding of an ESCO Association, and set up of the loan guarantee program (managed by CNI&G). Furthermore, as part of the 11th Five Year plan, which began in 2006, there is a target to reduce unit energy consumption (energy per unit of GDP) from current levels by 20% by 2010. The revision of the Energy Conservation Law in October, 2007 further strengthens regulations and support for energy efficiency. For example, the government will subsidize any projects with overall energy savings (until the time the investment is recovered) of standard coal equivalent 10 ktce or above, at 200 RMB (26.2 USD) per ton for eastern China, and 250 RMB (32.8 USD) per ton for western China. The ESCO industry in China gets stronger each year, and will continue to grow in the future as it delivers energy efficiency.

MEASURES TO PROMOTE AND EXPAND ESCO IN CHINA

The Chinese ESCO market is forming, with financial support of the GEF and World Bank. ESCO projects are characterized by use of private technology, know-how, and capital, and this is made possible by performance contracts. ESCO projects avoid performance risk through technology and know-how, which becomes an incentive for investment in energy efficiency. But it

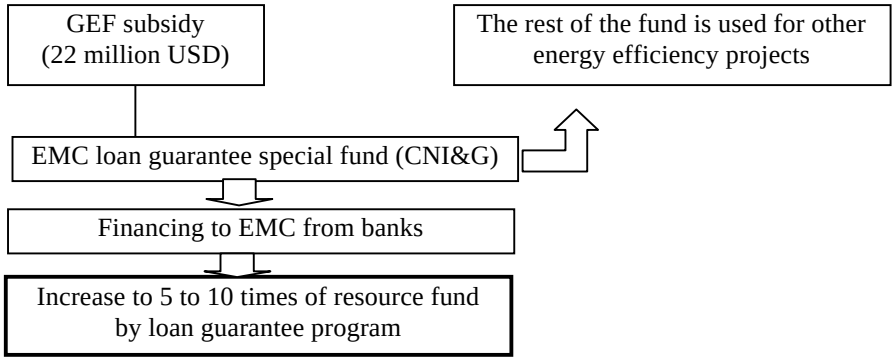
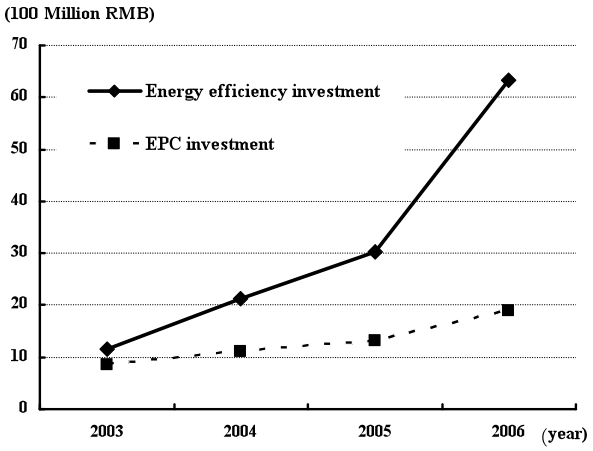
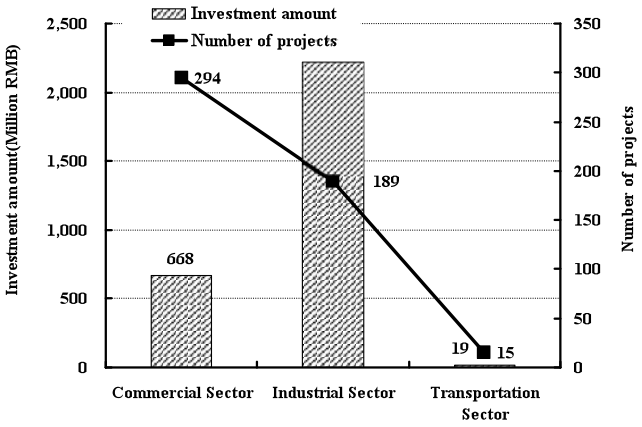


Figure 4. Overview of the loan guarantee program.



(data: Ming 2007)

Figure 5. Change in Chinese energy efficiency investment over time.



(data: EMCA survey, 2006)

Figure 6. Investment in Chinese ESCO business by sector, 2005. (Fei 2005)

takes considerable time for this arrangement to be understood by the market and to provide a favourable financial environment. In China that time was successfully, greatly shortened, by supporting financial aspects from the start.

On the other hand, the point that ESCO projects are long-term, reliable business has not penetrated the market. Chinese ESCO projects basically have short payback times because avoiding capital recovery and bankruptcy risk are major issues. Contracts are not reliably protected, and a system for capital recovery after bankruptcy is not fully developed. These are basically difficult topics involving reform of business customs and systematization by government. However, it is necessary to thoroughly instill correct recognition of ESCO business among ESCOs, their clients, and their financiers by expanding public awareness through introducing the fundamental parts, the role and effectiveness of ESCO business, the original ESCO concept, and examples of successful projects. Also, it is important to acquire trust from the market and contribute to increasing skills of ESCOs by developing and introducing standardized contracts and by implementing ESCO accreditation or registration system.

At the same time, it is necessary to support ESCOs by measures such as preparing data bases on energy consumption and developing skills related to technical know-how. Specifically, results of energy audits should be entered into a data base to make energy use and possibilities of energy efficiency clear for each type of industry. Training is needed about energy audits, technical information, measurement and verification, and contracts. This kind of technical skill development will increase trust in ESCO, and allow the market to recognize that this really does differ from other business. In other words, In order to form the ESCO market, improvement of business customs is needed, but the shortest path is to have ESCOs increase their own skills. Besides this, if it is possible to further expand the current loan guarantee system that would be even more effective.

Trends for the ESCO Industry in Thailand

HISTORY OF ESCO ACTIVITY AND OVERVIEW OF ENERGY EFFICIENCY IN THAILAND

In 1992, Thailand enacted the Energy Conservation Promotion Act (ENCON Act), in order to improve regulations and laws to encourage energy efficiency, new energy and their financing. Under the ENCON Act, the Ministry of Energy's Department of Alternative Energy Development and Energy Efficiency (DEDE) directs the Compulsory Program for Designated Factories and Buildings. Factories and buildings that are specified in the ENCON Act (facilities with peak electric load of 1 MW or greater) are required to manage energy use in the following categories: lighting electricity consumption, space condition-

ing energy consumption, and building envelope. Also, at these facilities, energy audits are mandatory, as are setting of energy efficiency targets and design of a plan to reach the targets. At present, revision of the ENCON Act is being considered, to (1) set different measures and evaluation standards for public and private facilities, (2) standardize the energy manager position, (3) and set energy standards for building types (hotel, office, hospital, department store).

The Energy Conservation Promotion Fund (ENCON Fund) is a financial measure to encourage energy efficiency from the 1992 ENCON Act. The ENCON Fund's initial 1992 capital came from moving 1.5 billion Baht (37.5 million USD) from the Petroleum Fund, which at that time was from a tax of 0.07 Baht/L (0.0018 USD/L) on consumption of petroleum products. From 2000 on, the budget from the Petroleum Fund came to exceed 3 billion Baht (75 million USD), and the annual budget has become 5.5 to 6.5 billion Baht (137.5 to 162.5 million USD). Recently, the tax rate for petroleum products is 0.04 Baht/L (0.001 USD/L).

The ENCON Fund provides low interest financing. During the first period, from 2003, lasting three years, loans were handled by six banks, with an interest rate of 4% for ESCO, and repayment from banks to DEDE at zero interest. During the second period, which began March 17, 2006, the principal is 2 billion Baht (50 million USD), and 11 banks handled the loans. The interest rate for ESCO is fixed at 4% (market rate is 7.5%) and repayment from banks to DEDE at 0.5%. The maximum loan per project is 50 million Baht (1.35 million USD), and the maximum loan term is 7 years. Designed for revolving operation, from the first year of operation, all of the 2 billion Baht (50 million USD) have been used. From 2008, DEDE started the ESCO Fund, which is for low interest loans. The total budget is 500 million Baht (13.5 million USD), and the maximum loan per project is 15 million Baht (0.4 million USD). DEDE plans to expand this budget next year.

As can be seen, compared with emerging countries of Asia that have delayed preparation of energy efficiency laws, Thailand's energy efficiency policies are well developed based on the ENCON Act, and there is a large energy savings potential. In particular, from 2005 on, jumps in the price of oil have served to assuage doubts about the operation of the ENCON Fund, making it functional. At the same time, interest in ESCO by government is increasing.

The ESCO industry in Thailand began in 1996, with its first activation in March, 1999, when the DEDP (now DEDE) was a recipient and the World Bank and GEF support project began. In the GEF project, as pilot projects, four industrial facilities were targeted and received energy audits. The recipient was the Electricity Generating Authority of Thailand (EGAT, currently EGAT Public Co. Ltd.), and the projects were carried out as part of demand side management.

One example is a project to install cogeneration at a factory of the Bangkok Produce Merchandising Public Co. Ltd. This 2002 project received 30% subsidy from the ENCON Fund. The 6 million Baht (0.15 million USD) cost of the energy audit was supplied by GEF funds, and the investment in ESCO business of 190 million Baht (4.75 million UDS) was borne by the factory. The investment was recovered in 4.9 years.

CURRENT SITUATION IN THAILAND

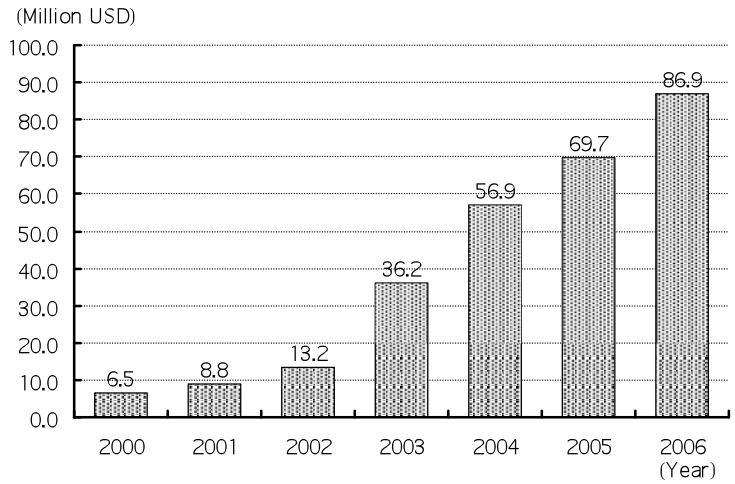
There are currently about 30 Thai ESCOs. A system of registration to access the low interest financing implemented by the Ministry of Energy (ESCO Fund) has begun, which includes about 30 companies. Many Japanese corporations have begun operations in Thailand, and many large scale factories are related to Japanese corporations. These Japanese factories have begun to introduce ESCO. At first, thinking that ESCO with Japanese roots would have an advantage with respect to sales, Japanese trading firms entered the ESCO market. However, market development did not go well, and they withdrew in 2007. After that, indigenous Thai ESCO pioneered the market for Japanese factories in Thailand, and are now succeeding. Considering this situation, we can regard Thailand as a turning point for the ESCO industry. It is not always the case that factories of Japanese corporations are energy efficient. Japanese ESCO did not succeed in market development, and instead, local Thai ESCO are succeeding at market development. This is due to many factors, such as the close ties to local enterprises of the Japanese factories, due to their long history in Thailand, the increasing need for energy efficiency due to jumps in the price of oil, and also that the Thai government's continual effort to promote ESCO is recently bearing fruit. In the future, with further jumps in oil prices in the forecast, the Thai ESCO industry can look forward to a period of full-fledged expansion.

As an incentive related to promotion of ESCO business, there is a revolving fund and a measure for tax exemption. The revolving fund is a program to provide low interest financing for energy efficiency projects. From 2002 to 2005, 80 energy efficiency or new energy projects were implemented, with a total finance amount of 100 million USD, 54 million of which came from the revolving fund, for an energy savings effect of 42.7 million USD. In 2006, 75 projects were implemented, with a total finance amount of 78.5 million USD, 41.2 million from the revolving fund, and an energy savings of 36 million USD. From now on, the government plans to gradually decrease its role, while banks increase the ratio of cooperative financing, and strengthen training related to bank energy efficiency instruments.

As for tax exempt measures for energy efficiency customers, the tax rate on large corporations, 30%, and medium and small corporations, 15%, profit gained from reduced energy consumption is excluded from taxation. In addition, there is also an 8-year exemption from corporate taxes for ESCOs (Special Public Corporations).

Below, we show recent trends in ESCO business in Thailand.

- In 2006 the Thai Military Bank (TMB), with support from the French Development Agency (AFD-France) investigated loan guarantees, but did not reach the point of implementation.
- EGAT's project to set up an ESCO has been suspended, due to personnel and budget considerations.
- The Federation of Thai Industries (FTI) took on the role of ESCO association, and held all kinds of events.
- ESCO Fund was started from 2008.



(data: DEDE survey, 2007)

Figure 7. Change in Thai investment in ESCO business

- Financial organizations interested in ESCO include Bank Thai, Bangkok Bank, and others.

Thai ESCO business has shown bullish growth. In 2000, contracts could be valued at 260 million Baht (6.5 million USD), and grew quickly to a record 3.2 billion Baht (86.9 million USD) in 2006 (Fig. 7). Further, it has been estimated that the potential market for Thai energy efficiency projects is 8.3 billion Baht (490 million USD).

MEASURES TO PROMOTE AND EXPAND ESCO IN THAILAND

In Thailand, energy efficiency policy based on the ENCON Act has been implemented, and the government is be-coming positive about promoting energy efficiency, especially due to the rise in crude oil prices since 2005. Therefore, compared with other emerging countries in Asia, Thailand has a high possibility that the energy efficiency business, including ESCO, will grow. The ESCO market expanded to 83 million USD in 2006, and is expected to increase greatly in the future. Additionally, many Japanese corporations have operations in Thailand, and many large factories belong to these Japanese companies. Therefore, focusing on these Japanese companies to build an ESCO market should also push overall Thai ESCO market development. Japanese factories have already begun to introduce ESCO, so we think that in the future all the more market development will proceed. However, it is not the case that energy efficiency business is generally accepted. Accordingly, a wide range of support measures are needed, including skill development, public awareness, project development, financial preparations, and policy strengthening. In particular, with technical information and training about energy efficiency technology, it is possible to activate ESCO projects.

There has not been an organization responsible for promoting growth of ESCO in Thailand, and this was done in a limited way by the government and EGAT. Until recently, EGAT took on the role of ESCO promotion and TMB implemented financial support, but since EGAT investigated and decided not to enter the ESCO business, it stopped its ESCO promotion activities. At the same time, TMB decreased some functions due to a personnel shortage, so the function of ESCO promotion completely declined. In response, from 2007, FTI began a project to promote ESCO expansion, so from now on, it will be effective to cooperate with FTI to carry out a variety of programs.

With respect to financing, systems are not yet adequate, due to factors such as collateral generally being required for loans, and leases being uncommon. An adequate finance system is essential for ESCO growth. Also, TMB planned to introduce a loan guarantee system, but it has not actually done so. Introducing such a system is important in creating a favourable financial environment.

Trends for the ESCO Industry in India

HISTORY OF ESCO ACTIVITY AND OVERVIEW OF ENERGY EFFICIENCY IN INDIA

India has many government agencies responsible for energy and the environment: Ministry of Power, Ministry of Petroleum and Natural Gas, Ministry of Non-Conventional Energy Sources, Ministry of Environment and Forests, and others. There has not been much cooperation between these agencies, and compared with China and Thailand, laws about energy efficiency have been relatively late, with enactment of the Energy Conservation Act (EC Act) in October, 2001 (implementation from March 1, 2002). Implementation and oversight of the EC Act is under the jurisdiction of the Bureau of Energy Efficiency (BEE), set up in the Ministry of Power. Items covered by the EC Act are shown below.

- Energy Manager/Energy Auditor:
  A national certification examination for Energy Manager and Energy Auditor began in 2004. As of 2008, 2000 people have become certified.

- Energy Management Facilities:
  BEE specifies factories and facilities using a lot of energy, and sets, evaluates, and provides guidance on energy consumption standards for these facilities. An Energy Manager is responsible for energy efficiency measures, and an Energy Auditor carries out an energy audit. Submission of a report on the progress of energy efficiency measures and current energy consumption is mandatory. If standards have not

been met, facilities are ordered to implement energy efficiency measures. Companies that have not submitted reports or taken energy efficiency measures by the end of the grace period (through March 2007) have their names listed on BEE's home page.

- Building energy efficiency standards:
  Energy efficiency standards have been set for exterior walls, roof, windows, lighting, and space conditioning equipment, applicable to commercial facilities with contract power of 500 kW or greater. There are various standards for five geographic regions. They took effect in May 2007.
- Energy Consumption Standards:
  These standards apply to cogeneration, industrial dryers, fans, chillers, lighting equipment, transformers and others.

CURRENT SITUATION IN INDIA

Until 1990, the Ministry of Petroleum and Natural Gas and the Ministry of Power each implemented their own energy efficiency programs. After that, funding from international organizations like the World Bank, governmental finance organizations, such as the Indian Renewable Energy Development Agency Ltd. (IREDA), has provided low interest financing for energy efficiency projects. Also, with United States Agency for International Development (USAID) support from around 1995, the first ESCO enterprise in India was born. From 2002, through cooperation of the United Nations Development Programme (UNDP), World Bank, and others, the 3 Country Energy Efficiency Project (3-CEE) began. This is a program to promote ESCO in India, China, and Brazil. In 2005, the International ESCO Conference was held in New Delhi, and in 2006, an ESCO association, the Indian Council for Promotion of Energy Efficiency Business (ICPEEB) was founded.

The Federation of Indian Chambers of Commerce and Industry (FICCI) and other industry groups led the way by carrying out model ESCO projects. The government quickly followed suit, by starting model ESCO projects in government buildings from around 2002.

The government, international agencies, ESCOs, industry groups, finance organizations, and others have all taken various actions to develop India's ESCO industry, and the ESCO industry has begun. However, at present, we cannot say that conditions have been laid for a market environment.

In 2003, there were 4 to 8 ESCOs, and as of 2008 this number has increased to at least 15 companies (members of ICPEEB). However, many of these do not carry on full-fledged ESCO business, instead only performing energy efficiency audits. Similarly, some equipment manufacturers, only use the scheme of ESCO as a tool to sell their own equipment. Furthermore, current ESCOs are small scale, financially weak, and lacking in reliability, and project formation has not gone smoothly.

As a customer of energy efficiency projects including ESCO business, BEE has targeted nine central government facilities (office buildings, hospitals, airports, etc.). Planning is underway. State and regional government ESCO business is being carried out with support from USAID, the World Bank and others. Examples of projects include street lighting in Bangalore, lighting at the water departments of Karnataka, Tamil Nadu, and Dehli. There are also results from ESCO projects in the industrial sector, for paper mills, food, steel, ceramics, and other industries. For large scale facilities, in-house energy managers can perform audits, so ESCO are not necessary. Accordingly, there are many ESCO projects for small and medium sized industries. But for small scale projects, the transaction costs become a major portion of total cost and it becomes more difficult to have profitable projects. For this reason, an investigation is underway into whether it is possible to expand ESCO business by trying to bundle projects for a given industry. In the commercial sector, there are some examples, including a hotel in Hyderabad and India Gandhi International Airport, but ESCO activities in the commercial sector remain undeveloped.

At present because there is only a small developed ESCO market and surveys have not been done, we cannot specify the scale of the market in India. However, because the potential for energy efficiency is large, five years after implementation of the EC Act further strengthening is under consideration, and the government is eager to promote ESCO business, we expect future growth of energy efficiency business in India.

MEASURES TO PROMOTE AND EXPAND ESCO IN INDIA

Until now, ESCO promotion measures have been implemented through support from international agencies, mainly USAID, but due to investment being decentralized, it is difficult to say that this has functioned effectively. At present, the private sector group FICCI is receiving support and is actively developing promotion activities. On the other hand, BEE organized a section which in charge ESCO promotion, so we think the government (BEE) and FICCI will take the lead in market development from now on. All kinds of measures need to be strongly expanded to promote the spread of ESCO: skill development, public awareness, project development, financial systems preparation, and policy strengthening.

To carry out these programs seminars and training will be needed, but many other aspects are important. Furnishing basic data, data bases from energy audits of case studies, and technical information will raise awareness among both ESCOs and their potential clients of the effectiveness of ESCO projects. Also, from offering effective materials for judgement about setting policy objectives, policy makers should actively take up that matter.

On the financial front, low interest financing has been implemented, but many measures that should be considered, such as subsidies, tax incentives, and a loan guarantee system, are left. Further, along with private sector activities, government organizations also need skill development. Strengthening of policies is also needed.

Discussion and Analysis of Success Factors among Asian ESCO Development Program

The Asian countries in which ESCO business development is proceeding and markets have formed to some degree, are only Japan, China, India, and Thailand. In other countries, such as Malaysia and the Philippines, there is great interest in ESCO business, and governments are currently taking measures to introduce ESCO projects, but markets have not yet been developed. In emerging countries, until now international agencies have supported programs with the goal of developing ESCO projects. However, even with the same GEF, various country's

programs differ, and cases abound where multiple sources of funding are invested in a single program. For example, in China, funds from the GEF, World Bank (IBRD), EU, and Britain formed Phase 1 of the CEEP. In Malaysia, funding was provided from the GEF, UNDP, Malaysia Electricity Supply Industry Trust Account (MESITA) Fund, and the Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP), which offers subsidies to ESCO. In India, there was funding from USAID and GEF, while in Thailand funding was offered from the GEF. In addition, funds not targeted to a specific country have been established by the Japan Bank for International Cooperation (JBIC), Asian Development Bank (ADB), Mitsubishi Corporation, and others. Here, we organize each country's programs to develop ESCO industries, and consider future measures to encourage ESCO business.

MAJOR PROGRAMS TO DEVELOP ESCO INDUSTRIES

In order to develop ESCO business various environmental preconditions are needed. We show measures carried out in Japan, the US, and other Asian countries to create an environment favourable to ESCO business.

Initial investigations/Feasibility studies

In 1996 and 1997, Japan's METI supported a comprehensive survey. In China the GEF, and in India the USAID supported initial investigations about introducing ESCO business. Based on these study results, in China the World Bank, and in India the USAID had pivotal roles in implementing initial programs to introduce ESCO. These were the first programs carried out in each country for developing a new ESCO industry.

Skill development

In Japan, various instruction manuals have been produced. In Asian countries, as part of the 3-CEE (China, India, and Brazil) supported by UNDP, there were programs for financial organizations to develop their abilities in offering information, guidelines for methods to evaluate energy efficiency projects, and support to develop financial instruments. For ESCO companies there were training courses, and guidelines for contracts. Also, in India there was technical training via USAID. For technical training, there is a great need for information about energy efficiency audits, measurement and verification, and high efficiency equipment, and support from Japan is also expected. On the other hand, because lack of understanding by financial organizations is a big barrier, each country is aware of the need for training aimed at financial organizations. However, in Japan, as in other Asian countries, such training has not yet been furnished.

Public awareness campaigns

In Japan, the Energy Conservation Centre Japan (ECCJ) and JAESCO have taken the lead in holding seminars, conferences, and exhibitions. In other countries ESCO associations and governmental organizations carry out similar activities. It is rare to have an international agency carry out a program that is solely aimed at public awareness. Usually such programs are carried out in coordination with other programs. As one part of skill development in the 3-CEE program, in China the GEF supported setting up an ESCO association, the EMCA, which took the lead in public awareness activities. In contrast, in countries like Thailand, where there are no groups other than the government to raise public awareness, or like the Philippines, where there is an ESCO association but it is not fully functional, the government, or a government-sponsored organization must take on that main role. In Thailand, EGAT had that main role, but EGAT's participation in ESCO business has been postponed, so instead, the industry group FTI has taken on the functions of an ESCO association. Thailand's Ministry of Energy and FTI coordinated to put on an ESCO Fair from 2007 on. At the same time, they began a system of public recognition for outstanding ESCO projects and held a recognition ceremony at ESCO Fair 2008.

There have been international conferences focusing on ESCO. In 2005, JAESCO convened the 1st Asia ESCO Conference in Bangkok, followed by the 2nd Asia ESCO Conference in 2007, in Beijing. Other international conferences also frequently occur in Asian countries.

Support for set-up and operation of main business

Support for setting up ESCOs and industry groups has been undertaken in emerging countries by international agencies. The GEF program in China to support start-up ESCO is representative. During the GEF's Phase 2, founding of EMCA was supported, and support for EMCA's operation continues. The role of GEF and the World Bank in development of China's ESCO industry was extremely comprehensive, and also effective.

In India, the USAID provided support through a program of information transfer to ESCOs, and through the 3-CEE program there was support for foundation of an ESCO association. Also, in Malaysia and the Philippines, ESCO associations were set up with support from governments.

In Japan, until now ECCJ and JAESCO have carried out activities as the core of the ESCO movement. However, the ECCJ functions are being integrated into JAESCO, to complete the functions of an ESCO association.

Business development

Following the initial phase of feasibility studies, many energy efficiency audits and pilot projects are underway. In Japan, pilot projects took place in 1998. There are many examples in Japan and elsewhere, of government subsidies allowing for free energy efficiency audits.

Energy efficiency audits supported by international agencies are integrated with pilot projects that follow. In India, USAID provided support, while in Malaysia, GEF provided the energy efficiency audits and provided low interest financing for the ensuing pilot projects. In Thailand, GEF funded energy audits, and pilot projects were carried out with subsidies from the ENCON fund. In China, there were no pilot projects, but GEF's support for setting up ESCOs and the World Bank's low interest financing covered the need sufficiently.

Markets for energy efficiency in Asian countries are still undeveloped. It is not an overstatement to say that they hardly exist. There are many examples of high efficiency equipment with lower life cycle costs that have not spread due to higher initial costs. High performance equipment not selling due to higher initial investment can be attributed to the market being immature. Therefore, developing ESCO in Asia can be considered tantamount to developing markets for energy efficiency.

Japan provides various supports to other Asian countries, but recently has promised support to many for promotion of energy efficiency. However, Japan's government also considers Japan's national interest. For example, if Japanese ESCO can enter markets with ESCO subsidies, or if demand for Japanese-made high-efficiency equipment increases, that would be in Japan's interest. Also, as many Japanese corporations have operations in Asia, Japanese ESCO expect it to be easy to enter these markets. But, as the markets are undeveloped, there are many hurdles for Japanese ESCO to participate, and they can only partially succeed. For these reasons, it seems that local enterprises are probably best situated to develop markets. In fact, market development has begun in China, where local ESCO have been the focus, and we see the same trend in Thailand. Once a market exists, companies with strong technology, reliability, and financing can enter that market. Accordingly, when Japan supports promotion of overseas energy efficiency, it makes sense to first start with local enterprises, and not expect a short term profit. As a country with few natural resources, we think it will be in Japan's national interest to develop Asian energy efficiency markets, thereby restraining overall Asian oil consumption.

Financial support

Main financial supports are low interest financing and loan guarantees. Low interest financing programs have been funded in China by the World Bank, in India by the World Bank, ADB, JBIC, USAID, and others, and in Malaysia by GEF. Loan guarantee programs are ways to get private capital invested in the energy efficiency market. In China GEF funding, and in India 3-CEE funding was used to implement such programs. Similar programs were planned for Thailand and the Philippines, but they have not been implemented. In addition of these programs, subsidies have been provided by domestic financing programs, such as the ENCON Fund in Thailand, NEDO and others in Japan. Also, in China and Thailand a system of tax breaks has been implemented.

Policy strengthening and system reform

An important element in promoting ESCO business is strong energy efficiency regulations. In China and Thailand, regulations are being strengthened due to energy efficiency legislation, and in other countries, existing energy laws do address energy efficiency, but there are big differences among countries. In Asia's emerging countries, the regulations cannot be called strict.

Strengthening regulations due to energy efficiency policy directly influences both ESCO and the promotion of energy efficiency. In large countries like China, this can come from domestic policy planning, but in smaller countries like, for example, the Philippines, the office in charge might not have the time or resources, and policy support from international cooperation could be effective.

As for system reforms, measures to introduce ESCO at government facilities are important. Countries that have succeeded in doing so include the USA, Canada, and Australia. In the USA and Canada a result was reform of procurement regulations (FEMP 2005), and in Australia ownership of buildings was transferred from the government. Government procurement regulations generally award a single-year contract to the low priced bidder, which became a barrier to procuring ESCO business. Because introducing ESCO business at government facilities greatly influences ESCO market development, it is desirable to create systems that enable smooth procurement of ESCO business as early as possible.

DISCUSSION OF SUCCESS FACTORS OF ESCO IN ASIAN COUNTRIES

To promote the spread of ESCO, essentially all the programs mentioned above, for developing ESCO projects and market formation are needed. Particularly at the initial stages, governments usually take the lead, but once an ESCO market is formed to some degree, there are cases in which the private sector takes the initiative. Also, for emerging countries, programs are carried out with support from various international organizations. Generally, these programs have a rough order in which they should be carried out, but if most proceed simultaneously there will be synergistic effects, so it is valid to say that there is no universal order for their introduction.

Similar programs had been in effect in Japan, China, Thailand and India, but success factors of these four main countries vary. In the Japanese case, we point out such factors as government initiative, regulation for energy efficiency (ECL), and the contributions of JAESCO and leasing companies as private sector participants. In the Chinese case, factors include initiative and intensive investment by international organizations to pilot ESCOs and a loan guarantee program. In the Thai case, factors include government initiative, regulation for energy efficiency (ENCON Act), and financial incentives. In the Indian case, the main factor has been initiative by international organizations. For both China and India, initiatives of international organization were important, but in China the investment was concentrated, while in India it was dispersed. On the other hand, limited programs have been carried out in Malaysia and the Philippines. However, basic conditions of energy policy and finance mechanisms are quite different in these countries. For example, energy prices are low in Malaysia, while a financial mechanisms and energy policy are delayed in the Philippines.

To develop ESCO markets, all of the programs that we categorized above are needed. In particular, it is important to strengthen energy efficiency policy, reform procurement systems, develop financial mechanisms, obtain intensive investment by government or international organizations, and develop an ESCO association.

Conclusion

Asian countries introduced ESCO, with reference to the US model. In this process, measures to introduce and spread ESCO have been carried out in each country.

Japan began to introduce ESCO from 1996, and has realized a 353 million USD market in 2007. Over that time, reductions of 1.095 Mton CO_2 have been achieved. Characteristics of the Japanese ESCO industry include the following: essentially all activity is in the private market; 90% of contracts are shared savings contracts; the industrial and commercial sectors have about equal shares of contracts; and many ESCO are either large corporations or their subsidiaries. Contributing to an environment in which the ESCO market could mature were the government, which strengthened energy efficiency regulations and provided incentives, such as subsidies, and JAESCO, which

increased public awareness of ESCO. In the future, we expect that the market for commercial sector projects will increase.

ESCOs were also introduced to other Asian countries in the 1990s, which can be considered a period of market expansion, particularly for China, and Thailand. Market development programs carried out can be categorized as (1) baseline surveys/ feasibility studies, (2) skill development, (3) public awareness campaigns, (4) founding of core businesses and support for operations, (5) project development, (6) financial support, and (7) strengthening of policies and systemic reforms. In general, through providing such programs, it is possible to initiate an ESCO industry. However, conditions in each country vary. In the future, it would be good to implement programs not yet present in various countries. In particular, it is important to strengthen energy efficiency policy, reform procurement systems, develop financial mechanisms, receive intensive investment by government or international organizations and develop an ESCO association.

In this paper, we have discussed points that are particularly notable for measures to encourage ESCO in Japan, China, Thailand, and India.

Amid the current global financial crisis, we wonder if energy efficiency investment will be reduced. But, we would like to insist that now is a good chance to invest in energy efficiency and ensure future profitability. Oil prices and construction costs are low but further jumps are forecast. Finally, we expect that this paper may serve as a reference for those who would like to promote ESCO to Asian emerging countries or other countries with undeveloped ESCO markets.

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Endnotes

1. GEF was founded by the United Nations and the World Bank in 1991, to support global climate change countermeasures of emerging countries. As of 2008, it has provided 6.8 billion USD, and for 1900 projects, including other funds, have developed 24 billion USD in projects.
2. NDRC: National Development and Reform Commission. At that time, NECIDC was under the jurisdiction of the SETC (State Economic and Trade Commission), and was called the SECIDC.

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