IEA DSM TASK Ⅹ － PERFORMANCE CONTRACTING

Country Report:　Japan

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1 EXECUTIVE SUMMARY

The Japanese ESCO industry was inaugurated in the second half of the 1990s. The ESCO market is still immature, but the size of the latent market for both the industrial and commercial sectors is estimated at 19.0 billion US$ (4.04 GL in oil equivalent). (Exchange rate:1US$ = ¥130).

The most important purpose of introducing ESCO in Japan is to achieve energy conservation and cost reductions, followed by reducing carbon dioxide emissions. To this end, energy service companies are required primarily to provide diagnostic and consulting services, to carry out energy-saving repairs (facility improvements), and to provide monitoring and verification services.

Obstacles in the way of wider use of energy service contracting, or performance contracting, in Japan are mainly a lack of public recognition of performance contracting, the absence of ESCO accounting and bidding systems in local governments, the unfamiliarity of project financing, and the absence of standards for contracts, laws, and measuring and verification methods.

The Japanese Government is now considering providing support measures to promote ESCO and actively employing energy service contractors in the public sector, while continuing the existing public support program. ESCO is expected to take an important part in Japan's energy conservation measures.

2 INTRODUCTION

Japan's final energy use is increasing year by year. Growth of energy use in the residential and commercial sector is particularly significant, and its share in the nation's final energy use is expanding year by year. In addition, Japan is urged to play its part at an international level to cope with global environmental problems. At the Third Conference of the Parties to the United Nations Framework Convention on Climate Change (COP3), held in Kyoto in December 1997, Japan pledged to reduce greenhouse gas emissions by 6 percent from the 1990 level by 2010. In order to honor this pledge, Japan needs to do everything it can to achieve substantial greenhouse gas reductions.

The Japanese Government is firming up its energy conservation policy by enforcing the revised Law Concerning the Rational Use of Energy (the revised Energy Conservation Law), and the Law for Promotion of Measures to Cope with Global Warming. Nonetheless, energy conservation in the business sector is dependent on voluntary efforts by business enterprises. In these circumstances, energy service contracting or ESCO is certain to play an important role in promoting Japan's energy conservation.

A study into ESCO in Japan started in 1996 when the Advisory Committee on ESCO

Investigation was created within the Agency of Natural Resources and Energy, Ministry of International Trade and Industry. The advisory committee examined the current status of ESCO, the possibility of ESCO being introduced in Japan, conditions for establishing ESCO as a business, an appropriate form of business, and business activities of ESCO.

In the following year, 1997, the Association for ESCO Business Introduction was formed within the Energy Conservation Center, Japan (ECCJ). With a membership of approximately 230, mainly from private enterprises, the association established a committee on institutions, a committee on contracts and standards, and a case study committee in order to define conditions for introducing ESCO in Japan. The association identified possible problems in introducing ESCO and presented suggestions.

In 1998, the Committee on ESCO Business Demonstration was formed. Based on actual energy-saving repair projects, the Committee looked into energy-saving possibilities, the feasibility of capital recovery, and terms and conditions of a contract. The committee also examined the possibility of introducing ESCO, and identified problems.

ESCO is attracting a lot of attention these days, as an increasing number of private enterprises have entered into the ESCO business or are considering starting an ESCO business. However, in order for energy service contractors to develop and achieve success in Japan, there are still numerous problems yet to be solved, such as the dissemination and development of ESCO, the elimination of barriers preventing energy service contractors from gaining entry into the public sector, the improvement of the financial system (project financing), and the establishment of systems to support ESCO. All of these problems are hard for private enterprises alone to handle. In 1999, therefore, the Japan Association of Energy Service Companies (JAESCO) was established, with the aim of achieving a sound development of ESCO.

Under the circumstances, it is important for Japan, where the ESCO market is still immature, to learn from unsuccessful and successful examples from other countries, and not to repeat the same mistakes in developing measures to promote wider use of ESCO from now on. Therefore, while collecting information through Task X, we also would like to cooperate in promotion of wider use of ESCO in other countries by introducing Japan's findings.

3 ADMINISTRATIVE INFORMATION

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4 METHODOLOGY

This country report has been prepared by Tokyo Electric Power Company, with cooperation from Japan Facility Solutions, Inc.(JFS), based on official publications (including those of ECCJ and the New Energy and Industrial Technology Development Organization (NEDO)), data from JAESCO, newspapers, magazines and materials distributed in seminars related to ESCOs etc.

5 GENERAL ENERGY CONTEXT

5.1 Progress of deregulation

In March 2000, the retail power market was partially liberalized. Independent power producers would be allowed to sell electricity at retail to extra-high voltage service customers taking service at supply voltage of 20 kV or more and with a contract demand of 2000 kW (2 MW) or more. Extra-high voltage service customers, accounting for approximately 30 % of electricity sales, can purchase electricity from independent power producers

Since October 2001, a study has been conducted to examine the possibility of expanding the scope of liberalization, complete liberalization and the creation of a pool market etc. A report is expected in 2002.

5.2 Privatization

The Japanese electric power industry has been completely privatized since 1951. However, ten general electricity suppliers (electric power companies) are operating in the Japanese market place to supply electricity almost monopolistically in their respective service areas.

Japanese electric power companies are operating an integrated system of electricity production from power generation to transmission and distribution.

Figure 1. Power supply system under 1999 Law (Year 2000～)

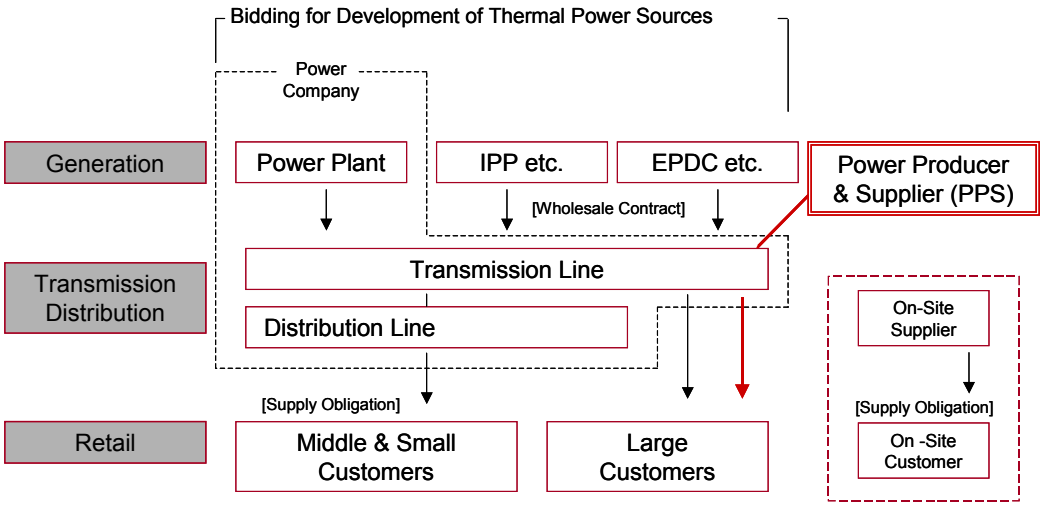
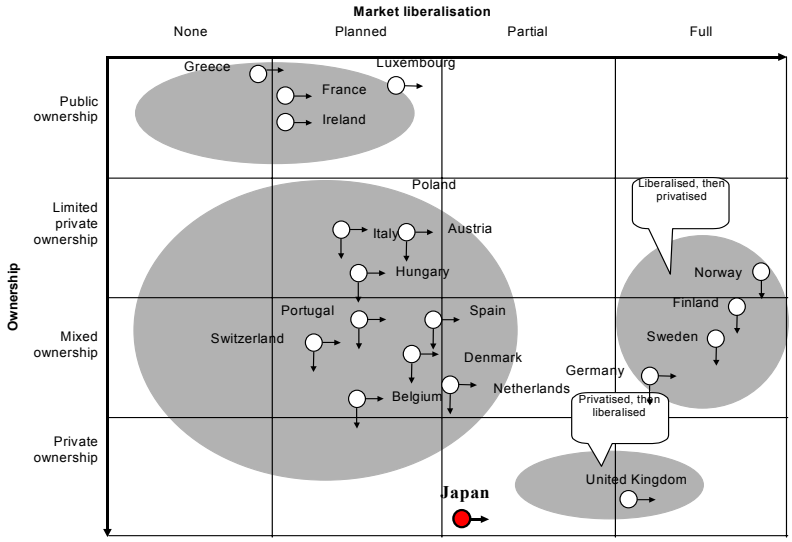


Figure 2. (as reference). Japanese status of deregulation and privatization in comparison with European power sector



(based on data form VTT ENERGY in Finland)

5.3 Public policies

5.3.1 Best energy mix (supply side)

Being a resources-poor nation, Japan relies on overseas suppliers for more than 80 % of its energy requirements. In order to achieve a steady supply of energy, efforts are needed to accomplish a best mixture of various energy sources without excessive dependence on specific energy sources.

When it comes to a best energy mix, there are two factors that must be taken into consideration.

First, alternative sources of energy must be introduced actively. While efforts must be made to develop home-grown energy and diversify energy suppliers, it is important to reduce the nation's dependence on oil imports, particularly from the Middle East, by breaking away from oil, with its risk of supply instability, and expanding the use of coal, natural gas, and nuclear power.

Secondly, active efforts must be made to address the global warming issue. In order to curb carbon dioxide and other greenhouse gas emissions to every possible extent, efforts must be made to increase energy supplies by non-fossil energy sources including nuclear power, new and renewable energy sources.

With these factors in mind, it is necessary to create a best energy mix, based on overall analysis of supply stability, economic efficiency, environmental impact, and the feasibility of introducing various energy sources.

5.3.2 Energy conservation measures (demand side)

In an effort to achieve the target set forth in the Kyoto Protocol (Japan promised 6 % reduction of greenhouse gas emissions relative to the 1990 level), the Japanese government in June 1998 laid down the fundamental principles of measures to fight global warming.

The fundamental principles call for the industrial, residential and commercial, and transport sectors to make all-out efforts to take energy conservation measures in order to reduce energy consumption-caused carbon dioxide emissions.

Table 1. Energy Supply Structure in Japan (F.Y1999)

	MTOE	shares(％)
coal	87.6	17.0%
oil	266.4	51.7%
gas	62.1	12.0%
nuclear	82.5	16.0%
hydro	16.8	3.3%
total	515.5	100%

＊hydro includes geothermal, renewable energy and import-export electricity
(Source:IEA ENERGY ENERGY BALANCES of OECD Countries 1998-1999)

Table 2. Electric Power Generation in Japan (F.Y1999)

	TWh	shares（％）
coal	224	21%
oil	176	17%
gas	234	22%
nuclear	317	30%
hydro etc.	106	10%
total	1057	100%

＊hydro includes geothermal, photovoltaic and other renewable energy etc.
(Source: IEA ENERGY ENERGY BALANCES of OECD Countries 1998-1999)

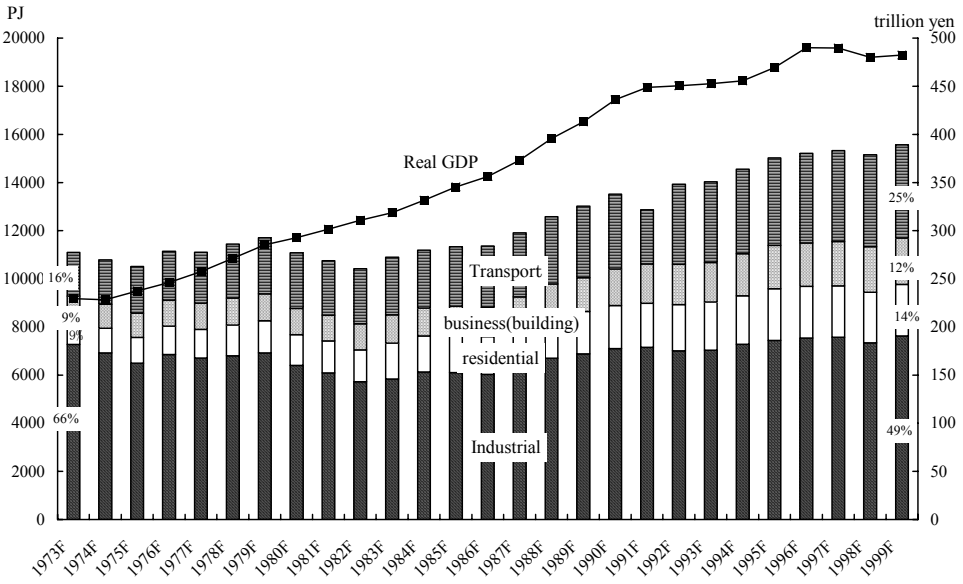
5.4 Trend of energy demand

5.4.1 End-use energy use － Upward trend

Since the latter half of the 1980s, the total amount of energy requirements has consistently increased against the background of the life style in which people were eager to pursue stabilization of crude oil prices at a low level and an increase in affluence (increased by as much as 2.4 % a year in 1990-1996).

After the first and second oil crises in the 1970s, the energy-saving measures taken by the industry were focused mainly on the sphere of hardware such as introduction of highly energy efficient equipment.

Figure 3. Changes in end-use energy consumption and real GDP

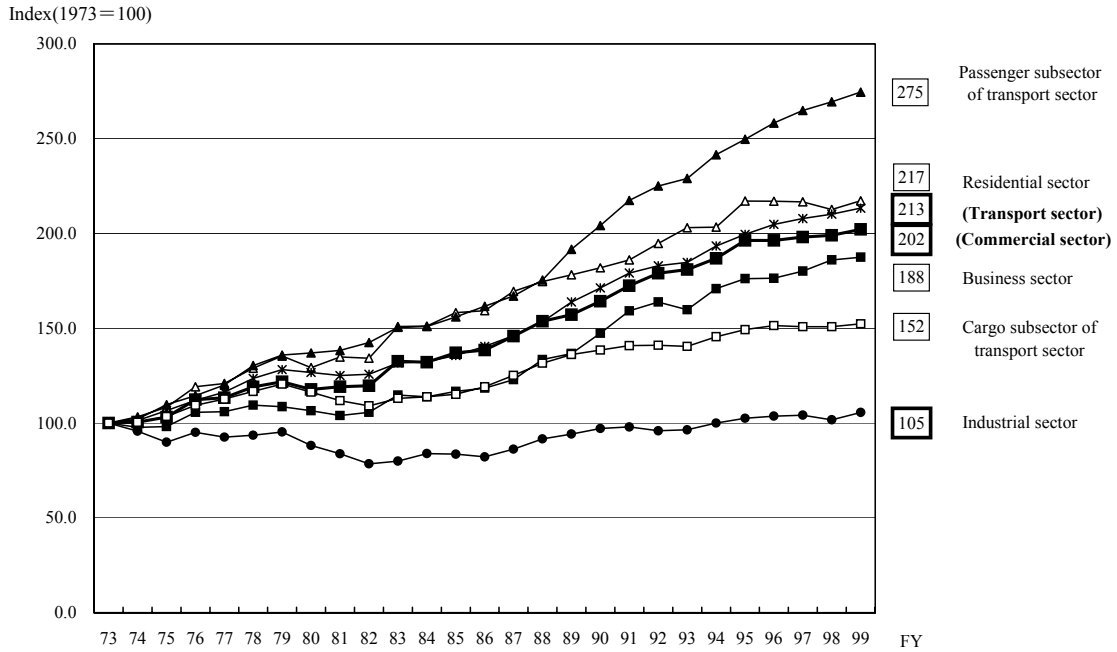


Source :Overall Energy Statistics, Agency of Natural Resources and Energy and Annual Report on National Economy

5.4.2 End-use energy use in breakdown by sector －End-use energy consumption in the commercial and transport sectors has consistently increased

Since the oil crisis, the end-use energy consumption in the commercial and transport sectors has significantly increased, while that in the industrial sector has remained almost unchanged.

Figure 4. Changes in end-use energy consumption by sectors



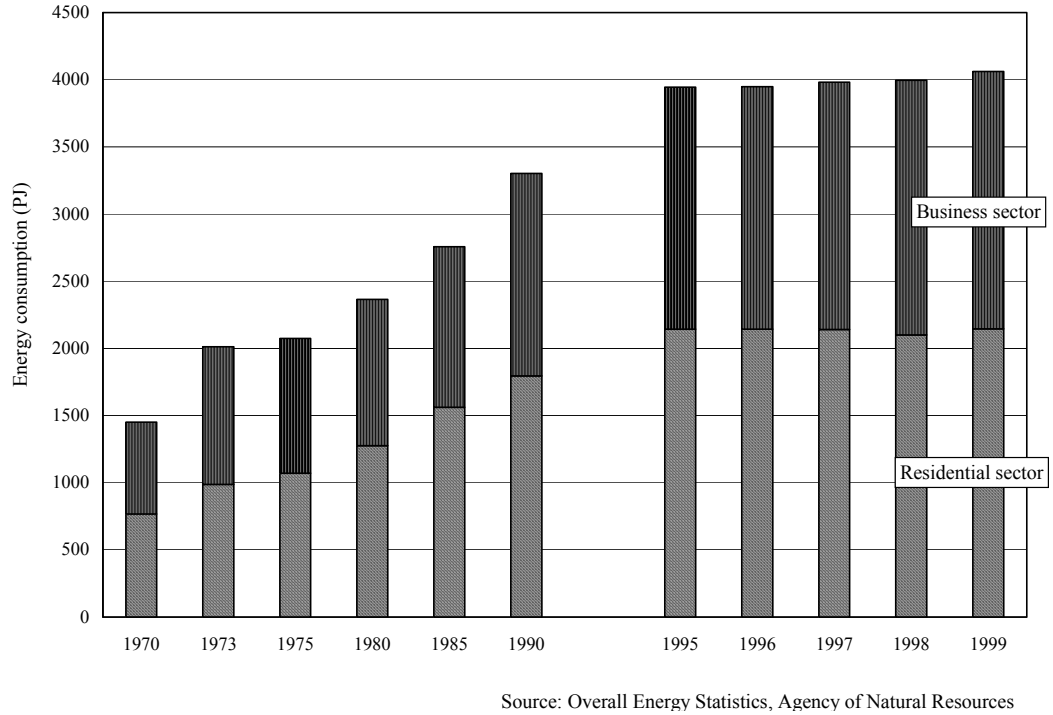
Source: Overall Energy Statistics, Agency of Natural Resources and Energy

5.4.3 Commercial sector － Consistently upward trend

End-use energy consumption in the commercial sector has been consistently on the upward trend. In the past two years, although energy consumption in the residential sector has started to decrease, end-use energy consumption in the business sector as a whole still has an upward trend, with the result that energy consumption in the commercial sector showed a large increase.

In the 1970s and 1980s, the growth rate of the end-use energy consumption in the residential sector was much larger than that in the business sector. In the 1990s, however, the growth rate in the business sector has been larger than that in the residential sector.

Figure 5. Changes in energy consumption in commercial sector（FYs1970-1998）

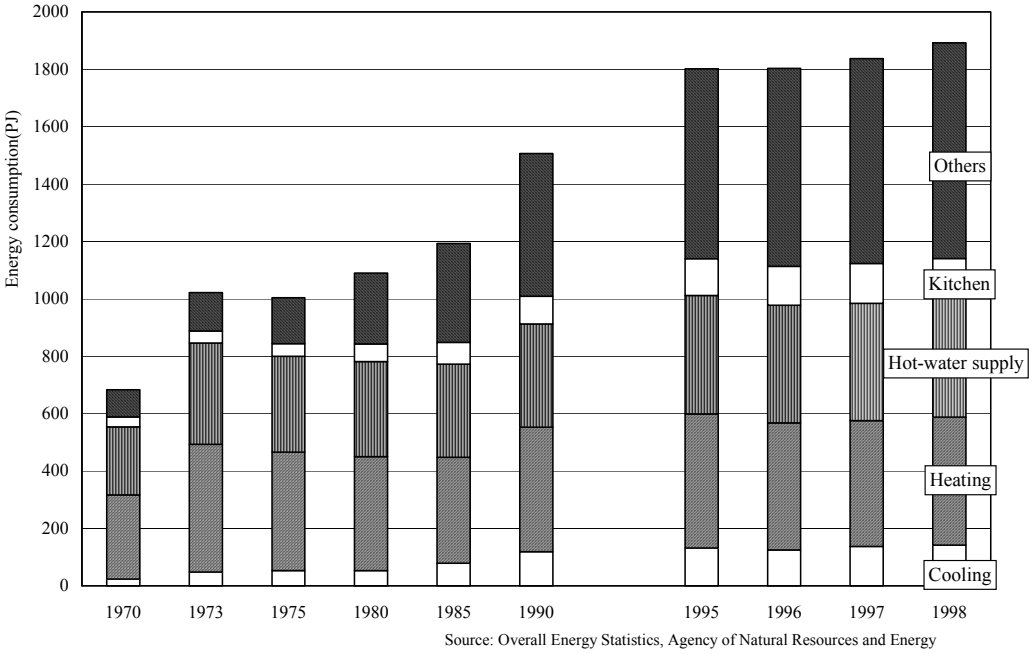


Source: Overall Energy Statistics, Agency of Natural Resources

5.4.4 Business sector － Consistently upward trend

End-use energy consumption in the business sector has been consistently on the upward trend because of such factors as an increase in the total floor areas of offices and the progress of computerization. The growth rate of the end-use energy consumption in this sector was as high as 3.2 % in 1998.

Figure 6. Changes in energy consumption in business sector by applications (FYs 1970-1998)



6. DEFINITION OF ESCO/PERFORMANCE CONTRACTING

6.1 Definition of ESCO in Japan

ESCO is defined as a business of providing comprehensive energy conservation-related services (without spoiling the existing convenience) and receiving some of customers' benefits from energy conservation as compensation.

Comprehensive services consist of all or some of:

1) Diagnostic and consulting services to advise energy-saving measures;

2) Planning, designing, construction and management to carry out energy-saving measures;

3) Measuring and verifying the energy-saving effects of measures;

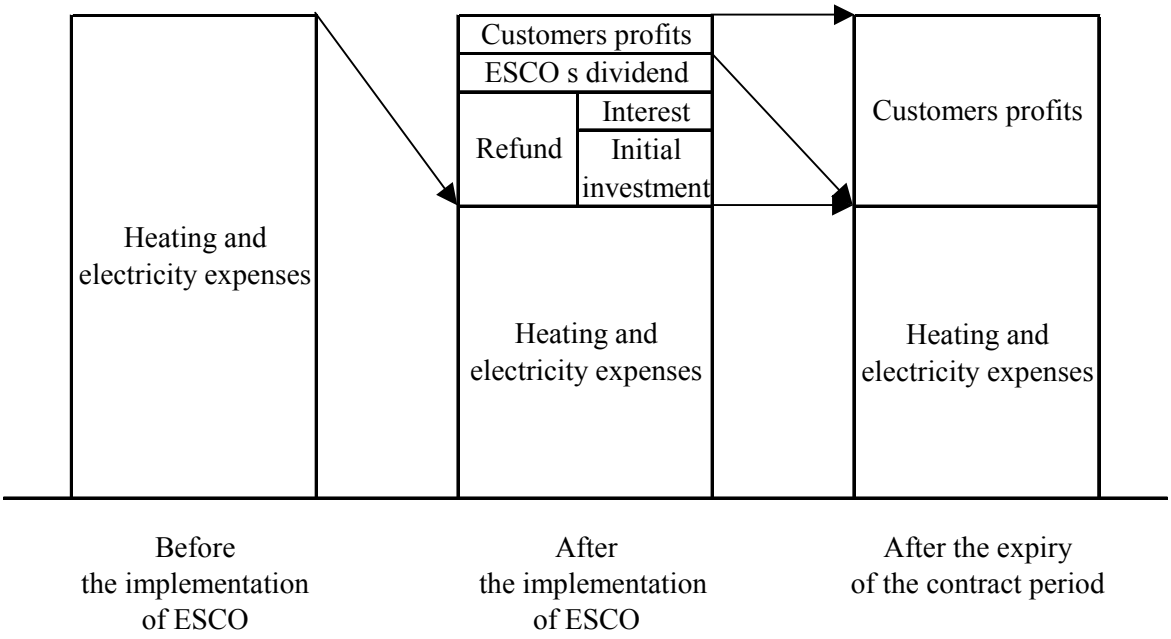
4) Maintenance and operational management of introduced systems and equipment;

5) Financing to raise business funds.

Energy service contractors or ESCOs will enter into an energy service contract with customers and warrant that projects will bring about energy-saving effects.

(JAESCO Web site)

Figure 7. A conception of ESCO business in Japan



6.2 Definition of ”Performance Contract” in Japan

The ”Performance Contract (performance-based agreement)” is an agreement that requires the ESCO to cover all expenses, in principle, by cost savings from the improvement of facilities for energy conservation purposes. This means that the amount of payment to the ESCO depends on the size of energy savings attained by the implementation of the project. Thus the amount of such payment varies with the size of energy savings that benefit the customer as well, but the ESCO is required to offer an assurance at least to the extent that the customer’s costs after the implementation of the project will not exceed those before its implementation. In other words, the agreement includes an indemnity clause stipulating that the ESCO refunds the customer for any portion of the project which fails to attain the estimated cost savings.

6.3 Target markets

The ESCO business has a high growth potential in the commercial and public sectors, where sufficient energy-saving measures have not been taken, but there are some successful ESCOs in factories.

6.4 Purpose

In Japan, purposes of ESCO business is as follows:

1) ESCO is to save energy and achieve cost reductions (the primary purpose).
2) Carbon dioxide emissions must be reduced.
3) Off-balancing of assets

Japanese background

The Japanese power industry is characterized by very high reliability of utility system power sources in terms of security, quantity, and quality.

One of the effective means of reducing electricity charges is to lower contract demand (demand charge). Demand charge can be decreased not only by improving and enhancing the efficiency of facilities but also introducing distributed power sources such as cogeneration power systems. (Needless to say, further cost reductions can be achieved if heat generated by power production can be used fully.

In Japan, the demand charge system, or the two-part tariff, is most commonly applied. This rate system determines electricity charges by combining a demand charge as expressed in kW (contract demand) and an energy charge as expressed in kWh (energy consumption). Decreasing this demand charge (normally the annual maximum demand) is also effective in achieving cost reductions.

In order to reduce the cost of power supply, load-leveling efforts must be made to improve the load factor and thereby to make it possible to the effective development and operation of nuclear power and other power generating facilities. Electric power companies offer rate options designed toward load leveling, such as load adjustment contracts and time-of-use rates.

For those private enterprises who expect off-balance (off-balancing of assets), improvement of equipment by ESCOs is attractive.

6.5 Size of ESCOs

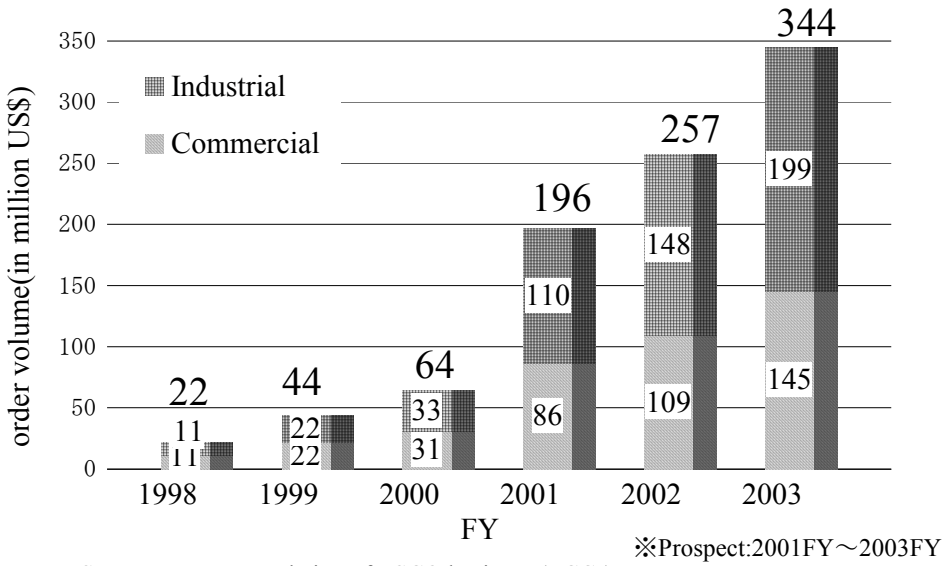
1) Corporate members of the Japan Association of Energy Service Companies (JAESCO)

The number of member companies participating in JAESCO is 84 (as of January 2002). There were only 15 member companies when JAESCO was founded, and the number of the member companies has increased since then. However, not all members always operate ESCO business.

2) Records and prospects of order volume of ESCO

The results of records and prospects of order volume of ESCO in Japan, which JAESCO investigated, are as follows. It is expected that the order volume of ESCO in 2003 will reach about 344 million US$ (as of June 2001).

Table 8. Records and prospects of order volume of ESCOs (1US$=¥130)



Source : Recommendation of ESCO business (ECCJ)

3) Potential ESCO Market

Table 3. Potential Market Size (1US$=¥130)

	Energy savings (in GL of oil equivalent /year)	Gross project investments (in billion US$)
Commercial	1.84	15.75
Industrial	2.20	3.26
Total	4.04	19.01

Source: A Report of the Association for ESCO Business Introduction, "For Promotion of ESCO," March 1998, Association for ESCO Business Introduction, Energy Conservation Center, Japan.

6.6 Type of ESCOs

- Independent ESCO
- Utility ESCO
- Vendor ESCO
- Construction ESCO
- Engineering ESCO

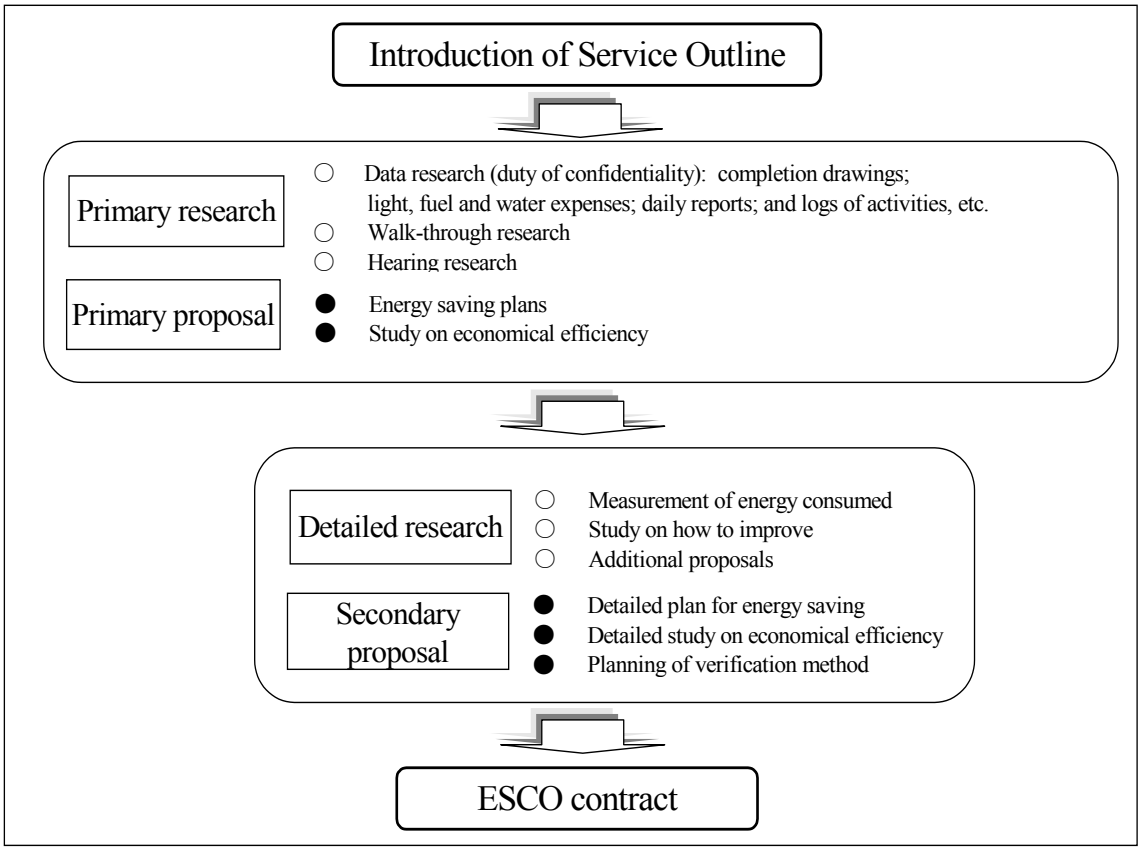
Some of ESCOs provide ESCO services as a primary business, while some operate these services as a secondary business. The latter companies have divisions specializing in ESCO.

7 ESCOS' OPERATIONS AND INDUSTRY'S INVOLVEMENT

7.1 Services of ESCOs

A typical or ideal flow of services offered by ESCOs is described below.

Figure 8. ESCO's service flow



7.2 Creation of the Japan Association of Energy Service Companies

On October 6, 1999, the Japan Association of Energy Service Companies (JAESCO) was created as a private voluntary organization aimed at the development and growth of ESCOs. The purpose of the association is to help ESCOs cultivate a market, promote the sound development of the ESCO industry, provide customers with cost-efficient, comprehensive energy-saving services, and thereby to enhance energy utilization efficiency and contribute to the protection of the global environment.

JAESCO's functions include:

① Dissemination and development of ESCO, and market cultivation;

② Provision of ESCO-related information available in Japan and foreign countries, and exchange of information with ESCO-related organizations;

③ Support for the research and development of energy-saving technologies relating to ESCO;

④ Recommendation of superior ESCOs that satisfy certain conditions; and

⑤ Other activities necessary to attain the purpose of the association.

8 MAIN ISSUES IN PERFORMANCE CONTRACTING

8.1 Financing

8.1.1 Project financing is still unfamiliar to Japanese enterprises

Commonly used forms of financing in Japan are financing against the collateral of assets and corporate financing or credit facility.

Credit lines are set on each business enterprise. Funds raised through financing are used in core businesses on a priority basis. The payback time is five to six years.

Most energy-saving improvement projects involve a longer payback time, so that business enterprises have little incentive to make energy-saving investments by getting loans.

Unfortunately, it is not customary in Japan to finance small projects such as energy-saving improvement projects.

If financial institutions become familiar with performance contracting in the future, project finance will be applied more frequently as an important method of raising funds for promoting energy conservation.

8.1.2 Leasing is not available

Now that project finance is not applied, leasing is a very realistic means of carrying out energy-saving improvement projects. In principle, however, equipment and facilities incidental to a building are excluded from finance leasing used in general (according to an "Official Notification on Leasing" issued by the National Tax Administration Agency).

Most of the energy-saving improvement projects carried out by ESCOs are concerned with building equipment and facilities. If equipment and facilities can be covered by leasing contracts, more diverse forms of financing will become available to ESCOs.

8.2 Long-term contract as psychological hurdle

ESCO contracts are long-term contracts for customers, and in some cases they require time-consuming procedures that are different from those of usual contracts. Though it depends on the effect of ESCO, there are still many cases in which customers select usual improvement works rather than such long-term contracts that require complicated procedures.

Such long-term contracts that require frequent transfers of duties may be disliked by Japanese firms, where persons in charge are frequently transferred due to regular personnel reshuffling.

8.3 Absence of a guideline on measuring and verification methods

It is very important for ESCOs to verify how effective projects have been in saving energy and reducing costs. However, methods of verifying these effects are so complicated that customers cannot understand them.

A guideline on verification methods is very important, not only for ESCOs precisely to assess the energy-saving effects of projects, but also for customers to understand what an ESCO is. Although studies have already been made, continued efforts must be made to conduct a detailed examination of guidelines.

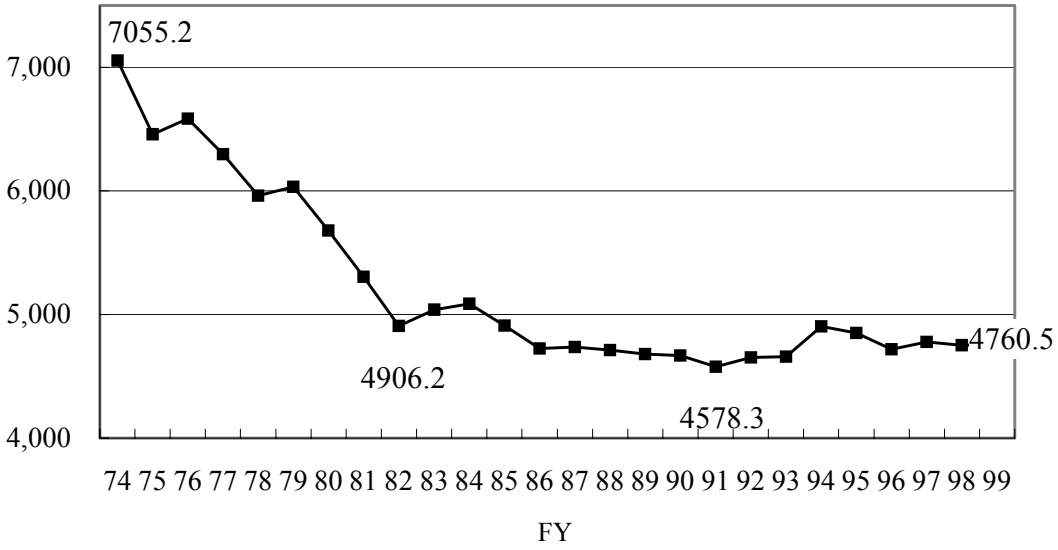
9 BARRIERS

9.1 Little room (allowance) for energy conservation

The ratio of Japan's gross primary energy supplies to GDP has been improved significantly compared with that during the first oil crisis. In 1991, the primary energy supplies-to-GDP ratio came to 4,578.3 GJ per hundred million yen, and it was improved by 35 % from the 1973 level. During a period from 1992 to 1994, the ratio tended to deteriorate, but it improved in 1995 and reached 4,760.6 GJ per hundred million yen in 1999.

According to the IEA statistics, meanwhile, the ratio of primary energy supplies to GDP stands at 57 % of the average for OECD member nations. Japan's per head energy consumption stands at 85 % of the average for OECD member nations. Thus, compared with other industrialized countries, Japan's energy efficiency stands at a very high level.

Figure 9. Japan's energy consumption (Changes in the ratio of gross primary energy supplies to GDP)



Source : Comprehensive Energy Statistics, MITI, and Report on National Account, EPA(GDP was calculated in accordance with the old standards).

9.2 Lack of public recognition

ESCOs are given little recognition in Japan. ESCO involves forms of business that are unfamiliar both to service contractors and customers, such as a performance contracting-based contract and an integrated set of activities, ranging from energy-saving diagnosis to designing, construction and measuring to verification and management.

In order to introduce and promote ESCO, efforts must be made to provide information on the content of business, contracting procedures, and benefits.

Suggested plans are to hold seminars and lecture meetings on ESCO for service contractors and give considerable publicity to ESCO in the media. And for customers, a guidebook must be prepared in order to popularize the concept of ESCO. This guidebook should be prepared from the standpoint of customers and investors and give a complete description of services available from ESCOs, an ESCO assessment method, and a model form of contract. (An instruction manual that forms the basis of a guidebook is already available.)

Moreover, demonstration projects aimed at accumulating know-how and popularizing the concept of ESCO must be carried out. (A few such demonstration projects have been carried out to date.)

9.3 A budgetary system and a bidding system are not suitable for ESCOs

9.3.1 Problems of a bidding system

Currently tenders are invited and are used only to compare bid prices in accordance with established specifications. It is necessary to introduce a bidding system that enables tenders to be compared by assessing the energy-saving effects and economical viability, without specifying methods of energy-saving improvements.

All of the present ESCO contracts are confidential contracts. So, it will be necessary to ensure the transparency of the contracts from now on.

Some local governments do not allow unregistered contractors to participate in tenders. This could be a barrier to ESCO businesses, which have no practical accomplishments yet.

9.3.2 Problems of a budgetary system

ESCO contracts usually last two years or more. Under the Local Government Law, a local government is allowed to enter into a contract resulting in debts for two years or more, subject to the approval of a municipal assembly. Yet it is very rare.

Under the current system, an ESCO contract involving payments over two years or more is subject to the approval of a municipal assembly because it is a contract resulting in debts. A suggested approach is to adopt a system under which ESCO contracts that meet given conditions can be accepted without the approval of a municipal assembly.

The Law for Promotion of the Construction of Public Facilities Through the Use of Private Finance Initiative (PFI Law), which became effective in July 1997, is expected to accelerate the introduction of ESCO as a means of using private funds to improve energy saving in public facilities.

9.4 Others

In many cases, the customers who own buildings that consume a lot of energy, which are likely to be targeted by ESCO businesses, have in-house engineers who are engaged in management and energy-saving works in the buildings. To realize ESCO for such customers, it is essential to win the in-house engineers' cooperation in an understanding of the ESCO business. Otherwise, even if ESCO is proposed, there is a risk that the know-how of energy-saving techniques is stolen, and buildings are improved by in-house engineers themselves.

There are quite a few customers who expect ESCO to improve their equipment and facilities but do not have adequate credit facilities to conclude long-term contracts. (Such customers expect much from ESCO because they do not have enough funds for initial investment in equipment improvement). On the other hand, even healthy customers who have adequate credit facilities do not introduce the ESCO service because they compare the cost of ESCO and the cost of mere purchase of energy-saving equipment, if ESCO's balance is not attractive.

In the case where those who pay energy costs are not the owners of buildings, such as tenanted buildings, there is no incentive to make improvements for energy saving.

As energy prices tend to decline with ongoing deregulation of the energy industry, the periods required to recover energy-saving investments will become longer and longer, and the energy-saving improvement techniques that we can recommend will be limited.

10 GOVERNMENT POLICIES

10.1 Reinforcement of the energy conservation standards

The Energy Conservation Law was revised to extend the scope of designated energy management factories in order further to promote the rational use of energy in factories and business establishments. Under the old law, those factories using more than 3,000 kl of crude oil or 12 million kWh of electricity annually were placed on the list of designated energy management factories. The revised law classifies these factories as

Class 1 designated energy management factories, and those using more than 1,500 kl of crude oil or 6 million kWh of electricity as Class 2 designated energy management factories. While the old law covered only factories, the revised law includes buildings, department stores, hospitals, and public office buildings in the list of designated energy management facilities. Operators of Class 2 designated facilities are required to appoint an energy manager, receive lectures on energy conservation, and record how energy is used.

Furthermore, the Japanese government is ready to present an Energy Conservation Law amendment proposal in the current ordinary session of the Diet in order to introduce a voluntary energy management mechanism in commercial buildings in a similar manner to large factories.

In other words, the designation of Class 1 energy management designated factories, which are now confined to factories in five industries, such as manufacturing, that consume significant amounts of energy, will be expanded to cover all types of industries. If the proposed amendment is passed, therefore, large office buildings, large retail stores, hotels, and hospitals will become liable for designation, and designated business establishments will be required to prepare and submit future (medium- to long-term) energy conservation plans, and submit reports regularly.

10.2 Use of ESCO

The Energy Efficiency and Conservation Subcommittee under the Advisory Committee For Energy, which was established by the Ministry of Economy, Trade and Industry(METI) in order to consider promoting energy conservation, has proposed, in its report in May 2001, to use energy service company (ESCO) services as a means of achieving energy conservation in commercial buildings. The Subcommittee suggests that efforts should be made to promote ESCO services as a pillar of important policy measures by creating better conditions for ESCOs and by using their services in the public sector. The Subcommittee also advances a suggestion to consider policy options in order to expand various incentives for ESCOs. The panel expects that energy-saving measures will afford a saving of approximately one million kiloliters of oil equivalent by the year 2010.

Proposed policy measures include:

- Encouraging the use of ESCO services in the public sector in order to gain public recognition of ESCOs (using ESCOs' services in Government office buildings, providing support for local public bodies in shaping plans to use ESCOs, and promoting positive use of PFI);

- Considering adopting a support system designed to facilitate ESCOs' funding through the use of project finance;

- Formulating measurement and verification (M&V) guidelines for ESCOs and considering introducing a complaint processing system; and

- Expanding the existing assistance system to make subsidies available to ESCOs.

10.3 Public support measures

At present, the following public support measures are available.

1) Tax System Designed to Promote Investment in Energy Demand Structural Reforms (Energy Reform Tax System)

Under this tax system, business operators carrying out projects approved in accordance with the Energy Conservation and Recycling Support Law are authorized to receive a 7 % tax credit or a 30 % special depreciation on equipment that will be obtained under these projects.

2) Model Projects for Introduction of Pioneering Equipment for Rationalization in the Use of Energy

If business operators who have made significant energy-saving efforts intend to introduce pioneering technologies or carry out advanced projects, they will be given a subsidy to cover some of expenses necessary for carrying out the projects (one-third of expenses, with a maximum of ¥200 million per project).

3) Program for Promoting the Introduction of High-Efficiency Energy Systems in Houses and Buildings

A system to provide the owners of the houses and buildings that introduce the systems specified by the New Energy and Industrial Technology Development Organization (NEDO) (the systems that can reduce energy consumption by about 20 % in the case of existing houses and buildings) with funds to subsidize a part (one-third) of the cost required for the system introduction.

4) Program for Promoting Local Energy Conservation Efforts

A system to provide the energy-saving equipment introduction programs now implemented by local municipalities and qualified for an advance of funds to subsidize a part (between one-third and a half) of the cost required for the equipment introduction.

5) Program for Supporting Local Initiatives to Prevent Global Warming

A system to provide funds to subsidize a part (between one-third and a half) of the necessary cost of the programs that handle multiple cases of introduction of new energy equipment or energy-saving equipment according to the plans worked out by local municipalities and based on the Law Concerning Promotion of Prevention of Global Warming.

11 LESSONS LEARNED

If the following points (based on experience gained to date) can be improved, it is considered possible for ESCO to come into wider use in Japan.

- To allow leasing to be applied to the equipment and facilities incidental to buildings.

- To reinforce legislative measures for energy management. (ongoing)

- Actively to improve public buildings by means of ESCO. (ongoing)

- To expand the range of incentives such as subsidies for ESCO businesses and customers who are served by ESCO. (ongoing)

APPENDIX A - CASE STUDIES (1)

1. General information

Name of case:
A project to fight global warming at the Main Building of the Mitaka Municipal Office.

Person to contact for further information:
First ESCO Co.

Type of project:

① Enhanced efficiency of lighting

(replacement of existing lighting at 1,246 places)

② Enhanced efficiency of air conditioning

(replacement of cooling towers and cooling tower fan temperature control)

③ Adoption of inverter power units

(two air-conditioning fans, two cooling pumps, and one rest room ventilating fan)

④ Monitoring systems

(at 22 places in order to gain accurate data on energy consumption)

Type of customer:
Local government (building)
(Public office building; total floor space: 9,600 m²; five stories above ground and two below ground)

2. Process

Time schedule: March 1999(completion), 6 months

3. Financing

Own funding (half of the expenses covered under the Environment Agency Subsidy Program for Models Projects to Cope with Global Warming), US$ 350 thousand (Amount of investment)

4. Contractual/legal matters

Type of contract: Energy savings (electricity savings) guarantee contract

Tendering procedure: Invitation of tenders for energy conservation

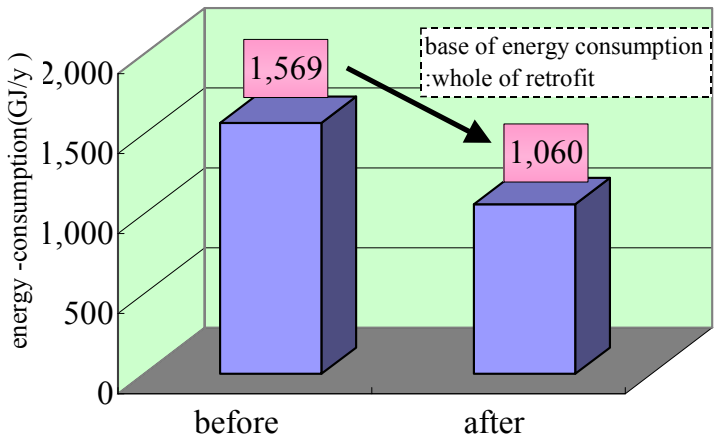
5. Role of different actors, including ESCO and Energy Agency

Environment Agency Subsidy Program for Model Projects to Cope with Global Warming (half of the cost subsidized)

6. Energy savings and other added values

Energy saving: 509 GJ/year (32.4 % savings)

Figure 10. Energy saving effect



Other savings (financial): USD 20,769 /year (10 % reduction)

Other added values: CO_2 reduction

Cost recovery period: about 7 years (actual cost excluding the subsidy)

7. Others

Purpose of introduction

The Mitaka municipal office building was constructed in 1965 and suffered a decline in efficiency due to worn out air conditioning and lighting units.

Benefits to customer

Energy savings and clarification of energy usage

Comments by customer

Most of the public facilities lack energy-saving-conscious managers with technical knowledge. Under the project, energy savings were achieved effectively thanks to ESCO's skills and know-how. We will carry out similar projects in other facilities.

Under the project, we received a subsidy from the Environment Agency, but it took some time for us to apply for this subsidy and achieve internal coordination among interested sections. Because a contract of two years or more is subject to the approval of the municipal assembly, we think it is difficult to enter into it.

The results of monitoring were published on the screen at the main lobby of the building. (Electricity savings and CO_2 reductions were indicated.)

Picture 1. Installation of automatic electric power measuring instrument

Picture 2. Screen of monitoring & report service information (installed in lobby [ground floor] of Mitaka municipal office)

The amount of accumulation reduced CO2

The amount of accumulation reduced electric power

APPENDIX B - CASE STUDIES (2)

1. General information

Name of case:
ESCO retrofit of OMRON business office in Mishima

Person to contact for further information:
OMRON CREATIVE FACILITIES CO., LTD

Type of project:

① Adoption of inverters in secondary cold and hot water pumps

(Two 22 kW secondary cold and hot water pumps and two 11 kW pumps have been installed, with flow control in proportion to load.)

② Adoption of inverters in AHU air conditioner fans

(Inverters have been fitted in 20 AHU supply fans and return fans (40 0.75 kW to 11 kW units), with airflow control in proportion to load.)

③ Replacement of fluorescent lamps with high-efficiency fluorescent lamps

(132 40 W and double-tube fluorescent lamps have been replaced with inverter [HF] lamps.)

④ Replacement of incandescent lamps with fluorescent lamps

(17 100 W incandescent lamps and 28 60 W incandescent lamps have been replaced with fluorescent lamps.)

⑤ Lighting control with occupancy detection sensors

(Infrared sensors have been installed in the entrance hall to provide On/Off control for 40 40 W and single-tube fluorescent lamps.)

⑥ Installation of an energy management system (EMS)

(An energy management system has been installed to reduce gas consumption by outdoor air cooling.)

Type of customers:
Office building; Total floor space: 33,118 m^2; five stories above ground, contract power 1,650 kW

2. Process

Time schedule: April 1999(completion)

3. Financing

Own funding (one-third of cost is subsidized by the retrofitting model project subsidy program for the high-efficiency energy-using building.)

4. Contractual/legal matters

Type of contract: Guaranteed savings contract

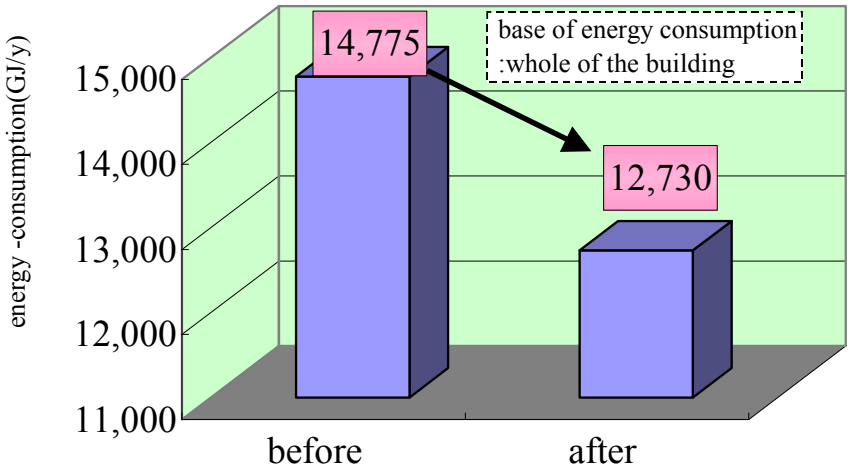
5. Role of different actors, including ESCO and Energy Agency

The retrofitting model project subsidy program for the high-efficiency energy-using building (FY1998) (1/3 of the cost subsidized)

6. Energy savings and other added values

Energy saving: 2,045 GJ/year (13.9 % savings)

Figure 11. Energy saving effect



Other savings (financial): about 106,000 USD/year (11.2% reductions)

7. Others

Selling points in terms of owners' benefits

The most important point of the project was that an energy management system (EMS) was installed to automate air-conditioning control, so that both energy conservation was combined with improvement of the indoor environment. In the off season, outdoor air cooling afforded a significant saving of energy. Because the EMS not only controls the air conditioning, but also monitors energy use, it allows an understanding of electric energy consumption by equipment and areas. The EMS is a highly useful management tool.

Comments by customer

HF type fluorescent lamps installed in the project provide higher levels of illumination than those previously installed. Accordingly, employees are now lighting lamps only in necessary areas. Further energy savings have been achieved as a result.

Because incandescent lamps have been replaced with fluorescent lamps, the frequency of replacing bulbs has been decreased.

The EMS is a very useful tool because, besides air-conditioning control and monitoring, it can be used for managing appliances.

Picture 3. The installed inverter

Picture 4. EMS（Energy Management System）

APPENDIX C - QUOTATION DATA

(1) *A Report of the Association for ESCO Business Introduction*, March 1998, Energy Conservation Center, Japan.

(2) *Investigation of evaluation on ESCO Business Demonstration project*, March 1999, Energy Conservation Center, Japan.

(3) *Recommendation of ESCO business*, September 2001, Energy Conservation Center, Japan.

(4) *Model Projects for Introduction of Pioneering Equipment for Rationalization in the Use of Energy*, March 2000, NEDO.

(5) *The Japan Association of Energy Service Companies Newsletter Vols. 1 and 2*.

(6) *Energy 2001*,February 2001, Agency of Natural Resources and Energy

(7) *HANDBOOK of ENERGY & ECONOMIC STATISTICS in Japan*, February 2001 （English version）, Energy Conservation Center, Japan

APPENDIX D - ADDITIONAL RESOURCES

New Energy and Industrial Technology Development Organization (NEDO)
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