JFS’s ESCO Business in Japan:  
a case of *Tokyo Metropolitan Hiroo Hospital*,  
ESCO Golden Award Winning Project in 2008  

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Takeshi Matsumura  
Japan Facility Solutions, Inc
JFS’s ESCO and Related Business
Characteristics of JFS’s ESCO service

Main targets:

- Non-industrial buildings such as commercial buildings, hospitals, universities, office buildings are the main customers.

Type of ESCO contracts:

- More shared savings contracts than guaranteed savings contracts.

Our competitive edge:

- Unique service based on each customer’s needs
- Strong procurement ability
- Independency from manufactures and particular energy saving methods
- Wealth of knowledge and information on electricity contracts and rate structure

JFS is leading the ESCO industry in Japan as one of the three big ESCO’s.
Our customers

ESCO Business:
1. Large shopping malls
2. Factories
3. Hotels
4. Banks
5. Universities
6. Local govt. buildings, etc.

62 customers

Retrofitting:
1. Factories
2. Hotels
3. Banks, etc.

Energy saving measures are also introduced in accordance with retrofitting.

27 customers

Energy Center:
1. University Hospital

1 customer

Energy Audit/Support Service for Regulations:
1. Govt. facilities
2. Commercial buildings
3. Research Institutes
4. Hospitals
5. Universities, schools, etc.

more than 300 customers
A Case of Tokyo Metropolitan Hiroo Hospital
ESCO project at Tokyo Metropolitan Hiroo Hospital

- The first ESCO competition by Tokyo Metropolitan Government.
- JFS is awarded The Golden Prize of Best ESCO Projects in Japan for the second consecutive year.

<table>
<thead>
<tr>
<th>Location</th>
<th>Shibuya ward, Tokyo</th>
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<tbody>
<tr>
<td>Building size</td>
<td>8 stories above the ground and 2 underground stories</td>
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<tr>
<td>Total floor space</td>
<td>36,511 m²</td>
</tr>
<tr>
<td>Construction</td>
<td>October 1980 (28 yrs)</td>
</tr>
<tr>
<td>Electricity demand</td>
<td>2,168 kW</td>
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<tr>
<td>Total energy consumption</td>
<td>188,075 GJ/year</td>
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<tr>
<td>Expenses for utilities</td>
<td>2,700,000 euros/year</td>
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- The hospital deals with a variety of medical cares including emergency/disaster medical care, cardiac medicine and cerebral vessel medicine.
- They have about 500 beds and 800 outpatients/day.
Big energy savings are guaranteed and actually achieved.

- **Primary Energy Equivalent:** 61,166 GJ/yr
- **CO2 Emission:** 2,795 t-CO2/yr

**Achievements**

- **Target Reduction Effect:** 25%
- **Energy Reduction Effect:** 27.5%
- **CO2 Reduction Effect:** 29.0%

Exceeded the reduction target.
The result of energy savings

The 1st Year (FY2006)
- Primary Energy Equivalent: 60,649 GJ/yr
- Reduction Effect: 27.0%

The 2nd Year (FY2007)
- Primary Energy Equivalent: 61,166 GJ/yr
- Reduction Effect: 27.5%
The result of CO2 emission reduction

- **The 1st Year (FY2006)**
  - Reduction Effect: 28.5%
  - CO2 emission: 2,778 t-CO2/yr

- **The 2nd Year (FY2007)**
  - Reduction Effect: 29.0%
  - CO2 emission: 2,795 t-CO2/yr
Savings guaranteed and achieved

Projected Reduction: 53,094 GJ/yr

91.3% of projected amount is guaranteed

Amount of Reduction Guaranteed/Projected

48,475 GJ/yr

100%

Compared to the guaranteed amount

115% achievement, compared to the projected amount.

Amount of Reduction Achieved (FY2007)

61,166 GJ/yr

126.2%

91.3% of projected amount is guaranteed

115% achievement, compared to the projected amount.
Reduction effect of CO2 emission

The amount of the CO2 reduction in 2007 is equivalent to the forest plantation approx. 69 times the area of the hospital.
Maximization of the client’s profit

Guaranteed Savings Contract

- Reduced Expenses: 2,136,000 euros
- Guaranteed Profit for the hospital: 439,000 euros
- ESCO Service: 89,000 euros

Cost redemption is possible within the ESCO term.

Total profit through six years’ ESCO term: 2,632,000 euros
> Renewal costs: 2,480,000 euros

Government Subsidy: 1,200,000 euros

Prospected total cost reduction: 578,000 euros (21.3%)
Energy saving techniques

Applying various energy saving techniques to every stage of heating, ventilating and air conditioning.

Reduce Air-conditioning Load Itself
1) Reduce the volume of outdoor air intake according to indoor CO2 density
2) Optimize cool and re-heat process in double coil AHUs by allowing small temperature and humidity fluctuation

Produce Heat Efficiently
3) Renew refrigerators/ boilers for higher efficiency (Heat source renewal)
4) Produce chilled water only with cooling tower operation under low out-air temperature (Free Cooling)

Transport Heat Efficiently
5) VWV control
6) VAV control

Others
7) Intermittence drive of AHUs and ventilation fans

Total energy saving rate: 28%
Generally speaking, the Co-Generation System (CGS) is considered to be suitable for hospitals since their heat demand is large.

- Various aspects are carefully examined such as energy consumption, CO2 emission, construction costs and maintenance costs.
- We reached to the conclusion that shifting the source of energy from gas to electricity can be more profitable than choosing a CGS by improving heating efficiency including partial loads of heat demand and optimizing the capacity of facilities.
- Without a CGS, we can avoid electric outages during construction work, and it is another advantage of our plan.
Heat quantity produced for cooling

Before the renewal

- Steam absorption-type refrigerator
- Turbo refrigerator

After the renewal

- Absorption-type cool & warm water generator
- Inverter Chiller
- Free Cooling

Most of the heat source for cooling was produced by the steam absorption-type refrigerator.

Half of the heat source for cooling is produced by the Inverter Chiller.

COP improved from 0.75 to 1.45
Analysis of 12 energy saving measures

- Refrigerator renewal
- Optimizing cool and reheat process
- Boiler renewal
- Control of outdoor air intake
- Air conditioner: Variable Air Volume
- Cooling water pump: Variable Water Volume
- Free cooling
- Air conditioner: air volume adjustment
- Primary pump: Variable Water Volume
- Secondary pump: Variable Water Volume
- Control of outdoor air intake
- Cooling water pump: Variable Water Volume
- Refrigerator renewal

Projected energy savings (GJ/yr)
The contract terms

Penalty articles when guaranteed values are not achieved:

The way of comparison between guaranteed and achieved energy savings:
- The energy saving amount will be calculated with respect to each M&V method of energy saving measures.

Countermeasures if the guaranteed amount of energy savings were not achieved:
- ESCO service charge shall be lowered by the amount of underachievement.
- Some technical actions shall be taken for the following years by JFS.

Term concerning important risks:

Business abandonment and bankruptcy:
- Either party can cancel the contract. Conditions in case of cancellation and methods of compensation for damages are provided in the contract.

Change of unit prices of utilities:
- Unit prices of utilities applied for the effect calculation are fixed at the time of contract.

Baseline adjustment:
- In case of the change of climate and/or energy demand, baseline can be corrected by mutual accord between the client and JFS.
Problem solving through the regular meeting:

- After ESCO service started, a regular meeting among the concerned parties is held every month.
- The members of the meeting are the client, JFS, the operation manager, the maintenance staffs, etc.
- The results of previous month’s M&V are checked, and a maintenance schedule for next month is revised.
- Influential events such as machine trouble are shared by the meeting members.
- In addition to energy savings relating to ESCO facilities, some other possible measures in the hospital are discussed.

The partnership system between the client and the ESCO is build in order to collaborate with one another and achieve more energy savings: “We are on the same boat.”
Customer satisfaction

Benefits for the client

- Although this is the first ESCO project for Tokyo Met. Govt., more energy savings have been achieved than expected.
- It contributes to the activity of global warming countermeasures promoted by Tokyo Met. Govt.
- The ESCO project is displayed on the TV monitor in the hospital to the publics.
- Many requests for observation visits form other local governments and overseas. This project has been known as a successful ESCO case of the public sector.
Issues in ESCO Business in Japan
Issues in ESCO business in Japan (1)

The down side of improved recognition of ESCO

- The notion that “all initial costs can be covered by a reduction in running costs by a ESCO method” is being overemphasized, and so sometimes the concept of ESCO itself can be an obstacle. (in case of large refurbishment such as heating system replacement, completing a deal is not easy.)

- “Comprehensive service and performance guarantee” should be the basic concept of ESCO in the first place.

- A scheme that is not constrained by the extent of running cost reduction should be more developed. (JFS has some successful projects of this kind. They are called “sticking out ESCO.”)

Pro and con of ESCO competition by local governments

- Pro: improving the recognition of ESCO
- Con: weakening ESCO industry by excessive competition?

Difficulty in finding ESCO projects

- JFS has started a Web-based energy management service called “@Energy” with a view to subsequent ESCO projects.
Issues in ESCO business in Japan (2)

Solutions for small buildings

- Energy consumption of each building is small, but total amount as a whole category is huge.
- Reduction in the running cost is too small to cover the initial costs.
- Cost effective methods for small buildings should be developed.
  - A new finance scheme
  - Government Assistance such as a subsidy for ESCO projects for small and medium sized enterprises.

Customers’ need for CO2 emission reduction

- In addition to the conventional guarantee method of financial compensation, JFS has introduced guarantee scheme for CO2 emission reduction for its ESCO service.

Friction with client’s in-house engineers

- Sometimes concerns are raised that ESCO might enter in-house engineers’ territories and interfere with their job.
Thank you for your attention.