IEA DSM Task X – Performance Contracting

Country Report Sweden

Swedish Energy Agency
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1 EXECUTIVE SUMMARY

Energy Savings Performance contracts are offered in Sweden, although the exact scale of this business is unknown. There are two types of ESCO – those that mainly produce energy and those whose core business is manufacturing equipment or selling maintenance services. Customers come from industry and the service sector (sometimes residential) in fairly equal proportions.

The available PC projects seem to have worked satisfactorily and according to plan, with savings ranging from 5% to 50%. However, the concept is not well known, and new customers are hesitant. The potential market for PC is probably much larger than the current use of PC. Audits carried out of projects organised by STEM have confirmed the large energy savings potentials in, for example, Swedish industry.

There are different approaches to the level of detail of the contract, how savings are guaranteed or divided, if financing is included etc. These approaches are as varied and as many as there are ESCOs on the market.

2 INTRODUCTION, RATIONALE

From the customers' point of view, performance contracting is a way of saving money, updating the property's technical status and achieving a measurable improvement in environmental impact.

From the energy service companies' point of view, it is a way of obtaining earlier and therefore more projects. From society's point of view, market-driven energy rationalization is an inexpensive way of reducing carbon dioxide emissions and reducing the conflict between carbon dioxide and other environmental targets; such as decommissioning of nuclear energy or preservation of undeveloped rivers.

3 ADMINISTRATIVE INFORMATION

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4 METHODOLOGY

The information in this report has been collected through meetings with sellers of PC in 1997, written material provided by ESCOs, and interviews with sellers and buyers of previous PC projects in the autumn of 2000.

A reference group for IEA DSM Task X was created in the autumn of 2001, and has held five meetings to date. The group consists of property owners, energy service companies, energy companies, consultants and policy makers. The aims of Swedish energy policy, in force since 1997, have formed the background to the group's work. During this project, the policy has been confirmed by a new Government bill, which was presented in March 2002.

5 GENERAL ENERGY CONTEXT

5.1 The 1997 Energy Policy in Sweden

The aims of Swedish energy policy were approved by Parliament in 1997. The Government Bill states:

"The objectives of Swedish energy policy are to secure short- and long-term electricity supply, as well as the supply of other energy, on terms which are competitive in relation to the world around us. Energy policy should create the conditions for efficient energy use and a cost-efficient Swedish energy supply with a low negative impact on health, the environment and the climate. It should also facilitate the transformation towards an ecologically sustainable society, promoting a sound economic and social development in Sweden. Energy policy should contribute towards the creation of stable conditions for a competitive business sector and towards a renewal and development of Swedish industry. Energy policy should also contribute to a broadening of cooperation within the Baltic region with regard to energy, the environment and the climate. The national electricity supply should be secured through an energy system based on lasting, preferably indigenous and renewable energy sources as well as cost-efficient use of energy. Energy should be used as efficiently as possible, taking account of total resource endowment. Strict demands should be made on safety and care for health and the environment in the use and development of all energy technology."

The lead responsibility for developing energy policy rests with the Minister of Industry, Employment and Communications. The Swedish Energy Agency, which was established on 1 January 1998 to replace the energy policy administration functions of the National Board for Industrial and Technical Development, is the central Government body responsible for most functions within the energy area. The Swedish Energy Agency has responsibility for implementing most of the energy policy programme, and for co-ordinating the programme as a whole.

5.2 New Energy Policy Bill in March 2002

A new energy policy bill was introduced in March 2002. It includes both a short-term and a long-term programme for energy efficiency and alternative forms of energy. In short, this bill makes major provisions for future information activities, technology procurement and demonstration projects. Among the projects on the production side there are subsidies for wind power, which will be progressively phased out. More development of *Third Party Financing* and of *Performance Contracting* will be taken into consideration, including what are known as "green certificates".

For the whole five-year period, the bill proposes to make the following provisions:

- SEK 135 million for information activities
- SEK 540 million for local and regional activities
- SEK 325 million (i.e. SEK 65 million kronor per year) for technology procurement and market introduction.

This will be followed by more detailed investigation in preparation for new regulations, where the development of new "tools" is taken into consideration. The emphasis in the bill is also on the work with *systems* instead of with *components*, including *methodologies and energy declarations for buildings*, which is also proposed in a directive by the European Union.

5.3 Energy market liberalisation and energy taxes

Sweden opened its electricity market to competition in 1996, when extensive changes were made to the Swedish electricity legislation. The purpose of the electricity market reform was to introduce increased competition and provide consumers with greater freedom of choice and, through open and increased trade in electricity, to create the conditions for efficient pricing.

Energy tax is levied on most fuels, and is independent of their energy content. Carbon dioxide tax, which was introduced in 1991, is levied on the amount of carbon dioxide emitted by all fuels except bio-fuels and peat. Taxation is at the point of use. Domestic users pay different rates of electricity tax, depending on whether they live in the north of the country or the rest of the country. Manufacturing industry, horticulture and – since 1 July 2000 – agriculture, forestry and fisheries are exempt from energy tax, and pay only 35 % of the carbon dioxide tax.

Electricity prices are relatively low. Energy services are provided by some energy producers, but as separate services, not included in a package of electricity and services. According to a study (B2B, 1999) industrial companies are not interested in bundled services: they want to see the electricity prices separately.

Other developments on the electricity market (Elmarknaden) include privatisation, vertical integration etc.

5.4 Residential, commercial, service sector etc.

About 86 % of the energy use in this sector is for space heating, domestic hot water production and the powering of domestic appliances. Energy used in land use applications accounts for about 5 % of total energy use in the sector, holiday homes account for another 2 %, and other service applications account for 7 %.

Use of electricity has grown uninterruptedly from 1970 until the middle of the 1990s, but has since stabilised at about 70 TWh. On the heating front, there has been a change from oil to other energy carriers, mainly to the use of electric heating, or to district heating. The number of heat pumps in use has increased considerably in recent years, contributing to a reduction in the actual use of energy for space heating and domestic hot water production. Heat pumps abstract heat from rock, earth, air or water and supply it to the building's heating system.

Of the 97 TWh that were used for space heating and domestic hot water production in 1998, it is estimated that about 45 % were used in detached houses, 29 % in apartment buildings and 26 % in commercial premises and public buildings. The most common form of heating in detached houses is electric heating. The reason for this high proportion of electric heating is that it is cheap to install and simple to run. Another common heating system in detached houses is electricity in combination with wood and/or oil firing. This means that such house heating systems are relatively flexible, with the use of electricity being determined by the relative prices of the various energy carriers.

District heating is the most common form of heating in apartment buildings, with approximately 73 % of apartments being supplied by it. Oil is used as the sole or main heat source for 13 % of the apartments. The main source of heat in offices, commercial buildings and public buildings, too, is district heating. Electric heating of commercial premises amounted to 5 TWh, which was also the amount of space heating and domestic hot water production energy supplied by oil.

The district heat is produced from oil or biomass. The district heating network is concentrated in the southern parts of the country.

The use of electricity for common purposes (e.g. building ventilation) in the service sector has increased substantially, from 8.2 TWh in 1970 to 26.1 TWh in 1999. The reasons for this development include rapid growth in the service sector and greater use of office machines. The high growth rate of private and public services has also resulted in a relatively substantial increase in the total floor area of offices and commercial premises. Lighting and ventilation, which at the beginning of the 1990s accounted for 70 % of the use of electricity for common purposes, have become more efficient as a result of new and improved light sources. The use of electricity for household purposes more than doubled between 1970 and 1999, from 9.2 TWh to 19.7 TWh, due to an increase in the number of households and greater ownership of domestic appliances. However, continued improvement in the electrical efficiency of such appliances – and particularly of white goods – has tended to offset this increase, as old, energy-demanding appliances are replaced by new, more efficient ones, and with the

introduction of improved light sources, more sophisticated operational control and correct sizing of systems at the time of installation.

5.5 Industry

In 1999, industry used 38 % of the country's final energy use. Final energy use in industry consisted of 26 % of fossil energy and 35 % of bio-fuels, peat etc., with the remainder consisting of electricity and district heating. Supplies of bio-fuels, peat etc. amounted to 52.2 TWh. Of this, over 40 TWh was used in the pulp and paper industry, made up in turn mostly of black liquors.

In Sweden, a relatively small number of sectors accounts for the bulk of energy use in industry. The pulp and paper industry uses about 46 %, the iron and steel industry about 14 % and the chemical industry about 7 %. Together, these three energy-intensive sectors account for two- thirds of total energy use in industry. The engineering industry, although not regarded as energy-intensive, nevertheless accounts for almost 8 % of total energy use in industry as a result of its high proportion of total industrial output in Sweden.

When comparing the time period from 1975-1997 with that from 1990-1997, it can be seen that the relationship between energy use and increased industrial output has fallen by about 40 %, due to such factors as technical development and structural changes within the sector.

Despite rising industrial output, the use of oil has fallen substantially since 1970, resulting from the greater use of electricity and improvements in the efficiency of energy use. This trend started in connection with the oil crises of the 1970s, with the ensuing intensive work by both State and business aimed at reducing the use of oil.

5.6 Transport

Energy use for domestic (internal) transport in 1999 amounted to 91 TWh, or 23 % of the country's total final domestic energy use. International marine bunkering used 17 TWh of bunker oils. The energy carrier for the transport sector consists almost entirely of oil products, primarily petrol and diesel fuel. In 1999, the use of these two fuels made up 83 % of the country's energy use for domestic transport. The use of alternative motor fuels, such as ethanol and biogas, is at present marginal. In recent years, the use of petrol has declined, while that of diesel fuel and aviation fuel has increased. Use is largely dependent on general economic conditions, although technical development also has a considerable effect on usage patterns. The two main guide measures intended to reduce the use of energy by the transport sector are energy tax and carbon dioxide tax.

Domestic passenger and goods transport in 1998 amounted to 110 billion passenger-km and 60 billion tonne-km respectively. Private cars provide 73 % of passenger transport: bus travel provides 8 %, rail travel provides 4 % and air travel provides somewhat over 4 %. 54 % of internal freight haulage is by road, 32 % by rail and 14 % by water. In recent years, freight haulage by road has increased at the expense of rail and water transport.

5.7 Energy efficiency policy

In the energy policy programme decided by Parliament in 1997, the five-year programme included measures that were aimed at a more efficient energy use. It was decided that the possibilities of conserving energy and reducing electricity consumption should be exploited. The aim is to increase knowledge of, and stimulate interest in, economically and environmentally sound energy efficiency. The programme includes procurement of energy-efficient technology, as well as information, training, municipal energy advisory services, and the testing, marking and certifying of energy-requiring equipment.

Additionally, in the energy policy programme, it was stated that conscious support for research, development and demonstration forms the basis of the long-term strategy for an ecologically and economically sustainable energy system. The objective in the seven-year policy programme is to reduce the costs of new technology using renewable energy sources and of new energy-efficient technologies.

6 DEFINITION OF ESCO/PERFORMANCE CONTRACTING, INCLUDING THIRD PARTY FINANCING

There is no real consensus in Sweden on the definition of the different forms, such as performance contracting, third party financing, or similar concepts.

One commonly used definition among PC providers is that a guarantee is given on the number of kWh that will be saved under the contract. Another common element that is recognised is that the payment to, or profit for, the ESCO can be directly related to the energy performance achieved.

One interpretation is that performance contracting involves a customer paying for, for example, a stated minimum and maximum temperature, air quality or illumination performance, instead of merely buying specific equipment hardware. The actual technology sold and how operations and maintenance are carried out is up the energy service company. Accordingly, there is an incentive to select low-cost energy, power and capital solutions, as well as to pursue progressive improvement following the initial investment.

6.1 Services offered

Typical steps or elements in an Energy Savings Performance Contract in Sweden are:

- preliminary analysis
- preliminary offer from ESCO
- detailed analysis
- implementation of energy savings measures e.g. through installation of equipment
- ESCO finances (optional)

- ESCO carries out O & M (at site, or monitors the systems from elsewhere) or trains the customer's own maintenance personnel
- Customer rents the equipment
- O & M agreement after contract ends (optional).

6.2 Savings

The contracted savings are usually somewhere between 5 and 50 %. Measures may include adjustments, heat recovery, optimizing of ventilation, control and monitoring system adjustments etc.

6.3 Supply

"Total Heat" and similar concepts are provided to some extent in Sweden. The concept was launched in 1985 and basically encompasses taking over the customer's heating plant. There are corresponding concepts for compressed air, cooling and support functions. These contracts have an incentive to conserve energy in those cases where the customer pays for consumed energy (such as compressed air, heating and cooling).

It is not common to include the supply of energy in other PC projects. One reason may be that the potential for micro-CHP (which is more often used in other European countries in PC projects) is quite small in Sweden. Large district heating systems are common in Sweden, and the price of electricity is relatively low. If the Nordic electricity system starts to suffer capacity limitations, this situation may change.

Secondly, the energy producers who offer PC services do not bundle the energy savings with the sale of electricity. A probable explanation is that customers want to see the electricity price separately in order to try to find the lowest price on the liberalised market (ref: B2B). However, security of supply is a special feature in electricity producers' portfolio of services.

Some ESCOs supply a central heating boiler and a distribution board. How in-depth they go into the end use varies.

6.4 Size of ESCOs and types of ESCOs

The backgrounds of ESCOs in Sweden vary widely. They may produce energy, manufacture equipment, work as facility managers, or provide consultancy services. Some of them have their own financing companies.

6.5 Target markets

ESPC has been applied in residential buildings, industrial premises, hospitals, schools, sports centres, offices and retail areas. Customers include municipalities, property companies (both commercial properties and apartment buildings), tenant-owners' societies and medium-size industries. It is generally regarded as being easiest to work with properties, since (for instance) they require relatively similar types of installations. Work with industry is more difficult, but on the other hand, even larger savings are

possible. It has been perceived by ESCOs have noted that there is no interest from heavy industries, since these have enough muscle to negotiate prices downward without doing anything about consumption.

No information is available on the proportions between these segments or the number of projects.

7 HOW ESCOS OPERATE

7.1 Different types of PC and ESCOs

The types of services provided can be divided into:

Third party financing agreements – the contractual period is decided depending on how large the savings are in relation to the investment.

Management agreement – guarantees an agreed indoor climate at a fixed fee. Energy savings are applied in order to meet the targets. These contracts include installation, management and maintenance. The ESCO makes the investment and bears the risk/opportunity of worse/better results than expected.

Energy incentive agreement – similar to management agreements, but with shared profit from energy savings, if the result is better than expected.

Energy service agreement – a combination of different services. Energy savings and an optimized energy system are combined with agreements on the provision of a no-break supply, good indoor climate and efficient lighting. The services may include training, implementation and/or financing.

"Function agreement" – guarantees a level of costs and an overall solution, which includes the customer renting the installed equipment after the energy savings measures have been applied. A fixed fee is charged. At the end of the contract period, the agreement can be prolonged with a lower fee. The customer can be released from the contract at three months' notice.

Performance contracting – tailor-made solutions for indoor climate, energy control and maintenance linked to a financial service.

It is obvious that mere outsourcing is not to be considered a performance contract. However, when outsourcing facility management, a bonus system can be used if costs are reduced through energy conservation measures. The typical outsourcing is defined – the selling company takes full responsibility for heating and ventilation, operations, maintenance, and control for a fixed fee. Supply of energy can thus be included as well as energy savings. The specific knowledge of the selling company is the key to the agreement – the customer can concentrate on his/her core business. The service provider can decide when it is cost-effective to install new equipment or modernize the systems. Most outsourcing contracts in Sweden have no energy conservation incentives, but if

the payment for the outsourced service is related to reducing the energy cost, this concept is thus also similar to PC.

If the building facility's operation is subcontracted to another company, the energy costs become a quite large part of the new budget's costs. Some of the advantages of CPF/TPF arise automatically, and further profit can be made by simpler external energy services, such as compiling statistics and installing and monitoring alarms.

Outsourcing is a concept with wide implications. In part, it can include so much else (telephony, janitorial services, computer services, catering) that energy conservation is often forgotten. On the other hand, it happens that only sections of the energy system (such as a boiler) are outsourced, which can mean that not all the potential benefits are realised, and that the remaining aspects receive even less consideration and lower investment budgets.

Furthermore, one aspect of outsourcing is that the reason for doing it is not only to concentrate on one's own core activities, but to save money. This needs to be seen in a long-term perspective so that it is not merely a question of saving on the costs of maintenance of the property's facilities.

To summarize, performance contracts can include some of the following elements: energy analysis, purchase, installation, financing, operations, maintenance, control and/or training.

ESCOs' strategies can differ in whether they conduct a brief or a thorough energy audit before a contract is signed with the customer. Hence, they also differ in whether they do this audit free or whether a separate payment is made for the thorough analysis. The difference in strategies has different effects on how easily the ESCO can enter into an agreement with a publicly owned customer.

7.2 How the industry is evolving

The 1980s saw development of performance contracting in Sweden. When drastic energy prices changes occurred, some of these firms went bankrupt, since the basis for the savings calculations and thus the payments changed. This historical background gave the industry a tarnished reputation.

The industry expanded during the 1990s, so that by 2001 there were approximately three or four energy producers and six equipment manufacturers or consulting/installation firms providing different types of energy services. There are no companies that have PC as their sole business. Levels of activity vary from hundreds of projects to very, very few projects. One ESCO says that its contracts cover about ten million square meters of building floor space (out of a total 400 million square meters).

The markets targeted by PC sellers are industry, public offices, hotels and hospitals, as well as the larger residential property companies.

One sign that the market is undeveloped is that up till now, it has always been the ESCO that has taken the initiative in contracting. There is still an enormous unmet demand for saving energy.

Possibly there are fewer PC contracts in an economic boom, because then the ESCOs have much work to do in their core businesses and do not have personnel for PC projects.

8 MAIN ISSUES IN PERFORMANCE CONTRACTING

The main issues are structured in a chronological order following the main steps of a typical PC projects. Those steps are preliminary analysis, preliminary offer from ESCO, detailed analysis, implementation of energy savings measures, ESCO finances, ESCO carries out O & M and/or trains customer's personnel, customer rents the equipment and possible O & M agreement after PC contract ends.

8.1 Project initiation and procurement matters

In the first phase of discussion between an ESCO and its potential customer – through initial analysis, offer and detailed analysis – the difficulty is getting the customer interested. Often the PC concept is something totally new and "too good to be true – there has to be a catch".

It is common that the ESCO approaches the energy end-users with an offer to make an initial brief analysis on potentials for saving energy. If the potential customer is a municipality, it is typically very uncertain how to handle such projects – should PC be interpreted as the purchase of a service or the purchase of equipment (which might be a part of the project), or is it a lease? Some PC projects have been carried out in municipalities, but it is not known what interpretation and procedures have been used in these cases.

From the customer's side, it can be felt that writing a contract is quite complicated, and sometimes consultants are brought into the process.

There are different approaches by different ESCOs. Some provide a more detailed analysis and the customer pays separately for it. Subsequent implementation of savings measures is another contract, or sometimes the customer implements himself and purchases from the ESCO or from some other company, e.g. a manufacturer of equipment. One possible disadvantage is that the savings decrease because the performance is not monitored and maintenance is not continuous. If only the first phase is purchased, it is an ordinary energy audit contract.

The other approach starts with a less detailed analysis, and if agreement is reached the second phase is a large package of detailed analysis, implementation of measures and maintenance. This whole second phase is one contract and has one price-tag.

From the Government perspective (the societal target of rational use of energy), the second approach may have a better success rate in achieving savings, because the risk decreases when the audit is put on a shelf and nothing is implemented. Additionally, the continuous process of monitoring and maintenance is important.

From the customers' perspective – if they implement themselves without the ESCO, and using their own financing, personnel etc – they must have the necessary knowledge and resources.

8.2 Contractual/Legal aspects

Buyers report that the contractual process is difficult. It is also considered difficult to evaluate and compare the offers from different ESCOs, since they have somewhat different concepts. These concepts need to be surveyed and described in more detail, but the contracts are confidential information.

Some contracts are quite brief – not as detailed as the standard contracts developed by the European Union.

Loans from the ESCO **cannot** be secured by the energy service company repossessing its equipment for non-payments. Repossession conflicts with current Swedish law (the code for land laws), under which capital improvements to buildings cannot be removed, and this includes virtually all investments in energy conservation. Even should the law be changed, it would still be impractical, and often impossible to repossess what has already been done; even if the threat to do so could be a powerful method to increase the willingness to pay.

There is no security through repossession. Changing the law is unrealistic, and would not solve the whole problem. For example, dismantling a lighting fitting is expensive and the chance of getting a good price for it on the used market is very limited.

Clearly, the property value does go up with modern energy-efficient improvements, which normally remain even after a bankruptcy, and is expressed as a higher value when selling at executive auction. But the prioritized creditors in a bankruptcy are those who have lent money as a pledge.

As the law prevents capital improvements from being repossessed, credit rating investigations are especially important for the ESCO to evaluate the creditworthiness of the customer. So far, there have been no problems with non-payment.

If the property is almost fully mortgaged, there is no security.

If it is not mortgaged at all, a lien on the property is full security, but with stamp taxes and service fees, this is an expensive form of security.

An increased lien on properties with limited mortgages provides full security in a satisfactory manner.

For national and municipal customers, a state guarantee fund could inexpensively solve the security problem. Because the state and municipalities cannot be declared bankrupt, a contract dispute is the only risk; i.e. the customer can pay but refuses to do so while the dispute is still going on. A guarantee fund would therefore very seldom be needed, and would cost taxpayers very little money and could be paid for by fees from those wanting to utilize it.

However, for private customers, there is a real credit risk should the customer go bankrupt, although this risk is very small with normal credit rating investigations (approximately one percent), and less for larger companies. A guarantee fund that also includes this must also have tangible resources, even if they are small in relation to the contract sums.

The other problem is that bankers are not particularly interested in working with small amounts. According to a financial expert, this could be solved by lumping together several projects from several installation companies or energy service companies into one project by forming a consortium from the credit providers' standpoint.

In such a case, the energy service companies' financial needs would cover only a short period, while the projects could be gathered into this collective lump. From the supplier's standpoint, this would afterwards be a cash payment.

8.3 Standard/Model contracts

Towards the end of the 1990s, the European Union produced in the late 1990's, without co-operation with the Swedish energy authorities, two model contracts for third-party financing which, although having been produced without liaison with the Swedish energy authorities, are tailor-made for the Swedish legal framework. There is one model contract for buildings and one for industrial companies. The publications are available from a publishing company in Sweden.

Some ESCOs have developed their own standard contracts. One consists of eight pages and requires very little legal work in the signing of new contracts.

8.4 General conditions and legal rules

Loans from third parties or the energy service company **cannot** be secured by the energy service company repossessing its equipment for non-payments. Repossession conflicts with current Swedish law, (the code for land laws), under the terms of which capital improvements to buildings cannot be removed, and this includes virtually all investments in energy conservation. Even if the law were changed, it would still be impractical, and often impossible, to repossess what has been already done; although the threat to do so could be a powerful method of increasing willingness to pay.

However, other ways in which ESCOs can obtain loans are available. The ESCO could obtain financing from banks or financial institutions on a bulk of projects (similar to loans on a bulk of invoices). However, this risk is perceived to be higher in project financing than in property financing, and so the interest rate would be higher.

Should conditions change, it must be possible to renegotiate the contract, because the contract must not interfere with a changed use of the property. The customer also has the right to buy its way out of the contract at any time, subject to negotiations to determine the value of what remains to be paid for.

8.5 Financing

Financing is either provided by the ESCO or by the customers themselves. The ESCO is sometimes backed by a financial institution– either a separate company or a company within the same group.

Some ESCOs have decided not to take part in financing.

Some ESCOs say that "The banks are very interested, but establishing collateral (due to the code of land laws) is a problem."

Smaller PC projects, such as more energy-efficient lighting, have problems in finding financing. The financial companies' lack of interest is due to the small amounts of money involved in these projects.

It is possible to sell incentive contracts without financing. The benefit for the customer is that it does not need to take additional loans, thus maintaining solvency, and there is no need to lodge security for a loan.

The ESCO has to evaluate the energy savings potential and the customers' credit rating. Municipalities are considered to have a very high credit rating, which means that the potential for PC is high in this sector. Municipality and government-owned buildings account for a large part of the Swedish building stock.

8.6 Ownership of installed equipment

The most common form of ownership is not known. Ownership is most probably vested in the customer, since Swedish laws state that equipment which is installed in a building, is part of that building and thus part of what is owned by the customer.

8.7 Payments, shared savings and length of contractual period

There are a number of methods for calculating the amount to be paid by the customer to the ESCO. Some ESCOs share the savings 50-50 with the customer from the first year of the contract. Others take the whole savings for a few years, leaving the customer with the same total cost as before, and after the contract the customer receives the whole cost reduction from the energy-saving measures taken through the project. Sometimes there is a guarantee and, if the guaranteed level of energy savings is exceeded, the extra profits could either be shared or are a bonus or incentive for the ESCO.

Contract lengths vary, because energy savings pay for the investment. Some ESCOs limit their contracts to 3-5 years, while others engage in contracts longer than seven years.

In some industrial PCs, the contract may be linked to some measure of output, such as tonnage of product produced.

8.8 Measurement and verification

In some PC cases in Sweden, monitoring energy demand and operations are essential: in other cases, remote monitoring or detailed monitoring are not normally included.

The problem with signing contracts with industries with variable activities and difficult boundary definitions between property-related energy use and process-related activities can – in principle – be solved with in two ways:

1. Gentlemen's agreements, where measures are specified, their effects estimated and payment is made without conducting any measurements.
2. Measurements are made over a limited period after the measures have been put into effect. If the contract runs for three or five years, the test results form the basis for payments, without renewed test measurements.

8.9 Other added values: environment, indoor climate, health and safety

Other values form an important part of the performance contracts. This is especially the case with indoor climate. However, conditions vary from one type of ESCO to another, depending on their core competence.

The contract may include upgrades of computer programs during the contract period.

Sometimes security and fire protection are included benefits or services in a PC contract. In these cases, the energy savings might be the added value when a customer wants these functions initially.

9 OBSTACLES AND OPPORTUNITIES

A brief compilation of obstacles follows:

- Some companies with limited knowledge offer, for example, only a five percent saving when 20 to 50 per cent is actually possible.
- The quality of energy consultants is uneven, and this can make some potential customers cautious.
- The problem of financial security in national legislation needs to be remedied.
- Customers are not used to the concept of performance contracting.
- There is a lot of work involved with energy efficiency, both in selling it and evaluating a property’s energy status.

Some of the opportunities and wishes for governmental actions are:

- More information on the possibilities of saving energy in general and performance contracting in particular.
- Create stable conditions, and particularly stable energy prices.
- A template for calculations.
- State guarantees for technological feasibility and the evaluation of energy savings potential is not needed.
- Revise the law so that municipal district heating plants no longer subsidize municipal properties at the expense of other customers and create situations where low district heating costs destroys the economic basis for energy efficiency. Many district heating suppliers in the early 1980s lowered their variable charges and raised their fixed charges, which lessened interest in energy savings. Another negative factor is that municipalities have paid lower energy taxes.

ESCOs mainly highlight stable conditions and information about the (as yet insufficiently known) concept of PC to energy consumers. One ESCO feels that some sort of subsidy for the execution phase would increase interest. Some mention the State providing a "quality stamp of approval" for projects, vouching that the project is technically sound and can achieve the energy savings and operational costs that have been contracted for. Others do not agree that this is necessary.

Performance contracting is an opportunity for achieving higher energy efficiency, since many measures have a five-year payoff, and it is rare that the building facilities department gets investment funds for it. But by using incentive contracts, often for five years, it is possible to take over the operations budget.

10 SOLUTIONS TO OBSTACLES

There are no governmental guarantees available. In the very first performance contract in Malmö in the 1980s there was an agreement that if there were any disputes between the parties concerning any technical aspects, the contracting parties would turn to a building research institution to resolve the disagreement.

The problems from the 1980s when several ESCOs went bankrupt due to changes in energy prices can be avoided if the contract has a fixed energy price to base energy savings on. Then the customer still takes the risk of energy price changing. However, if the price from energy suppliers suffers large changes later, the customer can interpret it to mean that division of the energy saving gains are unfairly divided.

11 GOVERNMENT POLICIES

The Government is in the process of developing a plan for stimulating the use of Performance Contracting. One possible instrument is providing independent information and advice.

A model contract for buildings and one for industrial enterprises have earlier been developed for Swedish conditions by the European Commission. However, these contracts have not been used in practical projects.

Work has also been going on with a "Tool Box" for Swedish activities to increase EPC arrangements. These activities, which have been described at earlier Experts' Meetings, include different tools to:

- increase credibility
- increase public procurement
- create possible framework credit arrangements for multiple small projects
- introduce modern contracts and processes
- clarify measurement and verification procedures
- introduce an EPC Award for the best *win-win partnership* in this area
- increase participation in and follow-up of international activities, also through the European Commission.

A priority list of actions from Sweden includes:

- a reference list of successful projects
- procurement projects
- process guidelines
- quality criteria
- information packages to target buyers, sellers, and financiers.

A plan is initiated for introducing measures to stimulate *Performance Contracting* in Sweden.

12 CASE STUDIES

Table 1 shows an overview of some cases. A more detailed description of three other cases has been given in Appendices 1, 2, and 3.

Table 1. Overview of some cases

Customer	Type of ESCO	Savings achieved	Measures taken	Contractual period	Comments
Hotel	ManuESCO	40 % on heating and hot water	Control system and hot water fittings	1998-	Better indoor climate
Hotel	ManuESCO	Heating not measured yet, but 75 % reduction in electricity for lighting	E.g. lighting		
Industry	ManuESCO	Approx – 50% given constant production	Mainly heating	5-year contracts	
Municipal swimming pool	ManuESCO		Replacing equip-ment, including dehumidification, heat recovery, lighting, a new chlorination system and new control systems	7-year contract	
Industry	ManuESCO		Modern techno-logy for monitor-ing, maintenance and heat recovery.	1984	Customers requirements on indoor climate
Bank	ManuESCO		Modern techno-logy for monitor-ing, maintenance and heat recovery.	1991, 1993, 1995, 1997	Customer's requirements on indoor climate
Municipality buildings	ManuESCO		Modern techno-logy for monitor-ing, maintenance and heat recovery.	1997-?	Customer's requirements on indoor climate
Hotel	ManuESCO		Modern techno-logy for monitor-ing, maintenance and heat recovery.	1997-?	Customer's requirements on indoor climate
Industry	ManuESCO		Modern techno-logy for monitor-ing, maintenance and heat recovery.	1196, 1997-?	Customer's requirements on indoor climate
Hospitals and offices	ManuESCO	4 600 MWh heat, 300 MWh electricity		1997-1998	Faster imple-mentation if customer uses own funds.
Office building	Energy ESCO		Solar heating	1996-2011	

The type of ESCO is classified into Manufacturer ESCO (ManuESCO) and Energy Producer ESCO (ProdESCO).

APPENDIX 1

Case study: ABB Building Systems AB

1 General information

Name of case:	**Alcro-Beckers, Stockholm**
Contact person:	**ESCO:** (Energy Service Company**)** Magnus Sjölund, magnus.sjolund@se.abb.com **Client:** Ingvar Chronwall, ingvar.chronwall@alcro-beckers.com
Type of project:	Within the energy-incentive: New air-handling units with improved heat recovery and cooling, including general computerised control and monitoring of the ventilation and heating systems. 33 000 m^2 industry and office-buildings.
Type of client:	Paint-manufacturer.
Main services included:	ABB has responsibility for indoor climate and performance of the heating, cooling, ventilation and building automation systems, including maintenance.

2 Process

2.1 Time schedule

The project started in 1997 (selling, analyses and calculations), and introductory installations were completed at the end of 1998. Monitoring and savings guarantee period started in March 1998, including maintenance of the HVAC systems. Status: ongoing.

3 Financing

The main part of the financing was provided by ABB. Remaining investments have been financed by the client, Alcro-Beckers.

4 Contractual/legal aspects

4.1 Type of contract

A modified form of Performance Contracting, with as much emphasis on maintenance and in guaranteed indoor climate as on the energy incentive.

4.2 Tendering procedure

No specific tendering process, just a normal procedure after active marketing and selling by the ESCO.

4.3 Evaluation of tenders/proposals

No information available, but obviously the economical “fairness” of the proposal as well as the technical feasibility of the proposal has been evaluated.

4.4 Guarantee and warranty

Bank-guarantee if needed for larger incentive-installations. The savings are guaranteed for the full period of repayment.

4.5 Special security for the fulfilling of warranties.

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5 Role of different parties, including ESCO and Energy Agency

(See 4.2.) After an introductory process of roughly one year, the client decided to contract out HVAC maintenance and at the same time to achieve saving and modernisation goals.

6 Energy savings and other added values

6.1 Energy saving

Energy savings were calculated as 1,569 MWh/year (district heating). The actual level reached 2,200 MWh/year, corresponding to 37 % heat savings (without corresponding increase of electricity for heating purpose). The reference level was 5,996 MWh/year.

6.2 Other added values

For example: better and assured indoor climate for the tenants (including the client’s sub-tenants) as well as for areas used by the client. Less internal need for resources/personnel, other than for the core business. A modernized building system, additional technical support and improvements in general. Long-range planned maintenance and guaranteed optimization of the technical installations over time.

6.3 Comparison with traditional or other ways of action

The business form realised desires and needs for modernisation, even though there were demands for short pay-off and the existing money was better needed/invested in production equipment.

6.4 Benchmarking/measuring/verification

The level of achieved savings, as well as the overall function and performance, is continuously measured and analysed to see that the systems are working as planned. Results are reported monthly to the client. Periodical payments (4 times a year) for the incentive are based on the actual reduction in energy consumption and costs.

7 Lessons learned

ABB has over twenty years of experience of this type of contracting (extensive service and maintenance combined with energy incentive). It has been very instructive and progressing, both for ABB and the clients. This is a common dynamic development work, and a process over time that involves a great deal of trust and open minds from both parties and organisations.

8 References to existing brochures/reports

Over a hundred different cases in varying form and extent are, until further notice accessible, via Magnus Sjölund (magnus.sjolund@se.abb.com).

APPENDIX 2

Case study: Siemens Building Technologies AB

1 General information

Name of case:	**Ormingehus, Boo, Nacka, Wallenstam Estates** **Previous hospital converted to nursery, dentist school and office facilities**
Contact persons:	**ESCO:** (Energy Service Company) Frank Johansson: frank.johansson@siemens.com alt Hans Tengdahl, hans.tengdahl@siemens.com **Client:** Håkan Örnelius, hakan.ornelius@wallenstam.se , Wallenstam Estates
Type of project:	Upgrading/retrofit of ventilation and heating systems including building automation system. 15,750 m^2
Type of Client:	Commercial facility owner
Main services included:	Analysis, Financing, Monitoring – Follow-up, Calculated and guaranteed energy savings.

2 Process

2.1 Time-schedule

The project started in July 2001, and installations were completed in March 2002. Monitoring and savings guarantee period started in March 2002. Status: ongoing.

3 Financing

All financing is provided by ESCO.

4 Contractual/legal aspects

4.1 Type of contract

Repayment is linked to guaranteed savings. Saving is linked with a formula taking into account the changes in weather and operational time in comparison with a reference year.

4.2 Tendering procedure

The contract was directly negotiated between the ESCO and the customer. No specific tendering process.

4.3 Evaluation of tenders/proposals

No evaluation of tenders, as it was a contracting agreement directly between the customer and the ESCO company.

4.4 Guarantee and warranty

The savings are guaranteed for the full period of repayment, seven years.

4.5 Special security for the fulfilling of warranties

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5 Role of different parties, including ESCO and Energy Agency

The first contact with the Client was made via a normal tendering process for a contracting job, with specification made by a consultant. Siemens noticed that with another solution there would be even greater energy-saving possibility. Siemens therefore introduced a Performance Contracting concept, PFC. An energy analysis was carried out in the spring of 2001, and calculations of costs and savings followed. By installing a new building automation system, including modernisation and modification of heating and ventilation systems, it was possible to guarantee a payback time of seven years and so finance the whole project's cost of approx. € 750,000.

6 Energy savings and other added values

6.1 Energy saving

Calculated energy savings are 3,100 MWh/year, of which 80 % are guarantied savings, 2,500 MWh/year. Guaranteed savings represent 38 % of the total energy use of the building. Measured savings have been verified to exceed the calculated savings. Annual cost saving is approx. 100,000 Euros.

6.2 Other added values

The indoor climate has improved radically, with better comfort due to even temperatures and no noise or draft from the ventilation system. The client asserts that thanks to achieved improvements they could keep and increase the number of tenants in the building.

6.3 Comparison with traditional or other ways of action

The traditional way of the client financing the investment would not have worked for the "PFC" solution. The client's company policy allows only a short payback time.

6.4 Benchmarking/measuring/verification

The level of achieved savings is measured, verifying that the system is working as planned. The savings are continuously measured and reported to the customer monthly.

7 Lessons learned

Be innovative!

8 References to existing brochures/reports

See web link:
www.landisstaefa.com/pfc

APPENDIX 3

Case study: TAC Svenska AB

1 General information

Name of case:	**AB Förvaltaren, Sundbyberg**
Contact persons:	**ESCO:** (Energy Service Company) Jonas Tegström, jote@tac.se , TAC Svenska AB **Client:** Claes Forsberg,claes.forsberg@energimarknad.se (client representative.)
Type of project:	Energy and maintenance incentive contract. In total 400,000 m^2 floor area.
Type of Client:	Municipality-owned facilities, apartments and commercial premises (50/50).
Main services included:	Analyses, Energy Monitoring, Financing of a gradual upgrading of all installation systems. Guaranteed energy savings.

2 Process

2.1 Time schedule

The present contract period is five years, 2001-2006.

3 Financing

The additional costs for gradual updating of the whole installation system (HVAC) are taken by TAC. The client pays the difference between the (new) measured energy costs and the cost for a reference year. The energy consumption is guaranteed not to exceed 70 GWh.

4 Contractual/legal aspects

4.1 Type of contract

Partnering agreement. The AFF model form of contract of general conditions for facility management has been used in the contract

4.2 Tendering procedure

Procurement and pre-qualification

4.3 Evaluation of tenders/proposals

Pre-defined evaluation

4.4 Guarantee and warranty

TAC guarantees the total energy consumption not to exceed 70 GWh. TAC takes the full risk for the energy savings. Installed HVAC components run under conventional warranty conditions.

4.5 Special security for the fulfilling of warranties
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5 Role of different parties, including ESCO and Energy Agency

The facility company has decided to contract out HVAC maintenance.

6 Energy savings and other added values

6.1 Energy saving

The reference level is set to 70 GWh (including heating 59 GWh, electricity 14 GWh and water 720,000 m^3). The level 70 GWh, is guaranteed not to be exceeded. The obtained energy savings after a gradual updating of the HVAC systems are calculated as the payback to the contractor. The estimated level to reach during the contract period is 60 GWh.

6.2 Other added values

Improved quality, quicker repairs after complaints and fewer complains from the tenants.

6.3 Comparison with traditional or other forms of action

The traditional way of action has resulted in a drop of quality and performance among the HVAC installations. Performance Contracting regains a better quality level.

6.4 Benchmarking/measuring/verification

Energy consumption is monitored and reviewed by the client. Periodical payments (4 times a year) are based on the actual reduction in energy consumption and cost.

7 Lessons learned

Working with Energy and Maintenance Incentive Contracts is a dynamic process that involves all parties in the organisation of the client, including his tenants. The objectives are to gain improved quality, energy savings and reduced environmental impact.

8 References to existing brochures/reports

"What is Performance Contracting?"
http://www.tac-global.com/pub/solutions/default.asp?NP=perfcont.htm