National Report on the Energy Efficiency Service Business in Sweden

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CHANGE BEST

Energy Efficiency Services

Market development

Energy and energy service companies

Task 2.1: National Report on the Energy Efficiency Service Business in Sweden

Wuppertal Institut für Klima, Umwelt, Energie GmbH

Intelligent Energy Europe

Change Best: Promoting the development of an energy efficiency service (EES) market – Good practice examples of changes in energy service business, strategies, and supportive policies and measures in the course of the implementation of Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services.

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A main objective of the Directive 2006/32/EC on energy end-use efficiency and energy services (ESD) is to stimulate the market for energy services and for the delivery of other energy efficiency improvement measures to final consumers. In order to achieve this objective, the ESD gives a special role to energy distributors, distribution system operators and retail energy sales companies. On the other hand, there are different types of "pure" energy service companies (ESCOs) in the market ready to expand their business in the field of energy efficiency services (EES).

Against this background, it is important to know, how and to which extent the EES market could be further developed, what are appropriate business strategies and promising services not only for “advanced” companies but also for “beginners”, what is a policy framework suitable to stimulate market development and to overcome existing barriers, and which role energy companies developing towards sustainable ESCOs could play.

The main objectives of ChangeBest are:

- to assist energy companies and ESCOs in entering the B2B and B2C market for EES,
- to contribute to the development of the EES market as part of the implementation of the ESD,
- to demonstrate good practice in implementing the ESD.

In order to achieve the objectives specified, the project work will consist of:

- empirical analysis of the EES market and the respective economic and policy framework in the course of the implementation of the ESD,
- exchange of experiences, national workshops and a European conference,
- a large bundle of promising EES business cases and strategies implemented in “field tests”,
- communication and dissemination activities, and
- induced further action and networking by energy (service) companies.

For the purpose of this paper, the following definitions have been applied:
Energy Efficiency Service (EES): Agreed task or tasks designed to lead to an energy efficiency improvement and other agreed performance criteria. The EES shall include energy audit as well as identification, selection and implementation of actions and verification. A documented description of the proposed or agreed framework for the actions and the follow-up procedure shall be provided. The improvement of energy efficiency shall be measured and verified over a contractually defined period of time through contractually agreed methods [prEN 15900:900].
Partial services connected to EES: Services that just include parts (“components”) of the EES value chain like energy audits, but are designed to directly or indirectly lead to an energy efficiency improvement

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Project Partner	Country
Wuppertal Institute for Climate, Environment, Energy	Germany
e7 Energie Markt Analyse GmbH	Austria
SEVEn	Czech Republic
ESB - Energy Saving Bureau	Estonia
ARMINES	France
EDF – Electricity of France	France
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ISR – University of Coimbra	Portugal
ECN - Energy research Centre of the Netherlands	The Netherlands
BSREC - Black Sea Regional Energy Centre	Bulgaria
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KISE - Krakow Institute for Sustainable Energy	Poland
CESYS - Center for Energy Systems	Slovakia
IJS - Jozef Stefan Institute – Energy Efficiency Centre	Slovenia
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Executive summary

After some pioneering activities in the late 1970's, the development of the Swedish EES market has gone through a series of phases. The main drivers behind the current, post year 2000, phase of EES market expansion have been: increasing energy prices, a supporting policy environment and societal concerns for climate change. The parallel progress of information and communication technologies has also facilitated the market development. Though it is difficult to state exact figures on the number and types of EES providers, there is a clear trend of increasing number of companies.

By 2001, there were some 10 companies (energy companies, equipment manufacturers or consultancy/installation firms) that provided energy services (Alopaeus Sandberg, 2003). A recent market survey identified at least 27 companies that, to various degrees, are engaged in the provision of EES (Lindgren, 2009). While some are doing large amount of business, others are about to start up business units for EES. The types of EES providers, ranging from local and regional to multinational companies, can be divided into the following categories: (1) Building controls, automation, and control manufacturers, (2) Companies within facility management and operation, (3) Consulting firms, (4) Energy companies. In addition to the 27 companies identified by Lindgren (2009) there are some 350 energy auditing companies and numerous companies with expertise in energy efficient technologies and solutions.

Energy Performance Contracting (EPC) and similarly advanced EES concepts are currently being offered by a handful of actors (i.e. ESCOs), that belong foremost to the first and second category of companies. Among consulting firms some have found a niche in supporting EPC customers with consultancy services related to procurement and project implementation. Energy companies are mainly active in offering indirect and low value EES, involving awareness raising and advisory services (i.e. audit and analysis). They rarely put any emphasis on guaranteed energy savings.

EPC has been particularly successful in the sector of public buildings and the number of contracts has grown steadily. Recently, some ten percent of the total public building area was covered by EPC projects (SOU 2008:25 NEEAP, p. 80), including examples of most building types. Also private sector buildings and industrial facilities have been involved in performance based contracts. Some end-users, like private residential buildings are partly ignored by the EES market. Through mandatory energy declarations, based on energy audits, these end-users are made aware of the energy performance of their properties but the level of implementation is still low. There are large EE potentials and opportunities for EES project within all demand sectors.

The success of EPC within the public building sector can be understood in light of the policy mix. To overcome property owner's lack of knowledge/understanding of the concept a set of initiatives (mainly funded by the Swedish Energy Agency) has been launched to gather market actors and disseminate good practice examples. Moreover, an investment subsidy program for EEI measures has often proved to facilitate the decisions of adopting EPC projects in the public sector.

Customer financed EPC is the main financing typology. Though some of the dominating EPC providers are offering different financing solutions, customers prefer to finance projects through internal funds and/or loan uptake. Public sector organisations are often able to receive good credit terms.

As regards marketing strategies, so far the EES market has been driven by the EPC providers that try to engage with potential customers early in the value chain. Building trust is central and using examples and giving references to earlier projects seems to be a very important element in marketing.

The EPC market for large size projects is concentrated to a few actors. The relation between them is characterised by both competition and cooperation. When a project has been secured, a contractor may cooperate with a competitor through purchase of equipment (in the public sector the public procurement laws regulate product lock-in). Consulting firms that are active in guiding EPC customers through the procurement process and project implementation have a function in speeding up decision making. At the same time they negotiate for the customer which is not always appreciated by the EPC providers. There are no documented examples on partnerships between EPC providers and energy companies. In a different policy framework (e.g. if a system of White Certificates were to exist in Sweden) partnerships could perhaps become more interesting. The identification of competition and potential partnerships between and within categories of EES providers is a complicated task that would require more in-depth studies.

During recent years EPC has been successfully implemented in large size properties, but still only a few percent of this building stock is currently covered by projects. The remaining potential is large, and the lack of knowledge/understanding about the concept still constitutes a barrier that market actors will have to overcome. Some types of end-users are not considered for the EPC concept. Likewise, there are types of EEI measures that won't be implemented through EPC projects. In the forthcoming development of the Swedish EES market this creates opportunities for new and modified EES.

To provide some good practice examples on the Swedish EES market this report describes the development and implementation of two EES products (see section 2). One is the general case of EPC in the public building sector. The other example is about an energy company that introduced a smart metering feedback system to increase customer's awareness about their energy consumption. As a unique feature the concept also contains a game function through which customers can compete against each other in reducing energy demand.

1 Introduction

According to an international survey of the energy service company (ESCO) industry, in Sweden, the first ESCO was established in 1978 (Vine, 2005). This is an early start in the international comparison but the initial ESCO activities were not that long-lived. Forsberg et al. (2007) describe how the development of a Swedish market for energy services has gone through a few phases and failed attempts.

The first phase started in the early 1980's and was characterised by rather unsophisticated contracts. The providers were often HVAC equipment manufacturers or entrepreneurs. Common among projects were boiler replacement in industries. In the building sector it happened that projects got bad reputation for controlling resident's behaviour. Contracts were often made up in monetary terms rather than energy savings and resulted in dissatisfaction when cost reductions could not be met. When the oil price returned to low levels in 1986 the interest for energy efficiency improvement diminished. As a result, many of the early ESCOs went bankrupt (Alopaeus Sandberg, 2003). In the building sector, since the 1970s, generous state support had built up capacity in energy counselling. From the mid 1980s these supports were abolished and energy counselling activities became questioned and declined sharply thereafter (Kjeang, 2005).

The second phase of EES market development started in the late 1980s. The 1988 governmental decision to start phasing out the Swedish nuclear reactors by 1995[1] became a driving force for electricity efficiency improvement (Prop. 1987/88:90). On the regulated market the government required distribution companies to combine their normal business as energy suppliers with offering energy services (exemplified by "Vattenfall Uppdrag 2000"). Inspired by the North American market the distribution companies were to pursue Integrated Resource Planning and become energy service companies. Vattenfall made offers to invest in energy efficient equipment in the facilities of their industrial customers; an approach that was met by scepticism (Bergmasth & Strid, 2004, p. 21). Other distribution companies launched information campaigns for energy efficient technologies (e.g. lighting and household appliances) targeting the commercial and residential sectors (Bergmasth & Strid, 2004, p. 22.). The planned nuclear phase out, however, was postponed in 1991. Around the same time the government suggested the electricity market to be deregulated (Prop. 1991/92:133). This lead the energy companies, with few exceptions, to terminate their EES businesses and await the market reform of 1996 (Bergmasth, & Strid, 2004, p. 22.).

The deregulation did not result in any immediate breakthroughs for EES business. A couple of wet years in the late 90s filled the Scandinavian hydropower reservoirs and kept electricity prices at low levels (STEM, 2006, p. 59). While the low energy prices dampened the interest for EES, the increasing prices (both on electricity and fuels) after 2000 is the main explanation for the start of the third phase of Swedish EES market development. A supporting policy environment and societal concerns for climate change are other factors, apart from energy prices, that are mentioned by ESCOs when these are asked about the main drivers for the EES market expansion (Lindgren, 2009). Worth mentioning is also the progress in information and communication technologies that have enabled better systems for monitoring, measurement and verification (Forsberg et al., 2007). Since around 2000 an increasing number of actors with different business and technology backgrounds

[1] After the people's referendum in 1980 it was decided that the twelve nuclear reactors would be decommissioned by 2010. It was not until 1999 however, that the first reactor was taken out of operation. A second reactor closed in 2005. Currently, ten reactors are in operation.

have seized the business opportunities and started to expand EES activities. Energy Performance Contracting (EPC) and similar concepts are currently offered by a handful of actors (i.e. ESCOs). EPC has been especially successful in the public building sector were the number of contracts has grown steadily. The ESCOs have driven the market and created more business opportunities for themselves; it has been them, not the customers, which have taken initiatives for contracting (STEM, 2006). Though the pioneering stage of EPC has been passed by now, this could indicate that the market so far has been undeveloped in terms of customer demand. Recently, some ten percent of the total public building area was covered by EPC projects (SOU 2008:25 NEEAP, p. 80). Presumably, there are other sectors and types of end-users that are not suited for the current EPC concept. Likewise, there could be types of applications that the traditional EPC does not acknowledge. Herein, in the progression of new and/or modified business models, lies the potential for a forthcoming development of the Swedish EES market (SOU 2008:25 NEEAP, p. 80).

2 Overview of the national EES market and its market players

This section provides an overview of the Swedish EES market and its market players. Further details about EES market segments and opportunities for energy companies and ESCOs are provided in chapter 3.

2.1 Number and types of EES providers

An identification of number and types of EES providers being active in Sweden is preferably linked to an effort of defining the term EES and to make categorisations between types of EES. The final version of prEN15900:2009 Energy efficiency services - Definitions and requirements (CEN, 2009), defines EES as follows:

"agreed task or tasks designed to lead to an energy efficiency improvement and other agreed performance."

Among the general requirements (stated by prEN15900:2009) are that an EES shall include an energy audit and subsequent identification, selection and implementation of energy efficiency improvement actions. A description of the framework for the actions and the follow-up procedure should be provided. The improvement of energy efficiency shall be measured and verified over a contractually defined period according to contractually agreed methods.

While this standard setting work is found to be important, for the purpose of the ChangeBest project also the definition of partial services connected to EES, i.e. services that just include parts of the EES value chain (see section 3.4) is adopted. For example, free-standing energy auditing is viewed and defined as a partial service connected to EES. A challenge for auditing companies and for the EES market development in general is to create extended offers along the EES value chain so to increase implementation rates resulting in increased energy efficiency improvement (EEI) and/or energy savings based on auditing results.

A review of literature describing the post 2000 Swedish EES market development, illustrates some categorization practices:

- By 2001, there were 3 or 4 energy companies and 6 equipment manufacturers or consultant/installation firms that provided different types of energy services (Alopaeus Sandberg, 2003).
- A 2002 survey estimates the number of ESCOs to be between 6 and 12. The survey informants were told that an ESCO refers to a company that conducts EPC. (Vine, 2005)
- In a 2003-2004 survey of European ESCO activities, Sweden was placed in the second league among European countries. The ranking referred to companies that provided EPC, which in the authors view are the only "real" ESCOs. Less advanced Energy Service Provider Companies (ESPCs) are using a fee-for-service model and do not involve in any performance related risk taking.[2] (Bertoldi et al., 2006)
- In 2007 there were 12 to 15 companies that offered EPC on the Swedish market (Bertoldi et al., 2007). For the same year another reference claims,

[2] An ESCO, in contrast to an ESPC, has the ability to: (1) guarantee a level of energy savings, (2) finance or arrange financing for the investments and (3) be remunerated, wholly or partly, based on the achieved energy savings (Bertoldi et al., 2006).

according to ESD definitions, that there were about ten ESCOs (Bratt et al., 2007).

- The most recent in-depth study of the Swedish ESCO market identifies at least 27 companies that, to various degrees, are engaged in the provision of EES. Some are currently doing large amount of business, while others are about to start up business units for EES. The 27 companies, divided into four categories[3], are presented in *Table 1*. (Lindgren, 2009)

Seemingly, some studies tend to regard EPC as the one and only type of energy efficiency service, and give ESCO-status only to companies that provide EPC. In this way parts of EES market activities are overlooked.

Table 1: EES providers in Sweden. Source: Lindgren, 2009 (with some modifications)

Business and technology background (main EES provider type)	**Company**	**# countries of operations**
1. Building controls, automation, and control manufacturers (Private ESCOs)	1. ABB	100
	2. Bravida	3
	3. Honeywell	100
	4. Johnson Controls	125
	5. Siemens	190
	6. Schneider Electric (former TAC)	80
2. Companies within facility management and operation companies (Private ESCOs)	7. Coor Service Management	5
	8. Dalkia	38
	9. Vesam	Sweden
	10. Skanska	16
	11. YIT	14
3. Consulting firms (Independent specialist companies and private ESCOs)	12. Bengt Dahlgren	Sweden
	13. Eneas Energy	3
	14. Grontmij	9
	15. Mersam	Sweden
	16. Sweco	15
	17. WSP	35
	18. ÅF	21
4. Energy companies (Energy distribution and energy retail)	19. Borås energi och miljö	Sweden
	20. E.ON	5
	21. Fortum	>10
	22. Göteborg Energi	Sweden
	23. Kalmar Energi	Sweden
	24. Mälarenergi	Sweden
	25. Telge Energi	Sweden
	26. Vattenfall	8
	27. Växjö Energi	Sweden

[3] In Sweden, there is a tendency to divide the EES market actors into the four categories given in *Table 1* (see Bratt et al., 2007; SOU 2008:25; Forsberg et al., 2007; Lindgren, 2009).

Out of the 27 companies only a handful are actually providing EPC. These belong foremost to the first category of companies (i.e. Building Controls, Automation, and Control Manufacturers), but EPC providers can be found also in the second and third category of companies. It can be assumed that EPC is given different meanings depending on where it is applied (see section 3.5 for a description of a Swedish EPC process). Some companies claim to be offering other performance based EES concepts in addition to EPC. While there can be similarities with EPC these are often branded differently.

In the category of consulting firms some have found a certain niche in supporting EPC customers with consultancy services related to procurement and project implementation. The companies of the fourth category (i.e. the energy companies) are commonly offering a service called Function agreement (sometimes called Climate agreement or Comfort agreement). In these type of EES concepts the customer pays for a function (e.g. a pleasant indoor climate) rather than the delivery of kilowatt-hours (e.g. for space heating). The energy company will then care for the optimization of the customer's technical installations. Only a few energy companies, however, put emphasis on guaranteed EEI and the sharing of energy cost savings. In general energy companies are more active in offering indirect and low value EES (see the value chain in section 3.4) involving awareness raising and advisory services. Of the energy supply companies listed in *Table 1* some are just about to establish their EES business units.

Also with the 27 companies presented in *Table 1* there is a risk that the actual number of more advanced EES market actors is being underestimated. The market is dynamic and anecdotally there are additional companies that have started EES activities. Given the broad understanding of EES adopted by the ChangeBest project also auditing services counts as EES. There are some 350 companies accredited for energy auditing according to the Swedish Energy Declaration of Buildings Act (i.e. the national implementation of Directive 2002/91/EC). Moreover there are numerous companies with technical expertise in energy efficient technologies, solutions and installations.

In this section different estimates have been put forward concerning number and types of EES providers operating on the Swedish market. Some concluding remarks are that:

- The use and understanding of terminology is crucial when estimating number and types of EES providers.
- Some studies tend to regard EPC as the one and only type of EES. The same studies only award ESCO-status to companies that provide EPC. These studies cannot depict the diversity of EES market activities.
- The market situation can change rapidly, altering the number and types of actors.
- Lindgren (2009) provides the most recent and in-depth study. It pictures the diversity of the vibrant EES market situation. Yet, only a handful of these 27 companies are providing EPC or similarly advanced contracts. There are about 350 companies that are accredited for conducting energy auditing under the Energy Declaration of Buildings Act. Some of these are also active providers of industrial energy auditing. In addition there are numerous companies with expertise in energy efficient technologies, solutions and installations.

2.2 Size of EES market

Estimates about the size of the Swedish EES market can be found in some of the previously mentioned surveys. The vague understanding about the market scope and how to determine the size brings uncertainty into any estimate. Terms like energy services, EES, ESCO etc. can be interpreted differently. Respondents of a survey are therefore inclined to include different business activities in their EES market scope. When it comes to determining size Lindgren (2009, p. 23) points out the crucial difference between asking for all revenues and savings (i.e. related to old, existing and new EES projects) or only revenues and savings from new projects of a given year. It is also important to distinguish between projected and realised revenues and savings. Thus, when asking actors about the market size these issues should be specified. Moreover, since different EES providers define deal size by different metrics (i.e. square meters, monetary units etc.), it is difficult to adopt a common view of market size and growth. Previous studies do not clarify how these issues have been treated. Hence, it must be understood that the following figures are rough estimates:

- In 2001, the total value of Swedish ESCO projects was $ 30 million (equal to about € 20 million). The study defined an ESCO project as an EPC based on either guaranteed energy savings, or shared energy savings. (Vine, 2005).
- Bertoldi et al. (2007) reports that according to expert estimates, in 2006, the turnover from projects using EPC was around € 50 million. In a broader sense, including all “performance oriented” contracts (for instance boiler and heat pump retrofits) the market size was twice as large, i.e. around € 80-100 million.
- Forsberg et al. (2007) estimate that in 2006 the EPC market had a turnover of € 50-60 million per year, making the Swedish EES market the fourth biggest in the EU.
- Based on interviews with 20 EES providers Lindgren (2009) estimates the 2008 revenues from ESCO projects to be € 85 million. However, some EES companies declined to be interviewed and others declined to provide financial information. Hence, € 85 million is certainly a low estimate on current EES market size.

Seemingly, there has been a clear upward trend for the Swedish post 2000 EES market development. Still, there is a great untapped potential as only a few percents of the total building stock is covered by EES projects. Within 5 to 10 years many existing and forthcoming EES projects will be finalised. Further market growth beyond this time horizon, rest on improvements of EES and EE technology. Higher rates of EEI will enable renewed and continued contracts with existing customers. Market actors express confidence about the future business opportunities. Indeed, the potential for EEI is huge within all sectors and it can be expected that the EES market will be growing in the short and medium-term future (SOU 2008:25 NEEAP, p. 71). Increasing energy prices, raised concern about climate change and a continued trend of outsourcing facility management are some important factors that will stimulate this development (Bratt et al., 2007).

Quantifications of EES market potential has been made for the sector of public buildings, comprising 90 million m^2 of non-residential and multi-dwelling residential buildings (this building area is merely 15 percent of the national building stock and excludes the entire sector of private buildings). Based on current situation that show an upward trend for EES implementation it is estimated that 3 percent of multi-dwelling residential buildings and 17 percent of the non-residential buildings (in terms of building area), will implement EES projects within the coming years (until

2016). This would generate annual energy savings of 1.3 TWh. This in turn corresponds to a total annual project value (in terms of net savings) of about € 84 million (Svensson cited in Bratt et al., 2007, p. 26). These estimates, made for the public sector, should not be extrapolated to estimate the total market potential of the national building stock. Though the technical EEI potential might be comparable for public and private sector buildings, the policy context, barriers and incentives differs (e.g. the ESD stipulates the public sector to fulfil an exemplary role in EEI). Further research is needed to estimate the market potential of the private sector and the total national building stock in general.

With a long-term perspective that assumes a series of measures are taken to facilitate EES market growth, it is estimated that 17 percent of multi-dwelling residential buildings and 42 percent of non-residential buildings implement EES projects between 2020 and 2050. This would generate annual energy savings of 3.6 TWh. The corresponding total annual project value is about € 260 million (Svensson cited in Bratt et al., 2007, p. 50). Again, these estimates only apply to public sector buildings.

There are no quantifications available about market potential within the industrial sector, which currently is assumed to constitute less than 10 percent of total EES market (Bratt et al., 2007, p. 35). Energy intensive industries, being accountable for 70 percent of the sector's energy consumption have so far been favouring traditional practices for EEI, i.e. internal efforts and fee-for-service models. Current energy tax exemptions provide little opportunity for ESCOs to operate profitably in this market segment. Therefore it is the less energy intensive industries, having limited experiences in energy management, which should be the most promising industrial sub-sector. A sample of 11 industrial EPC projects, implemented after year 2000, is estimated to achieve final energy savings of 41 GWh per year over the saving lifetime (STEM & NV, 2007). Hence, for this sample the average energy savings potential is about 4 GWh/year/project.

2.3 Existing incentives and barriers for EES

Increasing energy prices is an obvious driver for investing in EEI. As an indicator of price development, between 2000 and 2007 the total electricity price[4] for an average Swedish household increased by 70 percent (SCB, 2009). End-users in the commercial sector have met electricity price increases of about the same proportions. Some end-users have, at least to some extent, been protected from this development. Industrial activities and especially those being energy intensive are granted tax exemptions. The largest electricity consuming industries are also in position to negotiate long-term power contracts with their suppliers. There can also be cases where municipal housing companies are given favourable deals with the municipal energy companies. Thus, some end-users can sometimes face energy prices that are not high enough to create the short payback periods that are required. This can be perceived as a barrier to EEI in general, but perhaps even more to long-term EES, since end-users with low energy prices can be hesitant to invest in other than the "lowest hanging fruit" measures. EEI measures implemented in a Swedish EPC project can have payback periods of up to 15 years (Lindgren, 2009). On the other hand, within an EPC project, the most profitable measures should be able to

[4] The total electricity price here includes all components involved and charged to a final consumer for getting access to electricity. For a private household this includes: electricity price per kWh, energy tax, fee for renewable electricity certificates, grid fee (consisting of a fixed and a floating share) and VAT. In addition to this some energy retail companies claim additional charges.

compensate for those with longer payback. The profitability of an investment can be made more or less evident depending on the method used for investment appraisal. A total payback period of between 5 and 10 years is common for a Swedish EPC project (Svensson, 2007), and would probably have to be accepted by a prospective EPC customer.

In the following some incentives and barriers related to the residential and tertiary sector as well as the industrial sector are presented. The factors have been identified through interview studies conducted by Bratt et al. (2007).

Incentives for EES

In the **residential and tertiary sector** the following **incentives** have been identified:

- The potential for energy efficiency improvement and the related cost savings that could be utilised by EES is large.
- Multi-dwelling residential buildings and in particular the buildings from the ambitious Swedish housing program of the 1960s and 70s, are in need of refurbishment. EES could provide financing models to enable more extensive modernisations and building improvements than by the means of using traditional entrepreneurs.
- There are EES offers on the market that can suit property owners of different type. While EPC is apt for the larger size properties (>50 000 m^2), the so called Function agreements could suit medium and smaller size properties.
- A model has been developed that describes how EPC can be procured and implemented. This model is developed over time as new projects are initiated and more experiences are gathered (see http://www.epec.se).
- EES have made politicians and board members aware of the possibility to save money through EEI. As EES projects have been implemented it has become easier to convince management to make investment decisions for further EEI.
- EPC is a cost-effective EES in the sense that a single procurement process can be made for a large number of buildings. Some positive side effects gained by the EPC customer are that: risks are shared with the ESCO, indoor climate is improved, and regulations that relate to operations of buildings are fulfilled (e.g. inspections of HVAC equipment).
- EES can facilitate that property owners comply with the Energy Declaration of Buildings Act.

In the **industrial sector** the following **incentives** have been identified:

- Energy cost savings: rising energy prices has been the main driver behind the growing interest in EES, the average energy price level is expected to remain high and/or increase in the medium and long-term, energy cost-cutting provides a competitive advantage.
- Directives from management: a management that emphasize the importance of efficient energy use can incentivise adoption of EES.
- Customer requirements and company image: climate change concerns have increased in society and corporations have responded by demonstrating their concern and responsibility, some ESCOs are evaluating and reporting reduced emissions related with energy savings from EES projects.

Barriers to EES

In the **residential and tertiary sector** the following **barriers** have been identified:

- It can be difficult for potential EES customers to get oriented among existing EES offers. Terms like energy services and EES, are sometimes used for services without the clear aim of improving energy efficiency. A European standardisation process has been initiated and it remains to be seen how this will shape the understanding of the terms and ultimately influence the market.
- The level of knowledge and commitment concerning energy related issues is generally low at management level within municipal and private property companies.
- EPC is the dominating EES concept within the sector. Few property owners know about any other concepts. Function agreement, Climate agreement and Comfort agreement are some of the concepts that are marketed by energy companies, but for which there is a low level of awareness.
- There are no EES offers for single family houses even though these account for some 40 percent of the building area and an almost equal share of the sector's energy consumption.
- Lack of resources among EPC providers (i.e. the ESCOs) can make it difficult for them to satisfy an increasing demand. Personnel with combined competence in technical systems, economy and law are scarce.
- Customers, i.e. property companies and municipal administrations, may also lack resources to handle procurement and implementation of EES projects.
- There are few consulting firms with expertise in EPC and other EES concepts. Hence, only a few consultants are able to offer support in procurement and implementation of EES.
- There are hardly any higher educations courses that provide interdisciplinary knowledge in energy technology, economics and law.
- EEI measures related to the building envelope (e.g. change of windows and additional insulation) are hardly implemented in current EES projects. Payback periods are often considered too long if these do not conform to common contract periods of about 6 to 8 years.

In the **industrial sector** these **barriers** have been identified and divided into categories:

- Economical barriers: budget structure is sometimes separated between investments and O&M, lack of investment capital, choice of interest rate for investments, payback period on some EEI measures, and lack of life cycle cost perspective.
- Institutional barriers: low engagement on management level since energy related issues are delegated to the local level.
- Lack of technical information and awareness: insufficient energy metering, lack of knowledge about the smart and easy EEI measures and investment opportunities.
- Lack of coordination with other actors: lack of support and cooperation with energy supply companies, difficult to organise energy system integration (e.g. supplying a community with industrial waste heat from a nearby factory/plant).

2.4 Policy mix and development of EES

Various sector-wise and cross-sector policy instruments stimulate the supply and demand for EES. Likewise some instruments may discourage the application of EES. For some energy end-users EES are rarely offered nor adopted. In these fields of applications EES could potentially complement the existing energy policies. This section provides an overview by identifying policy instruments and commenting on their potential impact on the EES market.

1. Regulation

Environmental permits:

The Swedish **environmental code** (SFS 1998:808) applies legal requirements and issue permits for actors that pursue environmentally harmful activities, e.g. industrial facilities. In its general rules of consideration the code state that actors shall conserve raw materials and energy, reuse and recycle them wherever possible, and give preference to renewable energy sources (5 § chapter 2). Whether this principle of energy conservation is a driver for EEI, and EES in particular, depends amongst other things on the enforcement and supervision. So far there are only few examples where authorities have conducted supervision based on this principle. The authorities can, as exemplified in Bratt et al. (2007, p. 32), require actors to draw up an energy plan to prove fulfillment of the principle.

It is foremost the industrial sector that can be subject to supervision but for those about 100 energy intensive industries that are participants in the Swedish program for energy efficiency in energy intensive industries (PFE), the code cannot require energy conservation in addition to the PFE Act (SFS 2004:1196). The PFE companies stand for almost 70 percent of industrial energy consumption. For the rest of the industrial sector the PFE model has been proposed as a guideline in case supervision is conducted (Prop. 2008/09:163).

Also residential buildings can be defined as environmentally harmful according to an investigation of the Environmental Protection Agency and could, though it might seem unlikely, be subject to supervision on the energy conservation principle (Naturvårdsverket, 2005).

Standards (buildings and appliances):

The updated Swedish **building code BBR06** (enforced in 2006) applies to new buildings and set requirements on specific energy use (including space heating, DHW, electricity for building operation, and cooling). As an example, for new multi-dwelling buildings the maximum allowed specific energy use is 110 or 130 [kWh/m^2/year] depending on location (southern or northern region). To ensure thermal properties of the building envelope and to limit the window area, there are also restrictions on average U-value. The regulation also contains obligations regarding monitoring and verification of energy performance in compliance with the code. It has been estimated that BBR06 will lead to annual energy savings of 2.3 TWh by 2016 (SOU 2008:25, p. 180).

It is the task of the building contractor to meet the requirements of the code. Project type and the contracting arrangement are likely to influence the outcome. BBR06 could stimulate the supply of EES if building contractors decides to go beyond traditional contracting forms. Business opportunities can be found through adopting new working procedures for contractors and involved actors. Cooperation through partnering could perhaps increase the opportunities for optimized energy solutions. Adopting EPC early in the planning phase of a new construction could

imply that building contractors become key EES market actors. The requirements on M&V may require some ESCO expertise and involvement.

For property owners there can be synergies between implementing EES and complying with legal requirements. An example is the mandatory inspection and control of ventilation equipment, **OVK**, that applies to most building types (single family housing units are exempted). Legal requirements are thus indirectly stimulating the EES market since EES providers are in position to offer total solutions for facility management. Most of the EES providers of category 1 to 3, listed in *Table 1* of section 2.1, are authorized to conduct OVK inspections.

Energy Declarations:

The Swedish implementation of directive 2002/91/EC on the energy performance of buildings has created a market for energy declarations. Since the end of 2006 most building types are required to complete an energy audit to receive an energy declaration. Some 350 companies are currently accredited to provide this service.

Lindgren (2009) presents diverse attitudes towards the program of energy declarations. Some ESCOs feel that being an accredited provider gives recognition of being a credible company and thereby helps to get a foot in the door. Other ESCOs chose not be accredited since it would only give them access to lower level staff of the customers organizations, but not the higher-ups that make decisions about EES projects. Also, due to varying level of expertise among accredited companies, some ESCOs are reluctant to be associated with a program that might provide questionably rigorous energy audits.

The program of energy declaration can be an effective tool to identify EEI measures and so may indirectly stimulate the supply and demand for further EES. It still remains uncertain what the actual impact will be in terms of realized energy savings and/or adoption of EES. For the program to fulfill the actual EE potential it is vital that providers of the audits and declaration are able to offer extended services along the EES value chain. Different aspects of the program have been addressed as subjects for evaluation and possible improvements (SOU 2008:25 NEEAP, p. 65).

2. Financial incentives

Subsidies and fiscal facilities:

The **OFFROT** program (2005 to early 2009) was granting investment subsidies of up to 30 percent for a number of EEI actions (e.g. improved lighting, ventilation, control apparatus, building envelope) as well as conversion to renewable energy sources (e.g. district heating, free cooling, photovoltaic). The targeted sector was public non-residential buildings (e.g. hospitals, schools, universities, administration offices, sports and recreational facilities, etc.) covering 63 million m^2 of building area. In total, over the program period, the property owners were granted some € 200 million. The regulations made no requirements about EES, but there are clear indications that many EEI actions were implemented through EPC projects. In a sample of nine EPC projects (BA of 2 million m^2) there were five projects (BA of 1.2 million m^2) that were granted support (Svensson, 2007). Facility managers often claim that OFFROT has facilitated the political investment decision (Svensson D., 2007), and an ESCO representative is certain that OFFROT has contributed to the increasing demand for EPC (Johansson cited in STEM & NV, 2007, p. 46). Another ESCO representative, from the same company, claim that the market based incentives for EPC are so strong that policy instruments are excessive (Söderstedt cited in STEM & NV, 2007, p. 45).

Though OFFROT money has stimulated EPC projects there could also be a risk that the program, due to the restricted application period, has indirectly hindered some EEI actions from being implemented. In case technical planning for an EEI action has not been processed in time to meet the application deadline there is a risk that the action is kept unimplemented in waiting for another round of investment subsidies. Investment subsidies may cause these kinds of effects of both stimulating and slowing down implementation rates. This paradoxical situation has not been confirmed in the OFFROT case but it has been used by customers and ESCOs as an argument for extended subsidy programs. OFFROT was well-timed with the increasing energy prices and the targeted end-users are now in the forefront in terms of EPC implementation.

The **KLIMP** program (2003-2008) offered investment subsidies of about the same size as OFFROT (i.e. € 200 million), but was broader in terms of targeted sectors. The main focus for KLIMP subsidies has been on energy supply (e.g. expansion of district heating system and biogas infrastructure) rather than demand side measures. Still, there are evidences that also KLIMP has stimulated customer demand for EES (Lindgren, 2009, p. 33).

A system of **Energy Auditing Checks** (2010 - 2014) has been proposed to be launched in 2010. The check is basically a subsidy of about € 1000 for which the applicant have to conduct an energy audit. The target group is SMEs with energy consumption above 0.5 GWh/year (but not the energy intensive PFE companies). It is estimated that 3600 companies within the manufacturing industry will benefit from the subsidy (Energy bill 2008/09:163, p. 109). If the system proves effective it will lead to more professional energy auditing being done in the industrial sector. In this way it stimulates lower value EES (i.e. awareness raising and advisory services). As for the energy declaration of buildings, it can be questioned if this in turn will lead to greater implementation of EEI measures. If the energy auditing companies (i.e. ESCOs or EES provider) are able to push customers to implement measures by offering more advanced EES this could certainly simulate the EES market.

Moreover, over the coming five year period (2010-2014), a subvention of € 50 million is being offered to public sector organizations for them to adopt strategic planning on energy efficiency (Regeringskansliet, 2009). Considering that the subsidy is fairly small and that it does not target hands-on EEI measures, it will probably play a lesser role (compared to OFFROT and KLIMP) as a direct stimulus for the EES market. In the long term perspective, strategic planning may prove more important as an indirect stimulus for EES demand.

Taxes and special tariffs:

The kilowatt-hour price, grid fee, and taxes are the basic components of the electricity price. End-user's electricity savings will thus cause lost revenues not only for the energy supplier, but also for the grid owner and the government. For an energy supply company that offers EES to existing customers, the pricing of the service will have to exceed the lost revenues from energy sales. The grid fee and taxes have to be taken into account when establishing the profit margin. Depending on the type of EES also ESCOs, which are not involved in energy retail and/or supply, can be affected by taxes and tariffs (e.g. an EPC with shared savings).

If an energy end-user is granted reduced energy tax, as is the case for Swedish industrial facilities, there is of course less potential for energy cost savings which restricts the application of EES. Energy supply companies are not incentivized to offer EES to existing customers (those with tax reductions) since the tax cuts exclude the prospect of earning the profit from the government's share of the energy

price. For energy companies in the deregulated Swedish electricity market there should be business opportunities in offering EES to end-users/customers of other energy supply companies.

3. Agreements

The **PFE** program is a voluntary agreement for energy intensive industries. During the program period (which is ongoing from year 2005) some 100 participants are exempted from the EU minimum tax on electricity (0.5 €/MWh). In return the companies have to: conduct energy audit and analysis, identify and implement profitable electricity savings measures, implement and certify an energy management system, apply routines for procurement and project planning. Total gross annual electricity savings equal 3 percent or more. While EES providers may have conducted the energy auditing and analysis at the companies, these have hardly been involved in the implementation of EEI measures (Bratt et al. 2007). It seems like energy-intensive industries prefer to pursue EEI efforts in a traditional manner. PFE has stimulated supply and demand for energy efficient equipment (e.g. industrial motors) but has probably had little influence on the market for EES.

4. Market based instruments

There are no market based instruments for energy efficiency improvement (e.g. White Certificate) in Sweden.

5. Communication/procurement/labels

Dissemination and capacity building:

According to Forsberg et al. (2007) the rapid expansion of the EPC market has been stimulated by a national policy approach consisting of capacity building and dissemination activities. The initiatives have been launched progressively from year 2000 as important needs have been identified. *Table 2* presents how the different initiatives (cited in the top row) have addressed various aspects of the EPC development.[5]

Table 2: How different initiatives have contributed to the development of the Swedish EPC market. Source: Forsberg et al., 2007, p. 214.

	IEA-DSM Task 10	FES	EPEC	Eurocontract	PU benefs	Interco PPP
Ground study, including definitions, literature review, analysis of legal framework, and identification of barriers;	XX	X	-	X	X	X
Market study in form of country picture	-	X	-	X		X
Development of guidelines and model contract	-	Partly	X	X		-
Pilot projects	-		XX	X	X	-
Direct client oriented information	-		XX	X		-
Information and capacity building.	-	X	X	X		X
Other	OECD countries	National	National	EU-perspective	EU, Interregional	EU, Interregional

"-" : not addressed; "X": partly addressed; "XX": strong or main focus

[5] For descriptions of each of activity see Forsberg et al. (2007). How to kick-start a market for EPC: Lessons learned from a mix of measures in Sweden.

One initiative was Forum for Energy Services (FES) (see http://www.energitjanster.se) that was coordinated by the Swedish Energy Agency between 2004 and 2007. The project gathered stakeholders (authorities, public and private actors) in the property sector to accelerate energy efficiency improvement through the use EES. The two dominating EPC providers took active part in this dialog. There were no energy companies among the project partners.

Another important initiative was EPEC (see http://www.epec.se) that was running between 2003 and 2006 with the objective to develop guidelines for processes, models and checklists for EPC, and test them in pilot projects. EPEC was funded by STEM and implemented mainly by the consulting firm WSP-Environmental. This firm has also been an apparent market actor that has assisted some 30 EPC customers (i.e. property owners) in procurement, implementation, evaluation and negotiations with EPC providers.

These activities demonstrate the efforts that have been made to favor the EPC market in the public building sector. The funding used for implementing the different measures, between 2001 and 2006, has been a modest amount of € 1.4 million. The Swedish Energy Agency has provided most funding, but also the EU-IEE program and the Swedish Association of Local Authorities and Regions have made contributions.

Procurement laws:

The Swedish implementations of directives 2004/18/EC and 2004/17/EC are specified by the public procurement rules LOU (SFS 2007:1091). The regulations shall ensure fair access and competition for public contracts so that public sector money is well spent. The LOU concludes an extensive set of rules that do not exist in private market tendering. For example, a public sector body may have to request bids by advertising in all of Europe for a long period before making the decision. LOU can both enhance and hinder the introduction of EES. EPC has probably been enhanced since the concept is to bundle projects (i.e. buildings or installations) together into a single procurement process. EPC thus makes it less time consuming to follow LOU than if each building (or installation) were to be procured separately. On the other hand there is a risk that new companies are hindered to enter the EES market. To be qualified, a bidder should be able to demonstrate experience which can be difficult depending on the scope of the project. Since only a handful of companies have prior experience of EPC projects there is a risk that the EPC market remains concentrated to few companies. A solution might be project partnerships where groups of EES companies pool their collective experiences (Lindgren, 2009).

For some market actors LOU has clearly created business opportunities. Because of its complexity some consulting firms (see *Table 1*) have found their niche in guiding public EPC customers through the project procurement and implementation process.

2.5 (Potential) competitors and (potential) partners in the EES market

There are some examples of relations within and across the four categories of EES providers listed in Table 1 (section 2.1).

On the EPC market that is concentrated to few actors, it is the business units of multinational companies (e.g. Siemens and Schneider Electric) that provide the majority of projects. In a sample of 9 EPC projects, covering 2 million m2 of building area, all were conducted by these two companies (Svensson, 2007). Customers

have raised concerns about pricing in light of the high market concentration (Gottberg et al., 2009). The EPC providers on the other hand want customers to focus on quality dimensions in order to avoid a market driven by low bid competition (Lindgren, 2009, p. 31).

The relation between EPC providers is characterized by both competition and cooperation. They compete in winning important projects but as a project is taken on they may cooperate through buying equipment from each other (instead of requiring customers to use their own brand). Being open towards installing equipment from other manufacturers is a requirement in many public tenders and some ESCOs claim it has been a key to their success (Lindgren, 2009, p. 31).

The role of consulting firms to guide public sector customers through the procurement laws provides an example of relationship across categories. According to Lindgren (2009) there are mixed reactions about this among ESCOs. On the positive side it has helped to speed up customers' decision process and willingness to accept projects. On the other hand ESCOs have described examples where consultants were viewed as an interfering intermediary that sought to transfer all risk onto the ESCOs. Just as there are few providers of EPC there are few consulting firms specialized in assisting EPC customers.

There are no documented examples on partnerships between EPC providers and energy companies. It should not be unusual though, for any energy company to team-up with a consulting firm to perform some lower value EES. If a system of ESCO certification were to be established, those energy companies without competence or capacity in EES could be expected to start collaborating with ESCOs (i.e. certified providers of EES). Assuming a white certificate scheme that obliges energy companies to achieve energy savings were established, such partnerships could become important.

Mentioned among possible barriers in section 2.3 was that EES providers may lack resources in terms of experienced staff to meet an increasing demand for EPC. Partnering were EES providers, consultants and other relevant actors pool their collective know-how could perhaps overcome such a barrier. Though such initiative may exist, experiences from such partnership have not been disseminated. Other examples of partnerships can exists between EES providers and pure equipment manufacturers (e.g. of lighting technology) or IT software developers.

3 Analysis of market segments and opportunities for Energy Companies and ESCOs

This section contains further details and analysis of the EES market segments and the opportunities for energy companies and ESCOs.

3.1 Existing EES market offer sector by sector

In Sweden it is foremost within the institutional/public sector that a well established EES market exists.

The ESD points at the public sector to take the lead in implementing EES and reach the target of 9 percent energy savings by 2016. The Swedish public sector building area consists of about 90 million m^2 and so far some 10 million m^2 are being covered by EPC projects and to a small extent of so called function agreements. As made evident in section 3.9 there are examples of ongoing EES projects among all of the listed institutional type of end-users, though some (i.e. hospitals/health care, local administrations and schools) seems to be ahead of others (i.e. universities, public housing). Hence, it is especially the public sector non-residential buildings (63 million m^2) that have adopted EES, which is partly explained by the policies that have been in place.

Further information about the existing EES offers in the various demand sectors is provided in section 3.3.

3.2 Analysis of potential needs for EES in the different demand sectors

New and promising EESs[6] can probably be developed and applied in all sectors and types of end-users listed in section 3.9. The concept of guaranteed energy savings can certainly be applied on different levels, e.g.:

- **System level**: guaranteed savings for a property or premises (as in the case of current Swedish EPC projects).
- **Technology level:** guaranteed savings for a certain technological applications (e.g. lighting, electrical motors, pumps, fans etc.).
- **Process level:** guaranteed savings for a certain processes and its sub-components (e.g. optimization of compressed air system, heating or cooling process).

[6] The new and promising EES product could be either of the following:
- Promising EESs that have been developed already in one or few countries (at least to some extent) but have not been implemented broadly yet and could be transferred to other countries. Examples might be energy performance contracting for lighting, compressed air or cold.
- EESs that have been already implemented partly, but will only be successful if they are designed in specific manner. The re-designed EES will be the new promising product. Examples might be heat delivery service/ heat contracting and advanced metering combined with further EES.
- New promising EESs that have not been thought of yet in the EES market and science.

Current EPC projects commonly have contract period of 6 to 8 years which means that some EEI measure (e.g. changing windows and improving insulation) are excluded because of their longer payback periods. Since many public sector building owners have long-term ownership there should be a potential for EES that are conformed to long-term investments horizons.

Potential for adoption of EES, new as well as existing types, could be found among types of end-users that are not being offered EES today. One example is single family housing units that cover 256 million m^2 of building area (equal to 40 percent of the total building stock). According to Bratt et al. (2007), for these end-users, the majority of EES providers do not see business opportunities in providing EES with saving guarantees. The energy consumption of these end-users is strongly related to individual needs and behaviors, which can make it risky to set saving guarantees. Other EES market actors could perhaps be suitable for service provision. Manufacturers of heating systems could potentially extend their offers along the EES value chain. Energy companies should be able to provide preferred indoor climate against a fixed-fee-model. Banks and insurance companies could offer favorable terms to house owners that implement EEI measures. Financing services in connection to the EEI measures recommended by the system of energy declarations provides an interesting example.

In general there could be a stronger focus on the end-users (i.e. the actual users of buildings). Especially in the private sector, property owners do not pay for the tenants' electricity consumption and thus they are not incentivized to include electricity savings measures into EES projects. Lighting and office equipment are nevertheless important energy consumers in office buildings. Waste heat from such equipment are also influencing the heating and cooling needs of a building. In this regard there could be fruitful partnerships between EES providers and specific equipment manufacturers.

3.3 Positioning of energy companies and ESCOs in the different demand sectors

This section intends to describe how ESCOs and energy companies are positioned in the demand sectors. The institutional and private sectors are categorised into types of end-users according to the sections 3.8 and 3.9.

Institutional sector

EPC in the institutional/public sector is the success story of the Swedish EES market development (Forsberg et al., 2007). Over the last years all of the listed institutional sector types of end-users have been involved in EPC projects. The market dominators are ESCOs that belong to the first category of EES providers mentioned in *Table 1*. There are also some contractors in the second and third category reported in this table. Energy companies have a subordinate position in the provisions of EES. Local/regional exceptions exist where municipal energy companies provide EES, like function agreements, primarily to municipal property companies. Some comments can be made as follows:

- Primary and secondary schools are commonly in EES projects provided by ESCOs. In some cases school buildings (in the size of about 20 000 m^2) are treated as separate projects. In other cases, the ESCOs do comprehensive EPC projects that include more or less all municipal buildings and among

them the public schools.

- Universities: the state owned company Akademiska Hus is managing a large share of the building area used by universities and higher education (3.5 million m^2 in total). Akademiska Hus has been involved in one smaller size EPC project (about 30 000 m^2 building area). Since then, however, the company has been reluctant to do EPC, but has instead done EEI by acquiring separate services (e.g. hiring consulting firms for lighting improvement). Though university buildings are attractive for ESCOs and EPC projects, the number of contracts is very limited.
- Local administrations (municipalities, provinces, regions): administrative office buildings are often included in the comprehensive type of EPC projects in which ESCOs makes a single deal including the entire public building stock of a municipality. This will result in projects ranging from 100 000 to 900 000 m^2.
- Health care/hospitals: there are numerous examples of EPC projects, provided by ESCOs, which include entire county councils (i.e. regional organisations that manage building devoted to health and medical care). This can result in project sizes of up to 600 000 m^2.
- Public housing: residential buildings owned by municipal property companies are sometimes included in the comprehensive type of EPC projects. There are also examples of individual agreements with parts of the building stock of a municipal property company. Considering the large need for renovation in the coming years this market segment should be really compelling for EES providers.

Private sector

- Hotels/hospitality: the EES providers of the first category can provide a small number of examples on performance based contracts in hotels (project size of about 10 000 m^2). Reason may be that cold rent agreement give rise to situations of split incentives and difficulties in negotiating agreements.
- Office, commercial: there are some ongoing EES projects conducted by different categories of EES providers.
- Retail: there are some ongoing EES projects conducted by different categories of EES providers.
- Industry: ongoing EES projects exist within the less energy intensive industries and SMEs, but the market is small compared to the property sector. It is estimated that industrial projects constitute about 10 percent of the total EES market (Bratt et al., 2007). Market actors of all categories are, to various degrees, active in providing EES to industrial customers.
- Residential: the private residential market, and in particular single family housing units, is ignored by EES providers (apart from the energy auditing within the energy declaration scheme). There are just a few examples of more advanced EES projects with multi-dwelling residential buildings (Lindgren, 2009, p. 27).

Currently there are no apparent relations between ESCOs (EPC providers) and energy companies. Energy companies may for sure hire consulting firms to perform their EES offers but there is nothing extraordinary with such arrangements.

In a different policy context, e.g. assuming an ESCO certification system or a White Certificate Scheme was launched, partnerships could become more interesting.

Considering their large customer base, energy companies are in an advantageous position for delivering EES to private consumers. Private persons/households are currently only offered lower value EES. The implementation of measures is thereafter not really cared for by the energy companies. The situation of an energy company, in terms of their actual motivation for EEI, is complex. Municipal energy companies in cooperation with municipal property companies is an example were EES may hold mutual benefits. The municipal energy company Göteborg Energi that claims to be running EES projects for existing customers of some 3 million m^2 BA provides an example. Other energy companies are about to start up EES units. It could perhaps make sense for these actors to operate beyond their existing customer base.

There is no ESCO association in Sweden, and there seems to be low interest in establishing one. For the purpose of evaluating the energy savings achieved by EES projects such an association could play a central role. Reporting of EES data could also be arranged in other ways, e.g. to the authorities, which would generate greater understanding of the energy saving potentials and impacts of EES.

3.4 Positioning of energy companies and ESCOs in the value chain of EES products

The value chain of EEI measures is depicted by *Figure 1* that illustrates the broad range of activities that may fit in the scope of EES.

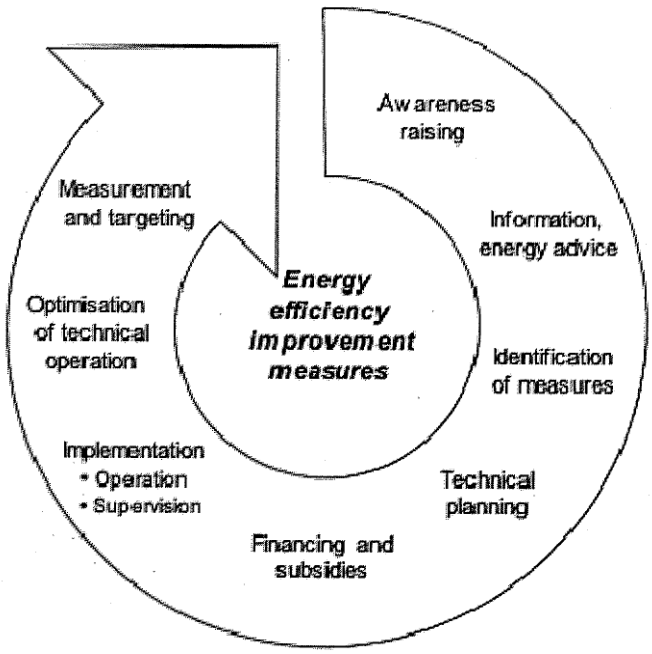

Figure 1: Energy efficiency improvement measures as consecutive stages of a value chain. Source: Change Best Annex I, 2009

Suggested by Bergmasth & Strid (2004) EES can be categorised as shown in *Figure 2*. Indirect services (IEES) are informative and/or advisory, e.g. when the EES

provider conducts an energy audit and analysis or provides the customer with detailed energy statistics. It is only when the IEES customer adopts appropriate measures that an energy efficiency improvement may be realised. A direct service (DEES) requires the EES provider to be engaged in the implementation of the energy efficiency improvement measure. A DEES may require a short or a long term engagement. Installing efficient lighting is typically a short-term DEES. A long-term DEES can be when a customer makes a contractual arrangement to outsource operation and maintenance of its energy installations to an EES provider (Bergmasth & Strid, 2004).

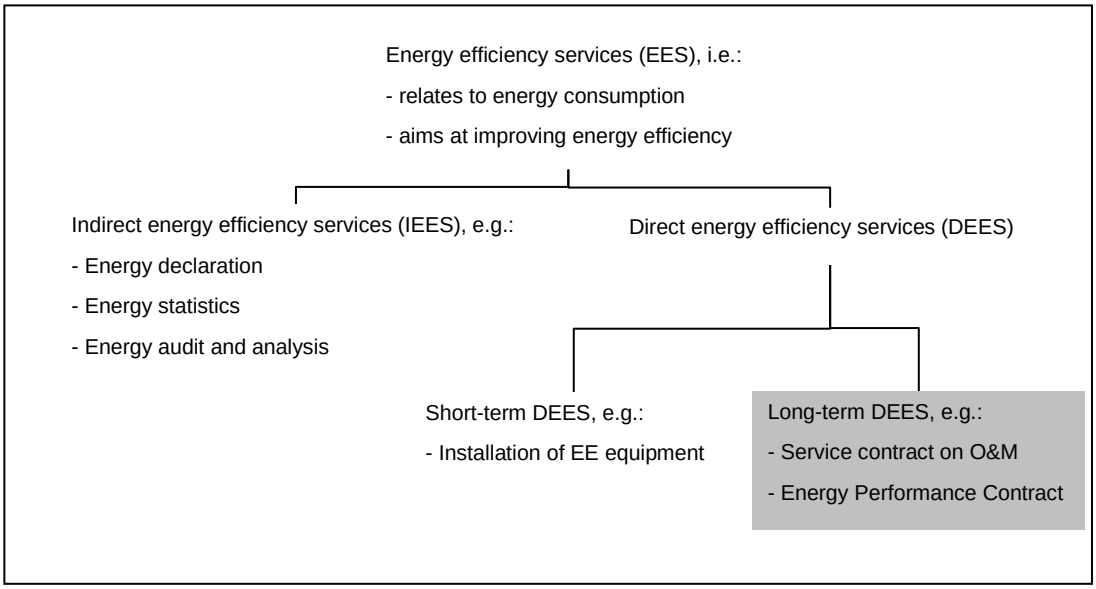

Figure 2: Categorisation of EES. The category of long-term DEES is highlighted since it matches closest with the ESD definition on energy service. Source: Bergmasth & Strid, 2004 (modified by the authors)

There are a large number of market actors with presence in the lower end of the value chain that offers IEES. The system of energy declaration of buildings provides a good example. The service includes awareness raising, information/energy advice and to some extent identification of measures. Among the 350 companies that are accredited for providing energy declarations there are companies of varying kind, from small consulting firms to business units of large multinational companies with extensive EES portfolios. A majority of the EES providers listed in *Table 1* and especially those within category 2 and 3 are accredited (SWEDAC, 2009).

In *Table 3* an attempt is made to categorise the type of companies in terms of occurrence in providing the different EES components of the value chain. The table presents an overview of the market situation and it ought to be understood that each category is characterised by diversity in terms of the range of services offered.

Table 3: The categories of EES provider and their position in the EES value chain. [X indicates a presence, while XX indicates a clear presence]

	1) Building controls, automation, and control manufacturers	2) Companies within facility management and operation companies	3) Consulting firms	4) Energy companies
1.Awareness raising	XX	XX	XX	X
2.Information, energy advice	XX	XX	XX	X
3. Identification of measures	XX	XX	XX	X
4.Technical	XX	XX	X	X
5. Financing and subsidies	XX	X		
6. Implementation: operation and supervision	XX	XX	X	X
7. Optimisation of technical operation	XX	XX	X	X
8.Measurement and targeting	XX	XX	X	

The two dominant EPC providers of the first category reported under the *Table 1* (Siemens and Schneider Electric) claim to be covering the whole EES value chain. Also the second and third category contains a few EPC providers (e.g. YIT and ENEAS Energy) that are in position to bid on the large size public sector projects. Options concerning financing models and provision of customized financing solutions are more clearly marketed by actors within the first category. Even though there are some consulting firms that offers advanced EES (i.e. EPC), this category is predominantly positioned around the lower stages of the value chain. Many consulting firms do not go beyond the stage of technical planning. As mentioned earlier in this report, some consulting firms have expertise to complement EPC projects by supporting customers through the process.

With some exceptions energy companies play a subordinated role on the EES market. Their EES are mainly offered to larger customers, i.e. companies and property owners. Household customers may receive information about potential energy saving measures and be offered more frequent energy consumption data, but are otherwise neglected. The provision of services may tighten customer relations, but the relation to energy savings and/or EEI at the customer is often vague. Service contracts are commonly offered but it is unclear to what extent these involve optimization of the technical operations. The function agreements (or climate agreements or comfort agreements) are the more advanced type of services. Against fixed fee the delivery of functions are guaranteed (like in-door climate, temperature etc.). It is claimed that operation is made more energy efficient but it is unclear whether this bring about cost savings for the customer. In general when energy companies are marketing EES there is no clear emphasis on energy saving guarantees and related M&V.

Education is an important EES component that is not present in the value chain of *Figure 1*. Though an EPC can be arranged differently it commonly involves educational efforts through which the facility management staff of the customer is

trained by the EPC provider in how to handle the installed equipment. This will sometimes be a prerequisite for fulfillment of the performance guarantee and to maintain performance after the contract period is over.

3.5 Main EES types provided, fields of application and technologies

In the broad sense an EES relate to energy consumption and aim at improving energy efficiency. In a stricter sense an EES should perhaps not just aim, but have to prove achievement in energy efficiency improvement (EEI) and/or primary energy savings. The standard document prEN15900:2009 definition of EES was stated in section 2.1. The definition in itself provides flexibility but combined with the general requirements of prEN15900:2009 the scope of EES narrows down. The ESD does not mention EES but article 3 of the ESD defines the related term *energy service* as:

"the physical benefit, utility or good derived from a combination of energy with energy efficient technology and/or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to lead to verifiable and measurable or estimable energy efficiency improvement and/or primary energy savings"

If this definition is accepted also for EES, some types of energy related services will have to be excluded. One example is advisory services that do not result in adoption of EEI actions. Only selling EE equipment (e.g. compact fluorescent lights) is another example; the offer is not based on a contract and neither does the retailer make any efforts to verify EEI. The contracted service of installing CFL (or another EE technology) and providing the customer with an estimate on the EEI, in comparison to a baseline, is more likely to qualify as an EES. Long-term performance-based contracts where the investments in EEI measures are financed by support of a guaranteed energy savings will typically qualify as an EES.

Given the elements of the EPC concept it ought to be an adequate EES (i.e. conform to the definitions of above) and it is an EES type that is commonly provided in Sweden. Considering the possibility that the concept has different meanings depending on where it is applied, for reasons of clarification, the EPC process in the Swedish building sector can be described as consisting of five consecutive steps (Svensson, 2007; Lindgren, 2009):

1. **Preparatory arrangements:** The property owner (customer) investigates whether EPC could be an option. Different in-house expertise and/or consultants are gathered in a steering group to decide about the scope of the project, i.e. the number of buildings to include, the technical and economical limitations, how internal staff should be involved. The objectives and monitoring practices are decided. Also, the type of procurement is decided on. The preparations may span over a time period of six months.
2. **Procurement and contract:** The customer makes a request for proposals, and eventually decides for a contractor (i.e. EPC provider). The contract is then negotiated. This step will require at least three months.
3. **Project development – phase 1:** The EPC provider makes an energy audit and analysis to gather data about measures, saving potentials, cost involved, educational needs, etc. The outputs are concluded in a report. The cost for this phase, lasting for about six months, will be in the range of € 0.2–1 per m^2.

4. **Project implementation - phase 2:** The EPC provider implements the measures decided upon, and starts educating the internal staff that will operate the equipment. The cost for this phase will be in the range € 15–25 per m^2 for a larger size project. The time span for this phase may be up to two years.
5. **Project follow up – phase 3:** The EPC provider makes an energy savings guarantee for the whole pay back period, which assures that the investments will be returned. For the whole project and preferably for each building (depending on the number of meters) a monthly report will be made. At yearly meetings the actual performance is compared to the agreement. If the project is underperforming the contractor will pay a fine equal to the missed out saving. If instead the performance is better than the guaranteed level the contractor will be rewarded. The cost for this phase will be in the range € 0.1–0.3 per m^2. This last phase will typically run between six and eight years.

EPC is viewed as especially suitable for larger size projects of 50 000 m^2 and above. The commonly adopted EEI measures can be divided into short and long-term measures. Short-term measures will require regular control and follow-up for optimal operation to be maintained and are typically (Bratt et al., 2007):

- Optimized control of heating and ventilation systems
- Adjustments of heating system
- Educating the customer's staff for operation of the facility
- Monitoring of electricity, heating, cooling and water consumption

The long-term EEI measures, with energy saving lifetimes of up to 15 years or more, are typically (Bratt et al., 2007):

- Installation of demand-controlled ventilation, steering and control systems, building automation system
- Installation of new ventilation aggregate
- Installing ventilation with heat recovery
- Shifting heating system
- Shifting heat exchangers

Some less frequent EEI measures of an EPC project are: optimization of lighting system, implementation of water saving measures, change of windows and improved insulation. The main reason is probably that these measures are less profitable with payback periods that go beyond typical contract periods of about 8 years. A simple explanation could also be that these measures are not routinely implemented by EPC companies and therefore become disregarded (Bratt et al., 2007).

As mentioned in section 2.1 the ChangeBest project has chosen to accept a broad understanding of EES. For example, energy auditing and analysis alone is counted as an EES, though being on the lower end of the EES value chain. In Sweden, auditing activities are common within all demand sectors. Most building types are required to perform energy audits under the Energy Declaration of Buildings Act. Also within the industrial energy efficiency programmes energy auditing is a vital element. The challenge for auditing companies and for the EES

market development in general is to create extended offers along the EES value chain so to increase the implementation rate and thus to achieve actual EEI based on auditing results.

3.6 Energy Efficiency Service financing

In terms of how EES can be financed, three main typologies can be distinguished[7]:

1. **EES provider financing:** refers to financing with internal funds of the EES provider (i.e. the EES provider is the borrower) and may involve use of its own capital or funding through other debt or lease instruments.
2. **Energy user/customer financing**: usually involves financing with internal funds of the energy user/customer backed or not by an energy saving guarantee provided by the EES provider. Energy-user/customer financing may also be associated with borrowing in the case when the energy-user/customer as a direct borrower has to provide a guarantee (collateral) to the finance institution.
3. **Third-party financing** (TPF) refers solely to debt financing. As its name suggests, project financing comes from a third party, e.g. a finance institution and not from internal funds of EES provider or of the customer. The finance institution may either assume the rights to the energy savings or may take a security interest in the project equipment. There are two conceptually different TPF arrangements; the key difference between them is which party borrows the money: (a) the EES provider or the (b) customer.

Some EPC providers can offer financing solutions, either through their internal financing division or by arranging with a third party financing institution. Such offers, however, are rarely asked for by EPC customers. Most customers and especially the public sector prefer to finance investments through a combination of internal funds and loan uptake (Lindgren, 2009). The credit terms that they receive will often outdo terms given by EPC providers.

Out of nine EPC projects that covers in total 2 million m^2 only one customer (a municipal property company) of a small size project (14 000 m^2) used a financing solution offered by the EPC provider. Clearly, customer financing is the predominant method and customers often state the benefit of separating the financing methodology from the energy saving guarantee (Svensson, 2007). From the customer perspective TPF arrangement are perceived to be associated with complications.

It can be assumed that EPC providers would like to provide more financing solutions to gain larger profits. EES providers that do not offer such solutions are likely to be satisfied with the common set up of customer financing.

Concerning contractual arrangements adopted for EPC, the customer will be protected from some of the project risk based on the negotiated saving guarantee. The guarantee is expressed as a certain percentage, for example 80 percent, of the

[7] For more information see “Energy Service Companies in Europe”, Status report 2005, Paolo Bertoldi and Silvia Rezessy, European Commission DG JRC, Institute for Environmental Sustainability, Renewable Energies Unit

expected savings. If the EPC provider does not fulfil the agreement the customer will be compensated for the underperformance. If the project exceeds the projected savings there can be different contractual arrangements on how to share these additional savings. Though the EPC provider will earn most of its revenue during the second phase (the implementation phase) such an arrangement is thought to incentivise greater performance.

3.7 Most commonly adopted and promising marketing strategies in the EES market sectors considered

EES are mainly provided as stand-alone offers to public building owners by EES providers of category 1 to 3 of *Table 1*. As in many other business areas, these suppliers of EES are trying to build long-term and trusting relationships with their customers. Trust is very central to the EES business in Sweden due to the nature of the business (e.g., with asymmetric information) and some early experiences that gave EPC a bad reputation.

The large EPC providers try to get engaged with potential customers very early in the value chain. Ideally, they like to be involved from the start, working with the customer and essentially make sure that the Request for Tender (RFT) is written in a way that suits their own business proposition. Using examples and giving references to earlier projects is also a very important element in marketing, which is made evident on the company websites. Likewise, consultants that assist customers also attempt to get engaged early in the value chain.

Adding value to the sales of EE equipment and selling “function” rather than gadgets has been a basic motivation for EES providers with a background in building automation and control, but this link appears to have weakened over time. Hardware and EES offers are often in separate business units and customer demands on EE equipment, e.g. determined by existing installations, must be respected. In fact, as mentioned earlier, even when two EES providers compete for a contract, the winning may engage the competitor as a supplier of hardware EE equipment for the contract when this is in the interest of the customer.

Public sector RFT are quite demanding due to procurement regulation and some smaller EES players therefore look for business more in the private sector. Requests for proposals from private sector customers involve much less formal demands and paper work for the bidder.

The extent to which EES are presently offered in combination with energy supply is uncertain. Many energy companies have a renewed interest in offering EES as they see an interesting market evolving. An earlier phase, 1995-2000, of energy company interest in the EES market offers some experience on marketing strategies. In this phase, interest was driven by the recognition that it would be hard to profit from electricity sales in a deregulated market. With electricity being an anonymous commodity, it was expected that developing other value added services would be necessary for building customer loyalty and remain profitable. In this period, combining sales of EES with energy supply was the basic proposition.

The experience from the 1995 to 2000 period was that customers did not want such package deals, but preferred to have separate supply contracts with transparent energy prices and then direct energy efficiency services separately. Indirect energy efficiency services (e.g., audits and advice) were sometimes packaged with energy sales, as a smaller add-on and not as a profitable business for the energy suppliers.

3.8 Summary on existing EES market offer

The following tables summarise the main information of the ESCO and energy company EES market as reported in sections 3.1, 3.3, 3.4 and 3.6. Tables are filled in by following the compilation example reported in the ANNEX I.

Table 4: ESCO EES market

	Sectors	EES market status	ESCO type	Positioning in the EES product value chain	EES financing	Incentives and barriers	Existing policy mix
Institutional sector	**Primary and secondary schools**	2	Private ESCOs, independent specialist companies	All stages	Mostly 2	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Universities	4	Private ESCOs, independent specialist companies	1, 2, 3, 4 (few EPC projects so far)	Mostly 2, often fixed-fee-service model	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Administrations (municipalities, provinces, regions)	2	Private ESCOs, independent specialist companies	All stages	Mostly 2	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Health/Hospitals	2	Private ESCOs, independent specialist companies	All stages	Mostly 2	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Public housing	3	Private ESCOs, independent specialist companies	All stages	Mostly 2	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 5
Private sector	**Hotels/hospitality**	4	Private ESCOs, independent specialist companies	1, 2, 3, 4 (few EPC projects so far)	Mostly 2 but sometimes 1, often fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Office, commercial	3	Private ESCOs, independent specialist companies	All stages	Mostly 2 but sometimes 1, often fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Retail	3	Private ESCOs, independent specialist companies	All stages	Mostly 2 but sometimes 1, often fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Industry	3	Private ESCOs, independent specialist companies	All stages	Mostly 2 but sometimes 1, often fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Low energy prices and strict payback requirements provide barrier against long-term EES contracts, lack of awareness	1, 2
	Residential	4 (or 5)	Private ESCOs, independent specialist companies	1, 2, 3	Mostly 2 but sometimes 1, often fixed-fee-service	Incentivised by regulations and cost reductions Barriers are lack on awareness/information.	1, 2

					model	ESCOs show little interest in small size projects	

Table 5: Energy Company EES market

	Sectors	EES market status	Energy company type	Positioning in the EES product value chain	EES financing	Incentives and barriers	Existing policy mix
Institutional sector	**Primary and secondary schools**	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Universities	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Administrations (municipalities, provinces, regions)	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Health/Hospitals	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Public housing	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 5
Private sector	**Hotels/hospitality**	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Office, commercial	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Retail	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Industry	4	Distribution and retail	1-4, 6, 7	2, based on fixed-fee-service model	Cost reductions and focus on core activities can incentivise EES Low energy prices and strict payback requirements provide barrier against long-term EES contracts, lack of awareness	1, 2
	Residential	4 (or 5)	Distribution and retail	1, 2, 3	2, based on fixed-fee-service model service	Incentivised by regulations and cost reductions Barriers are lack on awareness/information, little interest in small size projects	1, 2

3.9 Summary of potential needs for EES in the different demand sectors

The summary tables reported hereunder have been compiled based on the information reported in sections 3.2, 3.3, 3.4 and 3.6.

These tables relate to new and promising EESs that are or might be provided by ESCOs and energy companies in Sweden. A summary table compilation example is found in the ANNEX I.

Table 6: ESCO EES market

	Sectors	ESCO type	Positioning in the EES product value chain	EES financing	Incentives and barriers	Existing policy mix
Institutional sector	**Primary and secondary schools**	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Universities	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Administrations (municipalities, provinces, regions)	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Health/Hospitals	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Public housing	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 5
Private sector	**Hotels/hospitality**	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Office, commercial	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Retail	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Industry	Private ESCOs, independent specialist companies	All stages	2, 1, and combinations of financing typologies	Cost reductions and focus on core activities can incentivise EES Low energy prices and strict payback requirements provide barrier against long-term EES contracts, lack of awareness	1, 2
	Residential	Private ESCOs,	All stages	2, 1, and combinations	Incentivised by regulations and cost	1, 2

		independent specialist companies		of financing typologies	reductions Barriers are lack on awareness/information. ESCOs show little interest in small size projects	

Table 7: Energy Company EES market

	Sectors	Energy company type	Positioning in the EES product value chain	EES financing	Incentives and barriers	Existing policy mix
Institutional sector	**Primary and secondary schools**	Distribution and retail	All stages	2, potential for performance based remuneration	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Universities	Distribution and retail	All stages	2, potential for performance based remuneration	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Administrations (municipalities, provinces, regions)	Distribution and retail	All stages	2, potential for performance based remuneration	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 2, 5
	Health/Hospitals	Distribution and retail	All stages	2, potential for performance based remuneration	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 5
	Public housing	Distribution and retail	All stages	2, potential for performance based remuneration	Incentivised by cost reductions and refurbishment needs Barriers are lack of awareness/information	1, 5
Private sector	**Hotels/hospitality**	Distribution and retail	All stages	2, potential for performance based remuneration	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Office, commercial	Distribution and retail	All stages	2, potential for performance based remuneration	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Retail	Distribution and retail	All stages	2, potential for performance based remuneration	Cost reductions and focus on core activities can incentivise EES Cold rent agreements can be a barrier, lack of awareness	1
	Industry	Distribution and retail	All stages	2, potential for performance based remuneration	Cost reductions and focus on core activities can incentivise EES Low energy prices and strict payback requirements provide barrier against long-term EES contracts, lack of awareness	1, 2
	Residential	Distribution and retail	All stages	2, potential for performance based remuneration	Incentivised by regulations and cost reductions Barriers are lack on awareness/information, little interest in small size projects	1, 2

4 EES product and business strategy good practice examples

Good practice example 1 – EPC in public buildings in general

The implementation of EPC in the public building sector has proved to be quite successful on the Swedish EES market. Information about this development has been given throughout this report and thus only a brief description is provided in the table below.

Good practice example 2 – Energikollen offered by Växjö Energi

Växjö Energi is a municipal energy company with production capacity as well as distribution of electricity and district heating to 29 000 customers.

In cooperation with an IT partner Växjö Energi developed "Energikollen" which is an example of a lower value EES that has attracted some attention in recent years (it was the winner of the European Utility Awards 2007). "Energikollen" is basically a smart metering based feedback system that visualises energy usage in a pedagogical way to increase customer's awareness of their own energy consumption. "Energikollen" also consists of a game function through which customers can compete against each other in saving energy. In this way energy saving and energy efficiency improvement can become interesting for an increasing number of customers. The competition has engaged individuals and teams in the municipality of Växjö and thereby received publicity in local media channels. The basic version of "Energikollen" is offered to all customers for free, but there are additional applications that are offered against a cost.

Table 8 below contains brief information about the above described good practice examples. A table compilation example is found in the Annex II.

Table 8: Summary information about the best practice examples described.

	Good practice example 1	**Good practice example 2**
EES provider	Private ESCOs Mainly ESCOs with business backgrounds in building automation and controls manufacturing as well as facility management and operation.	Energy company
Sector(s) addressed	Mainly institutional/public sector	Institutional as well as private sector. The EES is also targeting the residential sector and private consumers.
Technology/ field of application	Optimisation of heating and ventilation, change of HVAC equipment, education of customer staff.	An example of indirect and lower value EES. Through a user friendly interface feedback is given on electricity and heating demand.
EES value chain stages considered	All stages (1-8)	Awareness raising (1)
EES financing typology	Mostly customer financing (2)	Basic version is free of charge. Additional applications are purchased by customer.
EES contract type	EPC with guaranteed savings	No contractually agreement
Existing policy instruments stimulating EES implementation	Capacity building and dissemination activities, investment subsidies for EEI measures, and some regulations.	Law on remote metering

Barriers overcome	The barrier of low awareness and understanding of EPC among customers has partly been overcome as a number of successful projects have been launched.	Can potentially overcome the barrier of low awareness among the otherwise neglected private residential energy end-users.

ANNEX I: Summary information to be reported in tables 4, 5, 6 and 7

Hereunder a compilation example of the tables reported in sections 3.8 and 3.9 is provided. The specific example refers to the existing ESCO EES market. The numbers in the table cells related to the EES market status, the positioning in the EES product value chain, to the EES financing typologies and to the existing policy mix adopted in the various sectors refer to the categories listed under the table. The information in the tables related e.g. to local administrations hence indicate that the ESCO market for local administrations is well developed, the ESCO implementing EES products for local administrations are mainly public ESCOs covering all EES product value chain stages excepting optimisation and technical operation of the installed solutions and measuring and verification of the savings generated. The EES financing typology adopted by local administration is mainly customer financing and third-party financing with the ESCO borrowing the financial resources necessary for project implementation. The main barrier to EES product implementation is represented by the principal/agent problem (i.e. the investor is different from the beneficiary of the savings) and the existing policy mix is represented by regulation (that in the specific case might be an existing standard related to local administration buildings) and communication/procurement/labels (that in the specific case might be procurement programmes adopted by the local administrations in the country considered). The numbers related to the existing policy mix should be included in the table according to a prioritization criterion of the influences by policy instruments and measures. Therefore regulation (1) comes before communication/procurement/labels (5) in the table because it is assumed that regulation stimulated the EES market for local administrations more than communication/procurement/labels. Based on the information available for the well developed and new and promising EES market related to ESCOs and energy companies in your country, the four tables in sections 3.8 and 3.9 should be filled according the compilation example here provided.

Table 9: ESCO EES market

	Sectors	EES market status	ESCO type	Positioning in the EES product value chain	EES Financing	Incentives and barriers	Existing Policy mix
Institutional Sector	**Primary and secondary schools**						
	Universities						
	Local administrations (municipalities, provinces, regions)	2	Public ESCOs	1,2,3,4,5,6	2, 3a	Principal/aagent problem	1,5
	Health/Hospitals						
	Public housing						
Private sector	**Hotels/hospitality**						
	Office, commercial						
	Retail						
	Industry						
	Residential		Private ESCOs	1,2,3,6	1, 3b	ESCOs not interested in small projects, Insufficient level of information and awareness by consumers	4,1b

EES market status:

1) very well developed with respect to the existing potentialities,

2) well developed with respect to the existing potentialities,

3) emerging with respect to the existing potentialities,

4) not well developed with respect to the existing potentialities,

5) not existent.

EES product value chain stages:

1) awareness raising,

2) information and energy advice,

3) identification of measures,

4) technical planning,

5) financing and subsidies,

6) implementation (operation, supervision),

7) optimisation of technical operation,

8) saving measurement and verification.

Existing policy mix

Provide your overview by distinguishing among the following policy instrument types:

1) Regulation

a) environmental permits (e.g. WBM)

b) standards (buildings and appliances)

2) Financial incentives

a) subsidies and fiscal facilities

b) taxes and special tariffs

3) Agreements

4) Market based instruments (WCS)

5) Communication/procurement/labels

6) Other

The numbers related to the existing policy mix should be included in the table according to a prioritization criterion of the influences by policy instruments and measures. For example, if regulation (1) comes before communication/procurement/labels (5) in the table, this means that regulation has been supposed to have stimulated the EES market for local administrations more than communication/procurement/labels.

EES financing typologies

1) *EES* provider financing,

2) *energy* user/customer financing,

3) *Third*-party financing:

a) the EES provider borrows the financial resources necessary for project implementation

b) energy user/customer takes a loan from a finance institution backed by an energy savings guarantee agreement with the EES provider showing that the energy savings achieved will certainly cover the debt repayment.

ANNEX II: Summary information to be reported in table 8

Information to be reported in the various fields of table 5 are summarized below:

EES provider: ESCO type (i.e. public ESCO, private ESCO, public-private joint venture, multinational company e.g. having or not heating and building control equipment retailer origin, independent specialist companies, ESCO of finance institutions) or energy company type (i.e. energy distributor, distribution system operator, retail energy sale company) or other company type or organisation responsible for EES implementation.

Sector(s) addressed: one or more of the sectors listed in tables 4,5,6,7

Technology/field of application: technology/field of application addressed by the EES considered (e.g. combined heat and power, HVAC, public lighting, energy efficient motors, etc.)

EES value chain stages considered: one or more of the EES value chain stages indexed in Annex I

EES financing typology: one or more of the EES financing typologies indexed in Annex I.

EES contracting typology: supply contracting, energy performance contracting or other contracting types (e.g. leasing, Build-Own-Operate-Transfer (BOOT) contracts, chauffage, etc.).

Existing policy instrument(s) stimulating EES implementation: one or more of the policy instruments indexed in Annex I. The numbers related to the existing policy mix should be possibly included in the table according to a prioritization criterion of the influences by policy instruments and measures. For example, if regulation (1) comes before communication/procurement/labels (5) in the table, this means that regulation has been supposed to have stimulated EES implementation more than communication/procurement/labels.

Barriers overcome: possibly existing barriers to EES implementation overcome by the good practice example addressed.

References: Interviews carried out and further sources used

The objective in selecting the interviewees was to include, to the extent possible, views from different EES market actors/stakeholder. Three EES providers from three different categories were contacted. Siemens is one of the main EPC providers on the Swedish EES market. Växjö Energi is a municipal energy company with ambition to expand their EES business unit. WSP is a consulting firm with experience in supporting EPC customers in the procurement and implementation of EPC projects.

EEF is an association of companies, with expertise in energy efficient technology and solutions, which take interest in the development of the EES market. A representative for the Swedish Energy Agency was interviewed for information on current and future market development and planned incentives.

List of the persons interviewed

Name	Company/institute of origin	Position in the company/institute
Stefan Källman	Siemens Industry sector – Building Technologies division	Part of performance contracting
Lotta Bångens	EEF Association of "Energy Efficiency Companies"	Manager of EEF
Magnus Eriksson	Växjö Energi	Manager of marketing and sales
Åke Lindström	Swedish Energy Agency	Handling officer energy efficiency in buildings
Daniel Svensson	WSP	WSP Environmental

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