

## **ESCO as Innovative Facilities Management in Danish Municipalities**

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## ESCO as Innovative Facilities Management in Danish Municipalities

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### ABSTRACT

**Purpose:** Increasing energy efficiency of existing buildings is high on the Facility Management (FM) agenda, therefore building owners and FM Managers need insight into a variety of organizational possibilities for energy renovation projects. This paper explores how contracts with Energy Service Companies (ESCO's) can foster innovative changes in the municipal FM-function, including dissemination of experiences gained from their ESCO-contracting to local building owners.

**Theory:** Theory of Public Innovation is used to see the new roles of local authorities in promoting energy renovations to building owners with a relatively limited FM-competence.

**Design/methodology/approach:** Since ESCO-contracting is relatively new in a Danish context; international experiences are investigated through literature review to establish a conceptual frame. The study is based on recent Danish and international surveys, literature studies on ESCO-initiatives and a case study of Kalundborg municipality combined with interviews with private FM-suppliers, energy consultants, ministries and municipalities.

**Findings:** The paper gives an overview of the current status of ESCO-initiatives in Danish municipalities. These first findings show that ESCO-contracting is a promising possibility to promote energy efficiency in municipal buildings and in many cases encourages municipalities to take innovative steps in disseminating experiences from ESCO-contracting to other areas, and thus overcoming barriers for introducing ESCO-initiatives in the private housing sector.

**Originality/value:** This paper adds to FM-research on how to make the existing building stock more attractive and energy efficient. It is the first publication from the project "Energy Service Concepts" carried out at the Danish Centre for Facilities Management ([www.cfm.dtu.dk](http://www.cfm.dtu.dk)). Results have not been published before.

### Keywords

Facilities Management (FM), Energy Service Companies (ESCO), public innovation, energy efficiency, housing

**EFMC 2010 theme: Sustainability or FM future and Innovation**

**Classification: Ongoing research**

## 1 INTRODUCTION

In Denmark 40% of the energy consumption goes to heating of buildings. In many policy papers on energy efficiency, ESCO-contracting (contracts with Energy Service Companies) is described as a promising way to achieve energy savings in existing buildings. From a facilities management point of view ESCO-contracting is an interesting concept as it targets energy efficiency in existing buildings, which has been difficult for Danish FM Managers to achieve (Jensen et al, 2008). An energy service company (ESCO) is a company that is engaged in developing, installing and financing comprehensive, performance-based projects (Vine, 2005). In an ESCO-contract, the ESCO takes the risk for achieving defined energy-savings, instead of the client (e.g. a building-owner). This makes investments in energy-savings more calculable and thereby attractive for clients.

In Denmark ESCO-contracting has so far mainly been used in the industry, but in recent years more and more municipalities have taken up ESCO-initiatives for renovation and FM-improvements in public buildings. The question is whether ESCO-contracting can be used in the existing housing stock which represents the largest potential for energy savings. So far some attempts have been made to use ESCO-contracting in private housing, but this includes many challenges for instance organising the contracting process with many owners, financing, overcoming transaction costs etc. It is relevant to consider different ESCO-models and services in different building types of the housing stock, where a large proportion (40% of all dwellings) consists of detached single-family houses.

The paper is based on an ongoing research project aiming at identifying the potentials and barriers to apply ESCO-contracting in the Danish housing market, therefore results are preliminary. The paper will give a brief introduction to ESCO's in Denmark and an overview of current ESCO-initiatives, including present experience from the municipalities and ESCO-suppliers. It will address the main questions in relation to adapting current ESCO-concepts to the housing market including the role of FM in different ESCO models.

### 1.1. Purpose and methodology of the study

The paper presents findings from the initial phases of the project including a survey of existing Danish ESCO-initiatives, literature studies of ESCO-experience as well as a case study on one of the first ESCO-contracting projects in a Danish municipality.

Our research question in the initial phase of the project is:

*How does the experience with ESCO-contracting influence the municipal FM-function in relation to create innovation and new roles for FM, for instance in order to disseminate their ESCO-experience to private house owners in the municipality?*

The main ESCO experience in Denmark is with the municipalities and the first part of the paper describes their background and experience. This part is based mainly on recent Danish and international surveys and literature studies on ESCO's and ESCO-contracting. The second part discusses the possibilities for ESCO-contracting in the housing sector based on interviews with private FM-suppliers, energy consultants, ministries and municipalities.

## 2 THEORETICAL APPROACH

### 2.1. Public Innovation

Our research interest is focused on the consequences of introducing ESCO-contracting in municipalities: What types of changes and innovation does it foster, and will it eventually give the FM function another role, especially in relation to promoting energy efficiency also amongst private building owners in the municipality?

To understand and conceptualise this possible development we will use 'public innovation' as a theoretical framework. Public innovation includes different types of innovations including product innovation, service innovation, process innovation, position innovation, strategic innovation, governance innovation and rhetorical innovation (Hartley, 2005). ESCO-contracting can be seen mainly as a process innovation; the products and services are well-known, but the way the services are organised is new. More interesting, however, is whether present and future ESCO arrangements might lead to strategic and governance innovation.

One of the main differences between private and public innovation is that the latter is based on dissemination of 'best practice' to other organisations, localities and jurisdictions in contrast to the private innovation which is based on gaining a competitive advantage (Hartley, 2005). Therefore it is interesting how the experience of the municipalities can be disseminated to other departments and actors in the municipality, especially private building owners. This also questions the extent of the changes from ESCO-contracting: Will it only lead to smaller changes and basically 'add-ons' to existing practices or can it also lead to major changes in the organisation on FM and energy efficiency? Mulgan and Albury's (2003) suggestion on different levels of innovation (IDeA Knowledge, 2005) might be useful to apply:

- Incremental, i.e. minor changes to existing services/processes
- Radical, i.e. new services or ways of 'doing things' in relation to the process or service delivery
- Transformative / systemic, i.e. new workforce structure, organisational types, and inter-organisational relationships

In our approach to understand how ESCO influences the existing FM-organisation, we have a certain focus on competences on energy efficiency and relation to the users. The main difference between FM and 'traditional' building operation is that the latter focuses on the buildings, whereas FM focuses on what goes on in the buildings; therefore analysis of needs and customer satisfaction are as important in FM as the technical issues related to the building (Jensen, 2006).

The use of ESCO-contracting in municipalities can be seen as a part of a changing perception of the public management as characterised by the three paradigms in Table 1.

Table 1. Innovation and the role of public managers in changing paradigms. Source: Hartley, 2005

	<b>'Traditional public management'</b>	<b>'New' public management</b>	<b>Networked governance</b>
<b>Context</b>	Stable	Competitive	Continuously changing
<b>Types of governance</b>	Hierarchies Public servants	Markets. Purchasers and providers Clients and contractors	Networks and partnerships. Civic leadership
<b>Role of public managers</b>	'Clerks and martyrs'	Efficiency and market maximizers	'Explorers'
<b>Role of population</b>	Clients	Customers	Co-producers

An increasing focus on FM as well as on ESCO-contracting suggests a new approach to municipal management of buildings and sustainability, where the public managers' role is defined through the 'networks governance' paradigm more than the 'traditional public management' paradigm. Although ESCO-contracting delivers many promises on energy efficiency, economic benefits, partnerships etc., it is necessary also to maintain a critical approach. Innovation does not necessarily lead to improvements, and improvements of public service are not necessarily based on innovation (Hartley, 2005). It is necessary to see ESCO-contracting not as a goal in itself, but as one out of different alternatives to reach better buildings including increased energy efficiency.

Our preliminary theoretical considerations lead us to an initial understanding of possible steps in public innovation that the introduction of ESCO might have on FM in the municipality:

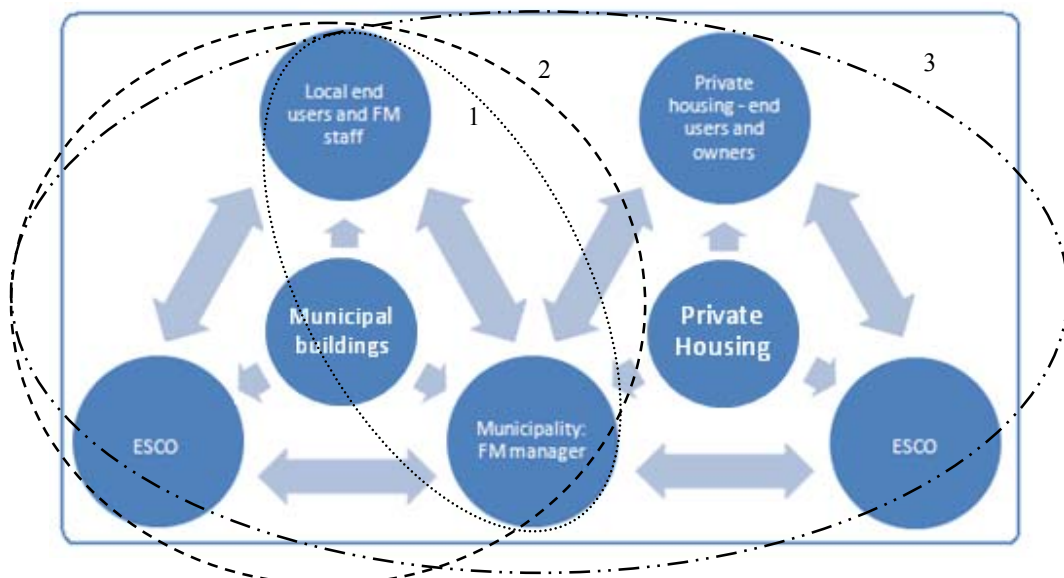


Figure 1. Illustration of three possible roles and functions for the municipal FM function, c.f. table 2.

Table 2. Three possible steps types and functions of the municipal FM function

Type of Facility Management	1. Traditional FM of municipal buildings	2. ESCO-based FM of municipal buildings	3. ESCO-based FM towards local housing market
<b>Public management paradigm</b>	Traditional public management	New public Management: Increasingly contractual management and strategic FM	Networked governance: Broker and negotiator between private owners and ESCOs FM function increasingly integrated with other sustainability initiatives
<b>Type on innovation</b>	<b>Incremental:</b> Constant improvements, but no real innovation	<b>Radical:</b> Ways of delivering service is changed, but within existing FM-framework	<b>Transformative:</b> ESCO experiences leads to new roles and function of the FM function and new types of organisation

### 3 ESCO IN DENMARK: AN INTERNATIONAL PERSPECTIVE

There are many different views on ESCO and this chapter will describe the most common understanding of ESCO in relation to both the public and private sector.

#### 3.1. Types of ESCO

An ESCO company provides a broad range of energy solutions. According to the Danish Savings Trust the process of an ESCO-contracting project consists of four phases: Screening, Analysis, Implementation and Operation.

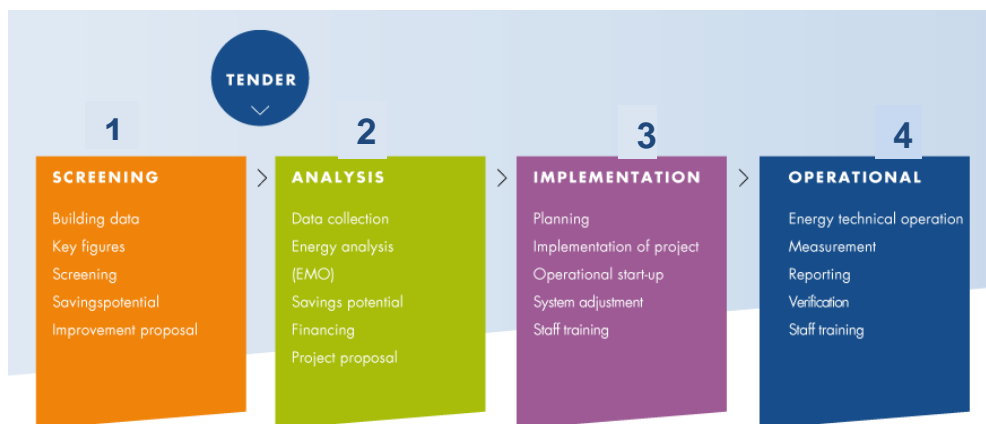


Figure 2. The four phases of an ESCO-contracting project. Source: The Danish Savings Trust

Phase 1 is performed by the client, typically in collaboration with a consultant, to estimate the savings potential, where after the ESCO collaboration takes over starting from an in-depth energy analysis to maintenance of the installed systems during the pay-back period. This is the common understanding of ESCO, but there are different financial structures to an ESCO project. See Figure 3.

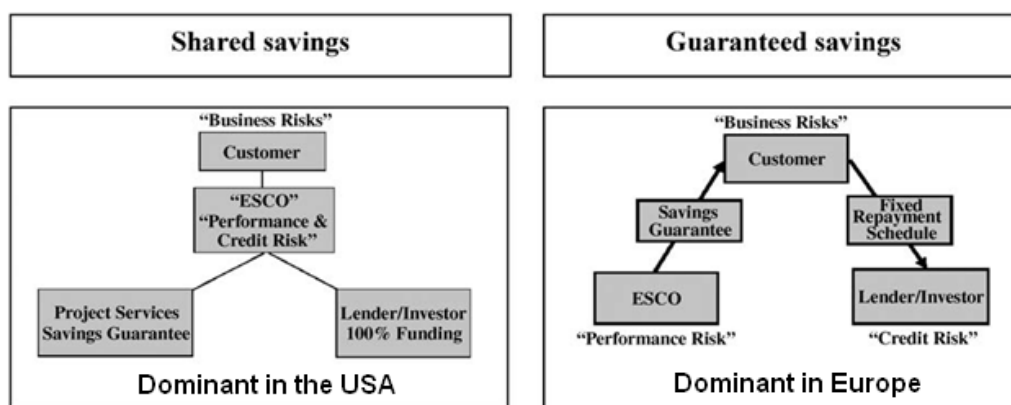


Figure 3. Primary ESCO financial structures. Source: Bertoldi et al, 2006

The ESCO-contracting model with *shared savings* is most dominant in the USA, where the client takes over some of the performance risks in the project though still avoiding any credit risks. In

Europe, ESCO-contracts are mostly based on *guaranteed savings* and thereby the ESCO takes over the entire performance risk. In this case, the client is financial responsible, not the ESCO.

According to a status update for ESCO development in Europe in 2006 Scandinavia is placed at the bottom end with only Sweden as the forerunner. This is based on the number of ESCOs operating in the country and the size of the market. Sweden had a turnover of €50 M in 2006, while Denmark was estimated to have €5 M per year (Bertoldi et al, 2007). Sweden's success results from having the municipalities and larger residential property companies as clients.

Danish municipalities look to Sweden to follow their lead, but ESCO in Denmark is perceived somewhat differently. The Danish Saving Trust defines the role of ESCO in four types of energy service agreements. See Figure 4. The Swedish model is defined as type 3, which is fairly comparable with the ESCO model with guaranteed savings. The fact that municipalities can take loans with better interest rates than the ESCOs means that this type of energy service agreement is very appealing because of the municipalities' lack of know-how.

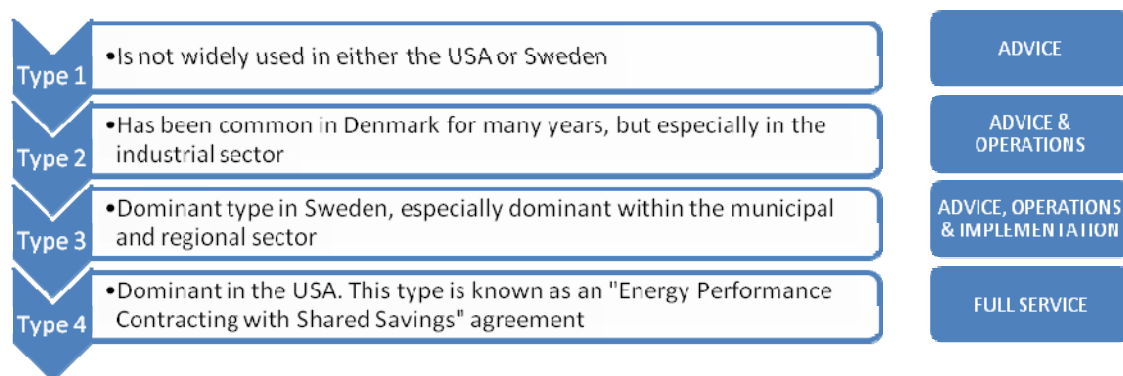


Figure 4. Types of energy service agreements. Source: Danish Savings Trust<sup>1</sup>

### 3.2. Political framework for ESCO in Denmark

On a national level ESCO-contracting is being promoted on two tracks in Denmark: As a way to gain energy efficiency in the building stock, and as a way to increase public-private partnerships (PPP).

The Danish Government signed a political agreement in 2005 as part of the EU Energy Performance of Buildings Directive, where the main objective was statutory energy labelling of both public and private buildings. However, it was found ineffective especially for smaller buildings (Togeby et al, 2008). So the government had to make a new energy strategy in 2009 recommending the use of ESCO-contracting as a tool to obtain energy reductions in the public sector. ESCO-contracting is also being promoted by the Ministry of the Interior and Social Affairs to increase municipalities' use of PPP. This effort includes workshops with private and public partners to promote networks and dissemination of knowledge, support to municipalities who consider ESCO-contracting, action plans for public-private collaboration, collection of knowledge and 'best practice' etc.

<sup>1</sup> [www.savingtrust.dk](http://www.savingtrust.dk)

### 3.3. The ESCO market in Denmark

So far, the market for ESCO-contracting in Denmark has been limited. There has been a small market in the industry with only one supplier for the production industry (Energibranchen, 2008). In the residential sector the market is clearly emerging and some attempts have been made to introduce ESCO-initiatives in private housing and social housing. For instance the large energy supplier, DONG (Danish Oil and Nature Gas), has developed an energy saving scheme for house owners (DONG CleanTech) with consulting, loans and implementation of heat pumps, insulation, new windows etc. in a partnership with the product suppliers. So far this new scheme is contracted by app. 50 house owners (Ejerboligforum, 2009). There are also attempts to establish ESCO with the large social housing departments, but so far no contracts have been signed. It is, however, in the Danish municipalities we see the fastest growth in ESCO-contracting.

## 4 ESCO IN DANISH MUNICIPALITIES

This chapter gives an overview of the status of ESCO projects and use in the Danish municipalities based on the findings from the literature review and case study of Kalundborg municipality.

### 4.1. The organisation of FM in Danish municipalities

Facilities management is organised very differently in the Danish municipalities. However, three dominating models can be listed: *the Committee-owned model*, *the Municipal Estates model* and *the Manager model* (Bygherreforeningen, 2006; Due, 2007).

The committee-owned model is the most widespread; where each municipal department owns the buildings it uses and administers facilities management. There is thus no central FM-unit, and the departments might reduce costs on maintenance when budgets get tight (Bygherreforeningen, 2006). The municipal estates model has a central FM-unit within the municipality, who owns and rents the municipal buildings. This implies a potential advantage of collecting volume and competences in one unit. At the moment only two municipalities are using this model, but several others are on their way to establish a similar organisation. A variation of this type is the manager model, where the different departments own the buildings but still having a central FM-unit.

These three models resemble the three types of FM based on the theory of public innovation, where the committee-owned model reflects the traditional type of FM organisation. The municipal estates and manager model seem on the other hand to be more adaptable to the ESCO-based FM, where the municipality will play a new role as the innovator. However, it has not been investigated how ESCO can be realised for each type of FM organisation and what kind of influence ESCO will have on the organisation.

### 4.2. Status amongst municipalities

The ESCO development in Denmark has been slow, but lately about 10 out of 98 municipalities have actually initiated ESCO-contracting in municipal buildings (see table 3).

In all cases the contracts are based on the guarantee-model; the municipalities do the financing and the ESCO guarantees a certain energy reduction. If the reduction is not reached, the ESCO will pay the municipality the difference. If more than the guaranteed savings are reached, the municipality and the ESCO will share the surplus (defined in the contract).



The guaranteed savings are typically  $\geq 20\%$  of the existing energy consumption. Short term improvements have a short pay-back period and thus cost-effective, whereas improvements that include the whole building (indoor environment and building envelope) have longer pay-back periods and thus economically less attractive. It is, however, possible to define a combination of building improvements, which some municipalities have already done.

Table 3. Status for ESCO-contracting in Danish municipalities as per 7 January.2010. Main source: Danish Savings Trust.

Municipality	Magnitude	ESCO-Contractor	Contract period	Improvements of:
Kalundborg	10 buildings, 20,000 m <sup>2</sup>	TAC	2009-2021	Technical system and installations
Middelfart	100 buildings, 190,000 m <sup>2</sup>	TAC	2008-2015	Installations and indoor environment in all municipal buildings and re-insulation of a few buildings. Energy labelling of all buildings.
København	27 buildings, 68,000 m <sup>2</sup>	DONG	2009-2018	Energy savings and energy labelling of properties in the nursing facility "De Gamles By".
Gribskov	100 buildings, 190,000 m <sup>2</sup>	TAC	2009-2016	Energy savings through better management and technical improvements of buildings.
Vallensbæk	40 buildings, 114,000 m <sup>2</sup>	Dansk Energi Management A/S	2009-2019	Technical systems and building envelope for the municipal buildings. Energy labelling
Kerteminde	60 buildings, 117000 m <sup>2</sup>		2009-2019	-
Høje Taastrup	270 buildings (all), 270,000 m <sup>2</sup>			-
Halsnæs	120 buildings, 130,000 m <sup>2</sup>	YIT	2009-2021	Installations and building envelope as well as incentives for users to savings.
Greve	12 schools, 110,000 m <sup>2</sup>	Siemens a/s	2009-2016	Better heat regulation, ventilation and lighting in schools and kinder gardens.
Sorø	all buildings	-	-	Energy systems and building envelope for all municipal buildings.

#### 4.3. Motivations to accept or reject an ESCO initiative

According to a survey on the first three 'ESCO-municipalities' (Kalundborg, Middelfart and Gribskov) the primary motivation for the ESCO-engagement is firstly a large maintenance backlog in the municipal buildings combined with raising energy prices and secondly a guarantee on energy savings from the ESCO, which gives a political security for the investment (Ramboll, 2009). Moreover, the buildings will indirectly gain a better indoor environment and in some cases be renovated. Such guarantees could not have been obtained if the municipality had decided to carry out the retrofitting themselves.

Many ESCO-municipalities had already committed themselves to energy savings by entering voluntary binding agreements with nongovernmental organisations. The first agreements paved the way for strategic public management and willingness to collaborate to obtain the set goals. So the transition of going from the traditional FM towards an ESCO-based FM in municipalities seems simplified. Combined with the possibilities of loans with lower interest rates this is a high motivation factor for these municipalities.

Although ESCO-contracting includes many principal advantages, there is also substantial scepticism. A number of municipalities have considered entering an ESCO-contract, but finally decided not to. An analysis amongst selected Danish municipalities indicates that the main reason for this is the possibility of keeping the profit by doing the improvements themselves. To some degree this reflects the limited knowledge of ESCO and partnership management (Ramboll, 2009). It is in line with the traditional way of keeping FM in-house and continuously making small improvements to the buildings. Furthermore, well-maintained buildings with already implemented basic energy efficiency measures have a limited savings potential in relation to ESCO-contracting. A good state of the buildings thus explains the lack of incentives for many municipalities to enter an ESCO-contract.

#### **4.4. ESCO experience and challenges**

Practical experience from ESCO-contracting in Denmark is so far limited. However, literature studies and a case study of an ongoing ESCO-project in Kalundborg municipality (Brokær and Frederiksen, 2010) point out some experience, conflicts and challenges that the responsible FM-department in the municipality might encounter in an ESCO-initiative.

*Establishing a baseline on existing buildings:* Establishing the 'baseline' is emphasised by many municipalities as a main challenge. The baseline is the basis for defining goals and targets for the ESCO contract. This might include dilemmas, since the municipalities often have a limited knowledge of their own buildings and it will be a long process to establish a detailed documentation of the buildings. Some municipalities even discovered that the ventilation systems in some buildings had been turned off. New systems would lead to lower savings due to the increased energy consumption and installation costs. The consequence can be to take this part out of the contract as it would increase the pay-back period like in Kalundborg (Brokær and Frederiksen, 2010).

*Training and competences:* In most projects the ESCO-contract includes a transferring of competences from the ESCO-company to the municipality (Ramboll, 2009), typically on terms of education and training of the FM staff on equipment operation and maintenance in the retrofitted buildings. The training can be defined by the ESCO-company and can include training only to a degree that they believe will imply energy reductions.

*Organising, collaborating and building competences on energy efficiency:* In general ESCO challenge the municipality to operate in a public-private realm. Instead of seeing building operation and FM-function as a provider-supplier relation, ESCO should ideally function as a public-private partnership that paves the way for a future strategic FM in the municipalities.

*Relation to users:* It is necessary for the municipality and the ESCO to involve the users as their attitude, behaviour and use of the buildings is decisive for a projects success. In the Kalundborg case the users expected new ventilation systems which they did not get and generally felt they were not involved in the decision making process. This has lead to a limited ownership amongst the users (Brokær and Frederiksen, 2009). The ESCO-providers feel no need to involve the users as too many opinions would slow the process.

*Relation to other energy saving initiatives:* Many municipalities have various initiatives on energy efficiency, which need to be coordinated with the ESCO-contracting. This might strengthen the efforts, but might also have challenges. In Kalundborg another department in the municipality had decided to start an energy saving campaign. As the municipality expected that

this might 'substitute' investments from the ESCO-supplier, they redrew buildings involved in the ESCO-contract from the campaign.

These different challenges might lead to innovations in ways to approach and organise the energy saving efforts in the buildings including thinking strategically on energy savings, using the building stock as an asset, establishing new types of collaborations with other departments in the municipality and other actors outside the municipal administration.

## **5 OPPORTUNITIES FOR ESCO IN THE RESIDENTIAL SECTOR?**

From a perspective of public innovation (Hartley, 2005) there is an obvious potential for the municipality to disseminate its experiences from ESCO-contracting in municipal buildings to include the local housing market as well. From an environmental point of view municipal buildings count only a limited part of the whole building stock in Denmark (4% of the floor area), whereas housing represents 49% of the floor area. Housing represents a large share of the total national energy consumption with huge technical potentials for improvements.

As for ESCO-contracting in the municipal sector, there are some persistent barriers that inhibit the development of ESCO-contracting on the private housing market. The common barriers are lack of information/understanding of the ESCO concept and the potential in energy efficiency projects, administrative hurdles, availability of financing and especially lack of government support (Vine, 2005) (Bertoldi et al, 2007). Since ESCOs are profit oriented businesses, they are hesitant to enter an area with too many risks. The question is then whether the experience in the municipalities can be used to promote ESCO-contracting to private building owners within the municipality? Some potential ways of doing so can be:

- Using developed methods and new technologies (buildings registers, energy labels, thermo photography etc.) to map existing building stock in relation to energy efficiency and identify suitable buildings for ESCO-tender
- Collect similar buildings for 'pooling' for an ESCO-tender in order to reduce transaction costs
- Use its knowledge/experience on contracts to guide owners
- Use the municipality's 'neutral' status to act as mediator between private building owners and ESCOs

For this purpose the Berlin model could be used as inspiration. The initiative '*The Energy Saving Partnership*' includes the savings potential in the existing building stock (Berliner Energie Agentur, 2006). The model is similar to the ESCO-model with shared savings, but differs by having a project manager who works on behalf of the contract partners (i.e. the client and the ESCO) and negotiate between them. During the entire contract period the manager functions as a mediator being the key element to the Berlin success. The knowledge barrier normally encountered in the residential sector is thereby avoided. Furthermore small buildings are offered to enter building pools so to gain a greater energy savings potential for the ESCO.

Although it might not be possible for most Danish municipalities to establish a similar model, the Berlin case illustrates the principal role a public body can play to promote energy savings in existing buildings. The municipal FM function becomes an intermediary actor. As a spin-off from the ESCO-contract, some municipalities focus on collaboration with SMEs and local enterprises to create local competences and innovation in ESCO and energy efficiency. Other municipalities have ambitions to involve other building types in ESCO-contracting such as private schools, other public buildings, social housing etc. Two municipalities (Middelfart and Høje Taastrup) have taken initiatives towards introducing ESCO-contracting to private building owners (Christensen, 2009). This indicates that some municipalities recognise the potential to exploit and disseminate experiences from ESCO-contracting to pursue energy savings in existing buildings in the municipality. Main current drivers seem to be political ambitions of CO<sub>2</sub>-neutral municipalities and municipal climate plans.

## 6 PERSPECTIVES AND CONCLUSION

From our observations on how municipalities think and react in relation to their ESCO experience, there are several possibilities for innovation of the facility management function. Learning about ESCO-contracting as a concept itself and implementing it might be characterised as a 'radical' innovation, whereas the learning from ESCO-contracting and the spin-off's from it seems to contain a potential for 'transformative' innovations. Our preliminary studies show that the municipalities' ESCO-experience encourages them to collaborate with actors outside the municipal administration, thereby disseminating their competences to local actors and defining a new role for the FM function as well as gaining new know-how from the ESCO-training of the FM staff.

Also internally in the municipal organisation, the ESCO-experience might lead to reorganisation and innovation. Energy efficiency in the existing building stock is a subject that involves other departments in the municipality, for instance the environmental department and the Agenda 21-unit. Therefore, initiatives to promote ESCO-contracting for private building owners should be coordinated with other initiatives for energy efficiency.

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