

## Energy Efficiency Improvement in the Interface between Industry and Its Service Providers

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This paper focuses on the interface between industry and its service providers in Finland to describe the current situation of barriers to energy efficiency improvement. The paper is based on empirical data from two interview studies carried out in industry and its equipment, systems and service providers. The results indicate an increasing interest in energy efficiency. The most important barriers to energy efficiency improvement are related to principal agent problems, i.e. incomplete information and information asymmetry in carrying out energy analyses and energy efficiency investment projects. These problems may be overcome by investing in energy performance measurement and building a more analytic and discussion-oriented investment project culture.

### 1. Introduction

Today, manufacturing industries are increasingly shifting from product-focused to service-focused operations, i.e. from selling products to providing solutions (Lay et al., 2009). This also applies to products and services being offered to improve energy efficiency in industry.

This paper focuses on the interface between industry and its service providers in Finland to describe what factors these two groups perceive as the most important barriers to energy efficiency improvement at present. The paper is based on empirical data from two interview studies carried out in industry and its equipment, systems and service providers.

#### 1.1 Background and motivation

Energy performance contracting includes a variety of different products or services from low-end (i.e. traditional products or services) to high-end (i.e. advanced services) (see e.g. Helle, 1997; Lindgren Soroye and Nilsson, 2010; Vine, 2005) (Figure 1). Energy service companies (ESCOs) at the high-end typically offer comprehensive contracts that include energy information and control systems, energy audits, installation, operation and maintenance of equipment, competitive finance, and fuel and electricity purchasing (Sorrell, 2007).

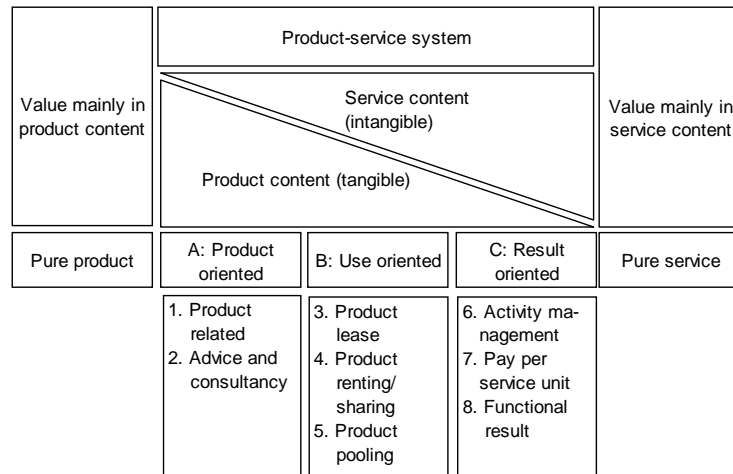


Figure 1: Main and subcategories of product-service systems (Tukker, 2004)

Barriers to energy efficiency improvement in industry are well-established by earlier literature (e.g. DeCanio, 1993; de Groot et al., 2001; Hasanbeigi et al., 2010; Sandberg and Söderström, 2003; Sardanou, 2008; Stern, 1992; Thollander and Ottosson, 2008; Weber, 1997). Country-specific issues play a significant role since public policy measures to support energy efficiency improvement vary considerably from one country to another. In addition, culture affects the behaviour of individuals and organisations (Lindgren Soroye and Nilsson, 2010).

The following factors have been reported earlier as the most important barriers to energy performance contracting in Finland (Vine, 2005)

- Customers are not familiar with or interested in energy performance contracting (or have other priorities)
- Engineering companies are not familiar with or interested in energy performance contracting
- Lack of interest and experience and conservative behaviour of banking industry

The above list is, however, not up-to-date and categorises only the most important barriers to ESCOs at general level. More detailed information is needed to overcome the barriers today.

## 2. Methods

Data in this paper originates from two separate interview studies. The first study was carried out in energy-intensive industry and focused mainly on questions of energy efficiency monitoring. Comments on external actors, however, concerned energy efficiency improvement in general. The study comprised six case companies representing the pulp and paper, basic metals and petrochemicals industries and a total of 32 personal interviews. The latter interview study focused on how energy efficiency improvement is taken into account in products and services. This study included 19 firms that provide equipment, automation and control systems, information systems,

operation and maintenance services or energy performance contracting for the energy-intensive industry. Qualitative research methods and case studies are used as a research strategy. This is advantageous especially when ‘how’ or ‘why’ questions are asked about a contemporary set of events over which the investigator has little or no control (Yin, 2003).

### 3. Results and discussion

The comments by managers in industry identify two gaps in the offering of services (Table 1). The first is related to information and control systems lacking tools to measure and monitor energy performance. The other relates to the desired depth of energy analyses. Critique focused on the contents of the services, in terms of quality and pricing. The managers also reported on mistrust in the products and services to live up to expectations and the difficulty of assessing the benefits before making decisions on investments.

*Table 1 : Comments on service suppliers by managers in industry*

Category	Citation
Information system providers	<p>“There is a need to develop [information] systems. In other words, the information system providers should discover their market niche.”</p> <p>“When system providers offer information systems, for example, for management or energy management, it would be of added value if they would support this [energy efficiency improvement] activity as well. I believe that companies hardly invest in a new separate system for this because people get exhausted with filling in extra data.”</p> <p>“They [now] sell products that have complicated unnecessary properties.”</p> <p>“The information systems that the system providers offer, do not add value to us [on issues of energy efficiency] because [at this point] we must first discover by ourselves what we need.”</p>
Design and engineering service providers	<p>“The reason for using external help is to allocate our blind spots and to improve energy efficiency in general. It also brings knowledge to our own organisation.”</p> <p>“In the field of energy service companies, a lot has happened in recent years. We emphasize the reduction of electricity consumption at the moment. Service companies contact us almost weekly, for example, to offer different pump and motor studies. I would say that it [energy service know-how] probably is at a quite good level in small engineering firms.”</p> <p>“One can’t help the idea that we really do need external consultants, if only they would have the correct templates [contents of services].”</p> <p>“A variety of know-how is available in this country, from equipment suppliers to consultants, but the use [or offering] of their services is not necessarily in balance.”</p>

“Resources are surely available in there [by equipment, system and service providers]. Our automation system provider has good knowledge of our business. In design, we cooperate with a firm that is specialised in our field of industry. They can tell us where the needs are.”

“Especially the audits that are done by consultants - they don’t want to disclose anything else than self-evident energy conservation opportunities. Other types of opportunities remain undiscovered.”

“We have explored consultant cooperation many times but it feels that they don’t have enough experience, either.”

“I am in the opinion of that if the [pinch] analysis becomes part of the consultants’ toolkit, it would enable a breakthrough. Good case examples, as well.”

“Process designers do not have information on what is energy efficient. They don’t know about new technology that much. They want to use the conventional. The design and engineering sector should improve their energy efficiency know-how.”

“It is just that service providers usually price their products so that the payback is two years. [...] On the buyers side, I don’t think that is the correct way to set a price for a product - that you share the benefit - because they [service providers] already get paid [by the hour] for the work.”

“I like to think so that the most important service providers that we have, they are the ones we must be able to communicate with our demands on energy efficiency.”

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Equipment suppliers

“In the energy services offered by equipment suppliers, there is always a fear of them only trying to sell their own equipment. Therefore, independent analysts are better.”

“Equipment suppliers advertise energy efficiency, but is it true, that is a different story.”

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Earlier literature explains the critique. ESCOs tend to specialize in generic energy technologies that are suitable for use in a wide variety of applications to increase the number of potential clients and reduce the need for training and learning by doing (Sorrell, 2007). This results in the lack of know-how in specific fields of industries and applications of technology. The question of pricing is related to when and where outsourcing is viable. ESCOs have to consider all the transaction costs and the potential risks related to the service, such as the opportunistic behavior of the client. For example, all energy service contracts require investment in data gathering and auditing. This represents a sunk cost that will be lost if the contract is not signed or is terminated early (Sorrell, 2007). In-depth energy analyses, which require investment to performance measurement, process and technology specific know-how and long-term commitment, should therefore be led or carried out by skilled in-house personnel. Earlier literature already shows signs of this transformation (Sivill et al., 2010).

Barriers referred by service firms mainly relate to the principal agent problem which arises from incomplete or asymmetric information and conflicting interests (Table 2). The results indicate that the clients have become more interested in energy efficiency even though the changes take time.

*Table 2: Comments on clients by managers and personnel in service firms*

Category	Citation
Interest in energy efficiency	“As far as I know, it is discussed in sales situations very much these days. In addition, the clients’ attitudes towards energy consumption have dramatically changed. That is a strong steering factor.”
	“Yes, they [customers] are looking for new solutions to save, related to energy efficiency, all the time.”
	“Yes, life cycle costing is beginning to take effect.”
	“There must always be some other technology-related issue behind. Energy efficiency alone barely is sufficient today.”
	“It [energy efficiency] is sort of a property that is supposed to be there but should not lead to additional costs.”
	“It depends much on who we are selling to. In other words, if there is a consultant in between, the consultant’s goal is to get the delivery price as low as possible - so they are not interested in energy efficiency whatsoever.”
	“I see a challenge in these large structures – organisations – they change quite slowly. They have a traditional way of doing things.”
	“People in production are typically interested only in tons. Site directors are thinking of costs. Then there are energy managers and other people for whom this is their main task. The intensity of the client’s interest [in energy efficiency] depends on the contact person’s position.”
Know-how and information sharing	“Know-how [on energy efficiency] missing from the client is the reason why the final solutions are not the most energy efficient, although the client may believe otherwise. A number of players are there to give their own presentations. It is very hard to bring out neutral information.”
	“They [clients in industry] don’t have much knowledge about these things [energy efficient solutions and new technology]. Information is delivered to them either by us or the consultants.”
	“The industry is very competent with regard to process know-how.”
	“One challenge is the accuracy of the initial data. The better the input is for design, the better the outcome.”
	“On our side, the greatest risk is that we are unfamiliar with the client’s process or the client has described it poorly. If we are unable to understand the design basis, we end up with the wrong choices.”
	“Somehow I feel that a lot more mutual discussion is required in the future.”

#### 4. Conclusions

Public awareness of energy performance contracting and energy efficiency improvement has increased in Finland over the years. Today, the most important barriers to energy efficiency improvement in the interface between industry and its service providers relate to principal agent problems. These problems could be overcome by investing in energy performance measurement in industry and by developing a more

analytic and discussion-oriented investment project culture led by skilled in-house personnel.

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