Energy service companies in Europe: assembling the puzzle. Preliminary analysis of the results to date from the first European ESCO database

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Abstract

A recent survey of energy service companies (ESCOs) in the EU-25 has indicated that the ESCO industry is still in its infancy stage and that major differences exist in the development of the ESCO business among the various countries. With a few notable exceptions, such as Germany, Austria, and Hungary and to certain extent France, ESCO industries are still struggling to get off the ground. Major differences exist among Member States not only in the development of national ESCO industries, but also in terms of actual type of ESCO projects (sectors, sizes, etc.) and their implementation (contractual terms, financing, etc.).

The present paper builds on and summarizes the first results of an ongoing in-depth survey of ESCO businesses in Europe (EU-25 plus candidate countries and selected neighbouring countries) and analyses a selection of ESCO projects, both ongoing and completed. The paper has three major parts. First, we review the most common types of companies providing energy services in Europe. Second, we discuss ESCO project specifics, such as the most widespread types of projects, preferred end-use technologies, sectors that receive most of the project developers' attention, most 'appealing' categories of clients and most common financing sources. Finally, we summarize on a country-by-country basis the features of the ESCO industry in selected EU Member States and candidate countries.

Introduction

In the last decade Europe has seen an increased interest in the provision of energy services that has been driven by electricity and gas restructuring and the push to bring sustainability to the energy sector.

With energy sector liberalization initially energy utilities offered relatively low gas and electricity prices to eligible customers. However, this process could not be sustained in the longer term as prices reached very low levels. The most entrepreneurial utilities understood that to retain customers, as well as to gain new ones, they had to offer services in addition to the supply of electricity and gas. Furthermore some other market actors, such as equipment and control system manufacturers, and installation and engineering companies, decided to enter this same market. The market for energy efficiency services in Western Europe was estimated to be 150 million Euro per annum in 2000, while the market potential was estimated to be 5 to 10 billion Euro per annum (Bertoldi et al. 2003 and references herein, Butson 1998).

Despite the recent increase in provision of energy services (see definitions below) in Europe, no comprehensive review of the development and the current status of the ESCO industry in Europe has been compiled to date. To correct for this deficiency, this paper presents the results (as of January 2005) of an ongoing survey of ESCOs and ESCO projects in Europe, the purpose of which is to gather insights on the development and status of national ESCO industries and extend the first online European ESCO database that has been created and maintained by DG Joint Research Center of the European Commission[1]. Three dedicated

questionnaires have been developed for the separate phases of the survey.

First, a general ESCO questionnaire with ten open-ended questions was distributed among national energy efficiency experts, national authorities and ESCO professionals. The questions related to issues such as existing ESCOs (number, national or multinational, existence of accreditation, or of a standard protocol defining their characteristics and requirements), targeted sectors and most common projects, support mechanisms for ESCOs, interest from financing institutions in energy efficiency projects. The attempt was to cover all Member States of the EU and New Accession States. An average of three experts per country has been contacted; at least one expert per country responded to the questionnaire. In addition the authors conducted informal semi-structured interviews based on the questionnaire and obtained complementary information via e-mail from country experts and ESCO professionals.

Next, an ESCO Characterisation Form and an ESCO Project Form have been created. The former aims at getting understanding of companies in terms of scope of activities, geographical coverage and origin, types of services provided and specific details related to their provision, criteria for passing a contract, etc. The ESCO Project Form has been developed at a much later stage and aims at collecting detailed information about a specific project implemented by each ESCO. An attempt has been made to distribute these forms among an as wide circle of ESCOs as possible in EU Member States and Candidate Countries. Existing country lists of ESCOs have been used, national energy efficiency experts, authorities and experts have been asked for ESCO contacts; the authors also used their network of professional contacts.

To date more than 100 ESCOs have been listed in the European ESCO database and the number of entries is quickly growing. The current paper contains analysis based on the ESCO Characterisation Forms submitted by 106 companies as of January 2005; in addition 22 ESCO Project Forms have been studied.

The paper builds on the results of the survey and supplements them with a review of existing literature on national ESCO developments in Europe and with the perspectives gathered through dedicated European initiatives such as the First European Conference on ESCOs (May 2003, Milan,)[2], the international workshop Electricity End-Use Efficiency in Candidate Countries (December 2004, Brussels)[3], the international conference Improving Energy Efficiency in Commercial Buildings (April 2004, Frankfurt), task X "Performance Contracting" of the International Energy Agency Demand Side (IEA-DSM) Implementing Agreement[4] and the Clearing House for Contracting Schemes (Clear Contract) project, carried out by the Austrian National Energy Agency and the Berlin Energy Agency[5].

The current paper has the following structure. First, we define our basic terminology in order to avoid ambiguities due to the lack of a common and unambiguous definition of "ESCO" and related jargon. Second, we review the most common types of companies providing energy services in Europe. Third, we discuss ESCO project specifics, such as the most widespread types of projects, preferred end-use technologies, sectors that receive most of the project developers' attention, most 'appealing' categories of clients and project financing. Finally, we summarize on country-by-country basis the features of the ESCO industry in selected EU Member States and candidate countries

Definitions

Energy services include a wide range of activities, such as energy analysis and audits, energy management, project design and implementation, maintenance and operation, monitoring and evaluation of savings, property management, and equipment supply (see CTI 2003 and ECS 2003).

In this paper companies providing energy services to final energy users are referred to as *Energy Service Provider Companies (ESPCs)*. ESPCs may be consulting engineers specialised in efficiency improvements, equipment manufacturers or utilities. ESPCs provide a service for a fixed fee or as added value to e.g. the supply of equipment or energy. In Europe many ESPCs have offered energy services for a number of years (see Bertoldi et al 2003 on how ESPCs became active in Europe).

ESCOs also offer these same services; however, ESCOs' activities can be distinguished from ESPCs' activities in the following ways: (1) they guarantee the energy savings and/or the provision of the same level of energy service at a lower cost[6], (2) their remuneration is directly tied to the energy savings achieved, and (3) they can finance, or assist in arranging financing for the operation of an energy system by providing a savings guarantee.

Under an *energy performance contracting* (EPC) arrangement an ESCO implements a project to deliver energy savings, or a renewable energy project, and uses the stream of income from the cost savings, or the renewable energy produced, to repay the costs of the project, including the costs of the investment. In EPC ESCO remuneration is based on performance (see footnote 6).

Three broad options for financing energy efficiency improvements can be distinguished. *ESCO financing* refers to financing with internal funds of the ESCO. ESCOs rarely use equity for financing, as this options limits their capability of implementing projects on a sustainable basis. *Energy-user/customer financing* usually involves financing with internal funds of the user/customer backed by an energy savings guarantee provided by the ESCO (for instance, a university can use its endowment fund to finance an energy project, in which the energy savings are guaranteed by an ESCO)[7].

1. See http://energyefficiency.jrc.cec.eu.int/html/list_esco.htm
2. See proceedings at http://energyefficiency.jrc.cec.eu.int/events/esco_conf.htm
3. See proceedings at http://energyefficiency.jrc.cec.eu.int/html/Workshop_EE_9.12.04.html
4. Reports available at http://dsm.iea.org/NewDSM/Work/Tasks/10/task10.asp
5. Reports available at http://clearcontract.net/
6. A performance guarantee can revolve around the actual flow of energy savings from a project, can stipulate that the energy savings will be sufficient to repay monthly debt service costs, or that the same level of energy service will be provided for less money.

Third-party financing (TPF) refers solely to debt financing, whereby project financing comes from a third party, e.g. a finance institution, and not from internal funds of the ESCO or of the customer. There are two conceptually different TPF arrangements associated with EPC; the key difference between them is which party borrows the money: the ESCO or the client. The first option is that the *ESCO borrows* the financial sources necessary for project implementation. The second option is that the *energy-user/customer takes a loan* from a finance institution, **backed by an energy savings guarantee agreement with an ESCO**. The purpose of the savings guarantee is to demonstrate to the bank that the project for which the customer borrows will generate a positive cash flow, i.e. that the savings achieved will certainly cover the debt repayment. Thus the energy savings guarantee reduces the risk perception of the bank, which has implications for the interest rates at which financing is acquired.

Shared savings and guaranteed savings are two common ways to structure an EPC. An important difference between guaranteed and shared savings models is that in the former case the performance guarantee is the level of energy saved, while in the latter this is the cost of energy saved.

Under a *shared savings* contract the cost savings are split for a pre-determined length of time in accordance with a pre-arranged percentage: there is no 'standard' split as this depends on the cost of the project, the length of the contract and the risks taken by the ESCO and the consumer. As in this case the client may take over some technical performance risk related to the share of savings, it will try to avoid assuming any credit risk: the ESCO will arrange the financing, repay the loan and take over the credit risk (CTI 2003). The financing in this case goes off the customer's balance sheet[8]. The ESCO therefore assumes both performance and the underlying customer credit risk – if the customer goes out of business, the revenue stream from the project will stop, putting the ESCO at risk. An 'extreme' form of the shared savings is the 'first out' contract whereby the ESCO receives 100% of the savings until the project costs, including the profit of the ESCO, are fully paid. A situation where savings exceed expectations should be taken into account in a shared savings contract. To avoid the risk of energy price changes, it is possible to stipulate in the contract a single energy price: in effect thus performance is set in physical terms with fixed energy prices, which makes the approach resemble guaranteed savings approach (Poole and Stoner 2003).

The shared savings concept is a good introductory model in developing markets because customers assume no financial risk. However it may limit long-term market growth and competition between ESCOs and between financing institutions: small new ESCOs with no previous experience in borrowing and few own resources are unlikely to enter the market if such agreements dominate because they will be unwilling to take the investment repayment risk (CTI 2003, Dreessen 2003). In addition small ESCOs rapidly become too highly leveraged and unable to contract further debt for subsequent projects. The shared saving concept works well where large ESCOs operate as it is easier for the client to accept it. It has been extensively used in Europe, especially in France where it has proved very successful for the ESCO industry to take off the ground. It focuses the attention on projects with short payback times ('cream skimming').

A scheme where the ESCO guarantees a certain level of energy savings and in this way shields the client from any technical performance risk is known as guaranteed savings[9]. Because under a guaranteed savings contract the ESCO takes over the entire performance risk, it is unlikely to be willing to further assume credit risk. Consequently a guaranteed savings contract usually goes along with TPF with client borrowing (CTI 2003). In this case the customer repays the loan and the credit risk stays with the bank. The purpose of the energy savings guarantee is to demonstrate to the bank that the project for which the customer borrows will generate a positive cash flow, i.e. that the financial savings achieved will certainly cover the debt repayment. The customer repays the loan and assumes the investment repayment risk; however if the savings are not enough to cover debt service, then the ESCO has to cover the difference. If savings exceed the guaranteed level, then the customer pays an agreed upon percentage of the savings to the ESCO[10]. Usually the contract also contains a proviso that the guarantee is only good provided that the price of energy does not go below a stipulated floor price. The cost of borrowing money with this arrangement tends to be lower than with a shared savings contract (Dreessen 2003 makes this point in the US context).

As experience in the US has shown, guaranteed savings concept is likely to function properly only in countries with a well established banking structure, high degree of familiarity with project financing and sufficient technical expertise, also within the banking sector, to understand energy-efficiency projects (such as the UK, Austria, and more recently, Hungary among the European countries). The guaranteed savings concept is difficult to use in introducing the ESCO concept in developing markets because it requires customers to assume investment repayment risk. However, as experience in the US has shown, it fosters long-term growth of ESCO and finance industries (Dreessen 2003): because newly-established ESCOs with no credit history and limited own resources would be unable to invest in the project they recommend; they may only enter the market if they guarantee the savings and the client secures the debt financing on its own.

Other common arrangements in EPC include the '*chauffage*' contract, the Build-Own-Operate-Transfer (*BOOT*) contract and *leasing* contract.

7. 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.
8. Under off-balance sheet financing, also called non-appropriation financing, financiers hold title to equipment during the term of the agreement.
9. Often ESCOs will guarantee a lower amount of energy savings than identified during the energy audit; this margin gives more security to the ESCO that it can achieve the guaranteed savings.
10. However, changes in energy consumption – e.g. business expansion and/or changes of processes ort production lines are likely to bring increased energy that can deteriorate the targets. Conversely, a contraction of business (e.g. an empty hotel) or a smaller production output will results in energy savings. Therefore crucial issues to consider involve setting the baselines and associated growth projections, setting the system boundary and conditions, as well as avoiding leakages.

ESCOs in Europe: preliminary analysis of the results from the ongoing ESCO survey

Below we summarize the results from the preliminary analysis of 106 ESCO Characterisation Forms that have been received by January 2005 in the process of expanding the first online European ESCO database compiled by the DG Joint Research Centre of the European Commission. It should be emphasized that as the European ESCO database is quickly growing, the current results should be treated as provisional; nevertheless they give useful insights into the current status of ESCO industry and activities in Europe.

ENERGY SERVICE COMPANIES IN EUROPE

Origin and services provided

Table 1 below summarizes societal characteristics and services provided by the sample analysed so far.

As can be seen, the majority of ESCOs consider themselves to be independent specialist companies. Around one third of the ESCOs originate from equipment manufacturers and suppliers. Approximately one sixth of the companies stem from energy utilities or supply companies and roughly 15% are public sector agencies or public-private joint ventures. In Europe the largest and most active ESCOs have been founded either by large companies or as subsidiaries of large companies, such as equipment manufacturers, facility management companies, operation, management and construction companies, or energy utilities[11]. In many cases ESCOs are more interested in the business of selling energy or equipment than in exploiting the financial opportunities of energy savings.

More than 87% of the ESCOs provide a guarantee of performance, which means that they are prepared to accept the part of technical and financial risks that they can control. More than 92% of ESCOs participate in project financing: through own internal funds (ESCO financing option), through TPF (either ESCO borrowing or client borrowing backed by energy savings guarantee), or through a combination of debt and equity.

In Europe under EPC arrangements most ESCOs have provided financing themselves (mainly in France, Italy and Germany). Only recently have more ESCOs started implementing EPC using TPF with a private bank or a lending institution as a project financier. Large ESCOs with deep pockets often prefer to get involved in a TPF arrangement than to use own financing because the costs of equity financing and long-term financing are too high: the weighed capital costs for internal funds are often much greater than what can be accessed on the financial markets. As experience in the US shows, if an ESCO arranges TPF, then its own risk is smaller, which allows for lower cost of money and hence higher size of the investment (Hansen 2004). In the US local practices, the inability of customers to meet financiers' creditworthiness criteria and costs of equity financing have been pointed to be the decisive factors that determine whether ESCOs will provide financing (Hansen 2004).

Slightly more than two thirds of the ESCOs in our database state that they can take care of purchasing the fuel or electricity. However from the comments and explanations provided in the survey forms it becomes clear that while ES-

Table 1. ESCO: societal characteristics and services provided. Based on 106 ESCO Characterisation Forms

ESCOs: societal characteristics*	Nr. of companies	Share in total
Equipment manufacturers and suppliers	32	30,48%
Independent specialist companies	65	61,9%
ESCOs of finance institutions	1	0,95%
Energy utility or supply company	18	17,14%
public sector agency	8	7,62%
public-private joint venture	9	8,57%
Other	4	3,81%
Services provided	**Nr. of companies**	**Share in total**
Guarantee of performance	93	88,57%
Financing	98	93,33%
Purchase of fuel/electricity	73	69,52%
Operation	91	86,67%
Insurance coverage	61	58,10%

* The total sum of companies exceeds the 106 ESCO Characterisation Forms analysed and consequently the percentage shares add up to more than 100% because some companies have defined themselves as belonging to two or even three of the below categories.

11. Obtaining data about annual turnover of ESCOs is often an illusive task and has been left out of the present attempt. We have left out of the current research the division of domestic versus multinational companies because the line is blurred. Most large ESCOs work on a multinational scale; as they often merge with or acquire national companies as their country branches, it is difficult to claim whether a company is domestic or multinational. Rather we are collecting information on countries where a company is active.

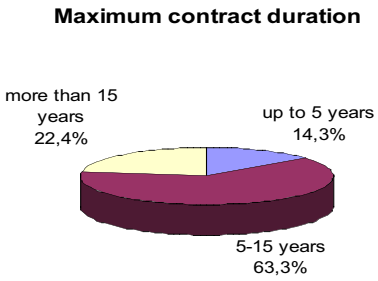

Figure 1. *Maximum contract duration.*
** Note: Based on a total of 49 responses*

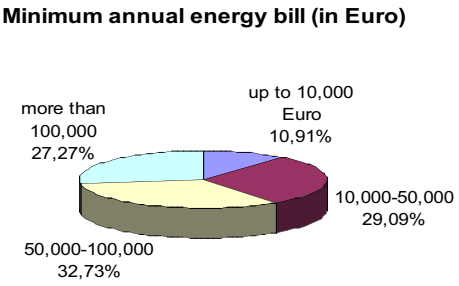

Figure 2. *Minimum annual energy bill of potential clients.*
** Note: Based on a total of 55 responses.*

COs are eager to get involved in fuel/electricity supply, selling the energy service to the client in terms of heat, cool, lighting is not yet very wide-spread.

More than 85% of the ESCOs surveyed indicate that they manage and maintain the equipment for a contractually stipulated time period (can be test period or a longer one). Finally, a bit more than half of the ESCOs surveyed indicate that depending on the guarantee of performance provided, they insure themselves against events that can imply financial penalties to them.

Criteria for passing contracts

To get understanding of what is the typical contract duration and above what minimum annual energy bill an energy user is likely to generate interest among ESCOs, we have included these two criteria as optional questions in the ESCO Characterisation Form. To date nearly half of the respondents to our ongoing ESCO survey have provided details about these two criteria; the results are summarized in Figures 1 and 2.

As can be seen on Figure 1 typically a contract signed ESCO covers a period of 5 to 15 years. 10 years is the most often quoted maximum contract duration within the sample of 55 responses we received on this question and 12.7 years is the average value of all responses. Less than 15% of the respondents indicated maximum contract duration of less than 5 years; more than one fifth indicated maximum contract duration exceeding 15 years. There seems to be a strong co-relation between the type of project and the maximum contract duration and we have observed that ESCOs specialised in indoor lighting are likely to indicate shorter maximum contract duration periods; conversely streetlighting projects that include outsourcing electricity supply usually involve very long contract duration. This issue has not yet been addressed in a systematic way in the present research.

As can be seen on Figure 2, roughly one third of respondents indicated that they will work with an energy user only in case the latter has an annual energy bill between 50 000 and 100 000 Euro. Slightly more than a quarter of the respondents require an annual energy bill of above 100 000 Euro; similar is the share of ESCOs that are interested in clients with annual energy bill between 10 000 and 50 000 Euro. Only 10.9% of the respondents will work with a client, whose annual energy bill is below 10 000 Euro. The most commonly cited minimum annual energy bill that generates interest among ESCOs is 100 000 Euro. Again in our view there is a strong relation between the type of project and the minimum annual energy bill required; this issue will be addressed in a systematic way in the future.

Project specifics

Out of the 26 ESCO Project Forms submitted by mid-January 2005, only 22 contain sufficient and unambiguous information to be included in the present analysis. The results are summarized in Table 2 (overleaf).

As can be seen, the majority of the projects in our database have been implemented at the supply side: CHP, DH refurbishment and fuel switch, burner improvements. Lighting and HVAC projects together account for a quarter of the projects analysed. The majority of the projects have been implemented in the industrial and public sectors. An equal number of respondents indicated that they have applied guaranteed and shared savings; however we are still expecting clarifications about contract type from 4 respondents that we have placed under "unspecified". Along the financing lines: almost all projects have a TPF element; the majority of these arrangements – as becomes clear from explanatory notes in the ESCO Project Forms – are a mixture of ESCO financing (equity and/or leasing) and debt financing. This analysis is based on first results; with the expansion of the database new insights may emerge.

SUMMARY: ESCOS AND ESCO PROJECTS IN EUROPE

The findings presented in this section re-confirm the results of our expert survey and the sources listed in the beginning of the paper: the majority of ESCOs' projects in Europe have focused on CHP, public lighting, HVAC, and energy management systems. In the 90s and before the majority of ESCO projects in Europe have been undertaken in the public sector, because the public sector is perceived as having 'safer' clients that do not normally go out of business, but in some cases (e.g. Germany and Austria) also as a result of national or local authorities and energy agencies taking the lead with public sector buildings. The recent energy industry restructuring has stimulated projects in combined heat and power (CHP) for industrial facilities, large commercial centres and hospitals; it has also triggered public lighting projects, where municipalities tendered lighting operation, including the supply of electricity.

Table 2. Project specifics.

CONTRACT DURATION	Nr. of projects	Share in total
up to 5 years	8	36,36 %
5-15 years	12	54,55 %
more than 15 years	1	4,55 %
unspecified	1	4,55 %
TECHNOLOGY		
Combined Heat and Power (CHP), District heating (DH) refurbishment, fuel switch, burner improvements	8	36,36 %
Heating, Ventilation, Air Conditioning (HVAC)	3	13,64 %
Renewable Energy Sources (RES) utilization	2	9,09 %
Lighting (indoor and streetlighting)	5	22,73 %
other (gas distribution, compressed air, reactive power, process unit and combustion improvement)	4	18,18 %
SECTOR		
Industry	11	50 %
Public	9	40,91 %
Tertiary	1	4,55 %
All sectors	1	4,55 %
CONTRACT TYPE		
Guaranteed savings	8	36,36 %
Shared savings	8	36,36 %
Build-Own-Operate-Transfer (BOOT)	2	9,09 %
Unspecified	4	18,18 %
FINANCING		
TPF	20	90,91 %
Client financing	2	9,09 %

National developments

The following sections report on the status of the ESCO industry in some European countries. The discussion illustrates both the diverging patterns of ESCO industry development and the various factors that have shaped these. The countries discussed in separate sections have been researched in more detail; we have attempted to outline the successful policies and drivers that have fostered the development of ESCO industry in the European "ESCO champions" in comparison with the rest of the countries with less developed ESCO markets.

ITALY

According to Capozza (2003) the following types of ESCOs can be distinguished in Italy: 'ad hoc' independent company, equipment supplier, fuel and/or electricity supplier, public energy agency, and public/private joint venture. The major sectors targeted include co-generation in the local health board sector, heating for public buildings, cogeneration and heat generation in the industrial sector, and lighting (Capozza 2003). A few large multinational companies coming from the heat supply and the building control sectors dominate the Italian ESCO industry. A few new ESCOs are starting operation, mainly in street lighting. In general, the Italian market is still dominated by ESPCs: for instance, there are more than 50 operators of facility management (Pela 2003). The Italian banks are still reluctant to provide financing for ESCO projects

Recently, an innovative policy mix was introduced in Italy, which ensures additional cash flow for energy efficiency projects and thus provides a strong incentive for ESCO activities. Two Ministerial Decrees establish a scheme that combines command-and-control measures (energy-savings targets for electricity distributors), with market instruments (tradable energy-efficiency certificates issued both to electricity distributors and energy service companies), as well as with elements of tariff regulation (cost recovery mechanism via electricity and gas tariffs). ESCO projects are eligible for certification and it is expected that several electricity distributors will purchase the so-called "white certificates" from them.

FRANCE

The term "energy service" appeared recently in France as a generic name to designate a rather broad range of activities. Before this name was introduced, many companies were already providing such services, all more or less based on the concept of EPC.

The most original part of the French model consists of the aggregation of financing and guarantee of savings, or aggregation between the operator, the guarantee and the financier: the ESCO ensures the financing of the operation at its risk, and refunding is carried out only through effective savings, to which the financier can contribute (Dupont and Adnot 2004). Co-generation is a good example of EPC in France for two reasons. First, co-generation is becoming the dominant 'Trojan horse' used by new independent producers to obtain market share. Second, its development has led to the introduction of a series of new services for sizing, financing, building, and operating CHP units. In fact CHP and renewable energy projects only got off the ground in France when they were presented within the framework of a full energy service provided by ESCOs.

The French market is rather well developed, although very 'special' and largely dominated by a few very large companies. Sixty companies adherent to the trade association FG3E represent a significant part of the ESCO industry in France (Jamet and Adnot 2003). The current contracts of facility management are concentrated primarily in the tertiary sector.

SPAIN

In Spain around 10 private ESCOs have been operating for a number of years according to the EPC concept (Blanco 2003). In addition, almost all regional and some local energy agencies, together with the national energy agency (Institute for Diversification and Energy Saving, IDAE), act as ESCOs and provide TPF in some of their projects. The private ESCOs are especially active in financing wind farms, while public ESCOs, in particular the IDAE, are trying to foster new markets such as CHP with biomass, biomass technologies for different uses, and solar thermal and photovoltaic applications. IDAE's customers range across all industrial sectors, including large energy intensive industries and small and medium-sized enterprises (SMEs), as well as the residential and transport sectors. TPF is a popular mechanism provided also by regional and local energy efficiency agencies, as well as IDAE. Direct project financing by energy efficiency agencies (TPF and other financing mechanisms) is a distinctive feature of the Spanish market (Blanco 2003). The number of banks and other financial institutions that carry out energy projects by means of TPF is rapidly increasing.

ESCOs in Spain are well established and very active, especially due to the involvement and the financial support of the regional and national energy agencies. In addition there is also a flourishing ESPC industry (producers of energy efficient equipment, installers and utilities).

GERMANY

Germany is the most mature ESCO market in the EU. The German ESCO market is characterised by more than 70 000 contracts for energy services[12] concluded by the end of 2000, which resulted in a total investment exceeding 5 billion Euro, more than 50 000 generation units, a total installed thermal capacity of 46 GW and a total installed electric capacity of 8 GW (Brand and Geissler 2003). More than 200 EPC agreements have been made since the mid-1990s, primarily for public buildings in the commercial sector with building "pools" of up to 100 separate buildings (Seefeldt 2003). In the City of Berlin alone more than 900 public buildings have been upgraded since the start of the Energy Saving Partnership program in 1995; these have been grouped in 16 pools. The total guaranteed savings is above 7.8 million Euro and the total investment is around 32 million Euro (Seefeldt 2005). Other large EPC projects have been realised in Hamburg, Munich, Leipzig, Bremen, the region of Hesse and in some cities in North-Rhine-Westphalia and Saxony-Anhalt.

There are around 480 ESCOs[13] in Germany with an overall annual turnover of about 3 billion Euro (Brand and Geissler 2003). Energy services are being implemented at 120 000 sites in 2003, estimated to be less than 9% of the existing market potential. The expectations for 2005 are that energy services will be delivered at around 280 000 sites (Brand and Geissler 2003).

The success of the German ESCO market has been driven by the financial and technical support for energy efficiency projects provided by the concerted effort of governmental action (research and development programs, loan/funding schemes, and incentive programs for renewable energies) and non-governmental programs (e.g. credit programs by eco-banks, efficiency checks by energy agencies, and boiler replacement by utilities). Customer information and motivation, different legal acts and loan programs and public-private partnerships have made Germany the European ESCO leader (Brand and Geissler 2003).

AUSTRIA

In the last 5 years the Austrian EPC market has seen a quick development (Seefeldt 2003). To date the energy efficiency of about 600 to 700 buildings has been improved via EPC, as compared to almost zero in 1998; these buildings represent roughly 4-6% of all service sector buildings. Another 300 to 400 federal buildings (about 50% of total floor area) will get an EPC contract in the next 3 years (Leutgöb 2003). Assuming that around 50% of the building stock is suitable for implementation of EPC concepts, in 2001 the Austrian Energy Agency estimated investment volume amounts to about 300 million Euro that would bring an estimated annual energy cost savings of around 50-60 million Euro and associated annual CO_2 reductions of 600 000 to 700 000 t.

There are about *40 ESCOs* in Austria. The main customers and driving forces are the federal building administration, a few local governments in large cities (Graz, Salzburg) and, surprisingly, housing associations and some small and medium-sized municipalities. Currently private commercial buildings are not typical EPC customers.

In Austria, as in Germany and Spain, the regional and the national energy agencies played a crucial role in the development of energy services and small ESCOs. The EPC projects in small and medium-sized municipalities have been supported by regional programs, e.g. in Styria, Upper Austria, and Tyrol. The increase of the Austrian EPC market is based mainly on increased know-how: energy agencies at the national, regional and local level have acted as know-how carriers and through action in public buildings drew the attention of businesses to the end-use energy efficiency market niche (Seefeldt 2003). Except in one region, no direct subsidies have been allocated to EPC projects. Instead, public money has been used for information and marketing activities and for advice to potential EPC customers (Seefeldt 2003). At the beginning of 2003 the program "Eco-facility" has been started that targets private commercial and service buildings through EPC, planning and compre-

12. Brand and Geissler (2003) distinguish between supply contracting, performance contracting and operation contracting. The number of contracts on energy services appears to cover all the three categories.
13. Due to more relaxed definition of ESCOs, other publications cite much higher number of such companies in Germany.

hensive service packages. It is estimated that at least 20% of the operation costs can be saved

UNITED KINGDOM

There are approximately 20 established ESCOs operating in the United Kingdom (UK). The major players are subsidiaries of large international control equipment companies, oil companies, and electric utilities. Many new small companies offering more than one service (e.g., consulting plus finance) consider themselves to be ESCOs. There is no established definition of "ESCO": different titles are used, such as Contract Energy Management (CEM) companies, TPF companies, Technology Performance Contracting (TPC) companies, etc (Iqbal 2003b). Generally, companies providing a totality of services and risk sharing are termed CEM companies. Commonly, the major players deal only with customers whose annual energy bill exceeds 75 000 Euro. Popular customers are located both in the private sector (commercial buildings, industry, generally excluding process aspects) and in the public sector (large state owned hospitals, prisons and defence establishments, local authority housing) (Iqbal 2003b).

ESCOs with significant capital may use their own finance, but most major ESCOs use external TPF from banks. Financial institutions are very active in financing ESCO projects. There are no current support mechanisms for ESCOs in the UK[14]. The UK, due to its large experience in project financing, the more innovative spirit of enterprises and the favourable market structure, has developed a flourishing ESCO industry, which could further develop due to the UK Carbon Levy. It should however be noted that with liberalization falling electricity prices have had a negative impact on energy efficiency projects. A specific attribute of the UK energy service market is its focus on the residential sector; this is a result of more than a decade of conventional energy suppliers having been required to assist their residential customers in improving energy efficiency.

OTHER WESTERN EUROPEAN COUNTRIES

There are some ESCO activities in Norway, the Netherlands, Portugal, Greece, Ireland, Finland and Sweden (the latter two are the most successful among these countries).

There are three ESCOs in *Finland* with ongoing projects, one of them being a business unit of a multinational company providing operation, maintenance and construction services; two ESCOs develop and implement only EPC projects. The ESCO market potential in Finland is estimated to be in the range of 350 to 400 million Euro (Väisänen 2003). The turnover in 2002 was estimated to be between 4 and 5 million Euro. The main customer is the process industry (80%); the municipal sector also has several projects in the pipeline. The most common types of energy efficiency projects are improvements related to industrial processes and building refurbishment of HVAC systems. These types of projects account for more than two thirds of the projects and more than 90 percent of the turnover of ESCO businesses. Unlike the rest of Europe, in Finland buildings and small-scale CHP are not primary targeted sectors: savings potential in buildings is not sufficient to pay back large refurbishment projects and there is not much place for new small scale CHP due to the coverage of district heating (Väisänen 2003). Performance contracts are financed by the ESCOs. There have been a few attempts to get the attention of financial institutions, but there is a chicken and egg problem.

In *Sweden* ESPCs and ESCOs offer various types of arrangements, such as TPF, management agreements (at a fixed fee), energy incentive agreements (similar to previous but with shared profit if savings exceed expectations), energy service agreements (combination of different services), function agreements (guarantee a level of costs and an overall solution) and EPC (SEA 2003). By 2001 there were about 3-4 energy producers, and 6 equipment manufacturers or consultant/installation firms providing different types of energy services. Some of these have own financing companies. However, EPC is not the sole business of any of these companies. The targeted market segments are medium-sized industry, public buildings, hotels and hospitals, as well as larger residential property companies. In 2001 the estimated total value of ESCO projects was $30 million (Vine 2004).

The pure ESCO activity in *Greece* is still in a pilot phase for some RES projects and does not affect yet the local energy market. The main reason for this is the lack of a specific legal framework on the ESCO business (apart from the legal framework of the energy market), and – more importantly – the lack of a properly adopted procurement, contractual and administrative procedure for the selection, control and repayment of the integrated energy services.

The situation is similar in *Ireland*, where three broad categories of companies in the energy efficiency sphere are companies supplying mainly CHP; facilities management companies, and companies offering contract energy management. However, the companies that contract ESCO-type work in Ireland are interested in saving hassle and time, not in energy efficiency (Scott 2004).

There are around 10 companies that define themselves as ESCOs in *Norway*, though EPC is very limited at present. The public sector is seen as the most interesting market segment, while industry is considered a harder segment to enter (NVE 2003). The most common types of projects are related to building refurbishments, heating plants and air conditioning systems.

There are 7 major ESCOs in *Portugal*, working primarily with medium and large industries, as well as large commercial buildings. ESCOs are implementing mostly CHP projects, often financed by banks. In *Belgium* there are a limited number of ESCOs mainly active in the lighting field and in industrial and building services (Vine 2004).

The cases of *Denmark* and *the Netherlands* are rather interesting. Although the countries have been among the leaders in energy efficiency actions, there is hardly any ESCO activity. Provisions for mandatory demand-side management (DSM) have required utilities to implement numerous energy efficiency projects. In addition, the national energy agency has been active in project implementation. These two driving forces seem to have left little space for commercial

14. An ESCO can claim capital tax allowances on the investment it makes, and pass this on to the customer.

ESCOs. This demonstrates that the promotion of energy efficiency can be done by means other than ESCO development only.

HUNGARY

According to a survey made by the Energy Centre Hungary and the United Nation Development Programme, there are 29 ESCOs, or ESCO related companies. The larger ESCOs are mainly multinational companies (about 7 large companies are in this category). More than two-thirds of ESCO customers are municipalities; most projects target DH systems and public lighting. There have been various trends over the years, shaped by the actual legislative and financial background: earlier public lighting projects were typical, whereas today CHPs (typically gas turbine based) are in the spotlight. There have also been some fuel conversion projects, and boiler house reconstructions. Since from a business perspective 'pure' demand-side projects are rather difficult in Central and Eastern Europe (CEE), especially in the industrial sector, comprehensive solutions to fix the whole system are offered combining e.g. on-site co- or trigeneration with ESCO services. The utility-based ESCOs are developing very intensively, and while the market is growing, they are increasing their market share (Ürge-Vorsatz et al. 2004). In addition to earning a profit, the utility-based ESCOs aim to expand the market share of the electricity utilities.

Banks and credit institutions are very active in financing ESCO projects and many International Finance Institutions (IFIs) have been also supportive, through different programs, in the promotion of the ESCO industry in Hungary (see Ürge-Vorsatz et al. 2004 for details). Analysts from the international energy community have observed that in Hungary the energy efficiency industry is better established (in terms of longevity) and at the same time more solidly based (in terms of competition and maturity of the market) than in most other countries with formerly centrally planned economies and also than in some Western European countries, and that Hungary is one of the leading countries to develop the scope of ESCOs (Ürge-Vorsatz et al. 2004 and references herein). In the period 1996-2000 alone the number of ESCOs active on the market increased at least fourfold. The TPF market is developing strongly with great competition among the ESCOs.

OTHER NEW MEMBER STATES OF THE EUROPEAN UNION AND NEW ACCESSION COUNTRIES

The experiences of ESCOs in the countries with formerly centrally planned economies that joined the European Union on 1st May 2004, and in those that are expected to join it in the near future, are rather mixed. IFIs have been active in the region: a recent initiative of IFC/GEF is the Commercializing Energy Efficiency Finance Programme (CEEF) approved in 2002 and covering the Baltic states of Latvia, Lithuania and Estonia, as well as Slovakia and the Czech Republic. The program targets local FIs, ESCOs and end-users, and provides a *pari passu* guarantee, up to 50% of the principal. The EBRD has provided financing to 14 private and 1 state ESCOs in Hungary, Poland, Czech republic, Slovakia, Lithuania, Romania, and Ukraine (Ligot 2004).

Several multinational companies are operating as ESCOs in the *Czech Republic*, mostly in public sector buildings (schools and hospitals), district heating and industry. However not all of these use EPC. An important development has been the inclusion in the Energy Management Act of a requirement for mandatory energy audits in state-owned buildings or in buildings of institutions funded by the state with an annual consumption over 1 500 GJ, as well as for industrial companies with annual consumption above 35 000 GJ. Institutions and building owners are then obliged to implement all low-cost energy efficiency measures identified. These provisions have supported the development of EPC that also includes the cost of the audit (ECS 2003).

ESCOs became active in the residential sector of *Slovakia* in the mid-1990s; most of them used foreign capital and loans. Since this has been a largely unsuccessful start (for details, see ESC 1999), later municipalities and the local DH companies became the target segment. At present there are 32 ESCOs and the competition among them is strong; there are 20 large DH projects, some EPC projects in hospitals, a swimming pool, service and industrial companies (Goldmann 2003). Among the existing ESCOs some have developed from utilities (mostly international), some have been established by IFIs; most are public-private partnerships in the form of joint ventures with municipalities.

Poland has around 13-15 ESCOs, the majority of which are branches of foreign companies (Wnuk 2003). Most of them are operating mainly in the DH sector. In the 90s, when the idea of TPF and EPC was entering the Polish market, numerous projects have been realised with contracts formulated in disadvantageous way from the clients' point of view: obligations were incommensurate with the scope and the volume of investments as well as reductions of energy costs achieved. Currently projects cover both the municipal (public buildings, infrastructure) and the private sectors (mainly housing cooperatives) (Goldmann 2003). A project started recently in the city of Lódz with the support of EBRD covers over 420 public buildings and is the largest ESCO project in the region.

In *Slovenia* there are some private investors acting as ESCOs; a pilot EPC project in public buildings has been implemented in the city of Kranj (a pool of 26 public buildings).

Since 2000, only 3-5 companies have started ESCO-related activities in *Lithuania*. These are mainly foreign subsidiaries, engaged in heat production and distribution and supply side energy management in the DH sector. The expectations for target market segments in Lithuania are buildings (including residential and public buildings, estimated size 125 million Euro) and industry (estimated size of 50 million Euro) (Franckevicius et al. 2003, Iqbal 2003). There are around 20 ESCOs in *Estonia*, but the total estimated value of ESCO projects is not very high, at around 1-3 million Euro in 2001 (Vine 2004). In *Latvia* municipal and state property, together with the housing sector, have been considered for EPC (Blumberga 2003). There are projects related to leasing of boiler stations, CHP, street lighting and efficient lighting of a sports hall (Goldmann 2003). There are many more contracts for energy delivery than for energy performance; only 2 ESCOs provide EPC.

To the authors' best knowledge no ESCOs operate either in *Malta* or in *Cyprus*.

In *Bulgaria* ESCOs are functioning on a limited scale and primarily in the municipal sector: schools and public lighting. Most projects cover small heating plants and the supply of heat at a negotiated price. There are five companies that offer EPC. There is an EPC in a pool of 300 public buildings in Sofia. In *Romania* 20 small private companies were selected in 1993 by USAID to be trained to become ESCOs. Romanian banks still consider the costs and risks of lending for energy efficiency projects too high. Through the co-operation between the Romanian government, the World Bank and the GEF, the Romanian Fund for Energy Efficiency was started intended as a revolving debt facility with an expected program life of 8 years; it should leverage co-financing from other commercial sources, in particular domestic banks. The industrial sector is initially the target of the fund, with commercial buildings and later municipal services to be included. The public sector was left out of the focus of the fund because of poor credit risk (ECS 2003).

Conclusion

While the initial ESCO concept started in Europe more than 100 years ago and moved to North America, it is now showing some resurgence in Europe. The paper has summarised the results to date of the ongoing survey of ESCOs and ESCO projects in Europe. It has demonstrated that the provision of energy services is a growing industry that involves a diversity of enterprises and covers a variety of activities. At present action at the supply side is attracting the lion's share of ESCOs' attention with CHP being the most common type of project; at the demand side streetlighting projects are common. Meanwhile building sector projects still need the support of energy efficiency policies and measures.

Recent policy developments, such as the new Italian Decree on energy efficiency that allows ESCOs to carry out energy-efficiency projects and be eligible for "white certificates", may result in a strong development of the ESCO industry (a similar scheme will be adopted in France). In the long term, a combination of legislative measures, such as the proposed energy service Directive imposing a certain level of energy-efficiency projects to be delivered by utilities, coupled with the strategic actions proposed in this paper, could trigger a wide expansion of the ESCO business in all 25 EU countries plus Bulgaria and Romania. The introduction of the Kyoto Protocol and its flexible mechanisms (emissions trading, clean development mechanism, and joint implementation), and the related proposals for Directives for responding to these mechanisms, will create a new opportunity for developing the ESCO industry, for project financing and the further diffusion of measurement and verification (M&V) techniques used in EPC. Because energy efficiency projects offer a very cost-effective approach to reducing greenhouse gas emissions, concerted effort is needed to bring energy efficiency to the carbon market, which currently excludes it[15].

Finally, with the growth of the energy service industry the need of setting a common language becomes clear: standardisation of contracts, and M&V procedures will help end-users and the financial community better understand EPC.

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