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An international survey of the energy service company (ESCO) industry

Edward Vine*

Lawrence Berkeley National Laboratory, EETD, Building 90-4000, Berkeley, CA 94720, USA

Abstract

Energy service companies (ESCOs) are expected to play an important role in promoting energy efficiency in countries outside of the US. However, there have been no studies examining the current level of ESCO activity internationally. To correct for this deficiency, a survey was conducted in the Fall of 2002 to collect information on the following key topics for selected countries: (1) the number of ESCOs; (2) the key sectors targeted by ESCOs; (3) the four most important barriers facing the ESCO industry; (4) the approximate value of projects conducted by ESCOs in 2001; and (5) the future of the ESCO industry in that particular country.

Information was collected on ESCO activity in 38 countries outside of the United States. Based on the survey data, we calculate the total amount of ESCO activity outside the US in 2001 to be between $560 million and $620 million. This is approximately one-half to one-third of the ESCO revenues in the US for 2001.

Keywords: ESCO; International; Survey

1. Introduction

An energy service company (ESCO) is a company that is engaged in developing, installing and financing comprehensive, performance-based projects, typically 5–10 years in duration, centered around improving the energy efficiency or load reduction of facilities owned or operated by customers (Cudahy and Dreessen, 1996; Dayton et al., 1998; Goldman and Dayton, 1996; Singer and Lockhart, 2002; Vine, Forthcoming). ESCOs are seen as an important vehicle for promoting energy efficiency around the world, especially in those countries experiencing increased competition and privatization in the electric utility business[1] (Goldman and Dayton, 1996; Vine et al., 2003), as well as in other sectors undergoing liberalization and privatization (e.g., heat production in Central and Eastern European countries). Recent studies have examined the growth and potential market for the ESCO industry in the United States (Goldman et al., 2002; Vine et al., 1999). For example, based on an a database of nearly 1500 case studies of energy-efficiency projects, it was estimated that ESCO industry revenues for energy-efficiency related services in the US ranged from $1.8–$2.1 billion in 2001 and that ESCO revenues increased at an average annual growth rate of 24% during the last decade (Goldman et al., 2002).

ESCOs are expected to play an important role in promoting energy efficiency in countries outside of the US (Vine et al., 2003). However, there have been no studies examining the current level of ESCO activity internationally. To correct for this deficiency, a survey was conducted in the Fall of 2002 to collect information on the following key topics for selected countries: (1) the number of ESCOs; (2) the key sectors targeted by ESCOs; (3) the four most important barriers facing the ESCO industry; (4) the approximate value of projects conducted by ESCOs in 2001; and (5) the future of the ESCO industry. Prior to presenting the results of this survey, we briefly discuss the survey methodology. After presenting the results, we discuss possible actions that

*Tel.: 1-510-486-6047; fax: 1-510-486-6996.
E-mail address: elvine@lbl.gov (E. Vine).

[1] One may argue that competition and privatization may reduce the opportunities for ESCOs and energy efficiency in general, as the expected low cost of energy and price competition (1) will force utility companies to reduce their own costs (e.g., by reducing budgets for energy-efficiency staff and programs) and (2) will make customers less interested in energy efficiency as their energy bills decrease and as the size of the expected savings becomes less certain.

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countries can take to promote the ESCO industry in their country, and then provide examples of recent ESCO activities around the world.

2. Methodology

In late 2002, a questionnaire was developed and sent to key ESCO contacts in countries known for their ESCO activity. The countries were selected based on personal knowledge of ESCO activity in a particular country, recommendations from experts in the field who were knowledgeable about the ESCO industry, and a review of the literature (e.g., Bertoldi et al., 2003; Biermann, 2001; Fraser, 1996; IIEC, 1998; Murakoshi et al., 2000; Poole and Geller, 1997; Schleich et al., 2001; Vine et al., 1998). For each survey participant, the following questions were asked:

- When was the first ESCO created in your country?
- How many ESCOs are active in your country?
- If there was an Association of ESCOs, what is the name of this association and when was it formed?
- What sectors are targeted by the ESCO industry?
- What are the four most important barriers facing the ESCO industry in your country?
- What is the approximate value of projects conducted by ESCOs in 2001?
- What does the future of the ESCO industry look like in your country: increasing number of ESCOs, decreasing number, or about the same (no change)?

In this survey, informants were told that an ESCO refers to a company that conducts energy performance contracting (using either guaranteed energy savings, or shared energy savings).[2]

There are several caveats to this study. First, some countries may have been missed because the author was not aware of ESCO activity in that country. Second, the individuals providing information on ESCOs were often very knowledgeable about the ESCO industry in their country. However, they are not typically aware of all ESCO transactions in that country, so the level of ESCO activity in a particular country may be underestimated. Similarly, we relied on only one person per country; a larger sample would have given us more confidence in these findings (particularly the assessment of barriers). Unfortunately, a lack of resources did not allow for a larger sample. Third, about 5% of the potential informants did not respond to the survey, so some countries with ESCO activity are not represented in this survey.[3]

3. ESCO development activity

Information was collected on ESCO activity in 38 countries outside of the United States (Table 1).[4] As is readily apparent, the development of the ESCO industry is still in its infancy in many countries. In a few countries (e.g., Canada, Sweden, and the United Kingdom), ESCOs were created in the late 1970s and early 1980s. However, most ESCO activity occurred in the late 1980s and 1990s and the creation of the "first ESCO" is continuing today (e.g., Nepal).

The number of ESCOs in each country varies, ranging from just a few ESCOs (e.g., Belgium, Nepal, Thailand, and South Africa) to over 50 (e.g., Brazil, Germany, Korea, and Switzerland). Most of these ESCOs are "local ESCOs"—in contrast to multi-national ESCOs that operate in two or more countries: e.g., Compagnie Generale de Chauffe (initiator of energy performance contracting in France over 100 years ago to guarantee results in district heating) had ESCOs in 20 countries and employed 28,000 people in performance contracting (Hansen, 2003). The number of entities does not reflect the level of investment activity by ESCOs: for example, the 20 ESCOs in Estonia implemented approximately $1–3 million dollars, while the eight ESCOs in Poland implemented approximately $30 million. It is also important to note that the level of investment reflects several factors, only one of which is the number of ESCOs in the country.

The survey data indicate that there is substantial ESCO activity in these countries. Based on these data, we calculate the total amount of ESCO activity outside the US in 2001 to be between $560 million and $620 million. This is approximately one-half to one-third of the ESCO revenues in the US for 2001 (Goldman et al., 2002).

4. Sectors targeted by ESCOs

The type of sectors targeted by ESCOs varied by country (for comparison, see Westling, 2003a, b). Typically, several sectors were targeted (Table 2 and Appendix A). In only two countries did ESCOs target only one sector: the industrial sector in Kenya, and the municipal sector in Lithuania. These were the excep-

[2] In some cases, it is possible that some informants reported ESCO activity as a combination of performance contracting and pay-for-service energy-efficiency work, particularly in those countries where performance contracting is nascent.

[3] Because of the above reasons, ESCO activity in the following countries are not covered in this paper: France, Italy, Latvia, Mongolia, Russia, and Sri Lanka. And limited information is available on Côte d'Ivoire, Jordan, Morocco, and Tunisia.

[4] For comparative purposes, ESCOs started in the US in the early 1980s. There are over 60 national and regional ESCOs operating in the US today (Goldman et al., 2002).

Table 1
ESCO activity indicators

Country	Date of first ESCO	Number of ESCOs	Total value of ESCO projects in 2001 [US ($)]
Argentina	1990s	5	Less than $1 million
Australia	1990	8	$25 million
Austria	1995	25	$7 million
Belgium	1990	4	Don't know
Brazil	1992	60	$100 million[a]
Bulgaria	1995	12	Don't know
Canada	1982	5	$50–100 million
Chile	1996	0–3	$0–200,000
China	1995	23	$49.7 million
Columbia	1997	1–3	Less than $200,000
Côte d'Ivoire	2000	4	$250,000
Czech Republic	1993	3	$1–2 million
Egypt	1996	14	Don't know
Estonia	1986	20	$1–3 million
Finland	2000	4	$0.5–1 million
Germany	1990–1995	500–1000	$150 million
Ghana	1996	1–3	Less than $100,000
Hungary	Late 1980s–early 1990s	10–20	Don't know
India	1994	4–8	$0.5–1 million
Italy	Early 1980s	20	Don't know
Japan	1997	21	$61.7 million
Jordan	1994	1	$2 million
Kenya	1997	2	Less than $10,000
Korea	1992	158	$20 million
Lithuania	1998	3	Don't know
Mexico	1998	7	Don't know
Morocco	1990	1	$500,000
Nepal	2002	2	$250,000
Philippines	1990s	5	Less than $200,000
Poland	1995	8	$30 million
Slovak Republic	1995	10	$1.7 million
South Africa	1998	3–5	$10 million
Sweden	1978	6–12	$30 million
Switzerland	1995	50	$13.5 million
Thailand	2000	6	$5–6 million
Tunisia	2000	1	$500,000
Ukraine	1996	5	$2.5 million
United Kingdom	1980	20	Don't know

[a] Due to electricity shortages, 2001 was an unusual year for Brazil. The prior year (2000) was more typical: in that year, ESCO services were valued at $30 million.

tions. In most countries, ESCOs targeted the commercial, industrial, and municipal sectors.

5. ESCO associations

One of the most important steps a country can take to promote the ESCO industry in their country is to establish an association of ESCOs.[5] Over a dozen countries have created ESCO associations (Table 3). These associations were generally established in the late 1990s. The associations often are created with a few members initially, but then grow in size as the association develops. For example, the Japanese Association of Energy Service Companies (JAESCO) was established in 1999 and now contains 110 members (Murakoshi and Nakagami, 2003). However, the number of companies in Japan with actual experience in performance contracting has not increased over that time period, remaining steady at 20 (and mainly large corporations).

6. Barriers to the development of an ESCO industry

Persistent barriers inhibit many cost-effective energy-efficiency projects and prevent the full development of the ESCO industry internationally. Recently, the International Energy Association's Demand-Side Management Implementing Agreement's Task X identified some major barriers: lack of information and understanding of the opportunities that energy efficiency offer; lack of culture for project financing; public procurement rules that prevent the use of ESCOs; "low" price of electricity; safety and reliability concerns that hinder the introduction of new technologies; burdensome administrative procedures that allow only very large projects to be carried out; and limited understanding of energy efficiency and performance contracting by financial institutions (Westling, 2003a, b).

These barriers are consistent with the types of barriers reported in the literature on ESCOs in other countries (e.g., Bertoldi et al., 2003; Biermann, 2001; Fraser, 1996; IIEC, 1998; Murakoshi et al., 2000; Poole and Geller, 1997; Schleich et al., 2001; Singer and Lockhart, 2002; Vine et al., 1998). While each country and market is different, several barriers are common:

- Energy-efficiency projects compete for *scarce capital* with more traditional investments such as small power plants and industrial expansion.
- Energy-efficiency projects and energy performance contracting are perceived to be *more risky* than supply side projects because they are often non-asset based investments (i.e., collateral is difficult to obtain). This is especially true for small or start-up ESCOs.
- Many energy-efficiency projects and ventures are *too small* to attract the attention of large multilateral financial institutions.

[5] In the United States, the National Association of ESCOs (NAESCO) was formed in 1983.

Table 2
Sectors targeted by ESCOs

Sector	Key countries targeting this sector
Residential[a]	Many ESCOs did not target the residential sector. ESCOs in seven countries targeted at least 10% of their activity in this sector, including Nepal (30%) and South Africa (15%).
Commercial	Many ESCOs targeted 10–40% of their activity in this sector. ESCOs in India, Japan, and Mexico targeted at least 50% of their activity in this sector.
Industrial	The highest percentage of ESCO activity within a country was in this sector for many countries. For example, ESCOs in Bulgaria, Egypt, Kenya, Philippines, Thailand, and Ukraine targeted at least 70% of their activity in this sector.
Municipal	ESCOs in several countries targeted this sector. In particular, ESCOs in Austria, Canada, Czech Republic, Hungary, Italy, Lithuania, and Poland targeted at least 50% of their activity in this sector.
Agricultural	ESCOs in only two countries targeted this sector: Estonia, and South Africa.

[a] Primarily, multi-family buildings comprise the target group in this sector.

Table 3
Associations of ESCOs

Country	Name of ESCO association	Date of formation
Australia	Australasian Energy Performance Contracting Association Limited (AEPCA)	1997
Brazil	Brazilian Association of ESCOs (ABESCO)	1997
Canada	Canadian Association of ESCOs (CAESCO) (defunct 2001)	1991
China	China Energy Management Company Association	2002
Côte d'Ivoire	Association of Enterprises of Energy Efficiency Services of Côte d'ivoire	2001
Egypt	Egyptian Energy Service Business Association	1999
Italy	Association of Integrated Systems (AGESI) and Association of Italian ESCOs (AIESCO)	1999/2003
Japan	Japanese Association of ESCOs (JAESCO)	1999
Korea	Korean Association of ESCOs (KAESCO)	1999
South Africa	Association of Energy Engineers, South African Chapter	2000
Switzerland	Swiss Contracting	1998
Ukraine	Ukrainian Association of ESCOs (AESCO)	1997
United Kingdom	Energy Systems Trade Association (ESTA)	1982

- The *legal and regulatory frameworks* are not compatible with energy-efficiency investments, particularly energy performance contracting. In particular, measurement and verification protocols for assuring performance guarantees are not understood.
- Few in-country financial institutions have *experience financing energy-efficiency* projects or ventures, especially through ESCOs.
- *Utility companies' negative response* to ESCOs/ (ranging from lack of interest to fierce resistance), for fear of decreased revenues.
- *Lack of government support* for energy performance contracting, especially in residential sector where local banks and private investors are reluctant to participate.

In the survey of international ESCOs, each participant reported on the four most important barriers facing the ESCO industry in their country. The barriers mentioned in Tables 4 and 5 (Appendix B) do not represent an exhaustive list of barriers; however, they are considered to be the principal barriers, as reported by the respondents. While all of the barriers are important, the financing challenges are a major stumbling block in the development of ESCOs—particularly in accessing funds and obtaining credit. Finally, the ESCO industry is not expected to resolve all of these barriers. The removal of these barriers will require a sustained effort by many parties.

In addition to these key barriers for the end user, there were also barriers cited that are more policy related (Table 5 and Appendix B; see also Westling, 2003a, b). The barriers listed in this table are not applicable to all countries; for example, some countries in our survey have implemented energy-efficiency building codes and appliance standards.

7. Future prospects for the international ESCO industry

Most respondents were optimistic about the future of the ESCO industry in their country: all but three countries thought that there would be an increasing number of ESCOs in their country in the next 5 years. One country (Brazil) thought that the number of ESCOs would remain unchanged during this period, while two countries (Canada and Hungary) thought that the number of ESCOs would actually decrease in the next 5 years.

Table 4
Key barriers to end users

Key barrier	Elements of barrier
Financing	Lack of access to capital and financing and credit; high cost of money; limited financial capital of potential customers; unclear accounting and treatment of energy performance contracting (EPC) (e.g., operational costs); bias in financing for large enterprises compared to smaller ones (as reflected in interest rates).
Perception of risk	Includes both technical and business risk; need for risk management and business plan; short-term view of investment (e.g., short paybacks required); conservative behavior of customers and banking industry; risk that core production processes may be affected.
Information/awareness/ knowledge	Customers, suppliers, engineering companies, banks, finance sector, industry lack information (or are not aware or knowledgeable) of EPCs (as well as technology characteristics, economic and financial costs and benefits, energy savings potential, sources of finance, and installation services); lack of understanding and interest in EPC; lower priority for energy efficiency.
EPC expertise	Lack of expertise in EPC—technical, financial, education; key areas needing assistance: energy-efficiency measures, and design and negotiation of EPC; few energy managers (emphasis on purchasing energy, not on energy efficiency).
Access to energy-efficiency equipment and technology	Shortage of equipment; lack of affordable and appropriate technology; lack of measurement equipment (e.g., meters); need for imported technology—but import taxes increase the costs of equipment.
Administrative	High *transaction costs* for identifying, procuring, installing, operation, and maintaining energy-efficient equipment, and ESCOs (e.g., information searching); time delays in project implementation; time-consuming process to agree on contracts; preparation costs for managing EPC; lack of time and manpower; management costs.
Reliability	Concerns about reliability of equipment (low energy performance of existing systems) and organizations (ESCOs) with poor track records (compounded by poorly performing energy-efficiency measures installed by ESCOs).
Credibility/confidence/trust	Lack of confidence of ESCO services and solutions, EPC; lack of credit history for ESCOs and customers (no credit history for small customers with banks and ESCOs); firms with few projects and references often viewed with skepticism.

The ESCO industry has evolved significantly over the last decade (see Vine et al., 1999). The next decade will engender more change. Although market conditions and opportunities vary widely across countries, several trends currently are evident in many of the largest countries (particularly developing countries), which tend to increase the demand for energy efficiency and ESCOs (IIEC, 1998; Vine et al., 2003):

- *Subsidy removal*. Many countries have in recent years begun to decrease or remove energy subsidies. This makes the true cost of energy more apparent to the end user and increases the incentives for efficiency.
- *Privatization*. Many countries are privatizing formerly state-owned energy utilities and major industries. This typically increases pressure on companies to improve efficiency in all aspects of operation, including energy use.
- *International competition*. Increased global trade and competition forces companies to minimize input costs. As wages and the costs of local inputs rise with economic development, energy costs become relatively more important, providing further incentive for efficiency.
- *Constrained power supply*. The demand for electricity is growing faster than the expansion of electricity supply, creating incentives and demand for energy-efficient equipment and processes. In fact, some countries (particularly developing countries) experience regular electricity shortfalls that threaten industrial expansion and economic growth.
- *Environmental concerns*. Countries are under increasing pressure to clean up local pollution from industry and the power sector, and to limit growth in emissions of greenhouse gases that contribute to climate change. The Kyoto Protocol could become an important mechanism for promoting energy efficiency and the ESCO industry.

8. Actions for promoting ESCOS internationally

Based on a review of the literature and discussions with experts in the field, several types of strategic actions are needed for fostering the development of the ESCO

Table 5
Key policy barriers

Barrier	Elements of barrier
Lack of governmental policy and leadership on energy efficiency and ESCO industry	No policy or leadership on energy efficiency or demand-side management, or on ESCO industry; no energy codes and standards; energy audits are not mandatory, nor subsidized.
Low cost of electricity and other energy carriers (gas and district heating)	Subsidized energy costs; externalities not included; results in long payback periods; energy prices equal average costs rather than long-run marginal costs.
Lack of budgeting and standardized public procurement rules, contracts, procedures and guidelines for ESCO services	Especially for state-owned properties and the municipal sector.
Large economic and political uncertainty	Little attention paid to energy efficiency.
Conflicts with other government policies	Little attention paid to energy efficiency.
Unfavorable tax regimes	Existing tax and fiscal system discourage energy efficiency.
No existing legal framework for protecting the interests of EPC participants	EPC unknown in country.

industry internationally—and some countries have already implemented one or more of these actions. The first action is to increase information about energy-efficiency projects, financing opportunities, and services offered by ESCOs. As already indicated, there is a lack of information by the end user on ways to improve energy efficiency in situations where there are limited financial or technical capabilities (e.g., in public buildings). Creating an awareness that ESCOs can help final users in implementing energy-efficiency projects is an important step. The same lack of awareness and interest is also present in financial institutions, especially in countries where there has not been a culture for third-party project financing. For example, to move in this direction, the European Commission's Joint Research Centre (JRC) plans to create a comprehensive list of ESCOs in the European Union, including a description of their projects, capabilities, and illustrative case studies (Bertoldi et al., 2003). A wealth of information is also available at national and local energy agencies. For example, a similar activity at the local level is being conducted by the Graz Energy Agency under a SAVE project (Bertoldi et al., 2003; Graz Energy Agency, 2002).

Energy managers of companies are important stakeholders for the promotion of ESCOs. These professional and qualified individuals should be familiar with the service and capabilities offered by ESCOs and should be able to rely on them for implementing projects in their companies. Thus, an important measure would be the organization of training courses for energy managers, making them aware of ESCO activities, ESCO-type projects, and measurement and verification methods and protocols for measuring energy savings.

A second important action is to ensure that ESCOs provide a qualified and reliable service. In the United States, an ESCO accreditation system has been implemented by the National Association of Energy Service Companies (NAESCO). In Europe, an effort is underway to define the minimum set of qualifications for ESCOs, together with a system to assure the quality of service (Bertoldi et al., 2003). Countries should understand the strengths and weaknesses of these activities and develop an ESCO accreditation system that meets the needs of both ESCOs and customers in their country.

A third action is to create more information for financial institutions, and provide incentives to the "first movers" in this sector. For example, a country could develop and publicise a web site dedicated to those financial institutions that support ESCO-type projects and that offer financial assistance.

A fourth action is to develop funding sources. ESCOs will need working capital for marketing and project preparation and development. Funding feasibility studies, energy audits and the preparation of financing applications would increase their ability to secure additional information and decrease the amount of equity capital required. In addition, sources of debt and equity financing need to be located. Several possible funding sources should be investigated: private banks and lending institutions; financial institutions that are already familiar with energy performance contracting; multi-lateral funders and donor agencies (e.g., European Bank for Reconstruction and Development, World Bank, Asian Development Bank, US Agency for International Development, International Finance Corporation (IFC), and the Global Environment Facility

(GEF)); venture capital firms; equity funds; strategic partners (e.g., utilities and engineering firms); leasing companies; and equipment manufacturers. A revolving fund to finance energy efficiency measures could also be set up. Dedicated debt organizations offering 80–100% financing for projects could be established and could use the above sources. Under this option, a master loan agreement would be standardized and executed between an ESCO and the debt facility which would commit the lender to provide financing according to defined terms and conditions. Funds would be drawn down on a project-by-project basis. The balance of financing would come from the ESCO, the customer or another equity investor. Alternatively, the debt facility could provide 100% of project costs, but returns to the debt facility would be higher to reflect the higher risk.

A fifth action is to standardize contracts. The development of standard contract terms can help both end users and the financial community better understand performance contracting. The development of standard contracts has been an elusive task because various companies consider their contract approaches unique and proprietary. Eight countries participating in Task X of the IEA DSM Implementing Agreement (Finland, France, Italy, Japan, The Netherlands, Norway, Sweden and the United States) have suggested a model energy performance saving contract to be used in public procurement of ESCO services (Westling, 2003a, b). Rather than developing a single standard energy services agreement, NAESCO, for example, is now focusing on standard language for a set of key contract provisions, such as insurance, equipment ownership and purchase options, which will allow standard contract forms to be built up gradually. It would also be useful to have standard contract provisions that could be adapted for use in smaller size projects.

A sixth action is to standardize measurement and verification (M&V). Performance-based projects are subject to M&V protocols, and standardization of M&V guidelines is an important activity (Kats et al., 1996, 1999; Kromer and Schiller, 2000; Raemsohl and Dudda, 2001). The International Performance Measurement and Verification Protocol (IPMVP) is a good model for countries and ESCOs to initially examine (US Department of Energy, 2000; Vine and Sathaye, 2000). NAESCO and industry representatives helped write the IPMVP, and they are being used around the world for measuring and evaluating energy-efficiency projects.

A seventh action is to conduct ESCO demonstration projects, perhaps as joint ventures with well-established ESCOs in the US and elsewhere. A critical factor in the future role and success of ESCOs will be the ability to demonstrate successful applications of the ESCO concept. The purpose of these demonstration projects would be to illustrate the applications of energy-efficient technologies, demonstrate the concept of energy performance contracting, and create areas of expertise in ESCO development. In order to attract potential customers, government agencies (or utilities) could identify and qualify customers with energy efficiency potential and, acting on behalf of a single customer or preferably a group of customers, undertake the procurement of turnkey energy efficiency equipment installation and services. The typical method is to develop and issue a request for proposals (RFP) to the energy efficiency industry. Before issuing the RFP, the procuring agency should secure the customer's commitment to the program, assist the customer in defining its decision making process and the acceptable range of financing and contracting terms, perform a preliminary analysis of the customer's creditworthiness, and assemble basic information on the energy cost, consumption and end use characteristics for the customer's facilities. The RFP should define the proposal format, its evaluation and selection process. This preliminary work delivers to the ESCO community a qualified and decision-ready customer. Experienced lenders can impart valuable information as well as demonstrate the importance of M&V to these projects' success. Early success of ESCO projects will be critical to the long-term growth and prosperity of the ESCO industry.

An eighth action is to promote energy performance contracting in local, regional, and federal government buildings. Government-owned property is a major energy user and can represent a significant proportion of the potential ESCO market. ESCOs can provide government organizations with valuable expertise and private sector investment capital. However, energy performance contracting is very often regarded as unconventional finance by government authorities. Rules and regulations may simply not allow energy performance contracting on government property. Therefore, an important first step is to review regulations and remove institutional impediments to provide a more hospitable environment for performance contracting. Countries should expedite the process as much as possible by providing subsidies to ESCOs and/or allowing 10–15% of government buildings be made available to performance contractors, raising the credibility of the ESCO business concept with major banks. The buildings could be made available to the top 3–4 qualifying ESCOs (the work should be divided up among the ESCOs). After this initial stage, all government buildings should be made available to energy performance contracting.

A ninth action is to develop a third-party financing network. The network would include ESCOs, national and regional energy efficiency agencies, associations of ESCOs, lighting and equipment manufacturers and suppliers, financial institutions, community agencies, utilities, and other suppliers of energy services that have

an interest in accelerating investments in energy efficiency. All of these actors have a role to play in disseminating information on how third-party financing can be used to overcome impediments to energy efficiency and thereby accelerate energy-efficiency investments. The network would have as its aim the co-ordination of the efforts of the various and diverse actors to accomplish market penetration of energy-efficient technologies. They could co-ordinate activities, collaborate on information dissemination, and periodically exchange information about their experiences.

A tenth action is to establish an equipment-leasing organization. Existing leasing companies might be persuaded to offer energy-efficient equipment. Depending on the availability of energy-saving measures, equipment-leasing organizations may need to be established to provide a supply of energy-efficient equipment for leasing.

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, as well as easing procedures for ESCO projects (e.g. procurement rules, etc.) could trigger a wide expansion of the ESCO business.

Finally, 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. Energy-efficiency projects offer very cost-effective approach for reducing greenhouse gas emissions. Emerging carbon markets will create new opportunities for project financing and the further diffusion of monitoring and verification techniques used in energy performance contracting.

In the sections that follow, we provide examples of recent ESCO activities in selected countries and regions. These examples are meant to provide information on how the ESCO industry is being promoted in these areas; some of these examples support some of the recommendations described previously.

8.1. European union

The European Commission (EC) has taken actions to help implement the first phase of the European Climate Change Program with initiatives and proposals for directives, such as the following (Westling, 2003a, b):

- Proposal for a framework directive for minimum efficiency requirements for end-use equipment
- Proposal for a directive on linking project-based mechanisms including Joint Implementation and Clean Development Mechanism (mechanisms in the Kyoto Protocol) to the EC Emissions Trading Scheme
- Proposal for a directive on energy demand management
- Initiatives on increase energy-efficient public procurement

To establish a "real" ESCO market, the EC is planning to take a number of actions, including the following (Bertoldi et al., 2003; Westling, 2003a, b):

- Introduce a clear and unique definition of an ESCO at the European Union (EU) level
- Establish an EU Code of Conduct for ESCOs, in order to develop: (1) an EU-wide accreditation of ESCOs; (2) an EU list of accredited ESCOs. and (3) the establishment of the European Energy Service Company Association (EAESCO)
- Propose a directive on the promotion of end-use efficiency by energy suppliers, which would include energy performance contracting and third-party financing.

To keep the momentum going, the European Commission DG Joint Research Centre organized a major international conference in May 2003 on the status, prospects and challenges that the ESCO industry is facing today in Europe. The conference gathered for the first time the numerous and different ESCOs operating in Europe, along with policy makers, experts, clients and members of the financial community, to develop a strategy to promote the ESCO industry in Europe.

8.2. Ukraine, Russia, and Belarus

During 2002, energy-efficiency leaders (ESCOs, energy-efficiency centers and engineering companies) made several proactive steps in developing an Ukraine–Russia–Belarus energy efficiency and ESCO market (Kharchenko, 2003). Several energy efficiency and ESCO conferences took place in Kiev, Moscow, and Minsk where the leaders made agreements on developing joint projects and programs aimed at boosting energy efficiency and ESCO markets in their countries. An Ukrainian ESCO (Eco-Sys., Ltd.), with the support of the Alliance to Save Energy, developed a web-site "ESCO Magazine" http://www.esco-ecosys.narod.ru/ (in Russian and Ukrainian), comprised of more than 12,000 pages of information on energy efficiency and ESCO issues.

8.3. Central Europe

In the late 1990s, the IFC, along with support from the GEF, launched the Hungary Commercialising Energy Efficiency Co-Financing Program (HEECP) to stimulate investments in energy efficiency (Crosby,

2003).[6] In addition to providing a Credit Guarantee Facility to banks and leasing companies, one of the main drivers of the program was to provide technical assistance to both the financial community and the ESCO industry. After 5 years of implementation, financing institutions are now independently financing energy-efficiency projects for which they had previously sought HEECP help. The experience with HEECP led the IFC and the GEF to develop the Commercialising Energy Efficiency Finance (CEEF) program that was launched in five Central European countries (Latvia, Lithuania, Estonia, Czech Republic, and Slovakia) at the end of 2002. The CEEF Guarantee Facility is designed to support energy-efficiency financing activities of qualified private sector financial intermediaries principally by providing partial credit guarantees and technical assistance. CEEF uses a grant of $15 million from the GEF to supplement an IFC investment of up to $75 million in creating a $90 million facility (News at SEVEn, 2003). This is expected to mobilize a portfolio of energy-efficiency projects with a total value of around $225 million.

8.4. Egypt

The US Agency for International Development is in the process of initiating a credit guarantee mechanism to encourage energy-efficiency financing in Egypt (Hassan, 2003). The new product is based on the Development Credit Authority model of providing a guarantee of up to 50% to a financial intermediary to provide preferential financing to energy-efficiency projects. The guarantee mechanism is expected to be in place with a joint venture bank in 2003. The United Nations Development Program also has a pilot program focused on the reduction of greenhouse gases through financing energy audits, and provides a savings guarantee through local banks.

8.5. Kenya

Kenya carried out a survey of banks and financial institutions and found that the majority of them were unaware of energy-efficiency financing (Kirai, 2003). The offices of the GEF-FAM Industrial Energy Efficiency Project hired an energy consultant to explore opportunities for the establishment of ESCOs, in collaboration with energy consultants in Kenya

8.6. Philippines

The IFC/GEF Efficient Lighting Initiative (ELI) program in the Philippines, with the objective to identify model ESCO transactions that include lighting retrofit projects in the Philippines, convened ESCO symposia to provide an introductory briefing to lighting businesses on lighting, ESCO business concepts, project financing, performance contracting methods, and financing sources (Lambuson, 2003). In these meetings, the stakeholders learned about project opportunities and barriers facing lighting firms active in the commercial and industrial sectors, in order to effectively design and deliver ELI's technical assistance program for this market.

The ELI Philippines program also sought to develop a Model ESCO Contract activity involving an ESCO project between the Philippine Department of Energy (PDOE), the Development Bank of the Philippines (DBP), and ELI. PDOE will lay the groundwork for an ESCO, providing an energy audit of DBP's facilities, which will then serve as an industry benchmark. DBP has a secondary responsibility in educating retail banks in energy-efficiency project financing. Based on this activity, ELI is preparing a business plan laying the groundwork for future ESCO transactions in the Philippines.

The ELI Philippines program has been working closely with the IFC to explore loan and equity financing opportunities in the Philippine banking sector to stimulate growth in ESCOs and other energy efficiency-related businesses. Once the model transactions have been made, ELI will meet with local banks and related leasing and financing institutions that can be enticed to extend loans to energy-efficiency businesses in the Philippines.

In December 2001, a PDOE lighting retrofit was successfully completed and showcased with the aid of ELI Philippines. The PDOE retrofit is envisioned to be the pioneer in lighting retrofits accomplished by an ESCO in the Philippines, and it serves as a high-profile "efficient energy" model for other government institutions and private establishments. It also provides an example for financing organizations and government agencies involved in standardizing energy-efficient practices for the public and private sector.

8.7. Australia

Standard contract documents and a best practice guide for ESCOs have been developed and endorsed by various governments in Australia (Szental, 2003). Initially, the government was involved in accreditating ESCOs—this is now in the process of moving to an industry self-accreditation process that is endorsed by various government agencies. In addition to the development of energy performance contracting demonstration case studies, energy performance contracting facilitators are being used to provide expert advice and energy performance contracting project management

[6] More information on the HEECP program can be found at the following web site: www.ifc.org/enviro/EFG/Eeficiency/HEECP/heecp.htm.

skills for energy performance contracting clients. The government is also: (1) allowing agencies to prepare 5-year energy budgets (so that energy-efficiency projects can be paid through guaranteed savings); (2) creating a $20 million treasury fund to allow agencies to repay loans from guaranteed savings; and (3) establishing commercial leasing arrangements.

8.8. India, China, Brazil

The World Bank is funding a project on developing financial intermediary mechanisms for energy-efficiency investments in India, China, and Brazil (Cherail, 2003). Surveys have been conducted on Indian ESCOs and energy audit and consulting companies regarding their perception of ESCOs in India, and regarding ESCO projects that have been implemented. The objective of this work will be to develop a list of ESCOs for visiting China and Brazil to help promote the ESCO industry in those countries. The government of Brazil established a national electricity conservation program known as PROCEL at the end of 1985. PROCEL, housed at Eletrobras, funds energy efficiency projects carried out by state and local utilities, state agencies, private companies, universities, and research institutes. Eletrobras/PROCEL is supporting the Brazilian association of ESCOs (ABESCO) in developing a national standard for the certification of ESCOs (Lopes, 2003). In addition, Electrobras/PROCEL is following the work being carried out by a group of institutions in Brazil on (1) different mechanisms for ESCO financing, (2) the identification of energy-efficiency projects to be financed by commercial banks, and (3) the establishment of models for performance contracting and for monitoring and verification.

8.9. Japan

The ESCO business in Japan started in 1996 and has seen increased interest and activity over the years

Table 6
Sectors targeted by country

Country	Residential (%)	Commercial (%)	Industrial (%)	Agricultural (%)	Municipal[a] (%)	Other[b] (%)
Argentina	0	40	0	0	0	60
Australia	0	85	15	0	10	0
Austria	5	10	10	0	50	25
Belgium	0	10	50	0	40	0
Brazil	5	35	35	0	20	5
Bulgaria	0	0	80	0	20	0
Canada	0	95	<5	0	0	0
Chile	0	40	40	0	20	0
China	10	20	60	0	5	5
Columbia	0	40	60	0	0	0
Czech Republic	5	20	25	0	50	0
Egypt	0	30	70	0	0	0
Estonia	10	5	30	5	30	20
Finland	0	10	60	0	30	0
Germany	10	25	35	0	30	0
Ghana	0	40	60	0	0	0
Hungary	10	0	10	0	80	0
India	0	50	50	0	0	0
Italy	3	4	3	0	90	0
Japan	0	64	36	0	0	0
Kenya	0	0	100	0	0	0
Korea	4.6	52.9	42.2	0	0	0
Lithuania	0	0	0	0	100	0
Mexico	0	60	40	0	0	0
Nepal	30	30	40	0	0	0
Philippines	0	30	70	0	0	0
Poland	0	30	20	0	50	0
Slovak Republic	0	30	20	0	30	20
South Africa	15	20	25	5	35	0
Sweden	10	10	20	0	30	30
Switzerland	—	—	—	—	—	—
Thailand	0	30	70	0	0	0
Ukraine	0	0	80	0	20	0
United Kingdom	0	25	40	0	25	10

[a] "Municipal" references are city-related operations, including railways; often "municipal" was not specified.
[b] "Other" references include street lighting, other government, and public sector not municipal; often "other" was not specified.

Table 7
Most important barriers

Barrier	Country
Customers are not familiar with (informed, knowledgeable, aware) or interested in energy performance contracting (or have other priorities)	Austria, Brazil, Canada, Chile, China, Columbia, Czech Republic, Egypt, Finland, Ghana, India, Italy, Japan, Mexico, Nepal, Poland, Slovak Republic, South Africa, Sweden, Switzerland, Thailand, Ukraine
Lack of financing	Argentina, Chile, China, Columbia, Czech Republic, Egypt, Ghana, India, Italy, Japan, Mexico, Nepal, South Africa, Thailand, Ukraine
Engineering companies are not familiar (knowledge, awareness) with or interested in energy performance contracting	Brazil, Chile, Columbia, Czech Republic, Finland, Ghana, India, Italy, Japan, Nepal, Sweden
Perception of risk (ESCOs are unusual/new) (lack of confidence and trust)	Australia, China, Czech Republic, Italy, Kenya, Mexico, Sweden, Switzerland, Thailand
Lack of qualified consultants and companies (financing and engineering expertise) in energy performance contracting (EPC))	Austria, Canada, Hungary, Kenya, Lithuania, Mexico, Philippines, Thailand
Low energy prices (including: cost of electricity failing to include the full cost of production such as externalities; subsidized energy costs), leads to long payback periods	Australia, Belgium, Egypt, Ghana, Japan, South Africa, United Kingdom
Shortage of energy-efficiency technology and that is affordable	Chile, China, Columbia, Ghana, South Africa
Lack of government support, commitment and leadership by example	Australia, Canada, India, United Kingdom
Lack of interest and experience and conservative behavior of banking industry (especially local banks)	Finland, Philippines, Switzerland
Energy audits (reliance on energy audit process; energy audits are not obligatory, and they are not subsidized like in a few EU countries)	Australia, Estonia
Time delays in project implementation due to contract negotiation	Australia, Sweden
Administrative (contract definition difficulties)	Austria, Italy
Absence of real accounting and precise economic valuation of operational costs, budgeting rules	Bulgaria, Slovak Republic
Short paybacks required	Germany, United Kingdom
Banks have other fields of business and are not interested	Lithuania, Ukraine
Companies are small and do not have relations with banks	Lithuania, Ukraine
Owner-tenant split incentives	Australia
Barriers to demand management in the national energy market	Australia
Conflicts with other government outcomes and policies	Australia
Preparation costs for managing energy performance contracting	Austria
Banks are not familiar (knowledge, awareness) with or interested in energy performance contracting	Ukraine
Inertia	Belgium
Volume/scale of energy-efficiency projects	Belgium
Cost of money	Brazil

(*continued on next page*)

Table 7 (*continued*)

Barrier	Country
Limited financial capital of potential customers	Bulgaria
Unclear accounting treatment of energy efficiency contracts	Bulgaria
Third-party financing requires payoff discipline and warranties—ESCO requires some form of guarantee for timely payment of due liabilities	Bulgaria
Reliability of ESCOs	Chile
Larger economic and political uncertainty	Columbia
Older companies in industrial sector may not last very long	Czech Republic
Absence of energy codes and standards	Egypt
The market needs a lot of investment in new technology, and new technology needs to reduce energy consumption	Estonia
High transaction (information) costs	Germany
Budgeting principles in the municipal sector	Germany
Companies are reluctant to use ESCOs when core production process is affected	Germany
Low energy performance of existing systems	Hungary
Unfavorable tax regimes	Hungary
Lack of measurement and meters	India
Bidding system of government and local authorities	Japan
Lack of awareness of energy-saving potential	Kenya
Human resource development	Nepal
Overlapping of renovation needs and energy-saving issues	Poland
Lack of experience and models on how ESCOs can use environmental funds for financing	Poland
Organization and ownership structure and differing interests of managers and shareholders	Slovak Republic
Lack of credit history for both ESCO and customers	Ukraine
Existing tax/fiscal system does not encourage energy efficiency	Ukraine
Fewer energy managers—emphasis on purchasing rather than energy-efficiency measures	United Kingdom

(Murakoshi and Nakagami, 2003). There are now more than 20 companies and entities from utilities, and the ESCO business is expected to grow 50% in 2002/2003. The Japanese Association of Energy Service Companies (JAESCO) was established in 1999 and now contains 110 members. Many local authorities are considering the introduction of ESCO schemes. In March 2002, the central government announced the New Climate Change Policy Program (NCCPP) which set forth policies to reduce greenhouse gases in order to meet Japan's targets in the Kyoto Protocol. By 2010, all local authorities are required to have implemented plans for,

inter alia, improving equipment efficiency and improving the energy efficiency of buildings and offices. To realize these plans, it is expected that concrete measures, such as strengthening of standards and regulations, expansion of subsidies, and provision of tax incentives will be implemented. If these steps are adopted, then it is possible that local government programs will grow to become the largest ESCO market in Japan.

9. Conclusions

In this paper, we have shown that there is significant ESCO activity in countries outside of the United States. In some countries, some of the key mechanisms for promoting energy efficiency and ESCO-type projects are in place (e.g., ESCO industry associations, financing, measurement and verification protocols, and information and education programs). Many countries are relatively new in promoting the ESCO industry, but are interested in promoting the ESCO industry. Nevertheless, there are key policy barriers and barriers to the end user that must be addressed before the ESCO industry can flourish. We expect that countries taking steps to remove subsidies, privatize the energy industry, and clean up local pollution from industry and the power sector will be among the leaders in developing the ESCO industry.

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Appendix A

As stated in text this appendix gives details on the types of sectors targeted by ESCOs as observed in different countries (see Table 6).

Appendix B

As stated in text this appendix gives details on most important barriers facing the ESCO industry in various countries according to the survey of international ESCOs (see Table 7).

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