Transforming the "efficiency gap" into a viable business opportunity: lessons learned from the ESCO experience in Sweden

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Abstract

Energy service companies (ESCOs) are often portrayed as important change agents in capturing energy efficiency opportunities to curb global energy demand and mitigate climate change. Yet, the literature in this area is limited. While many studies analyze economic and environmental impacts from energy efficiency programs, far less attention has been devoted to evaluating managerial and other challenges for ESCOs in transforming the "efficiency gap" into a viable business. Against the broader question of how to address Demand Side Management (DSM) in a deregulated market, we explore how and the extent to which the Swedish ESCO market's development has addressed the efficiency gap. Sweden presents an interesting case study given its early experience in energy market reform as well as the rapid growth in recent years of its ESCO market. The insights garnered are especially important as Member States prepare to implement the Directive on Energy End-use Efficiency and Energy Services. By conducting in-depth interviews with ESCOs operating in Sweden (including multi-nationals), we address the following: 1) current market opportunity analysis, including how Swedish market conditions shape firms' business strategies, 2) service functions and business characteristics, with attention to perceptions regarding which market segments are considered compelling, and 3) how policy might expand the size and attractiveness of additional sectors/market segments. This analysis is informed by follow-up discussions with policymakers and other relevant players. The paper concludes with insights regarding how public intervention and support as well as voluntary private sector action may stimulate ESCO business investment in energy efficiency.

Introduction

Energy efficiency has tremendous potential to curb global energy demand and mitigate climate change. The International Energy Agency (IEA) estimated that it is possible to achieve approximately 8.2 Gt CO^2/yr savings by 2030 if a series of energy efficiency actions were implemented globally without delay (IEA 2008).

As a Member State of the European Union, Sweden has committed to achieving energy efficiency reduction targets. According to EC Directive (2006/32/EC) on Energy End-use Efficiency and Energy Services (ESD), "Member States must adopt and achieve an indicative target for saving energy of 9% by 2016". In line with the Directive's requirements, Sweden has prepared its own National Energy Efficiency Action Plans (NEEAP) for how they will achieve the target. First, the Sweden NEEAP quantified the indicative target as 14% end use savings by 2016 in order to reach the 2020 target. More specifically, it translates as follows: 41.1 TWh in primary energy use - including weighting factors to convert energy end use to primary energy – or 32.3 TWh in final energy use (NEEAP 2008). Increased energy efficiency offers significant savings potential for Sweden. The challenge now is to determine how to and who is best suited to implement these efforts.

Both the EC and Swedish government have identified ESCOs as a key player for achieving the targets within the ESD. From the outset, the Directive acknowledged likely ESCO participation: the Directive itself provided explicit definitions to standardize what constituted an ESCO, energy performance

contracting (EPC), and third-party financing (TPF). Since then, the European Commission's Directorate General–Joint Research Center (EC DG JRC) has continued its work to evaluate and recommend how Member States may spur the development of their internal ESCO markets. Within Sweden, the Ministry of Enterprise, Energy and Communications appointed an independent commission of inquiry (the Energy Efficiency Improvement Commission of Inquiry). As part of its NEEAP efforts, the Energy Efficiency Improvement Commission of Inquiry engaged consulting firm WSP Environment to prepare a report on the market for energy services, with an eye to how ESCOs might contribute to meeting national targets (Bratt, Farelius, Petersen 2007).

Against the broader question of how to address Demand Side Management (DSM) in a deregulated market, we explore the extent to which the Swedish ESCO market's development has addressed the efficiency gap. The key question for this paper is to understand the managerial and other challenges for ESCOs in transforming the efficiency gap into a viable business. Through a series of first-hand interviews with ESCOs currently operating in Sweden as well as companies considering an entry to the energy service market, we evaluate: 1) current market opportunity, including how Swedish market conditions shape firms' business strategies, 2) service functions and business characteristics, with attention to the perceptions regarding which segments of the energy efficiency market are considered compelling, and 3) how policy (including certification and accreditation efforts) might expand the size and attractiveness of additional sectors/market segments. This analysis is informed by follow-up discussions with policymakers, customers, and other relevant players. The paper concludes by applying these insights to consider how Sweden might more effectively implement programs to support the ESCO market and achieve the ESD target reductions.

Terminology

As noted earlier, the ESD created a standard set of definitions for ESCOs, EPC, and TPF. Since then, the Swedish Standards Institute (SIS) has been working with the European Committee for Standardization (CEN) and its 30 National Members to develop a voluntary European Standard for the definition and essential requirements of energy efficiency services. For the purposes of this paper, we will use the same set of definitions from the ESD, as follows:

- 'energy service': the physical benefit, utility or good derived from a combination of energy with energy efficient technology and/or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to lead to verifiable and measurable or estimable energy efficiency improvement and/or primary energy savings;[1]
- 'energy service company' (ESCO): a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria;
- 'energy performance contracting' (EPC): a contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement;
- 'third-party financing' (TPF): a contractual arrangement involving a third party — in addition to the energy supplier and the beneficiary of the energy efficiency improvement measure — that provides the capital for that measure and charges the beneficiary a fee equivalent to a part of the energy savings achieved as a result of the energy efficiency improvement measure. That third party may or may not be an ESCO. (Directive 2006/32/EC).

There is an important caveat to our use and understanding of these definitions. Among EU Member States, there is an ongoing debate about what constitutes an "ESCO" that is a by-product of national issues regarding energy efficiency programs. Case in point: when Italy implemented a favourable national policy for ESCOs, over 160 companies adopted the moniker and were registered in 2005 as an ESCO with Autorità per l'Energia Elettrica e il Gas (EC DG JRC 2007; Interviews 2008-2009). Thus, developing a more stringent definition around ESCOs has been important to many Italian policy makers. In contrast, we are hesitant to apply too narrow of a definition when evaluating the growth of Sweden's ESCO market. For example, some consulting firms provide fixed fee consulting services to clients engaged in large, municipal projects. These companies play an important role in understanding the Swedish ESCO market development. Such services are different than a consulting firm that provides a client with a turnkey EPC solution. To exclude these actors from the discussion, however, would underestimate their influence on the Swedish market as well as the number of actors involved. While we use the ESD definition, we also discuss these associated service providers.

Background and History

The current resurgence of interest in ESCO market development in Sweden must be understood within its broader history of false starts, which followed major transformations in the Swedish energy market. First, the oil crisis in the 1970s spurred interest in energy conservation. In the early 1980s, companies experimented with energy performance contracting in Sweden. Electricity savings became a focal point during the 1980 public referendum to phase-out by 2010 nuclear power plants in Sweden. The Swedish Parliament subsequently voted the referendum into law. Approximately 50% of Sweden's electricity generation was (and still is) from nuclear, so the phase-out would require a major transition. Public and company interest greatly favoured end-use efficiency as a means to reduce the large growth in electricity demand that was forecasted in Sweden. During this time, the electricity market was still regulated.

1. In this paper, we use the terms energy services and energy efficiency services interchangeably.

Table 1. Prices on electricity, time series

The table shows a time serie over the prices on electricity for different kind of consumers. Price at 1st January ore/kWh excluding taxes. Prices on electric energy includes green certificates from 2007. Note: 100 ore = one SEK.

Type of consumer *Average price per kWh, …re (excluding taxes)*													
Home Type	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Dwelling, flat	28.2	29.2	29	27.1	25.8	27	35.6	51.9	55.8	48.2	54.4	76	72.1
One- or two dwelling house without electric heating	26.7	27.6	26.8	26.3	23.4	24.2	31.6	47.1	50.7	42.5	48.1	69.4	65.5
One- or two dwelling house with electric heating	24.7	25.9	25.1	24.4	21.8	22.5	29.6	44.7	48	39.7	45	66.1	62.2
Agriculture and forestry	23.7	24.9	24.1	23.1	21.4	22.1	29.3	44.5	47.5	39	44.5	65.9	61.7
Business activity	-	25.8	24.5	23.3	21	22.1	28.8	43.6	46.7	38.3	44.1	65.3	60.9
Small industry	24	25.6	24.1	22.8	20.4	22	28.5	44.3	45.7	37.8	44	64.7	60.7

1) 1996 - 1999 sale due to agreement on consession price, 2000 - sale due to agreement on standard price

Source: Statistics Sweden

While Sweden did not have any DSM regulation or incentives per se, some utilities began to offer energy efficiency services to industrial and commercial sector customers (Bergmasth, Nilsson, Strid, 2000).

Throughout this same time, HVAC equipment and HVAC entrepreneurs developed many of the first EPC contracts (Forsberg 2007). However, many of these contracts were relatively unsophisticated. Contracts often failed to establish energy saving targets, and focused instead on energy costs. Falling oil prices in the mid-1980s stymied further development. A lack of understanding about the need to train onsite people also hampered the successful implementation of these contracts. Instead, customers came to view the promises of EPC in a negative light, earning them the reputation of "freezing in the dark" (Forsberg 2007). Many of these 1980 experiments had over-promised and under-delivered in their energy and cost savings, creating a legacy of distrust among customers.

During the 1980s and early 1990s, utility companies, like Vattenfall, experimented with providing energy efficiency services to customers (Interviews 2008-2009). The range of energy services they provided included energy audits, proposals, ventilation, cooling, as well as EPC. Because electricity prices were regulated, these energy services were considered an important component of the package that utilities could offer to customers for negotiation or provide as a standalone service. But energy services provided only a small revenue stream: they were not a substantial part of the overall business.

ENTER DEREGULATION

A new era of market deregulation for the Swedish electricity market began in 1996. Many analysts expected the introduction of retail competition to usher in a new era of commercial value added services, including energy services. But initially, the price of electricity dominated customers' concerns. Several especially rainy years yielded excess hydropower, and energy prices in Sweden – especially electricity prices – fell, reaching a low in 2000. See Table 1. With record lows in energy prices, energy efficiency lost favor among customers.

In recent years, the nexus of rising energy prices, climate change concerns, and a favourable policy environment has elevated energy efficiency to become a top priority within the public sphere. Since 2000, Sweden's ESCO market has experienced rapid growth, with an estimated turnover of 50-60 M Euro/year in 2005-2006 (Svensson, 2006, as referenced in Forsberg 2007). There has been a resurgence of demand for ESCO and EPC services, especially within the public sector. According to an analysis of public sector EPC projects implemented in Sweden since 2000, these projects yielded an average savings of 22 percent for heating and hot water (NEEAP 2008).

Attention at both the EU and Swedish national level has also contributed to the expansion of and demand for ESCO and EPC services. Previous European Commission Recommendations and Directives (e.g. Directive 93/76/EC, Directive 2002/91/EC, and Directive 2005/32/EC) have indirectly and directly promoted ESCOs, EPC, and TPF (EC DG JRC 2007). But the Energy Services Directive itself has fostered a new sense of urgency for the energy services market within Member States like Sweden.

Research Methodology

Perceptions matter. Thus, this paper aims to evaluate the challenges and opportunities for ESCOs in Sweden by focusing on how these businesses interpret the current market development. The paper includes both a review of secondary literature on the subject and primary research – namely, interviews with representatives from 19 of the ESCOs operating in Sweden.

Given the broad range of potential applications and considerations for energy efficiency, the scope of this paper will be limited to the housing and services sector (i.e. buildings) to allow for a deeper level of analysis. The housing and services sector encompasses approximately 590 million square metres of buildings, which is almost 40 percent of energy end use in Sweden and approximately 42 percent of national energy end use covered by the EC Directive (NEEAP 2008). Still, it is important to note that some companies interviewed provide ESCO services to industry.

SURVEY DESIGN

Where possible and appropriate, we sought to align our efforts with existing research to allow for comparison. Questions from the 2005 international survey of the ESCO industry as well as the ongoing ESCO market surveys by the EC DG JRC were used as the foundation when we developed the standard set of our interview questions (Vine 2005; EC DG JRC 2007). The survey included three components:

Part I: Quantitative Data for Current Market: companies were asked to provide quantitative data regarding market sector focus, annual financial value of ESCO projects, and project size. These questions were based on the format of the 2005 international ESCO survey.

Part II: Services Offered and Business Characteristics for ESCOs: companies were provided a list of service functions and business characteristics to describe ESCO activity. They were then asked to explain which of these items best characterized their company's current activities. These were the same descriptions used by the EC DG JRC for their ongoing database surveys of international ESCO activity.

Part III: Industry Development Discussion Questions: we developed a series of open-ended questions intended to generate discussion about the current ESCO industry structure and trends. The analytical framework for this part is inspired by Porter's Five Forces approach to analyzing the industry forces that drive competition (Porter 1980). However, we used a modified version of Porter's model. First, instead of looking at the bargaining power of component suppliers, we evaluated the relative bargaining power of the ESCOs as compared to the customers. We felt this distinction offered richer insights into the relationships influencing market development. Moreover, the section on industry level of competition includes discussion about issues with component suppliers. Next, Porter's model does not single out the potentially powerful role of government and regulations within an industry. Given the impact of policies, such as the ESD, on ESCO market development in Sweden, additional questions were included to further assess the role of policy on industry growth. Thus, discussion questions considered the following topics:

- Bargaining power of ESCOs
- Bargaining power of customers
- Industry level of competition: rivalry among existing firms
- Threat of new entrants
- Threat of substitute products or services
- Role of policy in stimulating market activity

During the interviews, we inverted the order of the survey components (i.e. Part III, the discussion questions, was used at the beginning and we then moved into the specific questions about service functions and then to the questions about financial information). However, within the paper, we felt it made more sense to provide the results in the order listed above.

INTERVIEW PROCESS

Interviews were conducted between October 2008 and March 2009. We initially contacted company representatives via email. The interviews were then conducted either in-person (55%) or via phone (45%). At least one person per company was interviewed. In the case of the larger companies, multiple people were interviewed. For multinational companies, we sought to include perspectives from representatives in the Swedish business unit as well as the parent company. Interviews typically ran between one to two hours. Prior to the interview, we reviewed the company's annual reports, press releases, and website. Based on this secondary information, we supplemented the standard survey with additional questions and/or more specific questions regarding the company's current activities.

At the end of each interview, we asked interviewees for additional contacts within their company and at other companies. This process, the so-called snowball technique, expanded our network contact and helped us to learn about new companies that had recently entered the market (Jacobsen 2002).

When we began the interviews, some ESCOs were at first wary of questions that asked them to talk about topics like their company's unique value proposition or who they saw as their competitors. We explained that this study was purposefully designed from a business orientation in its language and structure. Moreover, we sought to reassure them that we would protect their anonymity and respect their requests that certain comments be treated as confidential (i.e. general insights are shared, but not all the specifics). Even so, there were gaps in the information that ESCOs felt comfortable providing.

To provide a more robust understanding of the current situation, we conducted additional interviews with relevant stakeholders including government authorities, agencies, customers, and non-customers (i.e. examples of companies who have opted not to pursue ESCO assistance for energy efficiency projects). While a comprehensive review of customer and policymaker perceptions regarding ESCOs is beyond the scope of this paper, these interviews highlighted additional considerations.

A list of interviewees is provided at the end of the paper. However, specific comments included in the paper are anonymous and interviewee sources are not cited individually. Unless noted otherwise, for the rest of this paper, all information comes from interviews conducted between October 2008 and March 2009 with 44 individuals, representing 19 ESCOs as well as customers, government agencies and other relevant actors.

Survey Results

QUANTITATIVE DATA FOR CURRENT MARKET

This section discusses key findings and insights generated by Part I (Quantitative Data) of the survey. As interviews confirmed, a wide range of local and multinational ESCOs now serve the public and private markets in Sweden. There were an estimated 12-15 ESCOs, in Sweden in 2006 with an annual turnover of approximately 50 million Euro (EC DG JRC 2007). We found evidence of at least 27 companies currently engaged in the provision of ESCO services in Sweden. See Table 2[2].

However, while we are sure that the market has increased, the numbers on annual turnover and number of actors (12-15 in 2006 and 27 in 2008) are not entirely comparable. Previous studies only listed number of actors: they did not cite the specific company names or discuss any issues with how in-country sources identified these actors. Similarly, the 2008 annual revenue and previous estimates are rough approximations. We

2. The data on annual revenue and range of deal size is based on information gathered from the interviews with 19 ESCOs operating in Sweden. However, the data set is incomplete: some companies declined to be interviewed and/or if they were interviewed, declined to provide this information. Thus, the number for 2008 annual revenue is artificially low: only 8 companies reported this data. Similar omission issues also affect the figures for range of deal size (i.e. the minimum and maximum deal sizes reported). Since different categories of ESCOs use different metrics to evaluate deal size (square meters, monetary units), it creates further challenges for developing a common view of market growth.

Table 2. Summary of basic data regarding the Swedish ESCO market

Number of ESCOs	27
Type of ESCOs	Local and multinational
ESCO association	No
Annual Revenue (2008) for ESCO projects	*72 million Euro in 2008 *The 'real' number is larger, because only 8 companies reported data
Range of deal size	10,000 to 900,000 square meters

do not have data from all 27 companies: some companies did not respond to the interview requests. Of the 19 companies interviewed, only 8 companies provided financial information. Thus, 72 million Euro is only the 2008 revenue from 8 companies with an estimated 50-70% market share.

Multinational ESCOs commented that the growth rate for their Swedish energy service business unit is among the fastest in Europe, if not the fastest. However, given the relative size differences between countries, certain markets, like the United States, may still outpace the Swedish business in absolute dollar terms. Even among the other Nordic countries (Denmark, Norway, Finland) that are part of the common NordPool wholesale electricity market, Sweden's ESCO growth is noteworthy. While Sweden generally falls between Denmark (highest) and Norway (lowest) in terms of additional energy taxes layered onto the NordPool prices, customer demand for energy services has been much higher in Sweden, according to ESCOs.

QUALITATIVE DATA FOR CURRENT MARKET

Analysis of Energy Services Offered and Business Characteristics of ESCOs

Since 2000, there has been a rapid growth in the number and type of ESCOs operating in Sweden. We identified at least 27 companies engaged in the provision of energy services, from companies already doing a large amount of business to companies planning to launch new energy services business units within the coming year. These 27 companies may be classified according to four broad categories, including: 1) building controls, automation, and control manufacturers; 2) facility management and operation companies, 3) consulting firms, and 4) energy supply companies (Bratt, Farelius, Petersen 2007). See Table 3[3] for ESCOs operating in Sweden, by category. While the majority of the companies on the list are already providing energy services, a few energy supply companies listed do not yet provide services, but are actively planning to provide such services within the next year. Keep in mind that this list is dynamic and it should be viewed as a snapshot of a changing and evolving market.

While building and controls manufacturers were early pioneers in the Sweden market, facility management companies also found a fit with the business model for providing energy services. Since then, consulting firms have also entered the market, offering a broad range of services from assistance with the public procurement process (e.g. a fixed fee service to complement an EPC project) to delivery of turnkey EPC projects for customers.

In the past 15 years, only a small number of energy supply companies remained continuously active in providing energy services. Typically, the large energy supply companies focused on providing energy services to their large, industrial customers. Smaller energy supply companies, (e.g. Göteborg Energi) developed energy services mainly for municipal property owners. There has been a resurgence of interest among multinational and municipal energy supply companies to further develop or restart these businesses (some of which were sold off or terminated at the end of the 1990s when energy prices fell).

Among the energy supply companies, there was discussion about how to interpret the language in the ESD and whether it would require action from them, according to Svensk Energi, a non-profit industry organization representing 335 companies involved in the production, distribution and trade of electricity. While Sweden is further along with market deregulation than other Member States, the ESD noted that liberalisation has not led to significant competition in products and services aimed at demand side management. According to the ESD preamble, "Member States should have the option of making it compulsory for energy distributors, distribution system operators or retail energy sales companies or, where appropriate, for two or all of these market actors, to provide such services and to participate in such measures", (2006/32/EC). This led to speculation among energy supply companies that the implementation of the ESD in Sweden might involve specific requirements for them. Ultimately, the Inquiry from the Swedish government did not include specific requirements for energy supply companies. But in the meantime, it sparked discussion among energy supply companies about developing energy services. In fact, a few companies said the ESD inspired them to move forward with a new ESCO unit.

To discuss what types of services companies are providing, we used a list of service functions and business characteristics developed by the EC DG JRC for their ongoing database surveys of international ESCO activities. Based on the interviews, we gathered information regarding the most common activities for ESCOs. See Table 4.

Almost all companies offered some form of TPF as an option – either through an internal financing division at their company or through arrangements with banks. However, TPF remains a relatively small part of the overall ESCO business in Sweden. Most customers – especially those in municipalities and regional administrations - preferred to use their own money or arrange the financing from another source: they were able to secure better credit terms than what companies could offer. The lack of customer interest in TPF was a surprise to many of the ESCOs; they had developed different offerings (either

3. The information regarding number of employees worldwide, countries/regions of operation, and 2008 turnover was gathered from information on company websites and from their annual reports. Figures for annual turnover include all business activity (not just energy services) and were converted from USD and SEK to Euro based on historical exchange rates from 12/31/2008.

Table 3. Companies Providing Energy Services in Sweden

Category	Company Name	Worldwide Employees	# of Countries for Operations	2008 Total Turnover (million Euro)
Building Controls, Automation, and Control Manufacturers	1. ABB	120,000	100	25,082.25
	2. Bravida	8,100	3	958.68
	3. Honeywell	128,000	100	26.29
	4. Johnson Controls	140,000	125	27,345.34
	5. Siemens	430,000	190	77,300.00
	6. TAC	8,000	80	1436.88 (2007)
Facility Management and Operation Companies	7. Coor Service Management	4000	5	595.00
	8. Dalkia	54,834	38	7878.70 (2007)
	9. Vesam AB	N/A	Sweden	N/A
	10. Skanska	60,000	16	13,133.89
	11. YIT Energy Management	25,057	14	3,940.00
Consulting Firms	12.Bengt Dahlgren AB	250	Sweden	N/A
	13. Grontmij (formerly Carl Bro AB)	7,000	9	720 (2006)
	14. Manuel SwŠrd, Mersam	N/A	Sweden	N/A
	15. Sweco	5,500	15	3,951.43
	16. WSP	10,000	35	7,820.00
	17. F Performance Partner AB	4,500	21	419.55
Energy Supply and Service Companies	18. BorŒs Energy	N/A	Sweden	0.02
	19. Eneas Energi	300	3	N/A
	20. E.On Sweden	6,000	5	3.41
	21. Fortum	8300	10+	5,636.00
	22. Gšteborg Energi AB	1,097	Sweden	365.67
	23. Kalmar Energi	100	Sweden	0.06
	24. MŠlarenergi	559	Sweden	0.22
	25. Telge Energi	N/A	Sweden	N/A
	26. Vattenfall	32,801	8	15,041.04
	27. VŠxjš Energi	158	Sweden	0.05 (2007)

Table 4. Common Types of ESCO Services and Prevalence in Sweden

Service Functions	Description	Prevalence in Sweden
Project Identification & Appraisal	Preliminary audit and selection of a number of energy saving options applicable.	Always
Project Technical Design	Detailed design specifications of the energy saving measures.	Always
Project Implementation	Identification of supplier companies, management of installation works and commissioning.	Very common, though outside assistance may be required.
Project Financing or Third-Party Financing (TPF)	The ESCO may finance up-front capital improvements in exchange for a portion of the savings generated or give a saving guarantee to the client to be used to get credit.	Rarely. Though most ESCOs have an offering, few customers seek it as a service provided by ESCOs.
Guarantee of Performances	The ESCO is prepared to accept the part of technical and financial risks that it can control. The performances are measured and verified according to a contractually defined Protocol (monitoring and verification Protocol).	Common. Companies offer a wide array of contract types, from guaranteed maximum kWh output up to full EPC.
Operation Service	Management and/or maintenance of the equipment for a time period, which can be either the test period or a longer one, as contractually stipulated.	Always among facility management ESCOs. Others may not, but still support / train customers.
Purchase of the Fuel / Electricity	The ESCO can take care of purchasing the fuel or electricity and selling to the customer. In some cases (though much less common), the energy service may be sold to the client in terms of heat, cool, lighting, etc.	Common among energy supply company ESCOs. Other companies may help negotiate contracts.
Insurance Coverage	Depending on the type of Guarantee of Performance given to the client, the ESCO can, in turn, be insured against events that can imply financial penalties for the ESCO.	Almost Never

in-house or with banks) in anticipation of customer demand. By the same token, it was relatively unheard of in Sweden for companies to purchase insurance coverage against events related to the performance guarantees that could imply financial penalties for the ESCO. It is important to note that while some companies (those that are not energy suppliers themselves), may help customers to negotiate energy contracts, there was not a trend of non-energy supply companies looking to sell energy, too.

In order to develop the necessary expertise to provide this range of energy efficiency services, companies adopted a wide variety of approaches, including acquiring companies, hiring skilled individuals from already established ESCOs, and/or developing their own in-house training programs for new employees. During the interviews with current ESCOs, we asked about their own backgrounds. Interestingly, many had worked for several other ESCOs. Since there is pent-up demand for skilled people within the industry, individuals frequently move between companies. While many Swedish industries anticipate a Baby Boomer exodus as large number of workers approach retirement in the coming years, companies said that their energy service divisions do not follow this trend: the average age of their worker is generally younger than in other divisions and departments.

While the overall Swedish market has grown in size and number of ESCOs, these companies focus on serving an increasingly segmented group of customers. Case in point: some companies currently have over 90% of their business in the public sector. The public tendering for large projects continues to be dominated by a small number of firms. As one ESCO noted, "I call the Swedish market like a Klondike. In the beginning, before the gold seekers came, only 10-15 people were running around, finding a huge amount of gold. Years later, you had 10,000 people in it, and the market was different. Right now we are only 4 or 5 companies in Sweden …. competing … [for public sector] big energy projects". While the large size of the public sector projects may make it an attractive market segment, smaller ESCOs often remarked that they opted not to play in this already highly competitive market. Instead, these companies have focused on establishing their own unique niche amid the large private market. While ESCOs commented that the private market is characterized by a much longer sales cycle, they also noted that it is quite a large market that allows for a diverse array of companies. One ESCO commented that they do not frequently encounter other sales team when competing for the private sector projects.

Although a 2007 report on ESCO activity across Europe found that the residential sector is becoming attractive for ESCOs in some countries, the relatively lower level of shared savings per transaction for individual households compared with the higher transaction costs creates ongoing challenges (EC DG JRC 2007). Not surprisingly, the private residential market in Sweden continues to be largely ignored by ESCOs, with a couple of notable exceptions. There are 1.7 million small houses in Sweden (including agriculture and permanently occupied weekend residences), representing 260 million square meters (NEEAP 2008). ESCOs reported some success with multi-unit dwellings and/or municipal owned cooperatives. This niche within the residential market is especially compelling because of the extensive retrofits required. Approximately 60 percent of the 165 million square meters in multiple-unit dwellings require renovations in the next 10 years (NEEAP 2008).

Analysis of Industry Development

Key Market Drivers

Through the extensive interviews with ESCOs, we gained insights into their perspectives regarding the key drivers for market development. Although it may be hard to isolate a single "cause", they commonly cited a combination of factors and timing that influenced the rapid growth in Sweden's ESCO market since the year 2000. First, the recent rise of energy prices in Sweden (the last six months non-withstanding) played a powerful role in the renaissance of interest in energy efficiency services. Energy bills could no longer be ignored. In many cases, facility managers were no longer able to stay within their operating budget. Moreover, the timing of energy price increases coincided with rising environmental concern that brought energy issues to the attention of top management.

Propelled by climate change concerns, the political will for action is incredibly strong among Swedish policymakers and companies. While energy efficiency has been a core part of many companies' products and services for years, ESCOs said that they are highlighting it more and more. Interestingly, many ESCOs commented that their own energy efficiency efforts connected with a larger company commitment, strategy, "green image," and/or brand around demonstrating environmental responsibility. One ESCO remarked, "I thank Al Gore every day for our business". Another company reported that when "An Inconvenient Truth" was released, they sent copies to potential customers. These issues will be discussed in greater detail in the sections below.

Bargaining Power of ESCOs

The early history of Swedish ESCOs failing to deliver expected savings continues to influence their behavior today: building mutual trust is paramount to the success and future growth of this industry, as stated/testified by almost all our informants. The business model is based upon the notion of shared risk and reward in energy savings for multi-year contracts that might extend for as long as 12-15 years. The risk is that if/when a company is unable to deliver something they guaranteed, it creates a bad name for the entire industry. As one ESCO remarked, "We are very, very respectful to not get in an unserious place in the market because it will destroy the reputation of what we are doing and this [EPC] concept". Many ESCOs spoke about the power of word-of-mouth marketing between their previous customers and potential customers. Such interactions among customers provide a powerful reason for ESCOs to self-regulate their behavior.

"Proving" energy savings is at the cornerstone of the ESCO business model. Many early EPC projects experienced problems because it was expensive and complicated to measure and verify energy savings. Early contracts often relied on estimates, which became especially contentious when energy prices fell. Since then, technology has developed, driven by new software and hardware options that did not exist in the 1980s. Today, new possibilities, such as remote monitoring of buildings, make

it easier and cheaper to measure and verify savings. ESCOs can detect issues much earlier and engage in ongoing discussions with customers to optimize projects. "We don't wait until you get the energy bill one month later… Going 5 or 6 weeks afterwards and doing something, that is too late. You have to do it day 2 or day 3. At least within the same week. In our opinion, you have to have these remote centers to watch your buildings and the systems to have a discussion with the organization inside", said one company. Some customers still prefer face-to-face meetings with ESCOs and monthly/quarterly/annual reports of energy savings. But increasingly, reports are provided in electronic format and/or through web-based interfaces.

Bargaining Power of Customers

Lack of knowledge remains a significant challenge for closing the efficiency gap and developing customers to become savvy consumers of energy services. There is an ongoing gap between potentially profitable energy efficiency measures and those actually undertaken. According to a 2005 investigation by Chalmers Energy Center (CEC), only 15% of efficiency measures in buildings that are apparently profitable are carried out, even with existing instruments (Report CEC 2005:1; SOU 2008:110)[4]. Yet, many customers do not respond favorably when ESCOs broach the subject of missed efficiency opportunities with them. Many ESCOs described a situation like the following: suppose there is a facility manager who has been making modest improvements of 2% in energy savings every year for the last 20 years, though he/she does not receive any specific financial incentive for saving more energy. Then, one day an ESCO comes and says they can do 25% in energy savings. Not surprisingly, the ESCO is often met with skepticism - at best, or hostility - at worst. Not only are there valid concerns about whether the ESCO can deliver such a grand plan, and how much work it will take, there are other, not inconsequential concerns such as, "Am I going to look bad for having missed this huge opportunity?".

Another common objection from potential customers is that they can do this work themselves. A change of customer mindset is often needed, according to ESCOs. Even if a customer has two skilled people doing very good work, it might take them 10 years to do the same thing an ESCO could do in two years. Instead of seeing it as losing money or lose savings to an entrepreneur, customers are encouraged by ESCOs to consider the accumulated savings they could achieve during those 10 years. Still, in some cases, customers demonstrate a cultural or institutional opposition to the idea of a company making money and profiting from their energy savings. "Not doing anything, at times, is more accepted than doing something," one company noted in describing this Swedish stubbornness.

Because of the issues with gaining acceptance and creating comfort among customers for energy services, the initial sales cycle for projects is often long and challenging. In response, ESCOs are developing increasingly sophisticated sales and marketing departments. For example, while a facility manager may have direct responsibility for energy use, many other stakeholders (i.e. those higher up within the organizational hierarchy) are typically involved in the decision-making process for an ESCO project. Thus, sales and marketing departments focus on identifying these stakeholders and building relationships throughout the customer's organization to "sell" the project internally.

Although the technical aspect of ESCO projects may not change in different countries, cultural differences do affect the sales process. For example, one multinational company noted that in Sweden, building owners or property managers typically play a leading role in contract negotiations for commercial projects. As a result, they focus on visits to building owners to develop projects in Sweden. In comparison, the company found that architects and consultants play a more dominant role in Denmark, so they need to persuade these stakeholders about the project's merits much more than they do in Sweden.

Other groups have focused on customer education to facilitate the uptake of energy services. A few Swedish consulting companies have developed a specific business practice around assisting customers throughout the public procurement process for EPC projects. The consulting firms typically focus on public sector projects and help customers to understand the public tendering requirements and avoid potential pitfalls with EPC projects. For example, consultants may help to reorient facility managers who are used to looking at typical maintenance costs to now think about investments in terms of balance sheets. Several other organizations have also developed materials to help assist customers seeking energy services. For example, Swedish Environmental Management Council (Miljöstyrningsrådet) is developing a new handbook to help municipalities with EPC procurement. The Swedish Association of Municipal Housing Companies (SABO), which represents the 300 public housing companies that manage 20 percent of the total housing stock in Sweden, has also been interested in ESCOs (SABO 2009). SABO has developed its own set of advisory materials based on customer experiences to recommend when an EPC project may or may not make sense.

Finally, customer education and support remains an important priority throughout the project lifetime. To maximize energy savings potential, customers need training in new technology and in how to align occupant behavior (i.e. for both the tenants and building operator). One ESCO noted, "You can put in the technology and do all your best but I think you have to make people understand why we are doing it and how they can contribute or participate in this".

Industry Level of Competition: Rivalry Among Existing Firms

While the number and type of competitors have grown, the rivalry among existing firms is marked by competition and cooperation. A common misconception is that ESCOs that originated in the building controls and automation business require customers to use their equipment and products. While some ESCOs are vertically integrated companies (i.e. they manufacture the equipment and perform the energy services), they do not demand product lock-in from customers. In fact, the energy services groups within these larger companies are typically separate business units – even located on different floors or in different buildings from the rest of the company. Customers may have pre-existing systems that they would like to continue

4. Two important caveats should be noted. First, the CEC report's calculations are based on engineering related costs (i.e. costs related directly to the investment). If other costs (e.g. transaction costs or knowledge acquisition costs) were included, it would reduce some parts of the profitable actions. Second, the report found significant differences in the degree of implementation of profitable actions among different categories of buildings, with a variation between about 5 and 35 percent.

to use, and the ESCOs comply with these demands. "If we had the choice to change something, of course, we'd be happy to install our component. But if the customer has other requirements, we need to follow them", said one building controls and automation ESCO.

Because following energy usage is key to energy efficiency projects, interoperability and open protocols have become an important industry trend. Building control and automation companies noted that products use open architecture so they can work with other manufacturer's components to manage energy use. Moreover, they said that being open to all products is key to their company's success and a requirement for most public tenderings. For example, companies may have competed during the public tendering process for a municipal project. But once the contract has been awarded, the winning company may actually work with one of the other companies to procure products and equipment from them. This phenomenon may then occur in reverse with the two companies switching the supplier and buyer roles.

At the same time, ESCOs are careful to keep discussions with customers focused on quality dimensions, rather than price. The ESCO market is not – and should not be – viewed as an industry driven by low bid competition, according to companies. Because the range of efficiency opportunities may vary greatly among individual buildings, many ESCOs commented on the importance of customers understanding the need for high-quality audits. As one company said, "We have some customers that want to do price, but we can't do a price competition. Now, we can have agreed to rates and things like that, but until we come in and do an investment grade audit, we don't know what we're going to do. Plus, we take all of the design and performance risk".

One area that is very competitive among existing ESCOs in Sweden is finding enough qualified people to meet the growing demand for energy services. "You have a lot of engineers in Sweden and very, very skilled engineers. But then you talk about energy engineers – in the terms we talk about energy engineers. And I would say you have maybe 20 in all of Sweden", commented one ESCO. While several companies have engaged with universities to discuss long-term training, they noted that the response has been mixed. Some companies reported more success with some smaller universities – notably, Västerås, Gävle, Umeå – that have developed new programs emphasizing energy efficiency. In the meantime, the more immediate tactic has been to devote significant company resources towards mentoring and designing in-house training for new hires to develop the necessary skill sets.

Threat of New Entrants

The timescale of ESCO projects and "trust" issues may present a barrier to entry for new companies. Paybacks may occur over a 3 to 15 year period. Both customer and ESCO must 'survive' to benefit from these savings. This may function as a deterrent for customers to engage with new entrants, especially with companies that lack an established reputation and/or whose longevity may be considered questionable. Most of the newcomers to the Swedish market for energy services already have other, well-established businesses in Sweden or in other countries. To-date, we have not identified an ESCO that is an entirely "new" business.

Requirements for public market EPCs are much more complex and represent a threshold that could present a barrier for new companies. While laws regarding public market tendering are designed to ensure that the public money is well spent, the demands for showing 'experience' may also hamper new companies from being qualified as a contender. Moreover, the rules and regulations for public projects can be quite complex. Case in point: one company noted that a private market tendering might only have 5 pages of rules and regulations. In comparison, a public market tendering might have as many as 50 or 100 pages of rules and regulations. Depending on the scope of the project, it may also be harder for a small company to demonstrate "experience" in all of the areas required. One potential solution that has been used in some public tendering is to allow for a group of companies to partner together on a project and pool their collective experience for consideration.

Threat of Substitute Products or Services

While a variety of non-financial factors helped to motivate ESCO projects, companies noted that higher prices played an influential role in the ultimate customer decision to proceed with a project. Since this research began in fall 2008, energy prices globally and in Sweden have fallen, although electricity prices are likely to remain relatively high. The risk is that lower energy prices may reduce the immediacy of cost concerns regarding energy use and the resulting demand for energy services, according to ESCOs. For example, a customer can receive light with much electricity and incandescents or with less electricity and CFLs. Here, a "substitute" to buying the more efficient CFLs would be to proceed with the lower efficiency, "business as usual" operations, which use more energy (i.e. maintaining higher electricity costs rather than incurring higher capital costs to make the switch). Given the challenges in "selling" ESCO projects to potential customers, companies expressed concerns that falling energy prices may lower the priority of efficiency efforts within organizations and result in projects being delayed or cancelled. But other aspects of the financial crisis, such as record low interest rates and increased cost containment concerns, may serve as a counterweight to falling energy prices in motivating energy efficiency projects.

Role of Policy in Stimulating ESCO Market Activity

Even before the 2006 ESD, a series of public programs and policies played an instrumental role in catalyzing the ESCO market in Sweden. These EU and Swedish government public programs and policies included investment subsidies, information campaigns, and energy labelling efforts. Meanwhile, a modest 1380 k Euro in public spending was used between 2001 to 2006 for a series of initiatives to kick-start Sweden's ESCO market, including ground studies, market studies, guidelines for procurement and model contracts, pilot projects, direct client oriented information, as well as information and capacity building efforts (Forsberg 2007). Since then, new policies around standardization, accreditation, and certification are also under discussion. These efforts will be reviewed in greater detail in the following section.

Investment subsidies played a powerful role in making energy services even more attractive for many municipalities. Indeed, the public sector became a rapidly growing market for ESCOs in part due to the generous subsidies for energy effi-

ciency projects. Between 2005 and 2008, the OFFROT program provided SEK 2.0 billion in investment support for a number of end-use actions targeting energy efficiency improvement and conversions to renewable energy sources in public, non-residential buildings. EPC was not a requirement for OFFROT funding, nor did the program track whether a recipient worked with an ESCO. However, some projects that received funding from OFFROT did utilize EPC, though the actual number of OFFROT projects that used EPC is unknown. In addition to the OFFROT funding, the Swedish Environmental Protection Agency's Climate Investment Programmes (KLIMP), offered approximately 214,9 million Euro (SEK 2.0 billion) between 2003 to 2008 for 126 climate investment programmes as well as 22 special ones called 'guldklimpar,' (i.e. gold nuggets) (Naturvårdsverket 2008). KLIMP subsidies were not reserved just for government buildings. Municipalities, municipal associations, county councils and companies across Sweden were eligible. (Naturvårdsverket 2008). As a result, some ESCO clients received government support for up to 30% of investment if the project fulfilled energy savings requirements to reduce greenhouse gases (Interviews 2008-2009).

Several other EU and Swedish policies have also helped stimulate the current ESCO market growth. New EU and Swedish regulations around 'Energy Declarations' helped some ESCOs to get a foot in the door – literally. The related Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings and Sweden's National Programme for Energy Efficiency and Energy-smart Construction (Govt Bill 2005/06:145) led to a market in energy declarations. When the Buildings Energy Certificate Act came into force in October 2006, public activities (i.e. special buildings) and multi-dwelling buildings (i.e. apartment blocks) were required to complete an audit to fulfill an energy declaration by the end of 2008. Many ESCOs sought accreditation to provide these energy declarations. Today, the energy declarations continue: as of 1 January 2009, other buildings are required to complete the energy declarations audit process.

For some ESCOs that participated in the program, energy declarations were an important vehicle for marketing and/or internal development. While the rules around energy declarations forbade companies from issuing a commercial proposal to a client in the course of completing an energy declaration, the process could serve as a long-term lead generation program for identifying new prospects and future work. Moreover, providing energy declarations could help to build overall company reputation and brand. According to some ESCOs, being an authorized provider of energy declarations provided recognition at some level – a stamp of approval, if you will - from the government that they were a credible company. Another company observed that the energy declarations provided useful, hands-on projects for their own operation and maintenance people to gain further work experience.

Yet, some ESCOs expressed skepticism about the role of energy declarations in terms of overall market development for energy efficiency services and actual energy savings in Sweden. Some ESCOs noted that they opted not to get certified to do energy declarations because they felt it would only provide access to lower level people within an organization – not the higher-ups often needed to "win" approval for a project. Other ESCOs felt that there was quite a wide range in the level of expertise provided through the energy declarations, and they did not want their name to be associated with a program that might provide questionably rigorous energy audits. Moreover, a foot in the door may or may not lead to greater energy efficiency savings: the impact of energy labelling schemes on energy savings is unclear. A report published by the Danish Institute of Governmental Research on the Danish Energy Labelling Scheme, an energy label program for energy consumption in single-family homes, did not find significant energy savings (Kjærbye 2008). Similarly, Sweden's Commission of Inquiry cited concern that there were few relevant studies to investigate the potential for energy efficiency improvement that may be identified by the energy declarations. In other words, this well-intentioned program might miss the tremendous opportunity in energy efficiency. In particular, the larger question becomes how to measure and verify the additionality of savings.

Beyond existing policies, we also discussed with ESCOs what they saw as the potential value of efforts like standardization, accreditation, and certification. Standardization of definitions for energy services might help customers to more easily and accurately compare bid proposals, according to ESCOs. Still, ESCOs were adamant that standards for energy services must maintain enough flexibility to allow them to differentiate themselves and their offerings. ESCOs did not see a need for contract standardization. They noted that there is a well-established set of building contracts in Swedish that are commonly used for ESCO projects. For example, they use existing standard contracts such as "ABK" (common agreements for consultancy services) for engineering and consultancy services, ABT (common agreements for building and construction work) for construction, and ABFF (common agreements for property operation) for operation and maintenance services, including project follow-up and savings guarantees (Forsberg 2007). Creating an ESCO accreditation was not a top priority among existing companies. Yet, some companies are participating in the ongoing discussions to create this system and said if the option were offered, they would get accredited. One possible explanation for this response is established companies are less concerned about proving their credentials.

Analysis, Discussion, and Recommendations

The broader question is: what are ESCOs really providing? Will you realize "all energy efficiency" potentials with ESCO activity, including EPC projects? Perhaps not. But customers are likely to achieve much more in energy savings than they would have if they attempted to do it all themselves. Projects demonstrate a wide range in energy savings (e.g. 5 to 85%), though customers typically save 20-30% in energy use, according to ESCOs. In this way, ESCOs do help to increase the number and percentage of profitable measures carried out. While the energy savings from ESCO projects are of considerable interest for the ESD, there is a paucity of data available. In absence of a national ESCO organization, there is no central reporting entity monitoring how much energy savings can be attributed to ESCO activities in Sweden. Gathering such information has its own set of challenges for researchers, including business confidentiality

concerns and/or how you "count" the multi-year savings from a project. This topic merits further research and consideration.

Today, the 27 companies engaged in the provision of energy services in Sweden hail from a wide range of backgrounds. These companies are building on their existing market position and customer base to craft their own market niche. The rapid development of the Swedish ESCO market has been influenced by the interplay of increasing energy prices, rising climate change concerns, and a favorable policy environment in Sweden.

Although the lack of knowledge among customers regarding energy efficiency opportunities creates a business opportunity for ESCOs in one sense, it also presents its own set of issues, especially for the long-term success of energy saving projects. For example, customers have significant opportunity to negotiate with companies, such as in requesting which equipment to use. Of course, this pre-supposes confident and savvy customer engagement, which is not always the case. In the interim, many consulting firms have developed a market niche in advising public sector customers on EPC projects. Whether customers use consultants or not, ESCOs are dedicating resources towards customer education, training, and support. Beyond the ESCOs themselves, a range of authorities and agencies in Sweden are focusing on activities to develop greater comfort with the ESCO business model.

While the public sector is a large and growing segment, it is an especially competitive area that has been dominated by a few, large companies. Other firms are looking for niches within the commercial and multi-unit residential dwellings sectors. Currently, third party financing though the ESCOs is not common in Sweden, though companies have offers. Public sector customers constitute the largest portion of the overall Swedish market, and typically, they can arrange more favorable financing terms than those offered by ESCOs. Even so, some companies provided anecdotes about large commercial projects (ranging from 6 to 20 million SEK) that were delayed because the client was unable to secure funding. Many ESCOs are operating at full capacity and limited by their own staffing constraints from taking on additional work. However, while ESCOs expressed confidence in a strong pipeline of future customer projects in Sweden, they said it is too soon to determine whether customers – even those who do not seek TPF - may delay or postpone their energy efficiency projects due to broader financial concerns.

While the actions of the ESCOs themselves played a powerful role in the development of this business model in Sweden, it would be a mistake to overlook the role of policy in attracting them to the Swedish market in the first place and to catalyzing their growth. Investment support programs, energy labelling programs, and information campaigns by a variety of agencies and authorities has helped to build support for this approach. Going forward, ESCOs talked about a variety of efforts that could increase the value of energy efficiency projects (tax credits for energy efficiency, investment subsidies, or even a program of white certificates to commoditize energy efficiency). But most agreed that higher energy prices were one of the most important forces for motivating customers to proceed with projects. The potential value of accreditation and standardization efforts is unclear. Differences in cultures and contracts among countries influence the business process for energy services. Any effective accreditation or standardization efforts must balance this fine line of promoting greater industry transparency while recognizing these differences. These insights are especially important for countries looking to stimulate further ESCO market activity in their own country.

Although the Swedish market does not appear to need strong stimulus, government still has a role in education, policy, as well as residential and commercial sector solutions. For existing companies, limited human resources constrain further market expansion and universities have been slow to respond to changing needs in the labor market. Investments are needed to strengthen energy efficiency related curriculum with universities, technical schools, and lower schools to cultivate the next-generation of Sweden's energy efficiency leaders and practitioners. The timescale of ESCO projects and "trust" issues may present a barrier to entry for new companies. The public tendering process should be re-evaluated to ensure that new entrants to the market are not discouraged from participating. Additional efforts may be needed so national programs and policies keep pace as effects of global financial crisis continue to unfold.

Still, there are limits to what ESCOs will achieve in energy savings. For example, while ESCOs are good with installations, they rarely deal with building shell. Given the 165 million square meters in multiple-unit dwellings in Sweden that require renovations in the next 10 years, policymakers and companies have a compelling reason to work more closely with manufacturers of windows, insulation, and other products in order to capitalise on these efficiency opportunities (NEEAP 2008). Finally, much of the residential and small commercial sectors are not a fit for the current ESCO business models due to high transaction costs. Creative thinking is needed to connect existing programs like, energy declarations, with specific energy saving actions and measurable results to close these gaps. One option is to direct educational and other efforts towards small builders, carpenters and others that are already serving house owners with renovations and refurbishment.

Conclusions

After a few false starts, the Swedish ESCO market has grown rapidly since 2000. Energy prices have been a key market driver. Yet, increasing climate consciousness and policy efforts have also played an important role in catalyzing ESCO market development and elevating energy use to the attention of top management. Today, Sweden's ESCO market is booming: many companies report double digit growth in their energy services business units. The growth in Swedish energy service business units has outpaced growth in counterparts for other European markets, according to multinational companies. In the coming years, ESCOs anticipate experiments with new business models and approaches as the market continues to evolve.

Mutual trust between companies and customers has grown, leading to increased experience and comfort with energy services. Even so, lack of knowledge still remains a significant challenge for developing savvy consumers of ESCO services who understand how to negotiate contracts, use new equipment, and align occupant behaviour to maximize the energy savings potential. Meanwhile, companies continue to launch new en-

ergy service businesses in Sweden, creating a dynamic, evolving market as the different players establish their niches. But these ESCOs are not entirely "new" businesses: the timescale of ESCO projects and "trust" issues presents a barrier to entry for companies without an existing customer base or reputation behind them. Finally, third party financing has played a surprisingly unimportant role in the services provided by ESCOs, in spite of the availability of offers to customers.

Looking ahead, ESCOs may play a significant role in helping Sweden to reach current targets in the ESD, though government still has a role in education, policy, and residential sector solutions. Investments are needed to strengthen the energy efficiency related curriculum with universities, technical schools, and lower schools to build Sweden's human resource capacity in energy efficiency. As the effects of the global financial crisis continue to unfold, additional efforts may be needed to ensure that national programs and policies continue to keep pace. Finally, although ESCOs may work well for large projects within the commercial, industrial, and public sectors, there are limits to the applicability of their business model. There is an opportunity to connect existing programs like, energy declarations, with specific energy saving actions and measurable results to help close the efficiency gap in Sweden.

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