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Review of U.S. ESCO Industry Market Trends: An Empirical Analysis of Project Data

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ABSTRACT

This article summarizes a comprehensive empirical analysis of U.S. energy service company (ESCO) industry trends and performance. We employ two parallel analytical approaches: a comprehensive survey of firms to estimate total industry size and a database of ~1500 ESCO projects, from which we report target markets and typical project characteristics, energy savings and customer economics. We estimate that industry investment for energy-efficiency related services reached US$2 billion in 2000 following a decade of strong growth. ESCO activity is concentrated in states with high economic activity and strong policy support. Typical projects save 150-200 MJ/m^2/year and are cost-effective with median benefit/cost ratios of 1.6 and 2.1 for institutional and private sector projects. The median simple payback time is 7 years among institutional customers; 3 years is typical in the private sector. Reliance on DSM incentives has decreased since 1995. Preliminary evidence suggests that state enabling policies have boosted the industry in medium-sized states. ESCOs have proven resilient in the face of restructuring and will probably shift toward selling “energy solutions”, with energy efficiency part of a package. We conclude that a private sector energy-efficiency services industry that targets large commercial and industrial customers is viable and self-sustaining with appropriate policy support – both financial and non-financial.

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1 Introduction

The U.S. energy service company (ESCO) industry is widely seen as a successful model for the private sector delivery of energy-efficiency technologies and services. Although the industry is relatively young, it has been resilient to significant changes in the business and regulatory environment in which it operates. From its beginnings in response to the oil shocks of the 1970s, it grew during the utility integrated resource planning (IRP) era of the late 1980s and early 1990s, and has survived recent electricity industry restructuring. U.S. ESCO industry development and the factors that have influenced it are of importance to policymakers interested in promoting similar models elsewhere. Yet until now very little empirical information has existed; industry observers have relied on anecdotal evidence to estimate industry size and limited case studies to assess industry performance (Cudahy and Dreessen, 1996; Easton and Feldman, 1999; Frost & Sullivan, 1997).

This study is a collaborative effort by the National Association of Energy Service Companies (NAESCO) and Ernest Orlando Lawrence Berkeley National Laboratory (LBNL) to fill this gap. Greatly expanded since initial results were published in Goldman et al (2000), it represents the first systematic attempt to estimate U.S. ESCO industry trends and performance empirically, and consists of two parallel analytical approaches. The first is a comprehensive survey of ESCO firms, supplemented by interviews with ESCO executives and industry experts to develop estimates of ESCO industry market activity over the last decade. The second draws on roughly 1500 completed ESCO projects with which we analyze target markets and typical project characteristics, costs, savings and economics from the customer's perspective. This bottom-up approach develops an industry track record, which is useful for benchmarking individual projects as well as gauging the success of public policy instruments on encouraging energy-efficiency investments.

This article is organized as follows. Section 2 outlines the approaches used in our industry survey and database analysis. In Section 3, we define the ESCO industry and report estimates of ESCO market activity and growth rates based on our survey and analysis of company financial and project data. Results from the project database are highlighted in Section 4, including typical project characteristics, costs, target markets, energy savings and economics. In section 5, we discuss the role of enabling policies in the industry's development, including an analysis of the impact of ratepayer-funded energy-efficiency program incentives on project development. In Section 6, we discuss ESCO business practices and supporting policies in terms of energy efficiency market barriers and failures. Trends in industry evolution and future business directions are described in Section 7. Finally, we draw conclusions in Section 8, focusing on lessons learned and their relevance to policymakers interested in developing similar industries internationally.

2 Approach

In this section, we summarize the approaches used in the two empirical aspects of this study. A more detailed discussion of methodologies and data sources can be found in Goldman et al (2002).

2.1 Analysis of aggregate ESCO industry activity

We identified and then surveyed 63 companies with regional or national operations that offer performance contracting as a core part of their energy efficiency services business. In estimating ESCO market activity, we included energy-efficiency related and other value-added services but excluded company revenues from electric or gas commodity procurement for those ESCOs involved in retail energy supply. For each ESCO, we collected information on the total number of projects completed, annual project revenues over time and their mix of products and services. When possible, we interviewed companies directly (N=14). For some, we used financial information from requests for qualification (RFQ) issued by state agencies soliciting performance contractors. Financial statements (N=17) or company business descriptions (N=6) submitted by ESCOs applying for NAESCO accreditation were consulted for others. When the above sources were not available, we surveyed industry experts through a modified delphi approach to develop high and low estimates of individual companies' market activity (N=26).

2.2 Project database

The majority of the projects in our database were collected through NAESCO's voluntary accreditation program, for which applicant companies must submit information on up to 50 energy efficiency projects completed within the previous 3 to 5 years. Eligible companies include those for whom performance contracting is a substantial portion of their business, but not all of their submitted projects must be performance contracts. In addition, 259 projects were provided by eight state agencies that administer performance-contracting programs.

The information requested for each project is presented in Table 1, along with the percent of projects that completed key data fields. We control data quality by reviewing projects and working with ESCOs and state agencies to ensure accuracy. Projects submitted for NAESCO accreditation are subject to verification through a peer-review process and customer reference checks of a subset of projects.

Because of reporting biases, our large sample of projects may not be representative of ESCO industry activity overall. Individual companies self-select projects to report in their accreditation applications, and they have been instructed to emphasize performance-contracting projects over other types of contractual agreements. ESCOs also tend to under-submit private sector projects because of greater concerns regarding disclosure of confidential customer business information. Finally, the additional projects collected from state agencies consist entirely of performance contracts in the institutional market, which may bias our data toward these particular market segments.

Table 1. Information requested for database projects and completeness of key data fields

Category	Details	Completeness (percent of projects)
Project Location	City, state, zip code, country	~
Customer Contact	Name, phone, email	~
Project Characteristics	Date of completion	90%
	Floor area	46%
	Number of buildings	~
	Market segment	99%
	Facility type	~
Project Economics	Project cost (including or excluding financing costs)	96%
	Project agreement type	53%
	Contract term	55%
	Ratepayer-funded energy-efficiency program (REEP) participation	83%
	REEP program type and incentive amount (if applicable)	~
Baseline Annual Energy Consumption	Baseline metric	35%
	Baseline consumption, by fuel/ energy source	37%
Annual Energy Savings (by fuel/ energy source)	Predicted savings	68%
	Guaranteed savings	~
	Actual savings (either yearly or averaged)	61%
Other Benefits	Operations and maintenance (O&M) and other non-energy savings over the project lifetime	~
Measures Installed	Selected from a categorized list	93%

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We segment our data to analyze three factors that illuminate industry trends: market segments and sectors (introduced in Section 4.1), retrofit strategies (see Section 4.3.1) and time trends. We chose two periods for comparison – the years up to and including 1995 and the years from 1996 onward – to reflect the impact of electricity restructuring. Although most states had not restructured by 1996, the prospect of electricity industry restructuring significantly impacted the overall business operating environment for ESCOs in the form of increased regulatory uncertainty, expectations of lower retail electric prices, and reduced utility demand-side management (DSM) expenditures.

3 U.S. ESCO Industry Market Activity

3.1 Defining the market

Several studies have characterized the U.S. market for energy efficiency or energy services and estimated industry activity or market potential. Different sampling methods and definitions of industry scope have been employed, with dramatically different results. Cudahy and Dreessen (1996) developed estimates of ESCO performance-contracting activity based on interviews with NAESCO members combined with their own expert judgment. Easton and Feldman (1999) examined trends in the ESCO industry in two states, New York and Wisconsin, and coupled ESCO field office data with estimates of revenues required to support them to extrapolate an estimate of ESCO industry activity. Frost & Sullivan (1997), a market research firm, characterized and estimated market potential for energy management services based on equipment sales, financing, operations and maintenance (O&M) contracting and other energy-related markets. As such, they define the market of interest in much broader terms than our study.

Definitions of ESCO market activity must reflect industry evolution and changes in ESCO products and services. This industry is not characterized merely by the provision of energy-efficient products and services – other entities, such as engineering contractors and consulting firms, offer these services but are not ESCOs. Historically, ESCOs have been distinguished from other energy-efficiency providers by their offering of performance contracting as a core business activity. Yet ESCOs are increasingly offering non-performance-based contracts for energy-efficiency projects, known as design/build contracts on a fee-for-service basis, as well as energy consulting and information services. Other ESCOs also provide other performance-based services beyond the traditional “shared savings” and “guaranteed savings” mechanisms, such as “build/own/operate” contracts for major energy facilities at customer sites. Some ESCOs have pursued new business opportunities in restructured electricity and natural gas markets, combining commodity procurement with risk management and energy-efficiency services in a single, bundled product.

For the purposes of this study, we define an ESCO as a company that provides energy-efficiency-related and other value-added services and that employs performance contracting as a core part of its energy-efficiency services business. ESCOs may also provide electric or natural gas commodity procurement, but we treat these services as a separate line of business, excluding revenues from these sources from our estimates of ESCO market activity for energy-efficiency related services.

3.2 Industry revenues reached ~US$2billion/year in 2000

We estimate that U.S. ESCO industry project investment reached US$1.8-2.1 billion in 2000 (see Figure 1). During the 1990s, the industry grew at a 24% annualized rate, although much of this growth occurred in the first half of the decade. From 1996 to 2000, industry revenue growth slowed to 9% per year. Factors that may explain this slower growth rate include the relative saturation and maturity of performance contracting in the institutional market and the upheaval and uncertainties created by electricity restructuring and retail competition in certain states, resulting in reduced spending on ratepayer-funded energy-efficiency programs. Competition from new market entrants such as retail energy service companies (RESCOs) may also have affected ESCO industry growth.

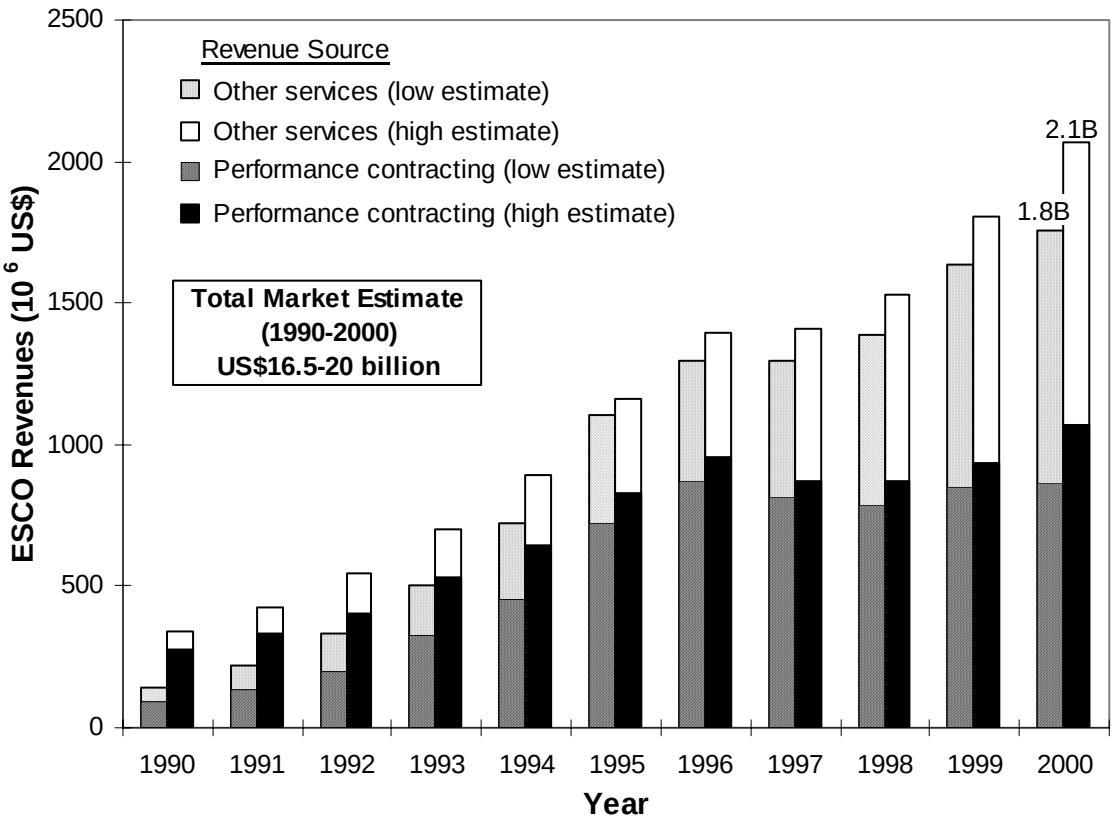


Figure 1. Aggregate ESCO industry activity

In terms of ownership characteristics, ESCOs can be grouped into four categories: (1) companies that are owned by building equipment or controls manufacturers, (2) companies that are subsidiaries of electric or gas utilities, (3) companies that are owned by other types of energy companies such as gas producers and pipelines, and (4) companies that provide engineering services and are “independent” in the sense that they are not owned by utilities, energy companies, or equipment/controls manufacturers. The composition of the industry as it appeared in 2000 is shown in Table 2. The market share of ESCOs owned by building equipment/controls manufacturers was about 27% of industry revenues in 2000, which is much lower than in the early 1990s.We estimate that utility-owned ESCOs account for about 39% of industry revenues in 2000, which is a substantial increase from the 1990-95 period. During the late 1990s, many utilities acquired existing “independent” ESCOs or started their own ESCO businesses. ESCOs owned by other types of energy companies are few in number, but account for about one quarter of ESCO market activity in 2000. “Independent” ESCOs are quite numerous (24 companies), yet tend to be somewhat smaller in size, and they account for a smaller proportional share of industry revenues (10%).

Table 2. Snapshot of the U.S. ESCO industry in 2000

Company type	Number of companies	Percent of industry revenues
Building Eqpt/Controls Manufacturers	8	27%
Utility Subsidiaries	19	39%
Other Energy Companies	3	24%
"Independents"	24	10%

In 2000, we estimate the size of the market for performance-contracting services was between US$0.9 billion and US$1.2 billion. Performance contracting as a fraction of ESCO market activity has dropped from approximately 70% in the first half of the 1990s to 60% between 1996 and 2000. This service offering is concentrated among institutional customers, a relatively mature market for ESCOs. Performance contracting business grew much more slowly during the latter half of the 1990s than other services offered by ESCOs. This trend suggests that performance contracting may not be a primary source of future growth for ESCOs. Instead, revenue growth going forward may hinge on development of other value-added services that build on ESCO core competencies, such as development, design, and construction of complex facility projects, and providing project and risk management products.

4 ESCO Project Characteristics and Performance

Our sample of projects contains 1489 energy-efficiency projects in 45 states. Completed between 1982 and 2001, these projects span the history of this industry. The total investment for all projects that reported costs (N=1426) is US$2.55 billion. The size of projects varies widely with project costs ranging from $200,000 to greater than $20M (Figure 2). Median and average project costs are $0.7M and $1.8M respectively over the entire sample. Based on our estimates of industry size (Section 3.2), we estimate that the projects in our database represent about 15% of total ESCO industry activity for the 1990-2000 period.

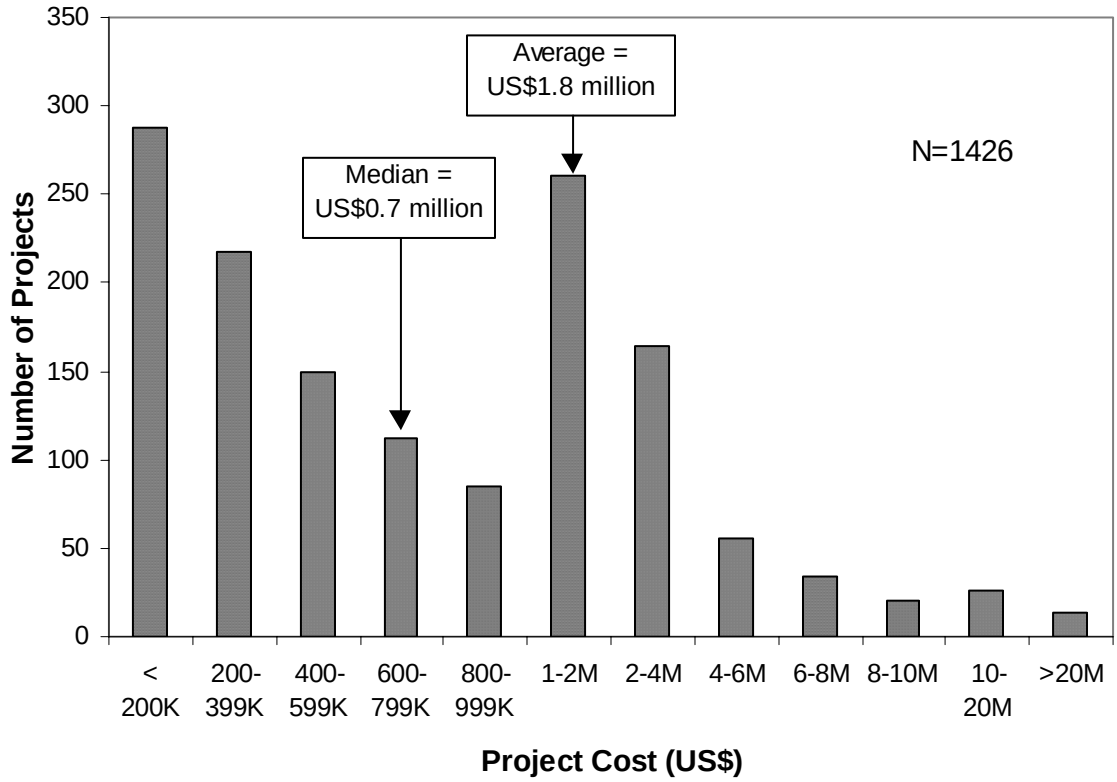


Figure 2. Range in project costs

In this section, we describe and summarize characteristics of our project sample and discuss major findings in terms of project energy savings, cost-effectiveness and customer economics, and contractual mechanisms (see Goldman et al (2002) for more detailed discussion of results).

4.1 Target markets for ESCO project investment

ESCOs were asked to classify projects by market segment (see Table 3). Most projects in our sample (73%) were completed for institutional sector customers. This share has been changing over time – we find that private sector representation has dropped from 33% in the years up to and including 1995 to 25% since then. We believe that the share of institutional sector projects in our database represents an upper bound on actual institutional market share in the ESCO industry as a whole because of data collection and reporting biases (see Section 2.2).

Table 3. Market Sectors and Associated Market Segments

Market sector	Market segment	Percent of projects (N=1473)
Institutional Sector	K-12 schools	30%
	State/ local government	14%
	University/ colleges	9%
	Federal government	6%
	Health/ hospitals	12%
	Public housing	3%
Private Sector	Hotel/ hospitality	2%
	Office/ commercial	10%
	Retail	4%
	Industrial	7%
	Residential	1%
	Other	2%

Median project costs are significantly higher in institutional sector facilities than for private sector projects (US$0.9 million and US$0.3 million respectively). However, the range in project costs within market segments is quite large. These general relationships hold true when project costs are normalized by floor space (see Figure 3). Median costs per m^2 of retrofitted floor space are 1.8 times higher in the institutional than the private sector, at US$27/$m^2$ and US$15/$m^2$ respectively. For all projects, regardless of market sector, median investment is US$25/$m^2$.

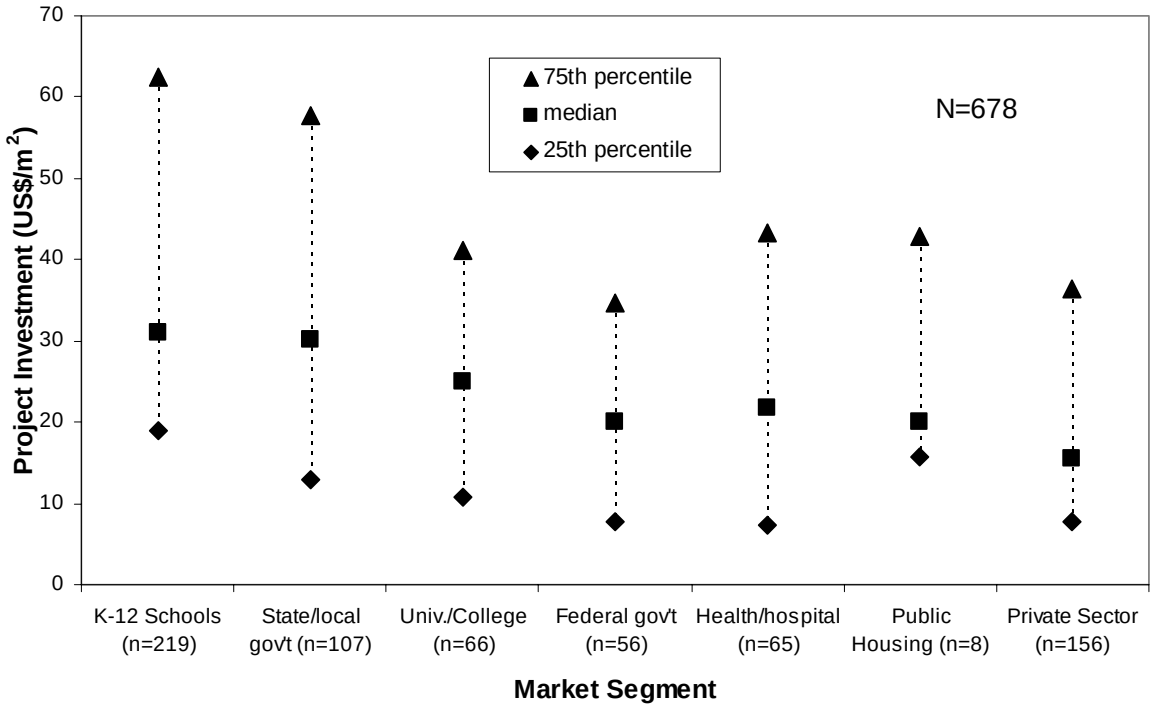


Figure 3. Project cost normalized by floor area

4.2 Regional and temporal investment trends

While ESCOs are active in almost all U.S. states, activity in our project sample is concentrated in regions of high population, economic activity, and policy support (see Figure 4 for geographic distribution). Four states account for 44% of the project investment in our database. Of these, New York, California and Texas rank in the top three U.S. states for both population (U.S. Census Bureau, 2000) and economic activity (Bureau of Economic Analysis, 2001). While the fourth, New Jersey, is ranked eighth for economic activity and ninth for population, sizeable and lucrative utility incentive programs in the 1990s attracted considerable ESCO investment.

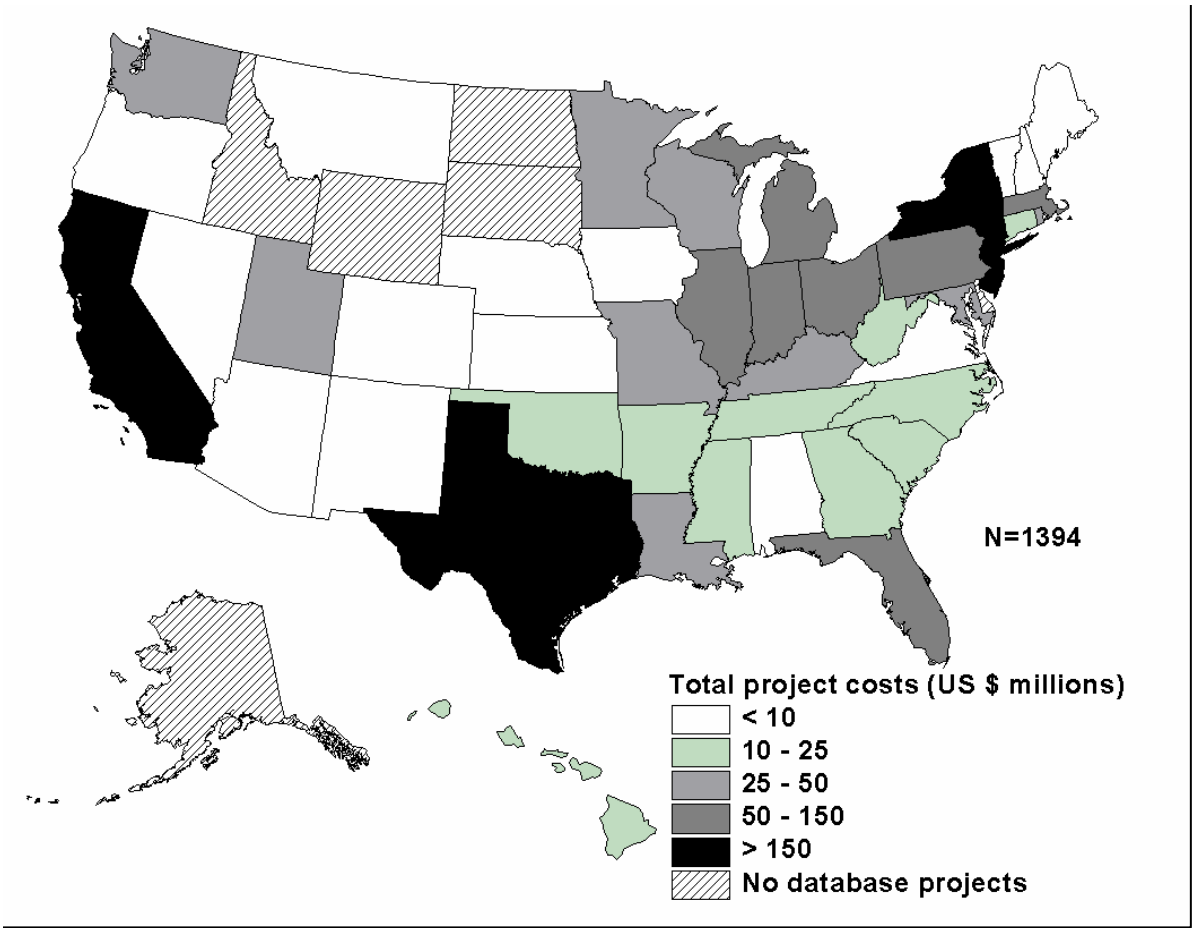


Figure 4. ESCO project activity by state

Over two thirds of projects were completed in 1996 or later. This reflects both intensified data collection efforts in recent years and the growth in the industry as a whole. For the years prior to 1996, total project costs in our database are US$0.6 billion (N=415), and projects completed since 1996 represent US$1.9 billion (N=972).

4.3 Patterns of usage and savings from Energy Conservation Measures

4.3.1 Multiple measures, end uses, and retrofit strategies

ESCOs reported project retrofit strategies by selecting from a list of over 100 energy conservation measures (ECMs), grouped into 11 “measure categories”. To adjust for varying degrees of individual measure specificity, we used these 11 categories as our level of analysis. In this way, we could better compare the breadth and depth of energy-efficiency improvements at the project and market sector level. Table 4 shows the number of projects that installed measures in the various measure categories. We find that most projects targeted more than one measure category – on average 1.9 per project.

Table 4. Deployment of Energy Efficiency Technologies and Strategies

Measure Category	Database penetration					
	Institutional sector (N=1008)		Private sector (N=359)		All Projects (N=1379)	
	N	%	N	%	N	%
Lighting	859	85%	264	74%	1134	82%
Comfort conditioning (HVAC)	768	76%	163	45%	936	68%
Motors/drives	254	25%	64	18%	320	23%
Water heaters	101	10%	15	4%	117	8%
Non-energy improvements[a]	46	5%	0	0%	46	3%
Power supply	63	6%	18	5%	81	6%
Refrigeration	15	1%	11	3%	26	2%
Miscellaneous equipment & systems[b]	37	4%	4	1%	41	3%
Industrial process improvements	8	1%	15	4%	23	2%
Other measures/strategies[c]	246	24%	41	11%	287	21%
Plumbing products & fittings	119	12%	13	4%	132	10%

[a]e.g., asbestos abatement, roof repair, new ceilings

[b]e.g., office equipment, vending machines, traffic signals

[c]e.g., fuel conversion, utility rate analysis, staff training

The penetration of virtually all measure categories is higher in the institutional than the private sector (see Table 4). The average institutional sector project installs measures in 2.2 measure categories, while private sector projects average only 1.6. This observation helps explain why project costs are typically higher for institutional than private sector projects.

We are also interested in the extent to which ESCOs develop “comprehensive” projects – projects that include high-efficiency measures addressing multiple end uses and which attempt to maximize the savings potential at each facility subject to the customer’s investment hurdle rates. We defined three retrofit strategies that provide a useful way of comparing project comprehensiveness: Lighting Only (LO), Lighting & Non-Lighting (LNL) and Non-Lighting Only (NLO). In essence, we characterize projects based on whether they installed only the single most common measure (LO), whether they installed lighting as well as other measures (LNL), or whether they focused solely on one or more non-lighting measures (NLO). LO retrofits tend to be the least comprehensive by our definition.

We find that institutional sector customers are much more likely to install comprehensive retrofits than private sector customers – 68% of institutional sector projects installed LNL retrofits, while only 31% of private sector projects did so. Likewise, LO retrofits are much more common in the private sector, appearing in 43% of projects, while only 18% of the institutional sector projects employed this strategy.

4.3.2 Delivered annual energy savings

Our analysis of ESCO project energy savings reveals that electricity savings are of critical importance to project success, accounting on average for over 80% of total energy savings on a

site energy basis (1 kWh = 3.60 MJ). We find significant variations in annual energy savings within similar markets, even after normalizing for differences in project size (as measured by floor space). For projects that reported sufficient information for this analysis (N=437), median electricity and fuel savings are 170 MJ/m^2/year. However, the interquartile range (the difference between 25th and 75th quartiles) varies by a factor of four.

We find some interesting trends when we compare median energy savings among individual market segments, as shown in Figure 5. State/local government and health/hospital market segments are highest, with median savings in the range of 200-215 MJ/m^2/year. Other institutional market segments and the private sector display medians in the range of 150-170 MJ/m^2/year. However, it is worth noting that even within individual market segments, we observe that savings/m^2 vary by a factor of 3-5 for the middle 50% of projects. Thus, the range *within* each market segment is far greater than the difference *between* market segment medians.

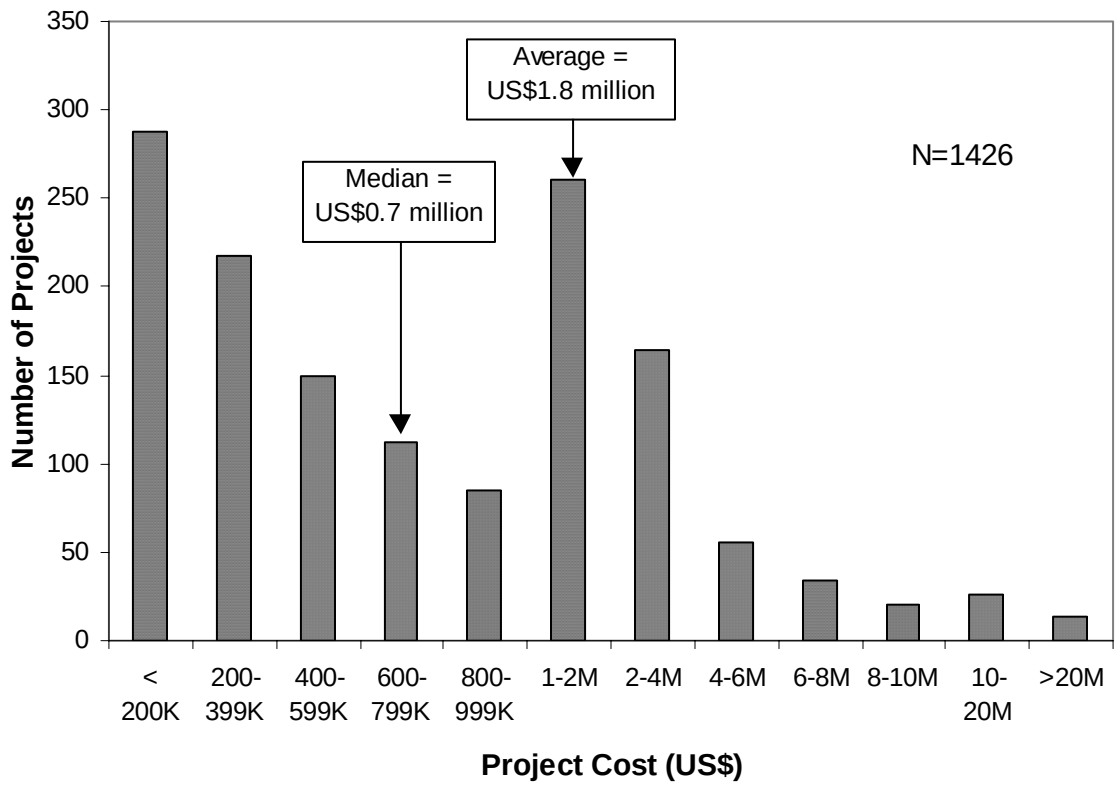


Figure 5. Average annual energy savings normalized by floor area

4.3.3 Percent electricity savings

We calculated annual electricity savings as a percentage of baseline consumption and group projects by baseline metric. Baseline metric refers to whether baseline consumption data is based on the utility bill for the facility or based on the end use or equipment targeted for retrofit and is closely correlated to retrofit strategy in our sample. LO projects typically measure baseline energy consumption for the targeted equipment only, and LNL projects tend to measure total facility consumption using utility bill analysis.

Figure 6 shows the distribution in savings as a percent of baseline consumption. For LO projects, median annual electricity savings are 47% of the *targeted equipment* baseline, with an inter-quartile range of 37% to 56%. These results suggest that ESCOs achieve significant reductions in lighting energy consumption. Median electricity savings are 23% of the *total electric bill* baseline for LNL projects, with an inter-quartile range of 17% to 32%. On a facility-wide basis, these savings are quite significant.

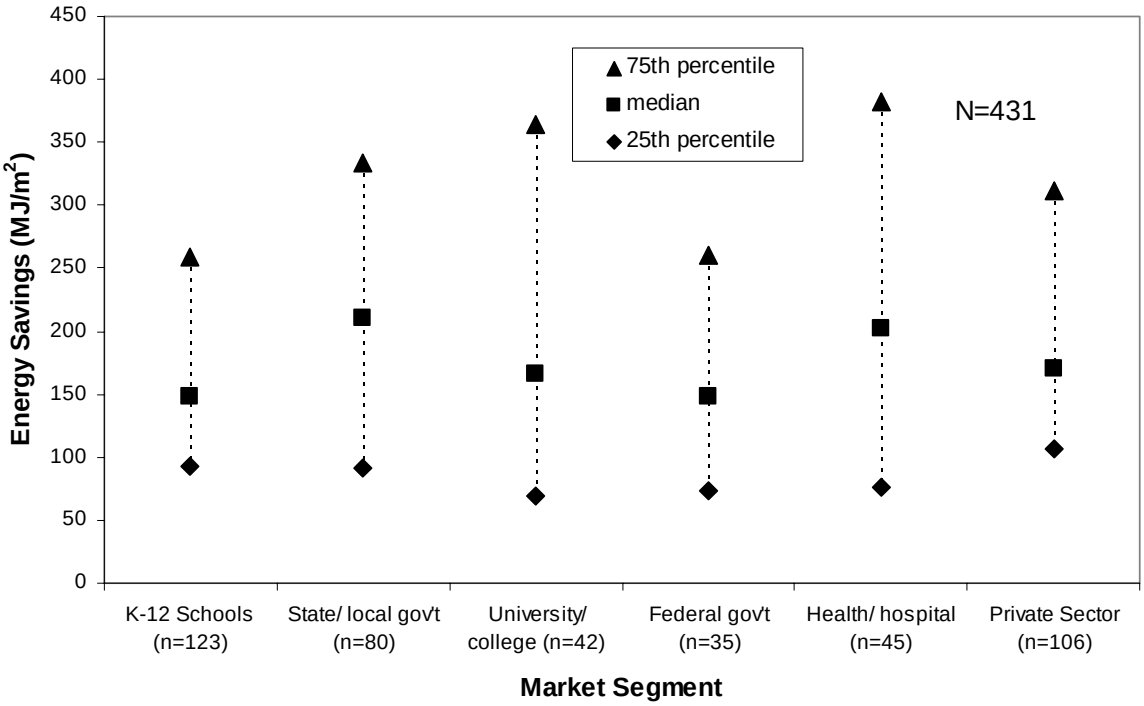


Figure 6. Electricity savings by retrofit strategy

4.4 Performance contracting

The ESCO business practice of performance contracting has historically been a distinguishing feature of this industry. By assuming project performance risk, ESCOs have been able to sell projects and arrange financing for their customers. In this section, we report trends in performance contracting and the related issues of ESCO savings predictions and guarantees.

4.4.1 Performance-contracting market share declining among ESCOs

Types of performance-based contractual agreements include guaranteed savings, shared savings, pay-from-savings and asset ownership/chauffage. Non-performance-based approaches include design/build, fee-for-service and fixed price contracts. For detailed descriptions of these contract types, refer to Goldman et al (2002). The most common types of project agreement in our sample are guaranteed savings and design/build. Of the performance-based contracts, 86% used the guaranteed savings contracting mechanism.

Over the last decade, there has been an evolution in the types of contractual agreements employed by ESCOs and their customers. Evidence from our survey of companies that performance contracting is declining in market share is corroborated by trends in our project sample. In our database projects, performance contracting has decreased from 92% of projects before 1996 to 76% since (cf. our industry survey results in Section 3.2).
We find that performance-contracting projects tend to be larger. In our sample, performance-based projects have median project costs of US$1.0 million (N=621), compared to US$0.5 million for non-performance-based projects (N=160). This may be an indication that customers are less willing to take on larger projects if the ESCO does not share some portion of the risk. Conversely stated, for smaller projects where the savings are relatively well known in advance, customers may be more willing to forgo savings guarantees for reduced measurement and verification (M&V) costs.

The typical duration of contracts is 10 years, although the average contract length is becoming shorter in accordance with the trend away from performance contracting – about 20% of projects completed since 1996 have terms shorter than 5 years (N=599). However, lengthier contracts do persist – the proportion of projects with contract terms of 15 years or greater has remained unchanged at approximately 10%.

4.4.2 Accuracy of ESCO savings predictions and guarantees

We assess the accuracy of ESCO savings predictions by comparing predicted to actual savings. Overall, ESCO estimates of savings tend to be reasonably accurate (59% of projects reported actual savings within 15% of estimates) and conservative (63% of projects under-estimated savings). These observations do not include the 13% of projects for which ESCOs reported "100% stipulated" savings, with reported actual savings exactly equal to predicted savings.

Some interesting trends are observed when we segment projects by retrofit strategy. For LO projects, ESCO savings forecasts are frequently "100% stipulated" – this is the case for 23% of these projects. Excluding such projects, 75% of LO actual savings are within 15% of predicted savings, which is relatively accurate (N=85). Moreover, 58% of these projects reported actual savings in excess of predictions. We find that for comprehensive (LNL) retrofits (N=183), savings estimates are less precise – only 43% of projects are within 15% - but that ESCOs err on the side of caution for roughly 70% of these projects. Very few LNL projects are "100% stipulated" (6%). Thus customers targeting lighting measures only can expect high accuracy in ESCO savings predictions. For comprehensive retrofits, predictions tend to be less precise, but in most cases the customer is likely to realize additional savings beyond what is predicted. For projects with savings shortfalls, performance-contracting arrangements can protect customers from the financial impacts.

To gauge the degree to which ESCOs buffer the effect of savings shortfalls themselves, we also examine the relationship between ESCO savings predictions and the level of savings that were guaranteed to customers. We performed this analysis by ESCO to compare individual companies' practices. We found that half (7) of the companies that provided this information consistently guaranteed 100% of predicted energy savings. Six of the companies guaranteed between 50% and 100% of predicted savings, and two companies actually guaranteed less than 50%.

4.5 Project economics from the customer's perspective

Our analysis of project economics quantifies project benefits from the customer's perspective. We did not attempt to include societal benefits from energy-efficiency investments, such as reduced pollution or deferred or avoided investment in electric generation or transmission capacity.

ESCO projects can provide a variety of benefits to customers, both *direct* and *indirect*. Directly quantifiable benefits include energy cost savings and decreased O&M costs. Indirect – or less tangible – benefits can include increased productivity, replacement of aging equipment, improved amenity and comfort levels and environmental improvements. For many customers, these difficult-to-quantify benefits may be as or more important than the direct cost-saving benefits of ESCO projects. Because of the difficulty in quantifying such benefits, we have excluded them from this analysis. Nonetheless, it is important to recognize that these indirect benefits can be key drivers of customer participation and satisfaction. As such, our attempt to quantify the value of projects to customers is conservative and may underestimate the true valuation of benefits.

We calculated three economic indicators: net benefits, benefit/cost (B/C) ratio and simple payback time (SPT). Details of our calculations and embodied assumptions are described in Goldman et al (2002). We made conservative assumptions in selecting discount rates for the first two indicators, and used different discount rates for institutional and private sector projects. Institutional sector customers tend to have longer planning horizons, receive third party financing at attractive interest rates and issue solicitations for performance contracts that allow for long economic payback times (10-25 years). In contrast, private sector customers have high investment hurdle rates, shorter planning horizons and face higher interest rates for third party financing – these factors translate to shorter expected payback times. To reflect these differences, we use base-case nominal discount rates of 7% for institutional projects and 10% for private sector projects. We also perform a sensitivity analysis using higher discount rates of 10% and 15% respectively.
In this analysis, we do not incorporate the effect of ratepayer-funded energy-efficiency program (REEP) incentives on project economics, again taking a conservative approach. However, we do examine the impact of these programs on the 38% of projects that participated in a REEP in Section 5.1.2.

4.5.1 Project net benefits and simple payback time

Tables 5 and 6 summarize the results of our economic analysis for institutional and private sector markets, including aggregate project costs, net economic benefits, and benefit/cost (B/C) ratios, using our selected discount rates. We estimate that the 771 institutional sector projects achieved ~US$1.3B in net economic benefits, while the 309 private sector projects achieved ~US$320M in net economic benefits using our base-case discount rates. Under our sensitivity analysis using higher discount rates, benefits decreased to ~US$870 million for institutional and private sector projects combined. We find that about 90% of direct economic benefits come from energy savings – the remaining 10% are attributable to non-energy savings such as reduced O&M costs and utility tariff adjustments.

Table 5. Institutional Sector Project Economics Benefit/Cost Analysis

Market segment	N	Total project costs (10^6 US$)	7% discount rate					10% discount rate				
			Direct economic benefits (10^6 US$)		Benefit/cost ratio			Direct economic benefits (10^6 US$)		Benefit/cost ratio		
			gross	net	25 val	median	75 val	gross	net	25 val	median	75 val
K-12 schools	289	714	803	88	0.7	1.0	1.7	633	-81	0.5	0.8	1.3
State/ local gov't	159	276	581	305	1.0	1.7	3.0	471	195	0.9	1.4	2.4
Univ./ colleges	100	301	809	508	1.2	1.7	3.1	637	336	0.9	1.4	2.4
Federal gov't	58	153	280	126	0.9	1.7	3.2	225	72	0.8	1.4	2.6
Health/ hospital	134	136	365	229	1.6	2.3	3.8	295	159	1.3	1.9	3.3
Public housing	31	96	140	45	0.7	1.5	1.8	114	18	0.6	1.2	1.4
Institutional sector	771	1677	2978	1301	0.9	1.6	2.5	2375	698	0.7	1.3	2.0

Table 6. Private Sector Project Economics Benefit/Cost Analysis

Market segment	N	Total project costs (10^6 US$)	10% discount rate					15% discount rate				
			Direct economic benefits (10^6 US$)		Benefit/cost ratio			Direct economic benefits (10^6 US$)		Benefit/cost ratio		
			gross	net	25 val	median	75 val	gross	net	25 val	median	75 val
Commercial[a]	192	137	349	212	1.7	2.2	3.7	265	128	1.3	1.7	2.8
Industrial	76	95	181	86	1.3	1.8	2.7	136	41	1.0	1.4	2.2
Other[b]	41	28	47	18	0.8	1.8	2.7	34	6.3	0.7	1.3	2.0
Private sector	309	260	576	317	1.4	2.1	3.2	435	176	1.1	1.6	2.6

[a]Includes hotels/hospitality, retail space, and commercial offices.

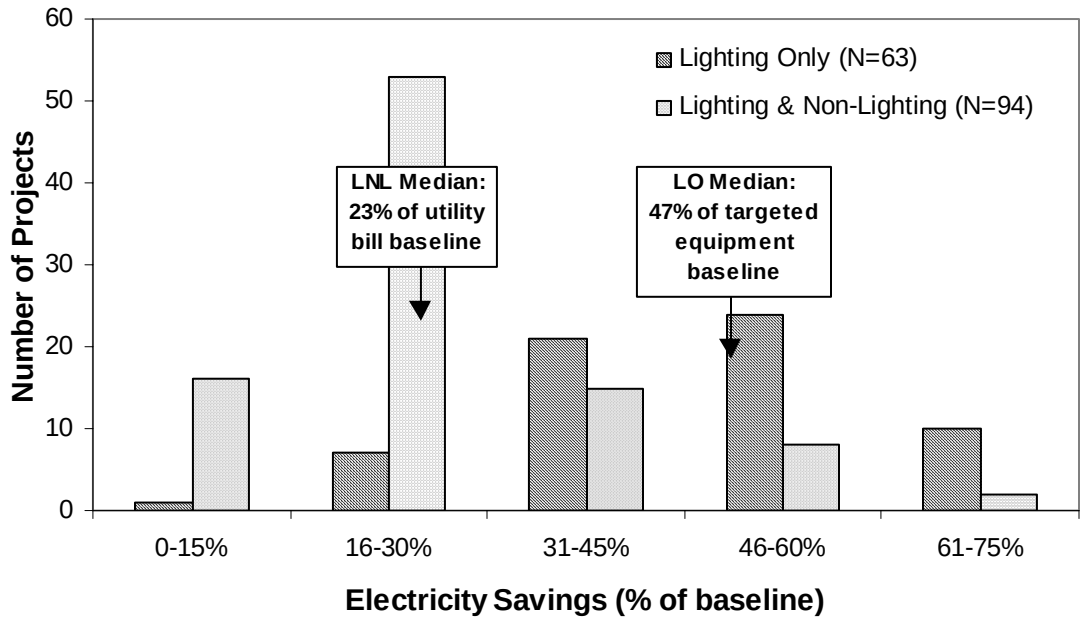
[b]Includes residential and projects that were classified as “other” by the ESCO.

Our analysis of project SPT yields the following results. For 788 institutional sector projects, the median SPT is 7 years with 44% having a SPT of six years or less (see Figure 7 on page 18). The K-12 schools market segment exhibits the longest payback times, with a median SPT of 10 years. A major driver for performance contracting in this market segment is widespread aging infrastructure and a lack of access to capital to replace obsolete equipment. More than any other market segment, K-12 schools projects tend to install non-energy improvements such as asbestos abatement and new roofs and ceilings, which “piggyback” on energy efficiency savings. These improvements are a major contributing factor to the relatively poor project-level economics in this market. Another element is the prevalence of state performance contracting legislation, which tends to target K-12 Schools more often than other institutional market segments and which legitimizes long payback terms (see Section 5.2.2)

The shortest institutional sector payback times correspond to health/hospitals and state/local governments, both with medians of 4 years. Given dramatic changes in the health care industry (the rise of health maintenance organizations and privatization), we suspect that energy

efficiency decision-making criteria for an increasing number of hospitals is evolving towards a private, rather than a public, sector perspective.

The private sector projects in our sample typically have shorter payback times, with median SPT of 3 years (N=319). There is very little variation between market segments (commercial, office, industry) within this sector. Over 80% of private sector projects have payback times of six years or less.



NOTE: All projects in LO sample employ Equipment Targeted baseline metric; LNL sample includes only Utility Bill baseline

Figure 7. Simple payback time for institutional sector projects

To better understand factors that influence project economics, we examine the correlation between retrofit strategy and payback time. Table 7 compares median and quartile values for SPT, segmented by sector and retrofit strategy. As already noted, LO retrofits are much more prevalent in the private than the institutional sector. These projects tend to have very short payback times, on the order of 1 to 4 years, and show little difference between sectors. In contrast, for LNL and NLO projects, there is a factor of 2 or 3 difference in SPT between sectors with median payback time of approximately 7 years in the institutional market and 3-4 years in the private sector. It appears that private sector customers selectively focus on individual measures with shorter payback times, which is consistent with the higher investment hurdle rates typically reported in the trade press for these customers.

Table 7. Impact of Retrofit Strategy on Simple Payback Time

Retrofit strategy	Institutional sector				Private sector			
	N	Simple payback time (years)			N	Simple payback time (years)		
		25 val	median	75 val		25 val	median	75 val
Lighting only	146	1.1	2.4	4.3	128	0.6	2.1	3.6
Lighting & non-lighting	498	5.2	7.8	13	97	2.7	3.9	6.0
Non-lighting only	98	2.3	7.5	14	73	1.4	2.5	5.0

4.5.2 Cost-effectiveness of ESCO projects

We find that 87% of the private sector projects (N=309) and 70% of the institutional sector projects (N=771) have benefit/cost (B/C) ratios greater than one using base case discount rates. Median B/C ratios are 1.6 for institutional sector projects and 2.1 in the private sector (see Tables 5 and 6). Employing higher discount rates reduces these medians to 1.3 and 1.6, indicating that the majority of projects are still cost effective when subjected to more conservative investment criterion.

We also examined trends in cost-effectiveness over time: projects completed before and since 1996. We find that the proportion of projects that are cost-effective using our base-case assumptions is decreasing – from 90% before 1996 (N=321) to only 68% since (N=742). This phenomenon is not explained by the decreasing share of private sector projects, as both institutional and private sectors exhibit the same trend when evaluated alone. Possible explanations for this trend include fewer projects left with “low hanging fruit” measures, sampling bias, or changes in customer perception and valuation of indirect benefits. Over the last decade, ESCOs have achieved significant market penetration rates in the traditional institutional markets, K-12 schools and state/local governments, thus it is quite plausible that the most cost-effective projects have already been completed, leaving less "low-hanging fruit" for ESCOs to target. Sampling biases may also be a factor as ESCOs seeking accreditation from NAESCO in recent years have had to provide greater numbers of completed projects than in previous years. Finally, the observed decrease in project cost-effectiveness may actually signal a change in customer drivers for engaging in ESCO projects toward greater valuation of indirect benefits not captured by our economic analysis, such as concerns about facility security and mitigating electric reliability concerns with onsite generation projects.

4.5.3 Estimated industry-wide economic benefits

We also developed an estimate of the economic benefits of all projects implemented by the U.S. ESCO industry. We used our estimate from our survey of aggregate ESCO industry market activity that our sample represents ~15% of industry activity and extrapolated economic results from our project sample under the assumption that it is typical of ESCO industry performance overall. Using this approach, net benefits obtained by customers from all ESCO projects is on the order of US$15 billion. Using our more conservative discount rates, these benefits are reduced almost by half to US$7.9 billion.

To put these economic benefits in perspective, U.S. annual expenditures on electricity by commercial and industrial customers are on the order of US$120 billion (EIA 1995; EIA 2001).

For the 1990-2000 time period, our industry-wide estimates of net benefits are roughly equivalent to 1% of all electricity expenditures in these associated customer classes. In assessing the impact of ESCO investments, it is important to note that customers that implemented ESCO projects represent a small fraction of all commercial and industrial electricity users.

5 The role and impact of enabling policies on ESCO industry development

In this section, we discuss the potential impact of several policies that were intended to stimulate U.S. ESCO industry development. These policies include utility demand-side management (DSM) and public benefit programs for energy efficiency, and state and federal enabling legislation and other support for procurement processes that encourage performance contracting.

5.1 Ratepayer-funded energy-efficiency programs

Ratepayer-funded energy-efficiency programs (REEPs) have had a significant impact on ESCO industry development in the U.S., even though this was not the primary basis of policy support for these programs. Initially, these programs were administered by utilities, and their funding peaked at ~US$1.7 billion in 1993-94 (Nadel 2000). ESCOs took advantage of and participated in various types of REEPs. For example, ESCOs often benefited indirectly from information, education, and technical assistance provided to customers as part of these programs. ESCOs used rebates that were offered by utilities for installation of high efficiency equipment to buy down the initial cost of projects. ESCOs also participated heavily in "performance-based" programs in which utilities provided incentives for verified electricity and peak demand savings from customer facilities. These programs included DSM bidding, in which ESCOs responded to a competitive solicitation that requested incentive payments for long-term energy and demand savings ("negawatts"), and standard performance contract (SPC) programs, where ESCOs signed a standardized contract to deliver verified energy savings over the contract term in return for pre-specified incentive payments. The prospect of electricity restructuring in the mid-1990s contributed to significant erosion in utility support for energy efficiency programs in many states and funding dropped by 40-50% nationally (Nadel 2000). As part of restructuring legislation, many states included provisions for a system benefit or public purpose charge to fund energy efficiency and/or renewable energy programs. Administration of public purpose programs varies by state. This role may be filled by utilities with prior experience administering DSM programs, existing or new state agencies, or non-profit corporations.

5.1.1 ESCO participation in utility DSM and public benefit programs

Incentives offered by REEP programs have been frequently used by ESCOs to leverage and market their projects, although this phenomenon has decreased somewhat since 1996 based on our database information. About 50% of the projects completed before 1996 indicated REEP program participation (N=438); this share has declined to 34% since (N=996). The remaining projects either indicated no REEP participation (32% before 1996 and 51% since) or did not answer the question. This decreasing reliance on financial incentives in developing ESCO projects corresponds with the decrease in funds available in the latter half of the 1990s.

5.1.2 Impact of financial incentives

ESCOs often leverage the value of REEP incentives by passing some or all of the payments through to the customer, effectively reducing the cost of the project. ESCOs provided information on REEP incentives received for individual projects in our database, although we do not know whether these incentives were actually passed through to customers. To be conservative, in our base case economic analysis (Section 4.5), we assumed that none of the incentives were seen by the customer.

Based on anecdotal evidence, it appears that ESCOs do pass through some or all of the incentives from REEP programs to customers. To estimate the impact of REEP incentives on project economics, we compared results from our base case analysis with a sensitivity analysis in which we assume that customers received 100% of rebate payments and 50% of the incentives for other program types (DSM bidding, SPCprograms).
We find that the financial impact of incentives is actually quite modest for most REEP program types. As Figure 8 shows, most programs reduce project SPT by one or two years. However, the New Jersey Standard Offer program (NJ SPC) reduced customer payback times by as much as five years, with incentives in some cases exceeding project costs (resulting in "negative" payback times).

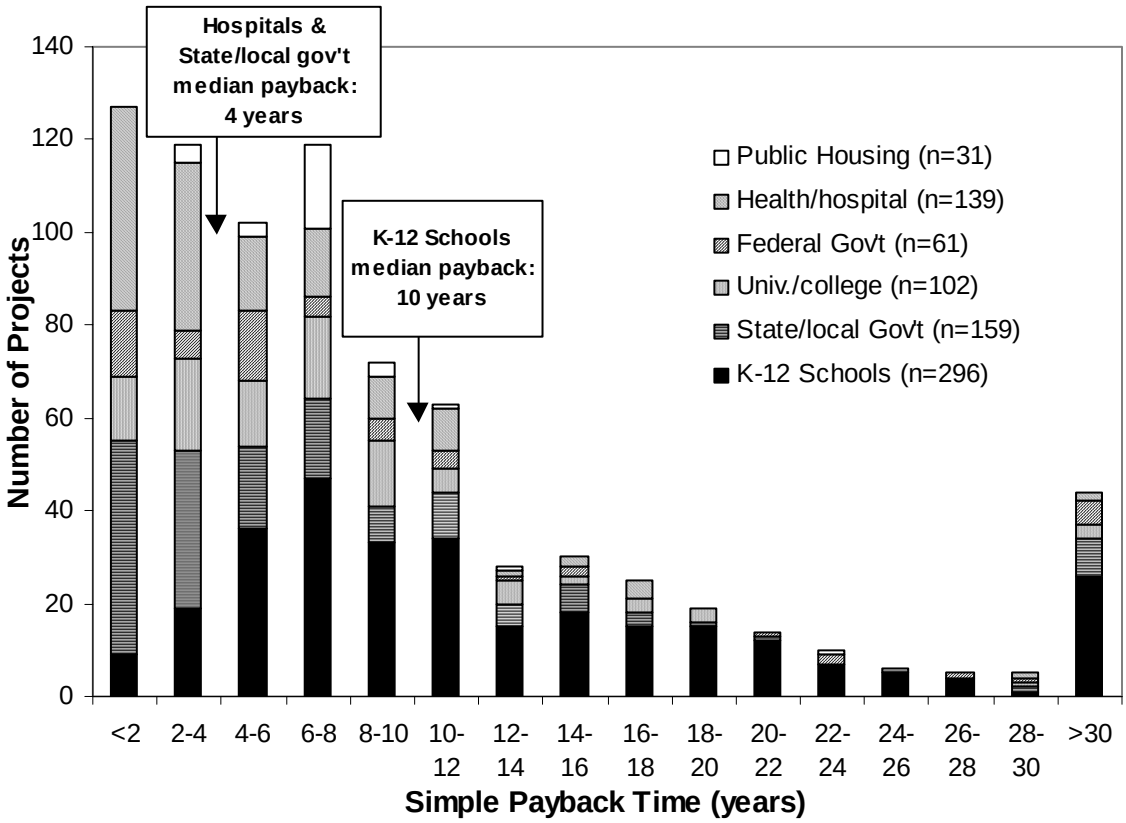


Figure 8. Impact of REEP incentives on simple payback time

Comparing the proportion of projects that are cost-effective (B/C ratio > 1) with and without REEP incentives yields negligible differences in all but the NJ SPC program. Thus, while utility DSM and public benefit financial incentives have certainly aided ESCO project development, it is not clear that they are responsible for enabling the development of projects that would otherwise *not* have been cost-effective. Utility and public purpose energy efficiency programs have also provided important indirect benefits – such as raising customer awareness about high-efficiency products, providing information on savings potential, and decreasing customer perceptions of technical and market risks from new technologies or firms – that facilitate development of ESCO projects but are not possible to quantify.

5.2 State policies to promote performance contracting

In this section, we describe key state and federal policies that facilitate performance contracting and offer an exploratory analysis of its effects on ESCO industry development.

We hypothesize that ESCO activity in institutional markets is affected by factors such as the state's overall economic activity level, the scope and effectiveness of enabling legislation and programs to encourage performance contracting, and REEP programs that are particularly attractive to ESCOs (SPC, DSM bidding).

5.2.1 Enabling legislation for institutional markets

State performance-contracting enabling legislation is a mechanism for encouraging ESCO business practices that focuses on removing institutional barriers to performance contracting for state entities – schools, universities and state and local governments. Typical enabling legislation allows institutions to enter into multi-year financial commitments, provides more flexible procurement rules by allowing decisions to be made favoring "best value" proposals rather than lowest-cost bids, and explicitly articulates societal investment hurdle rates by setting maximum payback times allowed for projects.
States with statutes that allow performance contracting in the institutional market typically designate one or more state agencies as administrative lead to develop consistent policies and program guidelines and provide technical assistance and training to state or local facility energy managers on performance contracting with ESCOs.

5.2.2 Effect on ESCO market activity

The scope of performance-contracting legislation varies by state and is typically defined in terms of the market segments covered – K-12 schools, university/colleges, and state/local government. As can be seen in Figure 9 on page 24, most of the 50 U.S. states have enacted some form of enabling legislation (Donahue, 2001; Rebuild America Financial Services, 2001). However, the scope of legislation varies considerably, as evidenced by the lower penetration rates in individual market segments from just under two-thirds of states for higher education to around three-quarters for K-12 schools and government institutions. Twenty-seven states have adopted legislation that allows performance contracting in all three market segments.

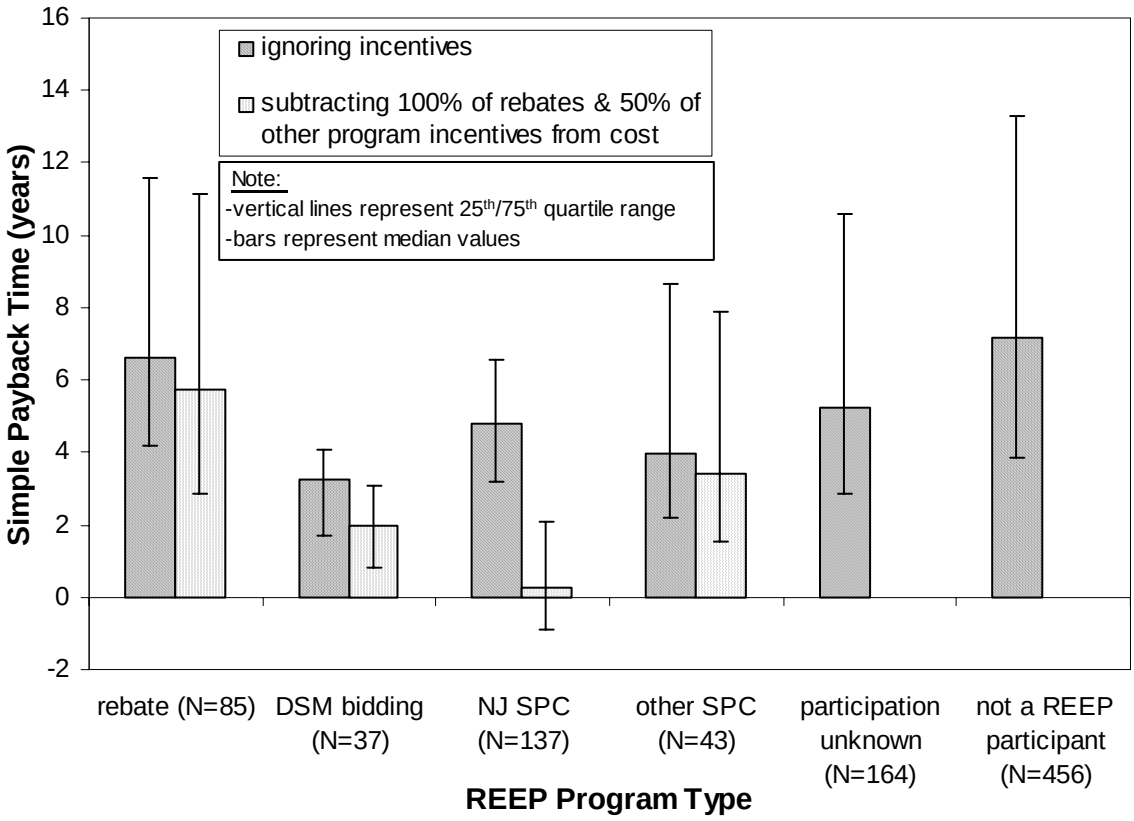


Figure 9. Most states promote performance contracting with legislation

Enabling legislation is a necessary but not sufficient condition to facilitate ESCO performance contracting activity. The way in which states develop their policy and program guidelines, rules and contracting procedures, is often equally critical to market development. To capture this effect, we developed a standardized metric to rank state's overall effectiveness at promoting performance contracting. We combined individual states' scope of legislation with experts' assessments of state energy office activity to measure overall effectiveness in a numeric rating. In Table 8, we present this metric for the top fifteen states in terms of reported ESCO project costs in these three market segments, rank states in terms of their economic activity, using publicly available Gross State Product (GSP) data, and indicate whether DSM bidding or SPC programs were offered by utilities or public purpose program administrators in that state. Our results suggest that the relative influence of state enabling policies and program support for performance contracting may be greatest in states with middle-tier economic activity ranking. The top three states in terms of ESCO project costs – New York, California and Texas – are also the biggest potential markets, and have historically seen large investments in REEP programs. These factors may outweigh the effect of state performance contracting legislation on ESCO activity in such states. However, states such as New Jersey, Wisconsin, Massachusetts and Kentucky, all of which have relatively strong state policy support, rank higher in ESCO project activity than would be expected from their GSP ranking alone. Some states appear anomalous – Indiana, for example, ranks high compared to its potential market size, yet receives low energy office activity rating. This may indicate that the scope of enabling legislation is actually more important than state energy office support.

Table 8. Factors Affecting Institutional ESCO Activity

State	ESCO project costs (SC, UC & GO)[a]			Economic activity (1999 GSP)[b]		REEP programs offered		State support for performance contracting		
	N	Rank[c]	(10^6 US$)	Rank[c]	(10^9 US$)	DSM Bidding	SPC	Energy office activity[d]	No. of market segments with enabling legislation	Overall rating[e]
New York	76	1	287	2	755	X	X	2.3	3	7
California	81	2	147	1	1229	X	X	1.0	3	3
Texas	40	3	131	3	687	X	X	2.0	3	6
Indiana	23	4	112	15	182			1.0	3	3
New Jersey	95	5	84	8	332		X	2.0	3	6
Illinois	38	6	75	4	446			2.0	3	6
Ohio	45	7	68	7	362			2.0	1	2
Massachusetts	27	8	66	11	263	X		1.7	3	5
Florida	23	9	65	5	443			1.0	3	3
Pennsylvania	37	10	54	6	383			2.0	3	6
Michigan	39	11	53	9	308			2.0	2	4
Wisconsin	9	12	43	20	166	X		2.5	3	8
Missouri	13	13	33	18	170			1.0	2	2
Kentucky	36	14	31	26	114			2.0	3	6
Louisiana	4	15	23	24	129			not rated	3	not rated

[a]SC = K-12 schools, UC = university/colleges, GO = state/local gov't

[b]*Source:* Bureau of Economic Analysis, 2001

[c]Ranking amoung the 50 U.S. states; 1=highest, 50=lowest.

[d]Mean responses in a blind survey of several industry experts; 1=low, 2=medium, 3=high.

[e]Calculated as "Energy Office Activity" multiplied by "No. of Market Segments with Enabling Legislation."

5.3 Federal facility energy-efficiency programs

The federal Energy Policy Act of 1992 mandated that federal agencies take prescribed steps to manage their energy use and pursue cost-effective energy-efficiency investments and established aggressive energy reduction targets. Included among the many provisions was enabling legislation for Energy Savings Performance Contracts (ESPC) of up to 25 years for ESCO projects, as well as continued support for Utility Energy Savings Contracts (UESC), in which utilities manage and oversee energy efficiency improvements at federal customer sites. These contracting mechanisms allow Federal agencies to leverage private sector funding for energy improvements. Without this option, federal agencies would have to rely on congressional appropriations for capital improvements, which, in recent years, have been far lower than agency capital requests. Between 1988-2002, federal agencies have signed ESPC contracts and delivery orders for about US$1.2 billion in energy efficiency investments (FEMP 2002). In our project sample, we have 85 Federal projects, representing US$200 million in investment. It is clear that the federal market has been a source of major growth for the ESCO industry during the last 5 years, accounting for 7% of projects in our sample compared to 3% during the 1990-95 period.

6 Overcoming barriers to energy efficiency: Role of ESCOs

Several authors have established the existence of an "efficiency gap", the difference between the observed level of investment in energy efficiency measures and the amount of investment that would be cost-effective from a societal perspective (Brown, 2001; Levine et al, 1995; Golove and Eto, 1996; Jaffe and Stavins, 1994; Sanstad and Howarth, 1994). The underlying reasons for the "efficiency gap" are discussed in terms of market failures and market barriers.[1] It is useful to examine how the ESCO industry and its business practices, particularly performance contracting, attempt to overcome several key market barriers and failures to energy efficiency, as this provides one of the key rationales for supporting public policies.

In promoting performance contracting, ESCOs have attempted to mitigate customer's real and perceived risks associated with energy efficiency projects. These include the project's technical risk – the probability that installed energy efficiency measures will produce estimated savings in practice – and performance risks associated with the ESCO – the ESCO's ability to design, manage, and implement a high-quality, complex project in a timely fashion. Specifically, in a guaranteed savings contract, ESCOs assume financial responsibility for the project's technical risk, which allows customers and financiers to enter into agreements for which risks would otherwise be deemed too great or undiversifiable and provide recourse should companies fail to deliver. Shared savings contracts, which were quite prevalent during the industry's formative years, provided an ongoing contractual mechanism where the ESCO's return was contingent on maintaining project savings over time and project debt was recorded on the ESCO's balance sheet, rather than the customer's.

ESCOs also address informational market failures. Performance contracting provides a mechanism for overcoming them to the extent that customer and financier risk perception is high relative to true risks. For example, ESCOs provide detailed investment-grade energy audits to customers in the process of designing projects. By hiring ESCOs, customers take advantage of their knowledge of available technologies and expertise in predicting savings that would otherwise be costly to determine themselves.

Industry-wide standards can also help reduce transaction and information search costs. For example, the development of standard M&V practices – the International Performance Monitoring and Verification Protocol (IPMVP), which has become the industry standard in the U.S., has helped increase the credibility of savings verification efforts with customers and financial institutions. Similarly, voluntary industry accreditation programs, if credible, can reduce customer and financier information costs in establishing company reputation.

However, in analyzing the role of ESCOs and performance contracting in reducing market barriers, it is important to note that performance contracting represents a niche product in the larger market for energy efficiency services. ESCO offerings of performance contracts tend to be focused on the larger commercial, institutional, and industrial customers. Recent surveys suggest that only one in eight small commercial customers in the U.S. receives offers for energy-efficient products or services within a two year period, while 64% of very large

[1] Market failures include misplaced incentives, unpriced costs, unpriced benefits, distortionary fiscal and regulatory policies, and costly, insufficient, or inaccurate information. Market barriers are other non-market failure obstacles that include low priority of energy issues, capital market barriers, and incomplete markets for energy efficiency.

customers (>2 MW) receive such offers (Rufo et al, 2002). This suggests that the traditional ESCO business model may not be able to overcome market barriers among all customer classes. Thus, encouraging ESCO industry development is a partial solution to the broader problem of achieving socially optimal levels of energy efficiency, and should be viewed one component in a package of policy and private sector tools to achieve this goal.

7 Industry Evolution

In this section, we discuss the evolution of the U.S. ESCO industry and its product and service offerings, drawing from discussions with key industry participants through our survey of firms.

7.1 Prospects for ESCO industry growth

On the eve of electricity industry restructuring in the early 1990s, observers were of mixed opinion about the future of the ESCO industry and its ability to survive the transition (Fraser and Montross, 2000). Skeptics felt that with the expected decline in REEP incentives, ESCOs would be unable to survive. Optimists, however, foresaw new opportunities for ESCOs to provide bundled energy-efficiency, risk management and commodity procurement services in competitive retail electricity markets.

To date, it seems that neither view has been entirely correct. Some ESCOs that had focused their business around lucrative utility DSM programs in the early 1990s did not survive when those funds dried up. However, many other ESCOs have continued to successfully deliver traditional ESCO services with decreased reliance on REEP incentives. Retail competition has not materialized as expected and retail energy service providers have had difficulty developing business models that successfully bundle electricity and gas commodity services with energy efficiency and other value-added services (witness the failure of Enron Energy Services, PG&E Energy Services, and other retailers). However, anecdotal evidence suggests that customer uncertainties and higher electricity rates in states, such as California and New York, have created opportunities for ESCOs to provide on-site generation and load management services to mitigate customer energy supply and price risk.

Our analysis indicates that the ESCO industry continued to grow throughout the latter half of the 1990s, although at a slower rate than previously. Whether this slowing growth rate represents a temporary response to an uncertain environment, or a more enduring trend, perhaps signaling a near-saturation of the ESCO market, is not clear. However, we do expect significant consolidation among ESCOs as smaller local and regional firms are either bought by or merged with larger ESCOs or go out of business. This trend is driven by various factors including increasing size and complexity of ESCO projects, requirements and preferences of certain customer market segments (e.g., federal market, national account chains) toward larger ESCOs with national operations, and entry by and competition from retail energy suppliers.

7.2 Trends in ESCO products and services

The decline in performance contracting observed in our project sample, corroborated by our industry survey results, is echoed by ESCOs themselves. They report that an increasing number of their customers are selecting “fee for service” or “design/build” type contracts rather than performance-based contracts. ESCOs report that customers have increased confidence in energy savings from certain types of measures, thus guaranteeing savings is less important in terms of minimizing perceived technical risk. Moreover, as the industry has matured and ESCOs have increasingly unbundled their service offerings, evaluating M&V costs and performance risk separately, customers are in a better position to evaluate whether the risk/reward tradeoff is acceptable. Customers have also become more comfortable with

ESCOs' ability to perform as companies have developed their reputations. Additionally, many ESCOs have been bought by large, well-established utilities or energy supply or controls companies, further improving customer recognition. Performance contracting products have stimulated these changes in the marketplace, but the underlying reasons to enter into these arrangements have become less compelling for some customers. Thus, over the long term, we suspect that there will be a continuing shift away from performance contracting as a core ESCO product, particularly in market segments where savings guarantees are not mandated by statute or regulations.

U.S. wholesale and retail electricity prices are expected to remain stable over the next 2-3 years, so they are unlikely to be a major driver of ESCO industry growth in the near term. However, we expect that concerns about system reliability, national security, the continued trend toward outsourcing non-core business activities, tight cutbacks in capital budgets in institutional markets, and increasing awareness of global, regional, and local environmental problems will be among the key drivers for customer demand for ESCO products and services. Energy reliability and national security concerns among federal and other institutional market energy managers may well stimulate increased spending on onsite generation, power quality and load management measures. In addition, a host of demand response (DR) programs and dynamic pricing tariffs designed to provide financial incentives for customers to manage load, particularly in states with restructured electricity markets, will also drive this trend. Given these drivers, we expect that "clean" onsite generation, perhaps through increasing use of “build/own/operate” agreements, energy information and supply arranging products and services will increase in importance in the future.. In essence, ESCOs will increasingly sell energy "solutions" to customers, with energy efficiency part of a larger package. Given the demonstrated historical ability of the ESCO industry to evolve within a changing environment, we expect continued growth in the future.

8 Conclusion

Between 1990 and 2000, the U.S. ESCO industry delivered about US$15 billion in energy cost savings through the installation of energy efficiency and onsite generation products and services to large institutional, commercial and industrial customers. The ESCO industry has continued to grow at 20-25% annual growth rates during most of this period despite a turbulent, complex, and uncertain business environment, characterized by electricity industry restructuring and increasing concerns about system reliability. Several policies, including utility DSM programs and state and federal regulation and legislation enabling performance contracting, have been extremely important in stimulating ESCO industry development.

ESCOs have demonstrated that performance contracting, in combination with other supporting policies, can be used to address and overcome many market barriers that inhibit energy-efficiency investments among large institutional, public sector customers. However, performance contracting has had limited market penetration among certain types of commercial and industrial customers, and few ESCOs promote or advocate performance contracting among smaller residential and commercial customers, citing minimum project size thresholds for profitability.

We would highlight several important lessons from this analysis of U.S. ESCO industry experience for policymakers in other countries:

- First, appropriate policy support can stimulate viable private sector ESCO industries that deliver significant economic and environmental benefits. However, performance contracting works best in a business environment where contract law is well established.
- Second, policy mechanisms need not be strictly financial. Our analysis shows that enabling legislation, regulations, and information/training can be just aseffective as project subsidies. Financial support for an “infant industry” and incentives to customers will most likely be necessary to jump-start an ESCO industry. However, based on U.S. experience, over time an increasing share of projects can be developed by ESCOs without direct financial incentives. Thus, there is the potential for a viable self-sustaining private sector energy efficiency industry to develop that offers services to large customers.
- Third, government leadership in the form of policies that promote energy efficiency in federal, state and local government buildings can be effective at promoting energy efficiency by signaling that it is an important priority, while encouraging development of a private sector energy efficiency services industry and investing in reduced energy costs for such facilities.
- Fourth, ESCOs and the performance contracting business model will not overcome barriers to energy efficiency in all market segments. To achieve optimal levels of energy efficiency in society as a whole, it is important to encourage investment in all sectors, some of which may be best served by small, localized contractors, other types of service providers, or other policy strategies such as building and appliance codes and efficiency standards. Thus, there is still a strong argument for targeted policy support.
- Fifth, it should be recognized that some of the factors that have encouraged the US ESCO industry may not be applicable to other countries. For example, ESCO activity in the single largest market segment in the US – K-12 Schools – has been driven in large part by lack of access to capital to replace aging infrastructure. In countries currently undergoing rapid infrastructure expansion, greater overall energy savings may be possible from efficiency standards for new construction.
- Sixth, there has been significant experimentation in the US by states seeking to develop optimal strategies to facilitate investments in energy efficiency in public and institutional

sector facilities. Compilation and analysis of ESCO projects, including the development of standardized methods to report project characteristics, costs, and savings, can be an important tool to enhance policymakers' ability to understand private sector energy efficiency services industry and market trends and to adopt appropriate policies.

- Finally, policymakers should expect significant change in the number and composition of ESCOs, their business strategies, and mix of products and services. In the U.S., over the last 15 years, the ESCO market has shifted away from "shared savings" to "guaranteed savings" type contracts and has survived a declining market share for "performance-based" contracts and entry by major new competitors such as retail energy service providers.

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