Introduction to Energy Performance Contracting

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October 2007

Introduction

This briefing report provides a tutorial in the fundamentals of energy performance contracting (EPC) for policy makers who need to understand how EPC fits into the broader context of energy efficiency policy and programs.

Organization of the Paper

The paper is divided into several major sections, including:

1. Executive Summary

The Executive Summary introduces each of the major topics that are covered in detail in the other sections, and includes electronic links to each of the other sections. The report is documented throughout with references to more detailed papers and analyses of various EPC topics that may be of interest to the reader.

1.1. What is Energy Performance Contracting (EPC)?

EPC is a turnkey service, sometimes compared to design/build construction contracting which provides customers with a comprehensive set of energy efficiency, renewable energy and distributed generation measures and often is accompanied with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project. A typical EPC project is delivered by an Energy Service Company (ESCO) and consists of the following elements:

- **Turnkey Service –** The ESCO provides all of the services required to design and implement a comprehensive project at the customer facility, from the initial energy audit through long-term Monitoring and Verification (M&V) of project savings.
- **Comprehensive Measures –** The ESCO tailors a comprehensive set of measures to fit the needs of a particular facility, and can include energy efficiency, renewables, distributed generation, water conservation and sustainable materials and operations.

- **Project financing –** The ESCO arranges for long-term project financing that is provided by a third-party financing company. Financing is typically in the form of an operating lease or municipal lease.
- **Project Savings Guarantee –** The ESCO provides a guarantee that the savings produced by the project will be sufficient to cover the cost of project financing for the life of the project.

(**For more detail, follow this link 2. What is Energy Performance Contracting (EPC)?**)

1.2. *Brief History of EPC*

The history of EPC can be usefully divided into four stages.

- **The Beginning of DSM (pre-1985) –** ESCOs were established to provide manpower and systems to enable utilities to meet federal and state mandates and offer energy conservation services.
- **Emergence of EPC (1985-1993) –** Utility programs evolved from purchasing services (*e.g.*, home energy audits) to acquiring large amounts of kW or kWh as part of their Integrated Resource Plans (IRPs). ESCOs bid to provide the kW or kWh and delivered turnkey projects to large industrial and institutional customers and financed the projects themselves.
- **Success and Consolidation (1994-2002) –** Successful experience with EPC documented in studies by the Lawrence Berkeley National Laboratory (LBNL) and the National Association of Energy Service Companies (NAESCO) encouraged the federal and state governments to promote EPC. The implementation of the International Performance Measurement and Verification Protocol (IPMVP), which provided standard methods for documenting project savings, gave commercial lenders the confidence to begin financing EPC projects on a large scale.
- **Pause and then Fast Growth (2003-present) –** The collapse of Enron, the suspension of the federal ESPC program and the uncertainty about the deregulation of the electric utility industry caused a slowdown in the growth of EPC from 2002-2004. EPC is now growing at more than 20% per year, driven by increasing and volatile energy prices, federal and state energy savings mandates, the continued lack of capital and maintenance budgets for federal facilities, and growing awareness of the need for large-scale action to limit greenhouse gas emissions.

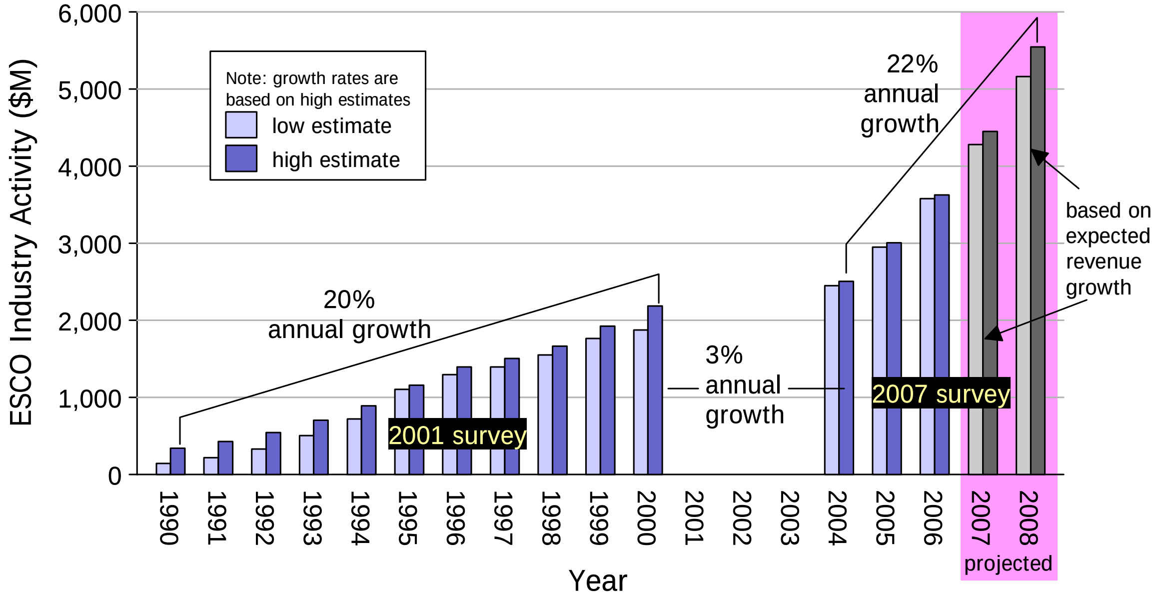
(For more detail, follow this link 3. Brief History of EPC)

1.3. *EPC Market Size and Characteristics*

A recent study by LBNL and NAESCO has documented the current size and growth trends of the ESCO industry, as summarized in the Figure ES-1.

Figure ES-1

ESCO Industry Activity, 1990-2008



In addition to the industry size and growth estimates, the LBNL/NAESCO report documented several other features of the ESCO marketplace.

- **ESCO Ownership –** The ESCO industry has consolidated since 2000. Utility companies abandoned the business as de-regulation stalled, and about 80% of the total EPC business is conducted by ESCO subsidiaries of large companies, primarily equipment manufacturers.
- **Geographic Scope of Activities –** About three-quarters of the total EPC business is done by 10 national ESCO companies, and another 20%+ by regional ESCOs. Local ESCOs, who confine their activities to one or more local markets, do less than 5% of the national EPC business.
- **Market and Project Trends –** The MUSH (municipals, universities, schools, and hospitals) market and the federal market account for about 80% of the total EPC projects. Commercial building projects comprise about 9%, industrial projects about 6%, and residential and public housing projects the remainder.
- **Project Technologies –** By dollar volume, ESCO projects are largely focused on the following: energy efficiency (73%), renewables (10%), and distributed generation or combined heat and power (6%). The balance of ESCO revenues is from consulting and planning services.
- **Project Contracts –** About 70% of ESCO projects are performance-based, and another 25% are design/build or engineering, procurement, and construction.

(For more detail, follow this link 4. EPC Market Size and Characteristics)

1.4 EPC Market Drivers

The EPC market has several major drivers, including:

- **Savings Mandates –** Federal and state governments are increasingly mandating aggressive energy savings goals for public facilities, but are not providing expanded capital budgets to pay for energy efficiency improvements. In this environment, EPC is the default method for implementing energy efficiency projects.
- **Facility Modernization –** MUSH market facilities, typically starved for capital and maintenance budgets, use EPC projects to obtain needed facility improvements.
- **Green Buildings –** Facility owners who want to "green" their buildings often implement EPC projects because "EE Pays for Green," that is, the savings produced from energy efficiency measures helps to finance renewables measures.
- **Climate Change –** Energy efficiency is the first choice of organizations trying to meet state mandates for greenhouse gas reductions. As with savings mandates, EPC projects enable facilities to meet greenhouse gas mandates that are not accompanied by capital budget increases.
- **Utility and ISO/RTO Capacity Programs –** State regulators faced with utility applications to build a new generation of power plants are increasingly looking to large-scale energy efficiency programs as an alternative. EPC projects, which can be self-financed through energy savings, are an attractive alternative.

  (For more detail, follow this link 5. EPC Market Drivers)

1.5 EPC Financing

EPC projects today are typically financed by third-party financial institutions using a set of financing vehicles that are tailored to the requirements of an individual project, not by ESCOs.

- **Financing Marketplace –** EPC projects are financed by large institutional lenders that offer very competitive rates and terms, and have made billions of dollars of financing available.
- **Financing Vehicles –** EPC project financiers offer a variety of financing vehicles, including:
  - **Tax-Exempt Lease Purchase Agreements,** also called Municipal Leases which allow the customer to finance an EPC project without carrying a liability on its balance sheet.
  - **State or Local Government Leasing Pools,** sometimes called Master Leases, which allow individual projects to lower their financing costs by participating in a larger aggregated financing.
  - **State or Local Government Bonds,** which can offer slightly lower interest rates than Municipal Leases, but are time-consuming to execute and often require voter approval.

- **Revolving Loan Pools,** which offer subsidized interest rates, but have multi-year waiting lists.
- **Power Purchase Agreements (PPAs),** in which the customer buys the output (*e.g.*, kWh or pounds of steam) of a distributed generation project, rather than the actual project.

(For more detail, follow this link 6. EPC Financing)

1.6 EPC Monitoring and Verification (M&V)

The Monitoring and Verification of EPC project savings has evolved in stages which parallel the development of the EPC market outlined above.

- **Pre-1985 –** M&V systems were initially used to track the progress of first-generation utility DSM programs, and tended to measure activities (*e.g.*, number of audits delivered) rather than outcomes (*e.g.*, kWh delivered).
- **1985-1993 –** ESCOs and customers struggled to develop replicable M&V systems for unfamiliar technologies, and often used "shared savings" contracts in which the ESCO was paid a share of project savings to mitigate perceived customer risk.
- **1994-2002** – Successful project experience proved to customers that EPC projects involved little technological risk, and the development of the International Performance Measurement and Verification Protocol (IPMVP) gave institutional financiers a standard method for validating project savings.
- **2003-present –** The emergence of various new EPC market drivers (see above) is pushing the development of a new generation of M&V that will validate new streams of EPC project value, such as operations and maintenance (O&M) savings, greenhouse gas reduction and electricity system capacity credits.

(For more detail, follow this link 7. Performance Contract M&V)

1.7 EPC Market Constraints

Several factors are holding back the growth of the EPC market, including:

- **M&V Limitations –** New systems are required to make the calculation of project energy savings more understandable to non-technical policy-makers who are depending on energy efficiency to meet public policy goals such as energy savings and greenhouse gas reduction mandates.
- **Shortage of Skilled Personnel –** ESCOs, utilities, state regulatory agencies and customers are struggling to find the skilled engineering and technical personnel required to implement large-scale energy efficiency and renewable energy programs, and to operate and maintain energy efficiency and renewable energy technologies.
- **Specific Market Barriers –** Each of the major EPC market segments suffers from it own constraints.

- **The Federal and MUSH Markets** are hindered by landlord agency and financial control bureaucracies that resist large-scale program implementation in the face of executive and legislative mandates.
- **The Commercial Real Estate Market** is hindered by the refusal of building owners to encumber their buildings with the debt required to finance comprehensive EPC projects.
- **The Industrial Market** is hindered by the insecurity of most American manufacturing companies, which results in project payback requirements, typically less than two years, which preclude comprehensive EPC projects.

(For more detail, follow this link 8. Performance Contract Market Constraints)

1.8 Conclusions

The importance of the EPC market can be summarized with the major conclusions of the recent LBNL/NAESCO survey outlined above.

- The annual dollar volume of ESCO projects today is approximately equal to the combined annual dollar volume of all U.S. utility DSM programs.
- ESCOs and EPC projects can be a crucial component of the rapidly expanding (in some states) or emerging (in other states) utility DSM programs.
- ESCOs and EPC projects can be important contributors to the development of clean energy, sustainability and climate change mitigation strategies, particularly in urban areas.

(For more detail, follow this link 9. Conclusion and Summary)

2. What is Energy Performance Contracting (EPC)?

EPC is a turnkey service, sometimes compared to design/build construction contracting which provides customers with a comprehensive set of energy efficiency, renewable energy and distributed generation measures and often is accompanied with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project.

2.1 Turnkey Service

In an EPC, an ESCO can provide the full range of services required to complete the project, including:

- Energy audit
- Design engineering
- Construction management
- Arrangement of long-term project financing
- Commissioning
- Operations & Maintenance
- Savings Monitoring & Verification

Not every EPC project includes all of these services; the choice of the exact mix of services in a project is made by the customer.

2.2 Comprehensive Measures

In an EPC, the ESCO tailors a comprehensive set of measures to fit the needs of the customer, including any of the following:

- Lighting
- Heating, air conditioning and ventilation
- Control systems
- Building envelope improvements (insulation, roofs, windows, etc.)
- Cogeneration and CHP
- Demand Response
- Renewables and biomass
- Water and sewer – metering and use reduction
- Sustainable materials and operations

ESCOs are constantly adding new measures to their projects, in response to customer requests, but ESCOs should not be considered vehicles to push new technologies into the marketplace. ESCOs and their customers tend to be fairly conservative when selecting technologies for projects, because the total cost of most ESCO projects are paid from energy savings, often secured with financial guarantees. This is further discussed below.

2.3 EPC Project Financing

Most EPC projects are financed with long-term debt or leases, though some customers are able to pay a portion or all of the cost of an EPC project with capital budget allocations. In the early days of EPC, ESCOs typically provided both project technical services and project financing, because financial institutions did not understand EPC and were unwilling to finance EPC projects. Some ESCOs also acted as product distributors, because normal construction distributors were not willing to stock newfangled devices like electronic ballasts for fluorescent light fixtures. But ESCOs no longer provide EPC project financing, because there is now a robust, competitive marketplace of major financial institutions that provide it.

2.4 Project Savings Guarantees

Many EPC projects involve guarantees made by the ESCO to the customer that the project energy savings will be sufficient to pay the full cost of the long-term project financing. The form of the guarantees varies between projects, because the guarantees are designed to fit the requirements of particular customers, as well as federal and state legislation and regulations.

3. Brief History of EPC

The history of the performance contracting industry can be usefully divided into four stages.

3.1 Pre-1985: The Beginning of DSM

The seeds of the performance contracting industry were sown in the late 1970s and early 1980s, when the federal government and state regulatory agencies mandated utilities to provide energy conservation services primarily to residential customers. Energy service companies were founded to provide services -- manpower, energy audit systems, project financing and construction tracking systems -- to utilities on a subcontract basis.

3.2 1985-1993: Emergence of Performance Contracting

The second stage of the performance contracting industry began in the mid-1980s, when state utility regulators decided that energy conservation -- now called energy efficiency -- could provide thousands of MW of resources at a time when new electric generating technologies (principally thermal steam and nuclear plants) were getting significantly more expensive and difficult to site. Utilities were ordered to produce Integrated Resource Plans (IRPs) which usually included an energy efficiency component, and procured bulk quantities of energy efficiency resources, often through bids that required turnkey project delivery. A new breed of energy service companies emerged which implemented these turnkey projects for large industrial and institutional customers. The projects, however, required new types of M&V protocols that accurately measured the energy and demand savings produced by a project.

3.3 1994-2002: Success and Consolidation

The advent of the International Performance Measurement and Verification Protocol (IPMVP) (see discussion in M&V section below), as well as the body of project savings histories, enabled the performance contracting business to enter a fast-growth stage in the late 1990s and early 2000s, as documented in a series of reports on the industry produced by the Lawrence Berkeley National Laboratory and NAESCO, with sponsorship and funding from the U.S. DOE (see www.lbl.gov). Commercial lenders jumped into the business, and quickly drove down the cost of project financing through competition and the development of new financing vehicles, such as low-cost municipal leases with ESCO savings guarantees. M&V costs were substantially reduced by using the M&V options set forth in the IPMVP. Customers saw that a much larger percentage of the total project costs were being delivered to them as efficiency improvements rather than being consumed as project overhead. Customers also saw that performance contracting was a viable way for them to address capital equipment and maintenance issues that they could not address adequately, if at all, through their capital budget processes.

The federal government and state governments adopted performance contracting as the preferred method for producing energy efficiency improvements in large facilities. California and New York implemented standard performance contracting programs as the largest programs in their state energy efficiency program portfolios, pouring hundreds of millions of dollars into project incentives. Many utilities decided that they needed energy service capabilities to compete in the re-regulating energy markets, and so purchased ESCOs or started their own ESCOs.

3.4 2003 – Present: Pause, and now Fast Growth and New Services

The spectacular collapse of Enron, the one-year sunset of the federal performance contracting program, and the diminished prospects for the de-regulated retail energy business all combined to moderate ESCO growth in 2002-2004. The industry consolidated as many utilities folded up or sold their ESCOs. Successful ESCO companies used this hiatus to broaden their offerings to new types of customers, and to integrate renewables and "green" technologies into their product and service portfolios, allowing them to be ready for the next growth spurt, which began in late 2004, according to the most recent NAESCO/LBNL ESCO industry survey.

That growth is driven by a number of factors, including:

- High and volatile energy prices;
- A renewed emphasis by federal and state policy makers on energy efficiency and renewables delivered in performance contracts;
- The continuing lack of capital and maintenance funds for large facilities;
- A renewed interest by federal and state regulators in acquiring energy efficiency and renewable resources as part of an integrated portfolio which can best serve the needs of ratepayers; and,
- The growing awareness of the need to quickly implement large-scale programs to limit production of greenhouse gases, and vulnerability to national energy security risks.

4. EPC Market Size and Characteristics

The Lawrence Berkeley National Laboratory (LBNL) has studied and reported on the growth of the ESCO industry for the last decade. The latest in its series of reports was issued in May, 2007[1], and the chapter on ESCO industry size and growth is excerpted from the paragraph immediately below through the bottom of page 16 of this report.

Previous LBNL/NAESCO reports have discussed ESCO industry growth and trends from the early 1990s to 2000 (Goldman *et al.* 2002), the context for the ESCO business model among public and institutional customers (Hopper *et al.* 2005) and ESCO project characteristics, energy savings and economic performance based on a database of ESCO projects (Goldman *et al.* 2002, Hopper *et al*. 2005).

In the following sections of this brief, we discuss the role of ESCOs in the context of the broader energy efficiency, renewables and onsite generation markets, present updated industry size and growth estimates as of 2006, and examine the structure of the industry in more detail.

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[1] "A Survey of the U.S. ESCO Industry: Market Growth and Development from 2000 to 2006", Hopper, Goldman, Gilligan, Singer and Birr, May 2007, *Ernest Orlando Lawrence Berkeley National Laboratory, available at* *http://eetd.lbl.gov/ea/EMS/EMS_pubs.html*

4.1 ESCO Industry Context

Any discussion of the role of ESCOs in delivering energy efficiency and related energy services must begin by defining what an ESCO is. In this study, we adopt the same definition as in previous reports (Goldman *et al.* 2002, Hopper *et al.* 2005):

> *An ESCO is a company that provides energy-efficiency-related and other value-added services and for which performance contracting is a core part of its energy-efficiency services business.*

While ESCOs may offer other services beyond energy-efficiency offerings, we only consider them ESCOs if energy efficiency is a major product offering. Similarly, while companies may perform some projects on a design/build or fee-for-service basis, we only consider them to be ESCOs if they offer performance contracting—projects in which the ESCO assumes some performance risk during the project's economic lifetime —as a core business line.[2]

Conversely, this definition excludes companies such as engineering companies, contractors, equipment manufacturers, or construction firms that may offer energy-efficiency services but do not assume performance risk for their projects. It also excludes companies that only engage in other customer-side energy services—such as design and installation of onsite generation or renewable energy systems—without also deploying energy-efficiency measures. Both types of companies play important roles in the broader markets for energy efficiency, clean energy and other customer-side energy services, but are distinct from ESCOs, and are therefore not included in this survey.

Policymakers considering the role of ESCOs in procuring energy efficiency need to be aware of the market segments in which ESCOs work. Among the three major energy-consuming sectors in the economy *(i.e.*, transportation, industry, and buildings), ESCOs have been the most active in the buildings sector. Building efficiency improvements can be targeted to existing buildings (retrofits and/or equipment replacement), or new construction.

Historically, ESCOs have primarily pursued energy-efficiency improvements in existing buildings. Within this market, nearly all ESCOs have targeted performance contracting offerings to larger customers. In part, this is because the transaction costs in developing and implementing performance contracts are relatively high.[3] As a result, very few ESCOs work in the residential market, with those that do targeting larger multi-family and public housing facilities. Among non-residential customers, ESCOs have had most success in public and institutional markets—federal, state and local government facilities, schools, universities/colleges and hospitals. ESCOs are also active in the commercial and industrial sectors, but have had more limited success in penetrating these markets.[4] Other types of service providers, including equipment and controls manufacturers, engineering

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[2] See Hopper et al. (2005) for a detailed discussion of different types of performance contracts.

[3] See Hopper *et al.* (2005) for a discussion of the context, motivations for, and barriers to performance contracting in public and institutional markets.

[4] The proportional ESCO industry activity in various market segments is provided in section 0.

and construction firms, various types of contractors (heating and air conditioning, controls, windows, lighting, and insulation), and energy consulting firms also provide efficiency services to residential and commercial/industrial customers.

For new construction, the adoption of strategies such as building efficiency codes and standards, design assistance, commissioning, targeted incentives offered by utility energy efficiency programs, energy consumption labeling programs, and training and certification programs for energy-efficient builders can be very effective at bringing about large and lasting energy savings. Owners/developers of new buildings have not been particularly receptive to performance contracting for a variety of reasons (*e.g.*, difficulties in establishing a "baseline" energy usage level against which to compare savings, length of contract term due to the short-term perspective of some real estate developers, misplaced or "split" incentives which separate responsibilities for making capital investments and paying operating costs). Recently, some of the larger ESCOs have begun responding to owners' interest in green buildings (*i.e.*, achieving LEED certification) and are offering various energy-related services that support green building certification processes.

4.2 Current Market Size and Growth

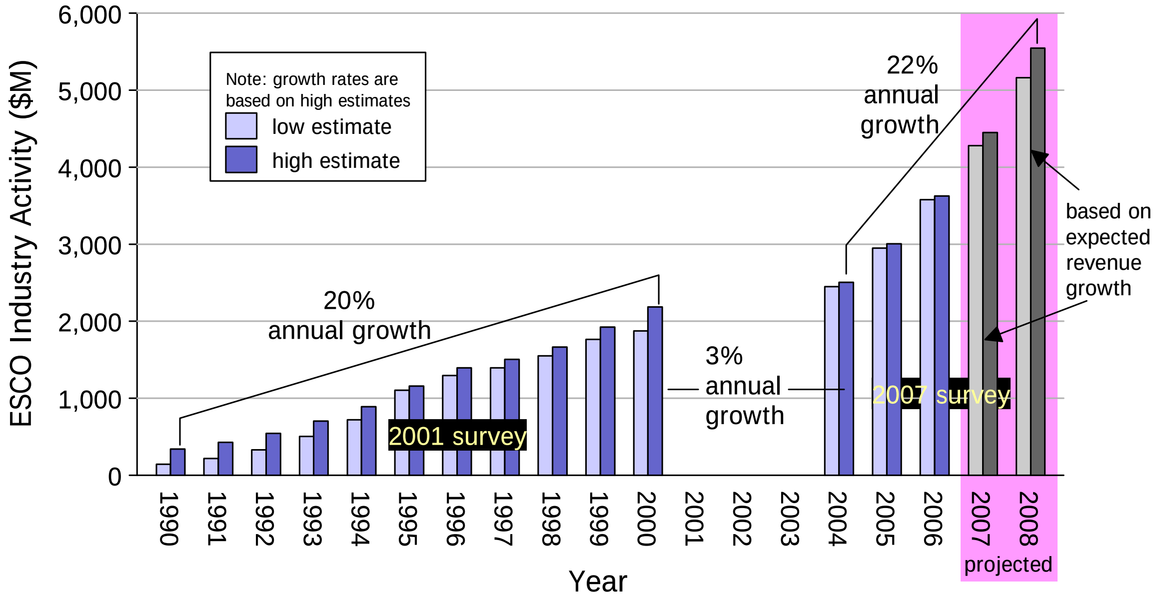
In the recent LBNL/NAESCO company survey, ESCOs were asked to provide their revenues from energy services[5] in 2006, as well as average annual growth rates experienced for the period from 2004–06 and projected for 2006–08.[6] We combined the results with data from our last industry survey, conducted in 2001, (Goldman *et al.* 2002) in **Figure 4-1**.

We estimate that industry revenues in 2006 were about $3.6 billion (our low and high estimates are $3.58 and $3.63 billion). By comparison, Goldman *et al.* (2002) estimated industry revenues of about $2 billion in 2000. Based on ESCOs' reported growth expectations, we project annual revenues of $5.2–5.5 billion in 2008.

[5] We defined energy services to include projects such as performance contracts, design/build projects, engineering, procurement & construction services (EPCS) projects, and consulting that involved energy efficiency or other energy-related services, including onsite generation projects for end users. We specifically asked companies **not** to include revenues from retail commodity sales or projects built to supply power to wholesale markets.

[6] For companies that did not respond to the survey, we developed high and low revenue estimates through a Delphi survey.

Figure 4-1. ESCO Industry Activity: 1900-2008



Although no data are available for the period from 2001 to 2003[7], the estimates for 2000 (from Goldman *et al*. 2002) and 2004 (from this survey) imply drastically reduced growth—down to 3% per year from 20% in the 1990s. This slowdown can be attributed to a number of factors:

- **Stalled retail competition**—The ESCO industry and many observers expected the advent of electric restructuring to provide a significant boost to ESCOs. In states that allowed retail competition, retail electric suppliers were expected to offer their customers optimized "bundles" of commodity and value-added services (including energy efficiency). However, repercussions from the California electricity crisis of 2000–2001 led a number of states to reconsider the implementation of electric industry restructuring in general, and their retail market designs in particular. For example, some states suspended or delayed retail access for some customer groups that had already been approved by state legislation (*i.e.*, California, Nevada, New Mexico, Arizona, Oklahoma and Montana), while other states decided not to move forward with retail competition at all. As retail competition stalled, a number of utilities that had acquired or started in-house ESCOs as part of their broader national and, in some cases, international corporate positioning began to reconsider whether to continue this line of business, which typically involved retail operations outside of their local service territories.[8]
- **The "Enron effect"**—The Enron scandal and bankruptcy of Enron Energy Services had direct and indirect short-term effects on the overall ESCO industry. Enron Energy

[7] It would have been impossible to reconstruct industry revenues in the early 2000's from surveys because many of the companies that were operating at that time are no longer in business.
[8] When interest in retail competition by policymakers looked to be a national phenomenon in the mid to late 1990s, some utilities had viewed ESCOs as a strategy to prepare for retail competition and to establish a presence in geographic regions and markets outside their local service territories.

Services was a relatively large ESCO. Thus, its demise had a direct impact on aggregate ESCO industry size for several years afterwards. The indirect effects on other ESCOs may have been even more significant. Fallout from the Enron scandal undermined accepted accounting methods for energy-related projects. Specifically, concerns about off-balance-sheet financing raised questions about the classification of debt in performance contracts. There were also marketing implications. The Enron scandal made some large customers more wary of contracting with ESCOs, particularly in arrangements that involved bundling of commodity and other value-added services (including energy efficiency) in which Enron Energy Services had specialized and subsequently abandoned.

- **Sunset of Federal Energy Savings Performance Contract (ESPC) legislation —** The legislation that authorized federal agencies to enter into long-term performance contracts with ESCOs expired in 2003 and was not re-instated for a full year. Because the federal government had been a significant source of new market growth for ESCOs, the lack of project activity had a significant impact on those ESCOs that were active in the federal market.
- **Industry consolidation—** A series of buyouts and mergers resulted in significant consolidation in the ESCO industry, driven in part by the market and industry events highlighted in this section. In the last LBNL/NAESCO survey conducted in 2000, we identified 63 ESCOs that were active. In the 2006 survey, we identified 46 ESCOs.

Based on our survey results, the industry showed significant recovery in recent years, with growth again reaching 20% per year for 2004–06. This can be attributed to several factors: rising energy prices; renewed interest by customers, utilities and policymakers in energy efficiency and climate change; the reauthorization of federal ESPCs and the adoption of aggressive energy savings goals for federal agencies by the U.S. Congress in 2005 (EPACT 2005); and the ramping up of public-benefit and ratepayer-funded energy efficiency and renewable energy programs. ESCOs are projecting continued growth, at similar rates, for the next two years.

4.3 Industry Structure and Ownership

The trend toward industry consolidation mentioned above is supported by our survey results. As of 2000, Goldman *et al*. (2002) reported that thirteen companies with revenues over $30 million per year accounted for approximately 75% of industry revenues. In 2006, eight companies had revenues over $100 million in 2006; together, they account for 79% of industry activity. In addition, the thirteen largest companies now account for over 90% of industry revenues (based on our high revenue estimate).

Yet these results belie the fact that the ESCO industry is characterized by a diversity of companies, large and small. In the following sections, we dissect the industry to examine trends in ESCO ownership and geographic scope.

4.3.1 Company Ownership

To examine trends in ESCO composition and ownership, we classified companies according to the following four categories:

- **Independent ESCOs—**ESCOs that are "independent" in the sense that they are not owned by an electric or gas utility, an equipment/controls manufacturer, or energy supply company; many "independent" ESCOs concentrate on a few geographic markets and/or target specific customer market segments;
- **Building equipment manufacturers—**ESCOs owned by building equipment or controls manufacturers; many of these ESCOs have an extensive network of branch offices that provides a national (and international) footprint, with sales forces and specialized national staffs providing packages of energy efficiency, renewables, and distributed generation "solutions" to customer market segments;
- **Utility companies—**ESCOs owned by regulated U.S. electric or gas utilities; many utility-owned ESCOs currently concentrate on regional markets or focus on the service territories of their parent utilities; and
- **Other energy/engineering companies—**ESCOs owned by international oil/gas companies, non-regulated energy suppliers, or large engineering firms.

These different types of ownership structure may have some bearing on companies' types of service offerings and/or their business and marketing approaches. For example, in marketing and developing projects, "independent" ESCOs that are not affiliated with equipment manufacturers or utilities often tout the fact that they do not promote specific technologies or products. However, because of brand loyalty to the equipment part of the business and overall customer brand recognition, ESCOs affiliated with controls or building equipment manufacturers may have certain marketing advantages. In addition, many ESCOs owned by controls or equipment manufacturers are large and tend to have the financial resources to compete in markets where transaction costs are high. Similarly, ESCOs owned by utilities often initially go after business opportunities that are geographically close to their local service territory where they have name recognition and/or customer contacts. Finally, ESCOs affiliated with large engineering companies often have large in-house engineering staff compared to other types of ESCOs, which they may tout as a competitive advantage.

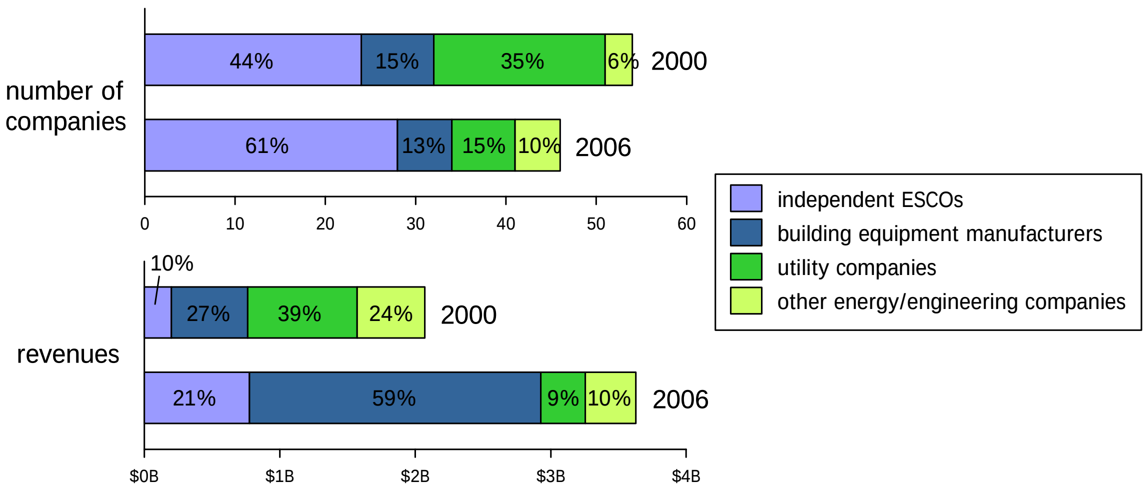
Figure 4-2 compares U.S. ESCO industry ownership, in terms of number of companies and revenues, in 2000 and 2006.[9]

Independent ESCOs are quite numerous but, with some exceptions, most are relatively small (*e.g.*, 61% of companies comprise only 21% of revenues in 2006). The industry share of independents increased both in terms of numbers and revenues between 2000 and 2006.

[9] The revenue breakdown is based on the high estimates for 2000 and 2006.

The market share of ESCOs that are subsidiaries of building equipment and controls manufacturers has remained fairly constant in terms of number of companies (13–15%), but their share of industry revenues has increased substantially, from 27% in 2000 to 59% in 2006. These companies have aggressively built their businesses in the last several years, through multiple acquisitions and also by taking advantage of synergies with other business lines within their parent companies (*e.g.*, bundling energy efficiency services with facility management, or outsourcing of facility operations and maintenance).

Figure 4-2. Trends in Industry Shares by Company Ownership



The number of utility-owned ESCOs has declined considerably, from 35% in 2000 to only 15% in 2006. In the 1990s, a number of utilities acquired ESCOs as a strategy for competing in retail electricity markets and establishing a presence in geographic regions and markets outside their local service territory. Since 2000, however, a number of utilities have made strategic decisions to focus on their core regulated businesses or developing power generation, rather than retail energy services or power marketing, and thus decided to sell or close their ESCO businesses. In addition, some utilities felt that their ESCO subsidiaries were not producing revenues in line with their rate-based businesses and thus were not, on the whole, compatible with their corporate financial objectives. Some utilities also discovered that long ESCO project sales cycles and tough market competition resulted in uncertain returns on investments of their ESCO subsidiaries. Based on our survey results, it appears that those utility-owned ESCOs who stayed in business were mostly smaller players—the revenue share of utility-owned ESCOs has dropped more dramatically than the number of companies, from 39% in 2000 to only 9% in 2006. Those utility-owned ESCOs who remain tend to be local or regional, rather than national, in their market focus.

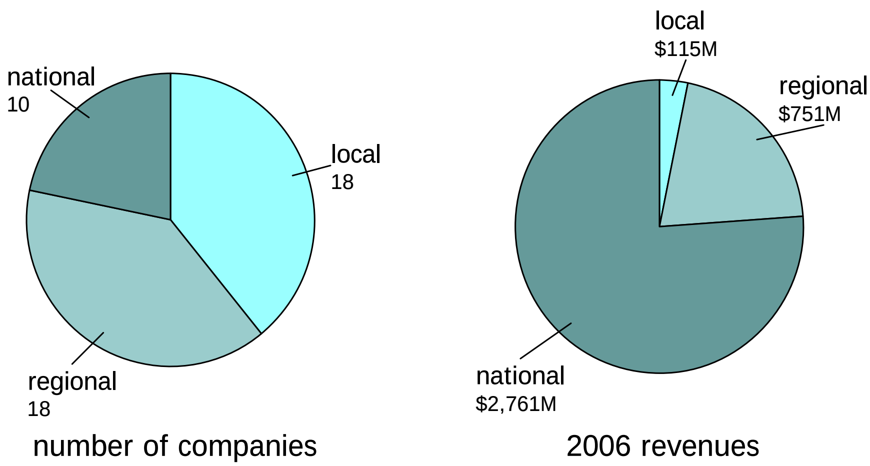
The share of companies owned by oil and gas companies, unregulated electric or gas suppliers, or large engineering companies has increased from 6% in 2000 to 9% in 2006. At the same time, their revenue share has decreased substantially, from 24% to 10%. In part, this is attributable to the Enron bankruptcy—Enron Energy Services comprised a sizeable portion of the revenues for this category in our 2000 survey. But this category is also changing structurally. The entry of large engineering firms into the ESCO market is a new development since the LBNL/NAESCO 2000 survey. If successful, these new players may open the door to a new trend in ESCO ownership and help grow the overall market.

4.3.2 Geographic Scope

We also distinguished ESCOs as local, regional, or national players (see Figure 4-3). We define these categories as follows:

- **Local**—ESCOs that restrict their activities to one or more local markets, and do not aspire to cover an entire region or the whole country;
- **Regional**—Companies that restrict their activities to one or more regions, either covering the region(s) with offices or responding to program opportunities within the region(s); and
- **National**—ESCOs that either have an established national presence, or, are willing and have the capability to establish branch offices anywhere they see significant business opportunities.

Figure 4-3. Industry Shares of Local, Regional and National ESCOs



As might be expected, local companies tend to be small and relatively numerous—they account for 39% of companies in our survey, but only 3% of revenues. However, we emphasize that the LBNL/NAESCO survey probably did not identify all the local ESCOs. As a result, the number of ESCOs with a local focus is likely higher than our survey results might suggest. Regional companies comprise 21% of revenues and 39% of companies. The national companies make up about 22% of companies in our survey, but contribute over three quarters of industry revenues.

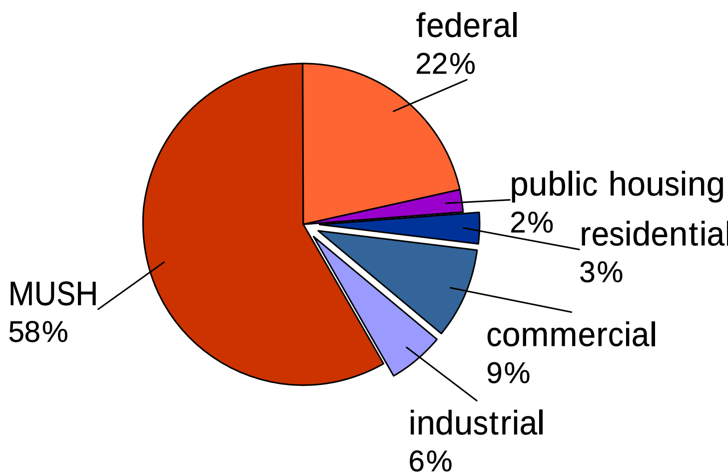
4.4 Market and Project Trends

In the LBNL/NAESCO2007 survey, we asked ESCOs to provide a breakdown of their 2006 revenues among various market segments, contract types and technology/project types. Thirty-two companies with combined 2006 revenues of $3.515 billion (97% of our high 2006 estimate) provided this information. We report the results in the following sections, comparing results to previously collected information where possible.

4.4.1 Market Segments

ESCO industry revenues for various customer market segments as of 2006 are represented in Figure 4-4.

Figure 4-4. 2006 ESCO Industry Revenues by Market Segment



In the U.S., the "MUSH" markets—municipal and state governments, universities and colleges, K-12 schools, and hospitals—have historically hosted the largest share of ESCO industry activity. The survey results for 2006 indicate that this is still the case; MUSH markets comprise 58% of industry revenues, worth over $2 billion.

The importance of the federal market has increased dramatically in the last decade.[10] According to survey results, it now represents 22% of industry revenues ($760 million), despite the hiatus in the ESPC enabling legislation in 2003–2004. It is important to note that ESCOs provide energy services to federal agencies through a variety of financing mechanisms. Some of this work consists of performance contracting (*i.e.*, ESPC projects), but ESCOs may also provide energy services to federal facilities on a design/build basis or act as contractors implementing Utility Energy Services contracts (UESC). To calibrate our federal sector estimates, we gathered investment information from the federal government under the following financing mechanisms:

[10] See Hopper et al. (2005) for a discussion of procurement mechanisms that have enabled the growth of the federal market.

- **Energy Savings Performance Contracts (ESPC)—**In FY2006, the total investment in Energy Savings Performance Contracts by various federal agencies (including the DOE Super-ESPC program, Army, Navy, and Air Force) was $321 million (Vallina 2007; FEMP 2007).
- **Utility Energy Services Contracts (UESC)—**Federal agencies may also invest in energy-efficiency improvements through the UESC financing mechanism, in which a local utility develops and manages the installation of energy-efficiency projects at federal facilities; ESCOs are sometimes selected to implement these projects. UESC activity in FY2006 was about $70 million, which is somewhat lower than in previous years (Vallina 2007).
- **Direct Congressional appropriations—**Another $276 million in federal project investment is accounted for by design/build or EPCS (Engineering, Procurement, and Construction Services) projects that are paid out of agencies' appropriated budgets.
- **Enhanced Use Leasing (EUL)—**A number of energy projects are being financed at federal facilities through enhanced used leasing (EUL), although we were unable to find an estimate of EUL activity in 2006.

Based on recent data compiled by the Office of Management and Budget (OMB), energy-efficiency investment at federal facilities in 2006 is estimated to total about $668 million (Vallina 2007). Our estimate of ESCO activity in the federal sector of $760 million in 2006, exceeds the activity reported by the federal government accounting by about 14%. Some of this discrepancy may be explained by the fact that some large ESCOs have begun including energy-efficiency services as an add-on to existing operations, maintenance and/or facility management contracts at federal sites. This activity may be included in the ESCO's estimates of their federal market activity, yet not included in the federal government's accounting because it does not fall under the financing mechanisms typically associated with federal sector energy efficiency.

According to our survey, only 18% of ESCO industry revenues in 2006 were attributable to private sector market segments (*i.e.*, industrial, commercial and residential). This is in contrast to ESCO market activity in several other countries (*e.g.* most Asian and some European countries), which are dominated by industrial and commercial customers (Vine 2005). The industrial market (6% of industry revenues) has been challenging for U.S. ESCOs to penetrate for a number of reasons: high customer investment hurdle rates, low priority for energy projects compared to investments with a more direct impact on sales, limited non-process related energy demand, limited ability of some ESCOs to work on core industrial processes, customer hesitancy to allow outsiders to alter industrial processes, and limited replicability of project designs (Elliot 2002).

Commercial market activity is slightly higher than the industrial market, but at 9% of revenues it remains a relatively small market segment. Barriers to ESCO activity in the commercial sector include misplaced or "split" incentives which separate responsibilities for making capital investments and paying operating costs that limit interest in long-term performance contracts (*e.g.*, building owner/tenant relationships). Other barriers include the relatively short terms of tenant leases (*e.g.*, one to five years), high investment hurdle rates for non-owner occupied commercial space and the unwillingness of some owners to take on long-term debt, which might interfere with their ability to "flip" their properties. However, increasing interest in green building improvements may drive the level of energy services investment in this sector going forward.

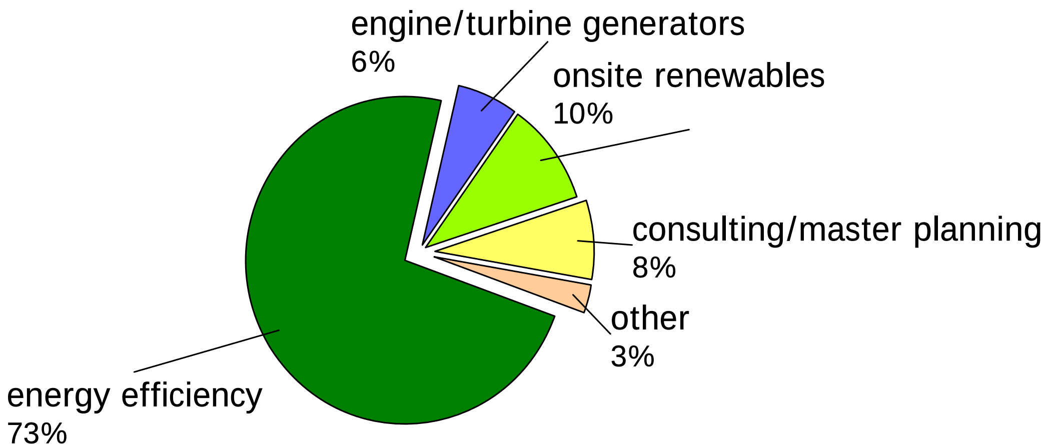
Residential and public housing markets together account for 5% of industry revenues, and are only targeted by a handful of ESCOs. Because of the difficulties working in these markets—high transaction costs, institutional barriers—they remain a niche market for ESCOs. In the case of public housing authorities, significant project delays have also arisen from inconsistencies between the Department of Housing and Urban Development (HUD) and its field offices in interpreting statutes and regulations affecting housing authority project implementation details. Nonetheless, ESCOs have achieved significant penetration in the public housing market. Revised legislation, extended allowable contract terms (from 12 to 20 years), rising energy and water costs, and aggressive marketing by ESCOs have contributed to significant expansion of the public housing market in the last few years.

4.5 Project/Technology Types

The "conventional wisdom" in the ESCO industry is that there has been a trend in recent years toward larger projects involving onsite generation, large central plant facilities, and renewable energy technologies. In the survey, we asked ESCOs to allocate their 2006 revenues among various project and technology strategies.

Our survey results indicate that energy efficiency still makes up a major share of industry activity (see Figure 4-5). At almost three quarters of industry revenues, ESCO-deployed energy efficiency amounts to an approximately $2.5 billion per year market.

Figure 4-5. 2006 ESCO Industry Revenues by Technology/Project Type



Engine/turbine generators installed to serve customer supply needs comprise 6% of industry revenues ($218 million).[11] A larger share was reported for renewables (10%) although when probed some large companies told us they had included activity in the green buildings market, which is primarily new construction, in this category.[12] Thus, the actual investment by ESCOs in renewable generating technologies such as photovoltaics, wind power and geothermal heat pumps is somewhat lower than the results in Figure 4-5 may suggest. In many cases, ESCOs are leveraging incentives offered by public benefit funds in some states for emerging renewable technologies as well as federal and state tax credits and bundling renewables with energy efficiency improvements in order to enhance the overall economic attractiveness of these projects.

Consulting and master planning (in which the ESCO provides a host of energy management services, including billing, commodity procurement or consulting, recommending efficiency improvements, etc.) and other services (typically operations and maintenance (O&M), water conservation, or non-energy improvements reported separately by the ESCOs) make up just over 10% of industry revenues.

4.6 Contractual Arrangements

We also asked ESCOs to break down their 2006 revenues into several types of contracting vehicles. Goldman *et al*. (2002) estimated that performance contracting—projects in which the ESCO assumes some portion of the project performance risk—accounted for 60% of ESCO industry activity in 1996-2000. This was down from the same study's estimate of 74% for 1990-95.

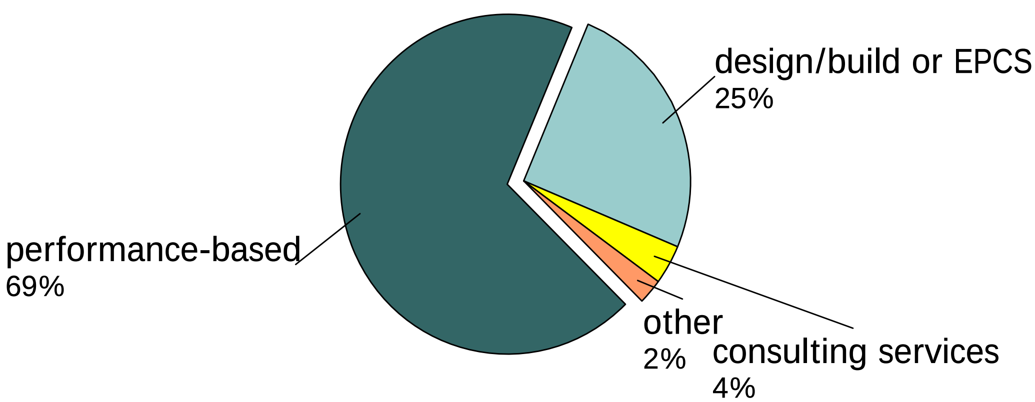
Based on our 2007 survey, performance-based contracts accounted for 69% of industry activity in 2006 (see Figure 4-6). This represents 16% average annual growth in revenues from performance-based agreements since 2000. We believe this increase is explained by two phenomena:

[11] Some ESCOs have constructed large power generating facilities to sell power into wholesale markets. We specifically asked companies **not** to include revenues from such projects in their survey responses.
[12] Some ESCOs have indicated that they believe that the 'greening" of buildings is emerging as a major industry driver, and are experimenting with project approaches that "use energy efficiency to pay for Green."

- **State and federal performance contracting requirements**
All states (with the exception of Wyoming) allow performance contracting projects in various institutional markets (*e.g*. K-12 schools, state and local governments, universities/colleges). A number of these states have ramped up their energy-efficiency project activity in public buildings in recent years in conjunction with relatively rigorous guarantee requirements (*e.g.*, Pennsylvania, Kansas, North Carolina, Kentucky, and Texas). This phenomenon, plus the growth in performance contracting in the federal market, has probably led to an overall increase in energy efficiency performance contracting since 2000.

- **Increased use of Power Purchase Agreements (PPAs)**
In a power purchase agreement, the ESCO maintains ownership of the generating assets and sells commodity (*e.g.*, electricity, steam, hot water) to the customer.[13] The contract specifies a guaranteed price and/or amenity output level that must be met by the ESCO, so it can be considered performance-based. These projects often target on-site generation and/or central plant opportunities. Because they tend to be very large projects, they may contribute substantially to the observed growth in performance-based agreements among ESCOs since our 2002 report.[14]

Figure 4-6. 2006 ESCO Industry Revenues by Contract Type



Non-performance-based agreements, such as design/build and “engineering, procurement and construction services” (EPCS) projects, account for about 25% of reported 2006 industry revenues (see Figure 4-6).[15]

[13] These contracts are also referred to as “build/own/operate” agreements.
[14] In this study, we broadened our definition of “performance-based agreements” to include power purchase and build/own/operate agreements as well as guaranteed and shared savings (see Hopper et al. (2005) for descriptions of these types of performance agreements). Because power purchase agreements were not that prevalent in 2000, including this type of performance agreement in our definition in Goldman et al. (2002) would not have changed the 2000 results significantly.
[15] Neither design/build nor EPCS projects entail ESCO assumption of project performance risk (e.g., energy savings) once the project has been completed. Under a design/build contract, a single entity (i.e. the ESCO) designs

Finally, a small additional share of industry revenues is attributable to consulting services and other energy services (typically O&M contracts) reported as distinct revenue streams by ESCOs.

5. EPC Market Drivers

The EPC market segments that are described and quantified above are motivated by several distinct market drivers, which are discussed in this section of the paper.

5.1 Savings Mandates

The federal government and a number of state governments have enacted mandatory energy savings initiatives for buildings under their control during the past fifteen years. In the early 1990's,the federal government led the way by imposing on all federal agencies what were considered to be very aggressive savings targets. These targets have been increased three times since their initial imposition because they have, in the aggregate, been achieved, though the performance differs significantly between agencies. States, seeing the results realized by the federal government, began imposing their own energy savings mandates several years ago. It is not clear how successful, in aggregate, these state mandates will be largely because, in many instances, the mandates have not imposed aggressive energy savings targets.

However, these mandates still comprise a major driver for federal and MUSH market EPC projects because they were not accompanied by increases in capital funding required to implement the kind of comprehensive energy efficiency programs required to meet the mandates. Thus, both federal and state agencies turn to EPCs because they can be financed outside the government capital appropriation process.

5.2 Facility Modernization

A second major driver, particularly for the MUSH market, is the need for facility modernization in state and local government facilities. The condition of the physical plants of government institutions, as documented in frequent news stories and reports, ranges from neglected to deplorable, and facility managers are often faced with building equipment crises, such as the imminent demise of a boiler plant, which require immediate attention. In the absence of capital appropriations, which are rare, an EPC can provide the capital required to replace the failing equipment. Projects driven by the need for facility modernization are typically comprehensive, because the short-payback measures, such as lighting retrofits, generate the savings required to pay for the longer-payback measures, such as a boiler replacement, which are often driving the project. It is important to note that the measures in an EPC project improve building performance as well as saving energy. Lighting, temperature conditions and ventilation are all

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and builds the project under a single agreement, which typically involves a guaranteed maximum price. EPCS contracts are entirely fee-based; different entities may be responsible for different phases of the project (e.g., design, construction), and the contractor does not assume project price risk.

improved, which has a measurable effect on the productivity of building occupants, whether they are employees or students.

5.3 Green Buildings

Another EPC driver that is prominent in the federal and MUSH markets, and is beginning to penetrate the private building market segments, is the desire of building owners to "green" their buildings. Many people think first of renewable energy technologies, such as photovoltaics, when they think about green buildings, but energy efficiency is the technical and economic foundation of a green building project. On the technical side, no renewable energy technology is inexpensive or reliable enough to offset inefficient end uses, so a building's energy use must be minimized to make optimal use of renewable energy. On the economic side, it is becoming increasingly obvious that "energy efficiency pays for green", that is the savings produced by energy efficiency measures finance the installation of renewable energy measures through a long-term EPC contract.

5.4 Climate Change and Emissions Reduction Initiatives

State governments are also beginning to enact emission reduction initiatives to address the problem of climate change. As policy planners try to convert the mandates of political leaders into practical programs, they increasingly focus on large-scale energy efficiency as the first choice in meeting the mandates. The characterization of energy efficiency as the cornerstone of these types of initiatives is because of its demonstrated cost-effectiveness and the lack of the major technical risks associated with alternatives such as carbon capture from power plants. EPC projects provide a quick way for policy makers to deliver major energy savings, and therefore emissions reductions, because the delivery infrastructure, the ESCO industry, is already in place and has a history of scaling up to service customer-driven growth opportunities. It is important to note that the revenues that will be attached to carbon cap-and-trade regimes are likely to expand the capability of ESCOs to deliver more comprehensive EPC projects that involve renewable technologies, because these carbon trading revenues are over and above the energy savings revenues that today finance comprehensive energy efficiency EPC projects. The development of additional revenue streams creates different project economics that can support the use of more costly technologies like renewables.

5.5 Utility and ISO/RTO Capacity Savings Programs

The final major driver for EPC projects is the emerging market for electricity market capacity credits. The U.S. today is facing the need to construct a new generation of electricity generating plants, which, because of the high and volatile price of natural gas, are likely to be coal and nuclear plants. The hope of a decade ago, that merchant power plants would eliminate the need for utilities to put new power plants into their rate bases or make long-term power purchase agreements with independent power plant operators, has evaporated. The financiers of the merchant plants in the late 1990s lost billions of dollars when the merchant generators overbuilt new capacity in most markets, and turned idle or underutilized plants over to the financiers.

The fact that ratepayers will have to bear the cost and risk of the projected development, construction and long-term operating costs of the new generation of plants is forcing state regulators, even in historically low-cost electricity states in the Southeast U.S., to look for more economic alternatives, such as energy efficiency, demand response and distributed generation. One mechanism that is being tried in New York and New England to encourage the development of these alternatives is to provide payments to their developers, through utility incentive programs or ISO bid programs. The payments are designed to be equivalent to, or less than, the payments that would be made to the developers of new central generating plants. Like the revenues that will be generated by carbon trading, these capacity credit revenues are over and above current EPC project revenue streams, and should allow ESCOs to expand the technologies delivered in EPC projects.

6. EPC Financing

This section of the paper describes the financing of EPC projects, offering an overview of the financing marketplace and more detailed descriptions of some of the most popular EPC project financing vehicles.

6.1 Third-party Financing Marketplace

Almost all EPC projects are financed by third-party finance companies – banks and other financial institutions. The large players in the business are recognizable names like Bank of America, Citibank, GE Capital, National City, PNC Bank, etc. There are also specialized EPC project finance brokers, somewhat analogous to mortgage brokers, who originate project financing deals which they then place with large institutions.

6.1.1 Available Capital

There is plenty of money available to finance EPC projects from the large institutions. For example, the Clinton Climate Initiative, in its recent announcement of a program to promote energy efficiency in major cities around the world, announced that several major investment banks had committed $1 billion apiece to the effort, and that more money would be forthcoming if the market needed it. This funding is over and above the current funding available in the U.S. EPC market, and largely from institutions that are not current players in that market.

6.1.2 Typical Rates and Terms

A typical EPC project is financed directly with the customer, not the ESCO, because customers, most of whom are public sector (MUSH market and federal) realize that they can get better interest rates than the ESCOs. So the customers borrow the money to finance the projects, and their payments are assured by an ESCO guarantee that project savings will be sufficient to pay the finance costs. A typical MUSH market project today is financed at rates of 4.5-5% for terms of up to 20 years. A typical federal project has rates up to 7%, higher than MUSH market rates, because federal facilities cannot take on debt without an act of

Congress, and so their EPC project financing involves more complex structures than MUSH market financing.

6.1.3 Competitive Process

The third-party EPC finance market is very competitive. A typical project will have several financing proposals, usually secured through a formal RFP process, with the financing companies competing at the level of .1% of interest (or 10 basis points), and offering substantial flexibility, structuring payment schedules to match the schedule of project savings cash flows.

6.2 Performance Contract Financing Vehicles

This section of the paper describes the most popular financing vehicles used in EPC projects, in rough order of their popularity.

6.2.1 Background: Operating Expenses vs. Capital Expenses[16]

To argue the advantages of a tax-exempt lease-purchase agreement and a performance contract, facility managers must be conversant with the roles that the operating expense budget and the capital expense budget play in their organizations. Typically, a capital expense budget is used for the funding to pay off long-term debt and the acquisition of fixed assets (such as buildings, furniture, and school buses) and where repayment typically extends beyond one operating period (one operating period usually being 12 months). In contrast, operating expenses are those general expenses (such as salaries or supply bills) that are incurred over the course of one operating period (again, typically 12 months).[1] For example, repayment of a bond issue is considered a capital expense, whereas paying monthly utility bills is considered an operating expense.

The disadvantages associated with trying to use capital expense budget dollars for your energy efficiency projects include the following: (1) capital dollars are already committed to other projects; (2) capital dollars are often scarce, so your projects are competing with other priorities; and (3) the approval process for requesting new capital dollars is time consuming, expensive, and typically requires voter approval ,or, in the case of commercial and industrial sector projects the sign-off by multiple management layers.

6.2.2 Tax-Exempt Lease-Purchase Agreements

Tax-exempt lease-purchase agreements are common public sector financing alternatives that allow repayment from operating expense dollars rather than capital expense dollars. They are effective alternatives to traditional debt financing (bonds, loans, etc.) and allow public organizations to pay for energy upgrades by using money already set aside in annual utility budgets. When properly structured, this type of financing mechanism allows public sector

[16] This section of the paper is excerpted from the ENERGY STAR publication entitled INNOVATIVE FINANCING SOLUTIONS: FINDING MONEY FOR YOUR ENERGY EFFICIENCY PROJECTS, available at the following URL: http://www.energystar.gov/ia/business/COO-CFO_Paper_final.pdf

agencies to draw on dollars saved from future utility bills to pay for new, energy-efficient equipment today.

A tax-exempt lease-purchase agreement, also known as a municipal lease, is like an installment-purchase agreement rather than a traditional lease or rental agreement. Under most rental agreements (such as those used in car leasing), the renter (lessee) returns the asset (the car) at the end of the lease term, without building any equity in the asset being leased and can postpone the decision to acquire the asset being financed until the end of the lease term. A lease-purchase agreement, however, presumes that the public sector organization will own the equipment after the term expires. Further, the interest rates are appreciably lower than those on a taxable commercial lease-purchase agreement because the interest paid on the debt instrument is exempt from federal income tax for public sector entities.

In addition, a tax-exempt lease-purchase agreement usually does constitute a long-term "debt" obligation because of non-appropriation language commonly written into the agreement. This language effectively limits the payment obligation to the organization's current operating budget period. Therefore, if for some reason future funds are not appropriated, the equipment is returned to the lender, and the repayment obligation is terminated at the end of the current operating period without placing any obligation on your future budgets.

Because of the non-appropriation language typically included in tax-exempt lease-purchase agreements, this type of financing may be considered an operating rather than a capital expense. As a result, the payments are not considered "debt" from a legal perspective in most states and usually do not require taxpayer approval. You will, however, have to assure lenders that the energy efficiency projects being financed are considered of essential use (*i.e.,* essential to the operation of your organization), which minimizes the non-appropriation risk to the lender.

Many public entities already lease equipment. Adding an energy project to an existing lease agreement may be surprisingly easy, especially if a Master Lease is in place with a lending institution. Governing statutes vary from state to state;[3] and the use of tax-exempt lease-purchase agreements may differ across schools, municipalities, and counties even within the same state. Public sector organizations should always consult legal counsel before entering into lease-purchase agreements.

There may be cases when a lease-purchase agreement is not advisable; for example, (1) state statute or charter may prohibit such financing mechanisms from being used; (2) the approval process may be too difficult or politically driven; or (3) other funds are readily available, (e.g., bond funding that will soon be accessible), or excess money exists in the current capital or operating budgets.

6.2.3 Capital Leases[17]

Capital Leases are installment purchases of equipment. Little or no initial capital outlay is required. With a capital lease, the facility owner eventually owns the equipment at the end of the lease term and may take deductions for depreciation and for the interest portion of payments. A capital asset and associated liability will be recorded on the facility owner's balance sheet. Based on the criteria defined by the Financial Accounting Standards Board (FASB) Statement No. 13, a lease meeting one or more of the following criteria qualifies as a capital lease:

- The lease transfers ownership of property to the customer at end of the lease term.
- The lease contains a bargain purchase option.
- The lease term covers 75 percent or more of the estimated economic life of the equipment.
- The value of the lease equals or exceeds 90 percent of the fair market value of the equipment at the beginning of the lease. Government entities may be eligible for a tax-exempt capital lease.

Because the lessor does not pay taxes on the interest from these leases, the rates are lower than typical market rates. For municipal organizations that can undertake new debt, tax-exempt capital leases can be very attractive.

6.2.4 Shared Savings

With shared savings, the dollar value of the measured savings is divided between the host facility and the service provider (see Figure 2). If there are no cost savings, the facility owner pays the energy bill and owes the contractor nothing for that period. The percentage distribution of the savings between the service provider and the customer is agreed upon in advance and documented in the performance contract. In a classic shared savings arrangement, the ESCO provides the financing as well as project development and implementation performance risks. The ESCO also bears interest rate risk and risk of rising utility costs beyond the escalation clause agreed to in the initial Energy Savings Agreement. The ESCO typically agrees that the facility owner will, in no instance, pay more for utilities than it did at the start of the contract. The ESCO receives a higher percentage of the savings at the beginning of the contract term to pay off the cost of the equipment. If there are no dollar savings, the ESCO is still responsible for meeting the financial obligations associated with the up front equipment purchases. At the end of the contract, ownership transfers to the building owner as specified in the contract. The owner either may purchase the equipment at fair market value or simply assume ownership of the equipment paid for during the contract term depending on the contracting structure. The largely one sided risk profile is the principal reason that the shared savings contracting structure is not often used by ESCOs except in the federal market where it is mandated by the enabling legislation.

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[17] This section of the paper is excerpted from the ENERGY STAR publication entitled "FINANCING", available at the following URL: http://www.energystar.gov/ia/business/BUM_financing.pdf

6.2.5 State or Local Government Leasing Pools

A number of states and local governments offer leases that are part of a larger pool to their constituent agencies. A state government, for example, might arrange with a third-party lender to provide a $100 million lease facility, which individual EPC projects can access through Certificates of Participation (COPs). COPs are simply another means of funding lease-purchase transactions through the sale of receipts evidencing partial ownership of a lease-purchase agreement. Certificates are sold to multiple investors much like bonds, however, unlike bonds; COPs have no independent legal existence or significance.

6.2.6 State or Local Government Bonds

States or local governments can also sell bonds to finance EPC projects. If the state sells bonds, it usually packages a number of projects into a single bond issue, to minimize the bond transaction costs and interest rate. This can often result in significant delays in EPC project implementation while a suitable package of projects is assembled. The ENERGY STAR Cash Flow Opportunity Calculator was designed to help facility owners decide if waiting for a pending state bond issue is more cost effective than utilizing immediately available lease-purchase financing. If a local government sells bonds, they are often for a single EPC project, but the issuance of the bonds requires approval by the local government’s legislative body (*e.g.* city council) as well as the locality’s voters at an election.

6.2.7 Revolving Loan Pools

Some states, such as California and Texas, have revolving loan pools dedicated to the financing of EPC projects. The rates for these pools are generally attractive, but the pools often have waiting lists of projects, so that a new project can be held up for several years until previous projects repay their loans and funding is available.

6.2.8 Cash from Capital Budgets

Sometimes cash is available from state or local government capital budgets to finance, or partially finance, an EPC project. Regulations on the employment of capital funds vary significantly from state to state. Some states forbid the use of any capital funds in EPC projects, reasoning that a project fully paid from capital funds should be implemented through the spec-and-bid public construction process. Other states allow the blending of capital funds and borrowed funds in an EPC project, so that the scope of the EPC project can be expanded to include measures or technologies that would not pay for themselves from energy savings, such as a new roof or a photovoltaic installation. Currently, federal managers cannot blend appropriated and non-appropriated funding and there is a push by many to be able to do so in order to increase the level of EPC investment and project scope.

6.2.9 Power Purchase Agreements (PPAs)

Projects that involve distributed generation or combined heat and power (CHP) measures often employ a different kind of financing, in which the facility owner contracts to pay for the output of the facility (*e.g. per* kWh or pounds of steam) rather than paying for the equipment. In this kind of contract, the facility owner pays nothing if the ESCO does not deliver the energy commodity. PPAs can be quite complex, because they allow for one or other of the parties to break the contract in the event, for example, that the cost of power from the utility becomes lower than the cost of power from the CHP facility, or if the gas supply contract for the CHP plant is worth more than the savings from the operation of the plant.

7. Performance Contract M&V

The final major element of a performance contract is the monitoring and verification (M&V) of the project savings. This element is critical because the facility owner that hosts and EPC project is depending on the project savings to pay its financing obligations, and the ESCO is guaranteeing the level of energy savings. Therefore, the design and implementation of M&V protocols is the foundation to the long-term success of the EPC project.

Not surprisingly, the historical development of EPC M&V protocols tracks the stages of the development of the ESCO industry that was outlined at the beginning of this paper. That development is summarized below.

7.1 Pre-1985: The Beginning of DSM

First generation M&V systems were established to track the progress of the utility programs, typically in terms of services delivered -- homes audited, contractors trained, banks signed up for loan programs, etc. – rather than actual kW or kWh savings achieved. Utilities also conducted extensive research on the efficacy of various types of energy conservation technologies in laboratory-like settings. For example, rather than rely on manufacturers' testing data, many utilities ran their own tests of the effectiveness of attic insulation.

7.2 1985-1993: Emergence of Performance Contracting

The fledgling ESCOs, the utilities and the project customers developed the protocols through an arduous process that usually involved a utility developing a proposed protocol, and then modifying the protocol through a series of project-by-project negotiations with the ESCOs and their customers. The utilities were under regulatory order to procure energy efficiency resources that were cheaper than generation resources, and so developed the notion of the "avoided costs" of future generation, essentially projections of the cost of generation over the life of the energy efficiency project. ESCOs priced efficiency projects against avoided costs. Some utility programs were criticized for over-paying for projects on this basis, and quickly learned that program monitoring requirements had to include both project costs and savings in order to deliver the best value to ratepayers.

At the same time, both customers and utilities were afraid of the risks inherent in the new technologies that were utilized in the projects, and insisted that all of the risks be borne by the ESCOs. A typical project contract was a "shared savings" contract in which the customer agreed to have the new technologies installed in its facility, and agreed to pay the ESCO a share of the verified savings produced by the project. No savings therefore equaled no payment. The financing for this type of project was very expensive, because few lenders were willing to commit to long-term loans for unproven technologies delivered by companies with little or no track record, and those that did lend required substantial ESCO equity as security. The ESCO business was thus limited in size and scope to either small companies with a limited number of projects financed through the company's own assets or companies with sizeable balance sheets that could essentially collateralize the debt assumed on behalf of the projects undertaken. The companies in the business, particularly the companies that did the project financing, were quite profitable. In fact, a few ESCOs adopted a business model of buying the projects of other companies which for whatever reasons needed to reduce their liabilities and remove long term debt from their balance sheet.

This second stage of the ESCO industry came to an effective conclusion in the New Jersey Standard Offer program, which was designed by regulators to deliver what they called an "energy efficiency power plant." In the mid-1990s ESCOs delivered about 300 MW of projects, verified by what was then the state-of-the-art M&V protocol: real-time monitoring of essentially every circuit in every customer facility in the program for the life of the project, with the data telemetered to ESCO offices and consolidated into monthly reports and invoices. All of this was done with 900-baud modems, and subject to utility post-audits for the life of the projects (5-15 years).

This measurement and verification protocol was very expensive, typically about 15% of the total project cost, and so demanding that the host utility established a very lucrative business financing the projects and providing the M&V services through a subsidiary, and eventually wound up owning more than half of the total projects in the program. Many of the other projects were owned by another utility subsidiary; in two successive years, the utility reported that about one-quarter of its profits had come from the subsidiary.

ESCOs, customers, utilities and regulators learned several major lessons during this second stage of the performance contracting business, including:

- The performance contracting business model could deliver large volumes of energy and demand savings, but the lack of a robust financing market and the elaborate M&V protocols were severely limiting its growth.
- The technologies employed in most performance contract projects were not very risky, because the technologies had matured and most customers shied away from cutting-edge technologies.
- The financing of performance contracts was profitable and not very risky.
- The M&V protocols employed in the New Jersey program were overkill as they were expensive to implement and over measured technologies with fairly well understood consumption patterns.

To accelerate industry growth, the ESCO industry would have to lead the development of a multi-stakeholder, standardized and simplified M&V protocol that could be understood by bankers and other non-expert parties. NAESCO took the lead in refining the New Jersey M&V Protocol and developed a new protocol which was the first non-utility protocol accepted for use by the California Public Utilities Commission.

7.3 1994-2002: Success and Consolidation

From 1994 to 1996, NAESCO, ASHRAE, U.S. DOE worked to create what is now the International Performance Monitoring and Verification Protocol (IPMVP), which was formally introduced in 1996, and has since become the "gold standard" of performance contracting M&V. It is used in most state programs, has been adapted for use in the federal program, and is used in most non-government performance contracting projects. Perhaps the most important feature of the IPMVP is its methodology for matching the rigor and cost of M&V to the risk of particular energy efficiency technologies. Simple technologies like lighting can be handled with deemed or stipulated savings that involve modest measurements, while complex technologies like digital control systems require sophisticated whole-building modeling and engineering calculations, as well as long-term project monitoring.

7.4 2003 – Present: Pause, and now Fast Growth and New Services

It is becoming increasingly apparent that the current generation of M&V protocols, including IPMVP, does not adequately address the requirements of some of these emerging performance contracting market drivers.

- Utility regulators, electricity system operators and utility supply-side managers need a greater level of precision than current M&V protocols provide to verify that demand and energy resources produced by performance contracting projects are being delivered, particularly at local system peaks.
- Environmental regulators and the emerging emissions credits trading markets need standardized monitoring and verifications systems that can assign emissions reductions credits to end-users with an acceptable level of precision so that these credits can be traded alongside credits for point source emitters.
- Public sector customers need standardized systems for identifying, recording and monitoring the operations and maintenance cost savings and capital cost avoidance that are often produced by performance contracting projects.

7.5 Current State-of-the Art of EPC M&V

A typical EPC project today employs the IPMVP, but makes maximum use of its stipulated savings protocol rather than its more rigorous, and costly, long-term monitoring alternatives. The trend to maximize the use of stipulated savings has been driven by all parties to an EPC project. The customer generally does not implement technologies that it perceives to be risky, and wants to maximize the capital investment in its facility, and so spend as little as possible on long-term M&V. The ESCO typically wants to stipulate as high a percentage of the projected savings as possible to minimize its long-term performance risk. EPC project financiers want stipulated savings, to minimize the risk that the facility owner will stop paying the financing charges because it believes it is not realizing the projected savings. Utility programs that provide incentives to EPC projects also want to maximize stipulated savings so that they can document that they are meeting their savings goals with minimal long-term M&V costs.

The stipulated savings approach generally works well, because all parties tend to be conservative in their implementation of technologies. But it is beginning to fray around the edges a bit, as the M&V protocols are stretched to account for operational savings, environmental emissions reductions and the documentation of capacity (rather than energy) savings required by utilities and transmission system operators.

8. Performance Contract Market Constraints

Though the EPC industry, as documented by the recent LBL study cited above, is growing at 20% or more annually, many industry observers believe that industry growth is in fact being constrained by several factors, and could grow much more rapidly if the constraints were removed. Policy makers also observe that EPCs must be much more widely employed if the U.S. is to meet is aggressive energy savings and emissions reductions goals during the next two decades. This section of the paper outlines some of the constraints and suggests some approaches to loosening them.

8.1 New Generation of M&V Protocols Needed

As noted in the discussion above, the state-of-the-art of EPC M&V is beginning to fray a bit. A new generation of M&V is needed to monitor and verify the operational savings, environmental emissions reductions credits and energy system capacity credits that EPC projects produce. This new generation of M&V will make full use of the metering and communications technologies that did not exist when the IPMVP was written in the mid-1990s, but are now widely available in utility re-metering programs, advanced building automation systems and expanding internet connectivity. Several efforts are now underway to begin the development of new M&V protocols, and these efforts should yield tangible results in the next two years.

8.2 National/International Shortage of Skilled Personnel

The growth of the ESCO industry is now seriously constrained by the lack of skilled personnel required to develop and implement EPC projects. ESCOs are now competing with utilities, renewable energy firms, environmental and energy consulting firms, and government agencies for a limited pool of professional and skilled technical talent. The personnel shortage is not just regional in the US, or national across the US, but rather worldwide. In the US, both university engineering programs and community college technical education programs have been slow to see the need for more energy efficiency and renewable energy personnel, and are now scrambling to develop new curricula and expand the student populations in these curricula. It will, unfortunately, take several years for the educational infrastructure to catch up to the market needs, so the short-term effect will be increasing compensation levels across the ESCO industry.

8.3 Specific Market Barriers

In addition to these general market constraints, specific market segments have unique constraints that must be addressed if EPS is to reach its full potential.

8.3.1 Federal and MUSH Market Bureaucracies

The primary constraint in the federal and MUSH markets is the difficulty that the bureaucracies have in implementing EPC programs. At all levels of government, there are two major bureaucratic constraints – the landlord agencies and the financial control agencies. The landlord agencies, the GSA at the federal level and its equivalent in the various states, have spent more than a century getting control of the buildings in their domains. EPC is a disruptive project model to these agencies, because it displaces longstanding contract methodologies and contractor relationships. The financial control agencies, such as the OMB or individual agency comptrollers at the federal level, are generally unfamiliar with, and suspicious of, the economics of EPC, and so resist its widespread implementation. The resistance can take the form of benign neglect, as when an agency comptroller simply does not act on a pending project for months, or of outright hostility, as when the federal OMB gave federal EPC a negative budget score by counting the costs of the projects but not the savings. The remedy for this constraint is the implementation of education programs, structured for the responsible officials in order to bring them up to speed on the uses of EPC. This work is painstaking, in that it has to identify the precise individuals who are the bottlenecks, and ongoing, in that those individuals often move on to other assignments and are replaced by new individuals who must be educated. To date there is no pool of money at either the federal or state level to fund this ongoing education effort.

8.3.2 Commercial Real Estate Economics

A major constraint on the implementation of EPC in the commercial real estate industry, which owns buildings for lease to tenants, is the resistance of the building owners to undertake any long-term debt obligations that might hinder their ability to “flip” or resell buildings on an opportunistic basis. Additionally, ESCOs trying to develop projects have a difficult time even finding the actual owners of the buildings, because these owners are represented by professional management firms, one of whose jobs is to keep vendors like ESCOs away from the owners. And it not as though the commercial real estate industry is using vehicles other than EPC to make their buildings energy efficient; they simply are not implementing energy efficiency other than the quick payback no and low-cost measures on a large scale.

There are, however, hopeful signs that some companies are making inroads. A few owner/operator companies have embraced energy efficiency and sustainability as a way to distinguish themselves in the market. Some large institutional investors, such as major pension funds, are beginning to impose efficiency and sustainability criteria on their investment decisions. And at least two commercial real estate owners actually have formed in-house ESCOs to implement projects in their buildings, though one of those ESCOs is now being disbanded because its parent company has been sold and is being broken up. The most promising approach to this constraint may be the next generation of utility energy efficiency programs, which try innovative approaches to project financing, such as attaching the repayment obligation to the building utility meter rather than the building owner.

8.3.4 Industrial Economics

The problem with EPC in the industrial marketplace is twofold. First, very few industrial customers are economically secure enough to commit to a long-term EPC contract. Second, industrial customers do not generally buy turnkey projects like EPCs. They have purchasing departments that typically pull the projects apart and wring out the profit. ESCOs generally avoid the industrial segment unless the local utility offers very rich incentive programs that can bring the EPC project down to the 18-24 month payback that industrial customers require.

9. Conclusion and Summary

The importance of EPC is highlighted by several of the conclusions quoted from the recently published study (cited above) by the National Association of Energy Service Companies (NAESCO) and the Lawrence Berkeley National Laboratory (LBNL), as follows:

9.1 Private-sector investment in energy efficiency leveraged by ESCOs is about the same as authorized spending for utility and public benefit energy efficiency programs.

Based on our survey, ESCOs report $2.5 billion in investments in energy efficiency equipment and services in 2006. By comparison, authorized budgets for ratepayer-funded electric and gas energy-efficiency programs (i.e., utility programs and public-benefits funded programs financed by charges on utility customers' bills) was about $2.5 billion in 2006 (CEE 2007). These budgets include costs to administer energy efficiency programs, technical assistance, information and financial incentives that partially offset the cost of high-efficiency equipment.[18] Though ESCOs' primary offerings are defined as providing energy and dollar savings through the design and implementation of high efficiency technologies and ongoing operations and maintenance services, one of the bases for the success and growth of the ESCO industry has been its ability to arrange for and obtain market-rate, private sector financing for energy efficiency projects on a large scale.

9.2 ESCOs can be a crucial trade ally in selected market sectors for program administrators of ratepayer-funded energy efficiency programs.

ESCOs can complement and support ratepayer-funded energy efficiency programs in the market sectors where they are active (e.g. developing comprehensive projects, arranging financing for customers who have difficulties obtaining funding for energy-related capital projects, managing performance risks as part of measuring and verifying savings). The core market in which the ESCO business model has been most successful is in energy-

[18] Utility energy efficiency program spending include costs to administer energy efficiency programs, technical assistance, information and financial incentives that partially offset the cost of high-efficiency equipment We estimate that the total investment in 2006 in energy efficient products and equipment derived from utility and public-benefits energy efficiency programs is in the range of $2.3-2.8 billion.

efficiency retrofits to large buildings, primarily owned by institutional clients. Policymakers need to recognize that ESCOs (and performance contracting) are not necessarily the optimal approach for delivering energy efficiency in all market sectors. This is particularly true for small projects where the prospective energy and dollar savings may not be large enough to offset the transaction costs of putting together a performance contract. Generally, small projects must be aggregated to be viable. Other types of energy service providers (e.g. lighting and HVAC contractors, engineering firms, architects, consultants) currently are more active in residential and small commercial markets as these providers tend to work on a design/build basis, are compensated directly through allocated funding, and assume no ongoing performance risk. In addition, ESCOs are not generally involved in new construction and have thus far ceded that market to other types of market providers.

9.3 ESCOs can be important partners in clean energy, sustainability, and climate change mitigation initiatives in urban areas.

U.S. ESCOs have a proven track record of developing comprehensive projects that utilize energy efficiency, onsite generation and renewable energy technologies. There is increasing interest in energy efficiency and clean energy among cities that are pursuing either sustainable energy and/or climate change mitigation initiatives. Given their long-standing relationships and track record with many institutional customers, ESCOs are well-positioned to work with cities, their energy managers, and financial institutions to develop "clean energy" projects. Recent examples include participation of several large ESCOs in the global Energy Efficiency Building Retrofit program which involves 16 cities (including New York, Chicago, and Houston in the U.S.) and five global banks.[19] Cambridge MA, Boston, and New York have also launched major clean energy initiatives to significantly reduce energy use in their cities that are likely to include partnerships with ESCOs and other energy efficiency service providers.

[19] "President Clinton Announces Landmark Program to Reduce Energy Use in Buildings Worldwide, May 16, 2007" see http://www.clintonfoundation.org/051607-nr-cf-pr-cci-president-clinton-announces-landmark-program-to-reduce-energy-use-in-buildings-worldwide.htm