

AN INTRODUCTION TO EPC

EPC TOOLKIT FOR HIGHER EDUCATION | APRIL 2009



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INDEX

WHAT ARE ENERGY SERVICE COMPANIES?.....	2
WHAT ARE THE DISTINGUISHING FEATURES OF ENERGY PERFORMANCE CONTRACTING?.....	3
GUARANTEED SAVINGS EPCs.....	5
THE RESULTS OF PERFORMANCE-BASED PROJECTS.....	6
WHEN IS IT BETTER TO NOT USE EPC OR AN ESCO FOR A RETROFIT PROJECT?.....	7
TECHNICAL CONSIDERATIONS.....	8
FINANCIAL CONSIDERATIONS.....	9

With permission from the author, this section was adapted from the report "Using Performance Contracting to Reduce Energy Use on Campus," by Merrian Fuller, University of California, Berkeley.

This section offers a general introduction to Energy Service Companies (ESCOs) and Energy Performance Contracting (EPC).

WHAT ARE ENERGY SERVICE COMPANIES (ESCOs)?

An ESCO, or Energy Service Company, is a business that develops, installs, and arranges financing for projects designed to improve the energy efficiency and maintenance costs for facilities over a seven to twenty year time period. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project.¹

The ESCO industry began in the late 1970s in response to rising energy prices, and has installed more than \$20 billion in projects in the US to date.² According to the National Association of Energy Service Companies (NAESCO) and the consulting group ICF International, ESCO industry revenues in 2006 totaled about \$3.6 billion.³ Based on historic industry growth, the same report projected annual revenues would reach between \$5.2 and \$5.5 billion in 2008.⁴

The ESCO industry is characterized by diverse companies with different corporate and ownership structures. Many are subsidiaries of large building equipment and control manufacturers, oil/gas companies, non-regulated energy suppliers, or engineering firms. Others are owned by regulated electric and gas utilities. Some are independent companies that sell no products – just resource performance improvement services. Some companies have a national or even global reach, while other ESCOs service only specific regions or localities in the US.

A general understanding of an ESCO's range of services can be derived from the source of their revenues as an industry. As shown in Figure 1, ESCO revenues are largely derived from energy efficiency (73%), renewables (10%), and distributed generation or combined heat and power (6%). The balance of ESCO revenues is derived from consulting and planning services.⁵

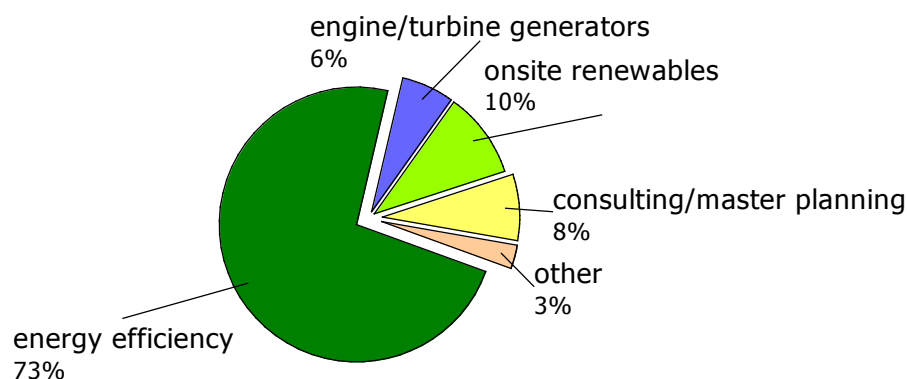


Figure 1. 2006 ESCO Industry Revenues by Technology/Project Type
 Source: "Introduction to Energy Performance Contracting"
 ICF International and the National Association of Energy Service Companies.
 Prepared for the US Environmental Protection Agency Energy Star Buildings. 2007. p. 20.

1 National Association of Energy Service Companies (NAESCO) website: <http://www.naesco.org/resources/esco.htm>

2 National Association of Energy Service Companies (NAESCO) website: <http://www.naesco.org/resources/esco.htm>

3 "Introduction to Energy Performance Contracting." ICF International and the National Association of Energy Service Companies. Prepared for the US Environmental Protection Agency Energy Star Buildings. 2007. p. 11.

4 Ibid. 2008 data not currently available.

5 "Introduction to Energy Performance Contracting." p. 3.

WHAT ARE THE DISTINGUISHING FEATURES OF ENERGY PERFORMANCE CONTRACTING?

EPC is an innovative form of contracting, developed to overcome the major barriers of delivering cost-effective energy efficiency. One of these barriers is the risk to the client that project generated resource savings may not be sufficient to provide an organization's minimum required return on capital. The key distinguishing feature of energy performance contracting is that, unlike traditional construction or services contracting, the ESCO takes on project performance risk to guarantee to the owner a minimum level of resource use reduction.

Another distinguishing feature of EPC is that ESCOs provide a turnkey service. The ESCO will be the party responsible for designing, implementing, and measuring the results of an EPC project. The ESCO can make a wide variety of recommendations⁶ of possible retrofit measures specific to each client's needs, including energy and water conservation measures, renewable energy systems, operations and maintenance services and training, and distributed energy generation.

Range of possible ESCO services in an EPC project

- Conduct resource efficiency audits to establish a baseline that will serve as the measure upon which the performance guarantee is based and identify resource saving opportunities.
- Develop recommendations for the systems and equipment to upgrade or replace, which fall into the following categories:
 - Lighting upgrades and replacement.
 - Heating, ventilation, and air conditioning (HVAC) system retrofits including boiler and chiller plant optimization and replacement, temperature control systems, etc.
 - Building "shell" improvements such as insulation, improved doors, window replacement and window films.
 - Energy Management Systems.
 - Water saving devices such as new faucets and toilets.
 - High efficiency motors.
 - Installation of sub-meters.
 - Procurement of energy efficient appliances.
- Design and write equipment and construction document specifications.
- Develop a project budget and provide construction project management services securing and overseeing all subcontractors.
- Implement the recommendations.
- Supply and install energy generation capacity, including renewable options such as cogeneration/combined heat and power (CHP), biomass boilers, solar heating and power generation, fuel cells, micro-turbines, wind turbines, etc.
- Commission or re-commission of newly or previously installed equipment.

⁶ These measures are often described under the catch-all term "Facilities Improvement Measures," or FIMs or "Energy Conservation Measures" or ECMs.

- Train facilities staff on how to maintain and manage new equipment and systems and/or provide third-party ongoing maintenance of buildings and equipment.
- Guarantee the performance of the installed improvements.
- Measure and verify the resource savings over the term of the guarantee period.
- In many cases, ESCOs also assist in the arrangement or direct provision of financing to cover project costs, including the utilization of utility, local, state, and federal government incentive programs.

One of the key purposes of an EPC's performance guarantee is to ensure that the ESCO has a financial stake in meeting the campus' expectations about future savings and facility performance. The performance guarantee is the vehicle by which the ESCO assumes the project's performance risk after the ESCO completes project implementation. The ESCO's assumption of this risk provides the client with a significant measure of certainty regarding the predictability of cash flows generated from energy savings, which is often used for project financing debt service payments.

Performance-based contracts can take different forms including:

GUARANTEED ENERGY SAVINGS

The ESCO guarantees that the project will result in a specified reduction in energy use over a set, contracted guarantee term, as measured by kilowatt hours, BTUs and other resource use metrics. If the guaranteed reduction in energy use is not realized as a result of factors pre-determined in the contract to be the ESCO's responsibility,⁷ the ESCO will pay the client the shortfall amount using utility rate calculations that are also pre-determined in the contract. Note the important distinction that the ESCO does not typically guarantee a reduction in utility bill charges because ESCOs cannot control utility rates. At the end of the project guarantee period, the building owner retains the full value of the energy savings.

POWER PURCHASE AGREEMENT (PPA)

The ESCO owns the assets and sells end-use services (such as heat or electricity) to the customer at agreed upon prices, often with an arrangement that allows for the building owner to purchase the asset at the end of a contract term. This mechanism is often employed for renewable and district energy systems development. The contractor usually guarantees a specified minimum level of output for the duration of the contract.⁸

SHARED SAVINGS

The ESCO and customer share the utility bill savings generated by an EPC project, with the share to each party defined in the EPC. The ESCO's share of the savings is the only compensation the ESCO receives for their services and equipment expenditures. The ESCO typically receives a greater percentage of savings in the early years of a contract, with its percentage decreasing over time.

⁷ Factors include such variables as poor equipment performance. Factors that are not included are those outside the control of the ESCO, such as a change in the use of the building (e.g., from lecture hall to science labs) or an increase in the use of HVAC services because the increased number of extremely cold or hot days compared to the baseline year.

⁸ This form of contracting can also be referred to as "Build, Operate and Transfer" (BOT), "Build, Own, Operate, Transfer" (BOOT), or "Design, Build, Operate, Maintain" (DBOM).

ESCOs can also implement design/build projects without a performance guarantee. These contracts simply pay the ESCO for providing agreed upon services, but do not reward or penalize the ESCO for the durability and quality of its work, leaving ongoing performance and operational risk on the shoulders of the client alone (except when product failures are covered under manufacturer warranties). The EPC's methodology differs from traditional contracting, the latter being invariably price driven. Performance contracting is results driven, ensuring quality of performance. For this reason, most states have passed laws that allow public entities to base ESCO selection on criteria other than simply the lowest responsible bid.

GUARANTEED SAVINGS EPCs

Public and institutional clients have a strong preference for guaranteed savings; in fact, 86% of performance contracts in the higher education market use this model.⁹ The best practices for EPC described in this toolkit are also based upon a guaranteed savings model.

Some advantages of a guaranteed savings EPC include:

EXPERT, INTEGRATED, WHOLE-BUILDING APPROACH

In contrast to the siloed, or stove-pipe approach that most specialized contractors use, the best ESCO engineers and project developers think holistically about buildings and energy systems. In addition, the best ESCO projects bring the latest knowledge and access to the most state-of-the-art technology and equipment, providing a full range of retrofit options. This holistic approach can result in superior project integration, implementation, and building energy performance, and in a project with a better economic scenario and environmental outcome.

ACCOUNTABILITY & EXPERTISE – ESCOS AS PROJECT MANAGERS

The turnkey services make it easier for the client to manage the project by having a single point of accountability rather than numerous contractors. A single contractor is responsible for providing project development, implementation, maintenance, and monitoring services. Also, because the performance guarantee compels the ESCO to view the project as a long-term partnership with the client, the ESCO will look to improve the project's performance. In the best cases, ESCOs bring continuous improvement during the guarantee period that would ordinarily not occur.

BLENDING PAYBACKS

An important characteristic of EPCs is the ESCO's ability to bundle multiple Facility Improvement Measures (FIMs) into one project. Some FIMs have short paybacks, meaning that the installation cost is paid back within just a few years by energy cost savings, while others have much longer paybacks. Many longer payback FIMs, when considered in isolation, are expensive to install, requiring prohibitively long lending terms. EPC uses the energy savings of items with short paybacks to help subsidize the cost of other items, blending the cash flows of the different FIMs. For example, a lighting retrofit might pay back in less than two years while a boiler system upgrade might have a payback of 15 years. With EPCs, the energy savings from the lighting retrofit help to pay for the cost of the boiler replacement, leading to a blended payback of less than 15 years for the entire project. This blending of paybacks in an integrated project is one of the principle value-adds inherent in a comprehensive approach to a retrofit project.

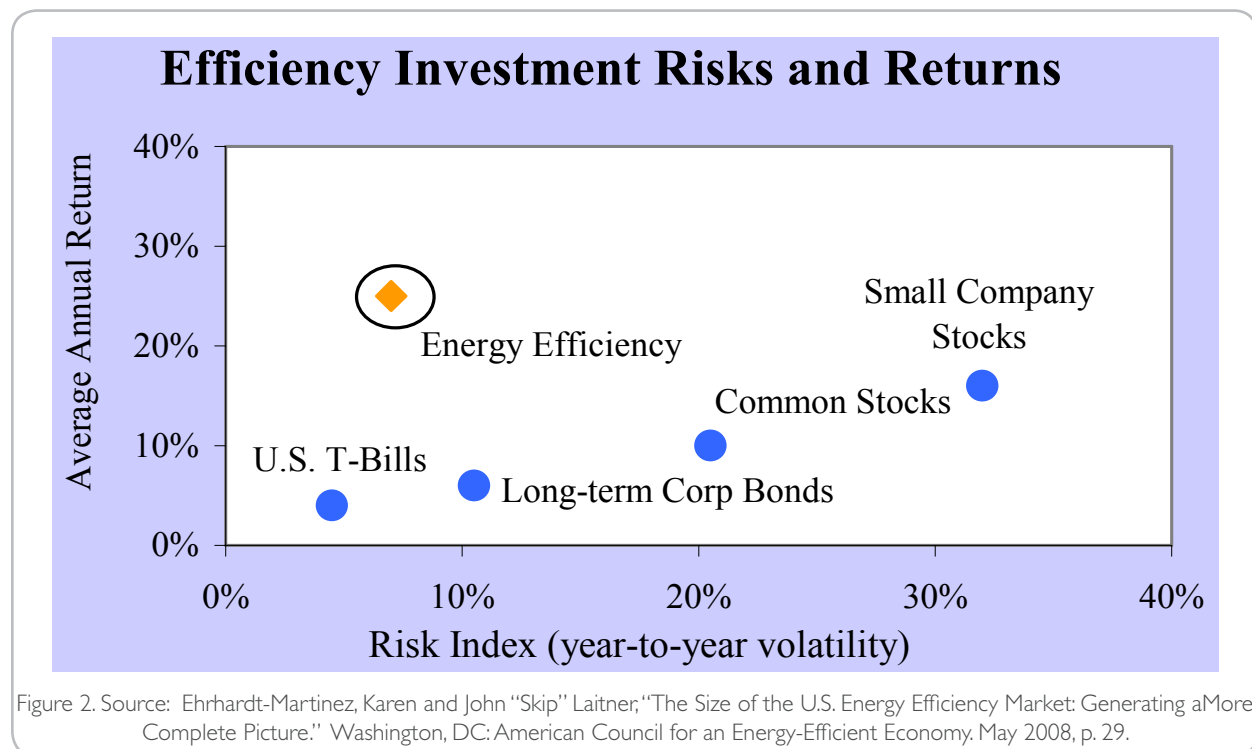
⁹ Hopper, N., C. Goldman, J. McWilliams, D. Birr, K. McMordie Stoughton "Public and Institutional Markets for ESCO Services: Comparing Programs, Practices and Performance." Ernest Orlando Lawrence National Laboratory, University of California Berkeley, 2005. p. 50. <http://eetd.lbl.gov/ea/ems/ee-pubs.html>

MEASUREMENT AND VERIFICATION (M&V)

To ensure ongoing equipment performance and assess compliance with the performance guarantee, ESCOs typically conduct regular measurement and verification of energy savings and submit their analysis' results and annual reports to the building owner. The cost of the M&V services is capitalized into the overall project cost.¹⁰ M&V activities include ensuring that installed equipment is performing to specifications, and performing calculations of the project's actual energy savings. Ongoing M&V of resource savings helps protect an owner from savings degradation as a result of deteriorating or failing equipment performance.

A COMPETITIVE INVESTMENT

Energy efficiency projects can generate returns competitive with a campus' endowment or other investments (see Figure 2).¹¹



THE RESULTS OF PERFORMANCE-BASED PROJECTS

Many colleges and universities have already undertaken retrofits projects through EPCs, which demonstrate a proven track record of reduced energy use and costs. Lawrence Berkeley National Laboratory produced a series of EPC performance statistics based on a survey of the industry. Their findings showed that for projects that include more than lighting retrofits, median electricity savings are around 20% of the total utility bill.¹² Most projects have historically focused on lighting retrofits and heating, ventilation, and air conditioning (HVAC) system upgrades. ESCO projects at colleges and universities have a median simple payback¹³ of 6.8 years.¹⁴

¹⁰ Some EPC clients hire a third party to review and confirm or dispute the ESCOs M&V conclusions each reporting period. The client bears the costs to hire its own third party, separate from the EPC project cost.

¹¹ Most of Harvard University's efficiency investment projects – funded with its endowment – have achieved a return on investment in excess of 20%, with 9 of 17 types of projects achieving a ROI better than 25%. For more information, please see: <http://www.greencampus.harvard.edu/gclf/achievements.php>

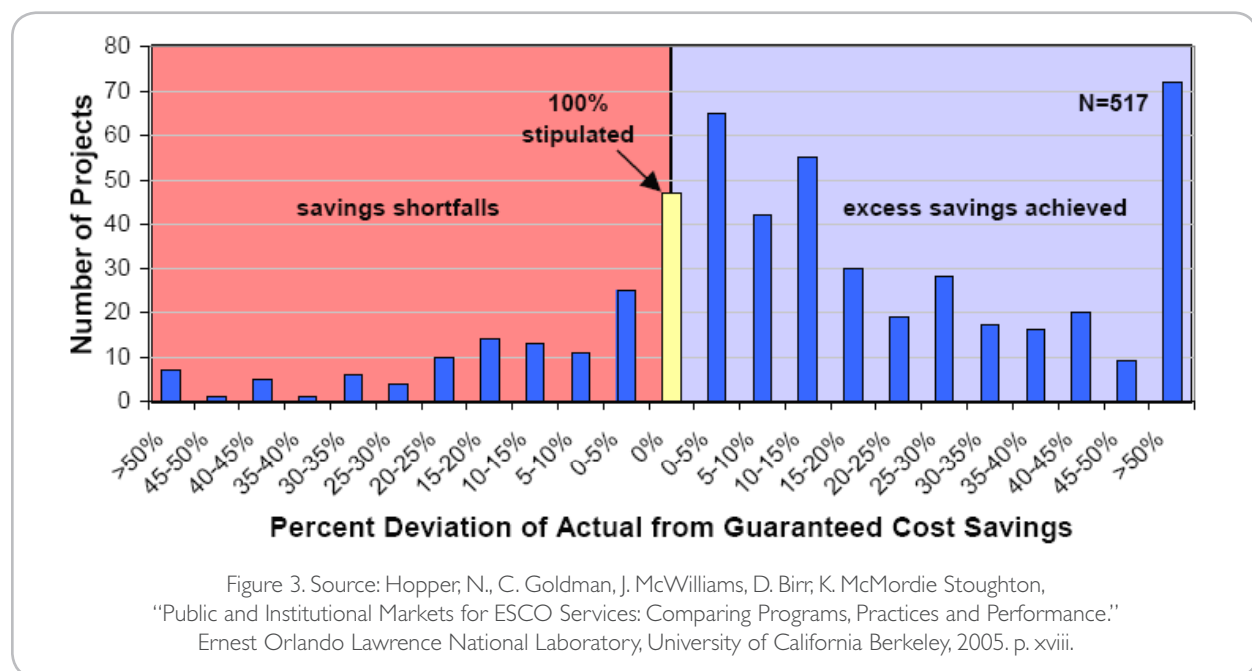
¹² Goldman, C.A., N.C. Hopper, and J.G. Osborn, "Review of US ESCO industry market trends: an empirical analysis of project data." Energy Policy, 2005. 33(3): p. 387-405.

¹³ "Simple payback" is the period in years that it takes for enough savings to accrue to equal the original project cost. The true payback period is longer, given that interest on the debt taken on to pay for the project accrues over the years.

¹⁴ Hopper, N. et. al. p. 17.

In addition to energy savings, universities also saved on water, and operations and maintenance (O&M) costs. Of the university projects surveyed in the 2005 study, 28% reported O&M savings and 13% reported savings from reduced water use.¹⁵ (It should be noted, however, that while O&M savings often result from an EPC retrofit, they are usually not subject to the same performance guarantee as energy and water related savings.)

The performance results for guaranteed savings projects are positive, not surprisingly, given the ESCO's incentive to meet the targets. In fact, 72% of projects reported greater savings than guaranteed, meaning that the clients had savings above the level guaranteed by the ESCO. Figure 3 summarizes these survey results for "stipulated savings" (those agreed upon in advance, such as FIMs that generate easily predictable savings and thus are not worth the cost of measuring and verifying).¹⁶ It is important to note that for the non-stipulated savings, M&V is a very important process in which the client must be fully engaged.



WHEN IS IT BETTER NOT TO USE EPC OR AN ESCO FOR A RETROFIT PROJECT?

Particularly well-resourced colleges and universities may have adequate in-house engineering expertise, knowledge of the latest technologies, and access to capital to implement and finance a comprehensive retrofit on their own. Other institutions may wonder whether enough cost savings are possible at their facility to make an EPC economically viable. Still others wonder whether ESCOs offer a truly cost-effective approach to retrofits. These are some of the technical and financial considerations to take into account before deciding whether or not to undertake an EPC project with an ESCO.

¹⁵ Hopper, N. et. al . p. 69.

¹⁶ Ibid.

TECHNICAL CONSIDERATIONS

SIZE OF SAVINGS OPPORTUNITY

EPCs work best when a facility has opportunities for substantial reductions in resource use and related operational costs. Potential total reductions in utility costs over a specified period must be sufficient to cover the costs of contracting with an ESCO. The buildings and supporting utility infrastructure selected on campus for an EPC should have a relatively high resource use profile, either on a dollar per square foot basis, per capita basis, or total facility consumption basis. Efficiency and age of existing mechanical, lighting and water equipment and distribution systems and recent upgrades or replacements of major systems including HVAC and lighting will give an indication of the energy savings potential. Benchmarking each building's energy performance against similar buildings in similar climates will also provide an indication of energy savings potential. In addition, facilities in areas with very low utility rates may not be ideal EPC candidates, as cost savings that result from resource use reduction may not be sufficient to cover annual payments on debt procured to finance the retrofit.

In a publication commissioned by the National Association of Energy Service Companies (NAESCO), a questionnaire was developed to provide guidance on determining if a facility is a good candidate for an EPC project. This questionnaire can be found in the 'Sample Documents' section of this toolkit.

SHALLOW VS. DEEP RETROFITS

There are many ways to pursue resource efficiency in facilities. The institution may be constrained to a "shallow" retrofit project, involving only lowest capital cost and shortest payback measures, such as building commissioning or replacing lighting. In other cases, an institution is able to reduce resource use by the maximum extent possible via "deep" retrofit. To do so, the client must have motivation for significant improvements (such as a climate neutrality pledge), access to a sufficient capital and the legal authority to tolerate long payback periods (of up to ten or more years). Deep retrofits involve a variety of FIMs with a range of payback periods (e.g. lighting, new windows or window films, new or upgraded HVAC system), technologies such as renewables, or a redesign of interior spaces to maximize use of natural light.

A shallow retrofit can be simple enough for a client to undertake the project on its own without the project management, financing, performance guarantee, and risk mitigations provided in an EPC project. For instance, replacing lighting equipment can be a low cost endeavor with relatively reliable energy savings estimates upon which to justify, rely on, and ultimately payback the investment. However, it should be noted that, once the "shallow retrofit" or "low hanging fruit" measures are completed, it is unlikely that the facility will be an attractive candidate for a "deep retrofit." To make a project economically attractive and to keep paybacks within a generally attractive range, there needs to be a blending of short and long term paybacks. By solely installing the short-term payback projects, other more complex, expensive longer payback projects may not be economically viable as blending will not be possible.

A client is more likely to make good use of an ESCO and the EPC approach in a deep retrofit project where holistic design skills and a performance guarantee are valuable. The complexity of working with multiple, interacting systems (e.g. more efficient lighting will create less heat, thus creating less demand on the HVAC system during hot days) requires sophisticated modeling and engineering expertise – assets that may not be available inside the client's organization. In addition, the intricacy of measuring the results of such a project and the risk of project performance can be shifted to an ESCO in an EPC.

FINANCIAL CONSIDERATIONS – THE “ADDITIONAL COSTS” OF HIRING AN ESCO

When people refer to the EPC’s additional costs, they may be referring to the costs of the performance guarantee, ESCO project management, or procuring an ESCO. Some institutions feel they could receive the benefits of EPC without incurring associated costs by pursuing their retrofits in other ways.

COSTS OF THE PERFORMANCE GUARANTEE – RISK PREMIUMS AND M&V

Servicing a performance guarantee entails ongoing monitoring and verification (M&V) of the project. This requires the ESCO to regularly dispatch employees to a project site and develop reports, which adds a cost. M&V costs vary depending upon the methodologies used. According to the Energy Valuation Organization, the costs normally fall within 3-5% of total EPC project costs and the maximum cost will rarely exceed 10% of total project costs.

In addition, since the ESCO takes on performance risk for an EPC project, they often incorporate a risk premium in their profit margins as part of the overall project cost. This risk premium is virtually non-existent in traditional construction contracts.

ESCO PROJECT MANAGEMENT

In an EPC project, the ESCO charges design, overhead, and project management fees. In addition, as part of their general procurement services (e.g., managing sub-contractors and purchasing equipment), ESCOs may impose markups on such expenses. Many of these “soft costs” and markups might be avoided if building owners undertake retrofits independently. Yet doing so requires clients to incur staff time and cost in design, project management, and procuring multiple contractors. In addition, self-performing measures might sacrifice the benefits of an integrated approach to reducing the facilities’ resource consumption and results in the loss of the project risk mitigation found in an EPC’s performance guarantee.

However, if a school decides to hire an ESCO to manage their retrofit, the school should be clear in their contract about the level of “transparency” they desire in the expression of these markups in the ESCO’s ultimate investment proposal, and in the ongoing accounting that takes place over the course of a project.

THE COST OF ESCO PROCUREMENT

Procuring an ESCO partner takes time and requires an allocation of client resources such as the time of financial officers, facilities managers, and legal and procurement officers. There is an opportunity cost to having these personnel dedicated to the EPC procurement process as opposed alternative, more familiar contracting methods. In addition, as EPC is a specialized contracting mechanism, building owners may require specialized advisory services to help with their contractor selection, project design, contract structuring, and the arrangement of financing.

There is also a “cost of waiting” associated with this procurement process, in the sense that every day a school spends on evaluating potential ESCO partners instead of engaging in a faster, more familiar procurement and project development model, the school is losing an opportunity for immediate-term reduction in its utility bills. This is balanced by the potential of designing and implementing a deeper, more efficient project through the EPC process.