Current Policies and Practices Related to the Incorporation of Non-energy Benefits in Energy Saving Performance Contract Projects

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ABSTRACT

This paper analyzes current policies and practices related to the incorporation of non-energy measures (NEMs) and their benefits to energy saving performance contract (ESPC) projects implemented by the U.S. energy service company (ESCO) industry. Previous research by our team has found that projects in the public and institutional sector are increasingly using ESPCs to address various non-energy-related needs (e.g., roof replacement). Unfortunately, there is no consistent guidance on methodologies for incorporating non-energy benefits (NEBs) into the cost/benefit analyses of projects. This paper presents the results of an in-depth review of state-by-state and federal legislation of the incorporation of non-energy benefits, including measures and benefits allowed and restrictions that apply.

Case studies indicate that the value of NEBs can be as much as 40% or more of the total economic savings generated by an ESPC project. However, there is significant variation across regions and levels of government, with regard to how many and which types of non-energy measures are allowed in ESPC project contracts. There appears to be little or no correlation between the level of government infrastructure need, which can be extensive, and the number of non-energy measures allowed by the jurisdiction. The authors recommend standardized, simplified, and transparent methodologies for estimating and verifying the savings generated by the various non-energy measures—in a manner that is analogous to the original development of the International Performance Monitoring and Verification Protocol (IPMVP).

Introduction

This paper is the second in a series of Lawrence Berkeley National Lab (LBNL) ACEEE conference papers on the subject of non-energy benefits (NEBs) in energy savings performance contract (ESPC) projects implemented by U.S. energy service companies. The first paper in this series reported that savings from ESPC projects increasingly included NEBs such as operations and maintenance (O&M) savings, capital cost avoidance, and avoided compliance costs associated with meeting environmental regulatory requirements (Larsen et al. 2012b). In particular, ESCO projects in the public/institutional sector, especially at K-12 schools, were found to be using performance-based contracting, at the behest of the customers, to partially—but not fully—offset substantial accumulated deferred maintenance needs (e.g., asbestos removal, wiring) and measures that have very long paybacks (e.g., roof replacement). This trend was affecting the traditional economic measures policymakers use to evaluate success on a benefit-to-cost basis.

This paper presents findings from an in-depth review of state-by-state laws and regulations related to the measurement and incorporation of NEBs that are allowed in ESPC projects implemented for local and state governments, higher education, and K-12 schools. State and federal laws and regulations governing the implementation of ESPCs are inconsistent with respect to allowing the inclusion of NEBs into the calculation of project savings. Currently allowed NEMs include measures that reduce operating costs, measures that reduce capital costs, demand response equipment, personnel training, solid waste reduction, wastewater recycling and other measures to reduce water and natural resource use. In addition, there are other types of benefits that have yet to be recognized or allowed by any statute, such as value of capital improvements beyond the ESPC contract period.

The U.S. ESCO Industry Today

This section briefly summarizes the recent history and growth prospects for the U.S. ESCO industry.[1]

ESCO Industry Past and Projected Growth

U.S. ESCO industry revenues have grown steadily during the past two decades, and significantly outpaced GDP growth during 2009-2011 despite the recent recession, as indicated in Figure 1 (Stuart et al. 2013). The ESCO industry is also projected to grow significantly over the coming decade. LBNL anticipates that ESCO industry revenues could grow from ~$6 billion to $10.6–$15.3 billion by 2020 (or more than double industry revenues from 2011). Stuart et al. (2013) note that this revenue growth is contingent on enabling policies, including the widespread allowance of non-energy benefits into ESPCs.

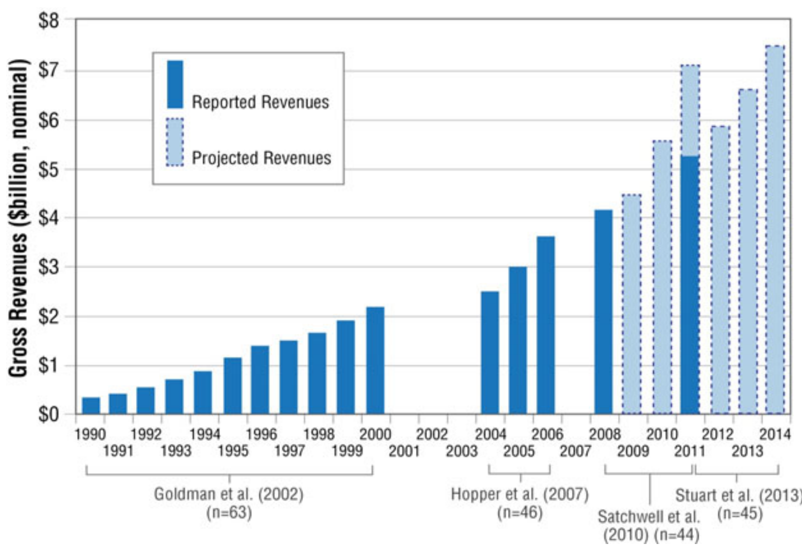

Figure 1. LBNL estimates of reported and projected ESCO industry revenues: 1990-2014[2].

[1] An ESCO is a company that provides energy efficiency-related and other services, and for which energy savings performance contracting (ESPC) is a core offering of its energy efficiency services business. In a performance contract, the ESCO guarantees energy and/or dollar savings and ESCO compensation is therefore linked in some way to the performance of the project (Larsen et al. 2012a, Hopper et al. 2007).

[2] This figure contains revenue estimates from four sources (Goldman et al. 2002; Hopper et al. 2007; Satchwell et al. 2010; and Stuart et al. 2013). The solid bars indicate revenues reported by ESCOs. Revenue projections (the dotted

Revenue Share by Market Segment

Historically, the bulk of ESCO industry revenues have come from the federal and "MUSH" markets (state and local, K-12 schools, universities/colleges, health/hospitals). Stuart et al. (2013) reported that about 88% of 2011 ESCO industry revenues came from the public and institutional sector (including public housing), which is generally consistent with previous LBNL study results (see Figure 2).

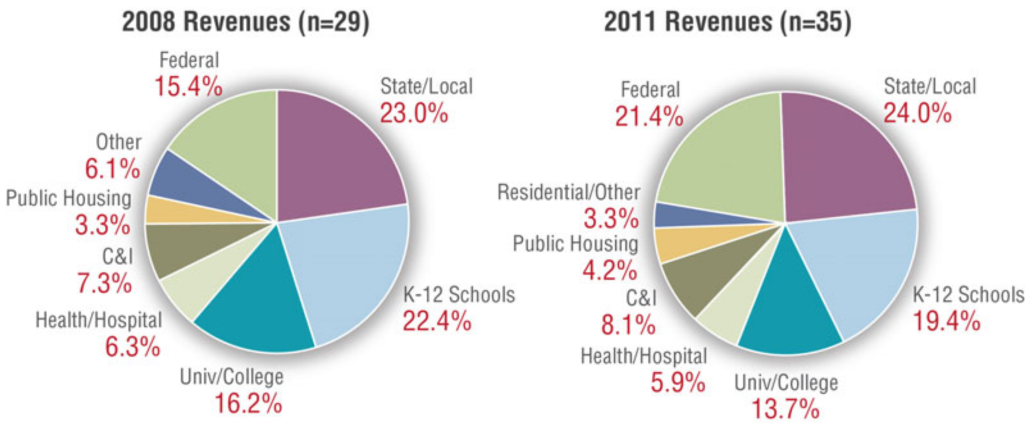

Figure 2. 2008 (left) and 2011 (right) ESCO industry revenues by market segment.

Drivers for Continued ESCO Industry Growth

There are two primary drivers for the continued growth of the ESCO industry in the public/institutional sector: (1) government mandates and (2) the need for capital improvements.

Government Energy Savings and Performance Contracting Mandates

A number of mandates are typically imposed on public sector facilities by federal, state and local governments (see below for examples). Many mandates are typically not accompanied by any increase in capital appropriations to finance energy efficiency improvements, which forces building managers to consider performance-based contracting as a way to fund these projects with little or no capital outlay.[3]

- **Federal Government Mandates.** Federal government agencies have been subject to increasingly strict energy savings mandates for the past two decades; the most recent is Section 432 of the Energy Independence and Security Act of 2007 (EISA 2007), which mandates a 3% annual energy consumption reduction. Legislative mandates are reinforced and expanded by executive orders, such as President Obama's 2011 Performance Contracting Challenge, which mandated that federal agencies implement $2 billion of performance contracts during 2012 and 2013.

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bars) for 2009-2011 and 2012-2014 are from Satchwell et al. (2010) and Stuart et al. (2013), respectively. Note: ESCOs did not report 2009-2010 and 2012-2014 revenues.

[3] In a guaranteed savings performance contract, the ESCO guarantees a level of energy or dollar savings sufficient to cover the annual debt service obligation. Projects are typically financed by a third party financial entity enabling implementation of large projects with little or no up-front capital outlay for the customer.

- **State Government Mandates.** A number of state governments have implemented energy savings and performance contracting mandates for state agencies through legislation and executive orders, a sampling of which can be found on the website of the Energy Services Coalition.[4]
- **Local Government Mandates.** An increasing number of local governments are mandating that large government and private sector buildings benchmark their energy usage using the U.S. EPA EnergyStar Portfolio Manager or equivalent software systems, a sampling of which can be found on the website of the Institute for Market Transformation.[5] The theory behind benchmarking mandates is that they will publicly identify the owners of inefficient buildings and inform prospective tenants of this inefficiency, both of which will push owners to improve efficiency.

Public Facilities Capital Improvement Needs

A 2013 report found that the nation's elementary and secondary schools need over $270 billion of capital investment to bring facilities into good repair, and will need another $270 billion in modernization improvements over the next decade (Center for Green Schools 2013). Given the current and anticipated fiscal constraints at all levels of government, an ESPC project provides a viable source of capital, because these projects re-purpose the money the customer is currently spending on wasted energy (or excessive maintenance) into a savings stream which can used to repay the cost of the needed capital investments.

Non Energy Benefits (NEBs)

In this section, we define non-energy benefits in more detail and present four case studies that describe how ESPC projects installed NEMs and monetized their benefits.

Types of Non Energy Benefits

There are two general categories of Non Energy Benefits (NEBs): (1) those that are produced by Non Energy Measures (NEMs), which by definition have little or no energy savings; and (2) those that are in addition to the energy savings produced by Energy Conservation Measures (ECMs). Furthermore, there is a distinction between "hard" NEBs—benefits that can be readily monetized (e.g., reduced maintenance expenditures from replacing lamps and ballasts in an old lighting system with lower maintenance equipment) and "soft" NEBs—those types of benefits that cannot be easily attributed and/or monetized (e.g, carbon emissions reductions, employee health and productivity benefits).

Table 1 lists some of the more common examples of non-energy measures and indicates whether the measure produces "hard" or "soft" benefits. Table 2 lists examples of Energy Conservation Measures (ECMs) that produce NEBs.

[4] See: http://energyservicescoalition.org/resources/tools/practice02
[5] See: http://www.imt.org/policy/building-energy-performance-policy/city-energy-project

Table 1. Examples of NEMs and NEBs

NEMs	Non-energy Benefit	"Hard" NEBs	"Soft" NEBs
Low-flow water fixtures[6]	Water savings, reduced sewage costs	X	
Replace water meters in municipal water district	Enhanced revenues from more accurate measurement of customer water use	X	
Fire and safety upgrades; asbestos removal	Code compliance savings; replace capital expenditures that would have to be made to bring building into code compliance	X	
Indoor humidity control and air quality improvements	Improved employee health and productivity		X
Training programs, solid waste reduction measures	Reduced costs for waste and toxic waste disposal	X	

Table 2. Examples of ECMs and NEBs

ECMs	Non-energy Benefit	"Hard" NEBs	"Soft" NEBs
Upgraded energy-related equipment (e.g, boilers, motors, lighting)	Operations and maintenance (O&M) savings which typically include decreased costs for materials and contracted labor	X	
Upgraded energy-related equipment	Avoided capital costs: future capital expenditures made unnecessary due to ECM upgrades.[7]	X	
ECMs that reduce emissions of air pollutants (NOx, SO_2 and CO_2)	Revenue from tradable emissions reductions credits, in jurisdictions where there is a market for the credits	X	
ECMS that improve lighting and building environment (e.g., HVAC, controls)	Improved building occupant productivity and/or reduced absenteeism (Lazar and Colburn 2013)		X

Significant Savings from NEBs: Case Studies

We contacted a number of ESCOs to collect information about projects that accrued non-energy benefits. The following list contains a few of the examples that were reported to us:

[6] Low-flow water fixtures have some energy benefits (reduced energy use for water pumping and heating) as well as non-energy benefits.
[7] For example, the cost of window replacements can be eliminated from a future year capital budget by including the replacements in a comprehensive ESCO project, which uses the short paybacks of some measures (e.g., lighting) to in effect subsidize the long payback of the new windows.

- **Case #1:** A small Florida city retrofitted street lighting, building lighting and parking garage lighting. The non-energy benefit savings from the project, comprised of material and labor savings for bulb replacement as well as maintenance vehicle fleet fuel and maintenance cost reductions, totaled approximately $254,000 per year, or about 43% of the forecasted total project annual savings for 2012.
- **Case #2:** A small Louisiana school district completed a comprehensive retrofit of the lighting, boilers, water use, and energy management systems. NEBs, which were comprised of capital cost avoidance and O&M savings, totaled approximately $98,000 annually, or about 30% of the total project savings.

  Case #3: A state agency retrofit of more than 50 facilities involved lighting, plumbing, irrigation systems and wells, and replacing a central boiler plant with distributed heating systems. The $20.4 million project had a simple payback of about seven years and NEBs (O&M, labor and water savings, plus revenue generation from installation of sub-meters allowing the agency to bill lessees for utility use) accounted for nearly 25% of total annual project savings.
- **Case #4:** A federal medical center reported revenue from emissions reductions: The replacement of an outdated gas turbine with new ultra low NOx emission turbine technology provided multiple benefits at a federal medical facility, including reduced energy and operating costs, reduced air pollution and infrastructure improvements. This project was able to monetize $4.2 million in emissions credits to help pay for a comprehensive retrofit.

Increasing Prevalence of Non Energy Benefits in ESCO projects

We also conducted an analysis of projects in the LBNL/NAESCO database (see Larsen et al. 2012a for a description of the database) to determine how many projects have reported avoided O&M or any type of non-energy-related benefits. Our analysis found that ESCOs report O&M savings for a significant share of projects, especially in K-12 schools (see Table 3). Unfortunately, only a relatively small number of projects currently report other types of non-energy benefits such as avoided capital costs (i.e., the vast majority of non-energy benefits reported were related to avoided O&M).

Table 3. Percent of projects in ESCO project database that report non-energy benefits[8]

		Percent of Projects Reporting	
Market Segment	Sample size	O&M Savings	O&M + other non-energy benefits
K-12 schools	1,182	49%	51%
All other public/institutional sector projects	1,864	31%	33%
Private projects	630	16%[9]	17%

[8] Larsen et al. (2012) discuss the reasons why public sector project typically report higher shares of non-energy benefits relative to the private sector (e.g., public sector projects use ESPC to addressed deferred maintenance needs).
[9] The percentage of projects reporting O&M savings or any non-energy benefits that are in the private sector is roughly equivalent to the share of private sector projects in the LBNL database (Larsen et. al 2012).

Interestingly, the results also indicate that NEBs are not only being recognized in a higher percentage of ESCO projects, but they are also making up an increasingly larger percentage of total project savings. Figure 3 shows that the share of total savings represented by NEBs (mostly avoided O&M expenditures) ranges from about 30% for K-12 schools to about 15% in both private projects and all other public projects.

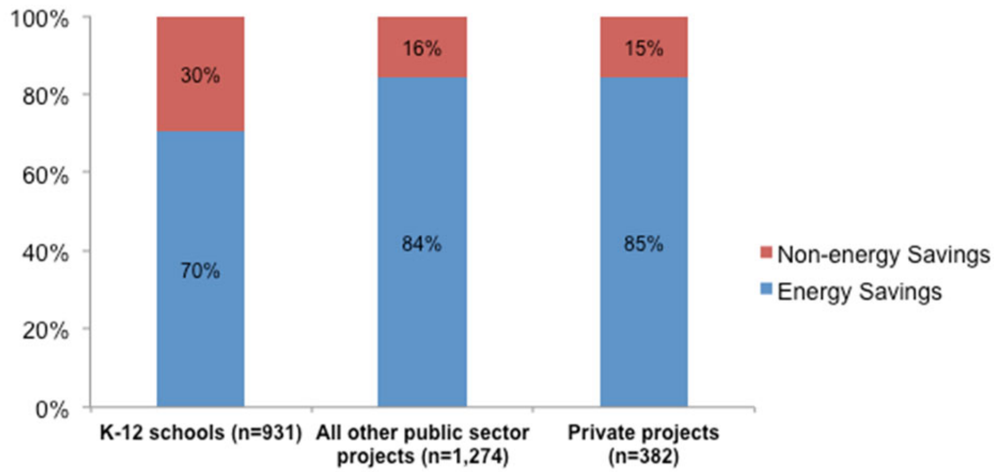

Figure 3. Percent share of dollar savings from energy vs. non-energy-related measures[10].

Next, we analyzed the percentage of public-sector projects that utilized different primary retrofit strategies and found that the share of projects utilizing non-energy retrofit strategies has increased significantly over the past ~25 years—from 3% in 1990–1997 to 21% in 2009-2012 (see Figure 4). These findings suggest that past ESCO industry revenue growth may be driven in part by the rising share of public sector projects that include significant non-energy measures.

[10] It is important to note that not all projects in the database report dollar savings from energy or from avoided O&M.

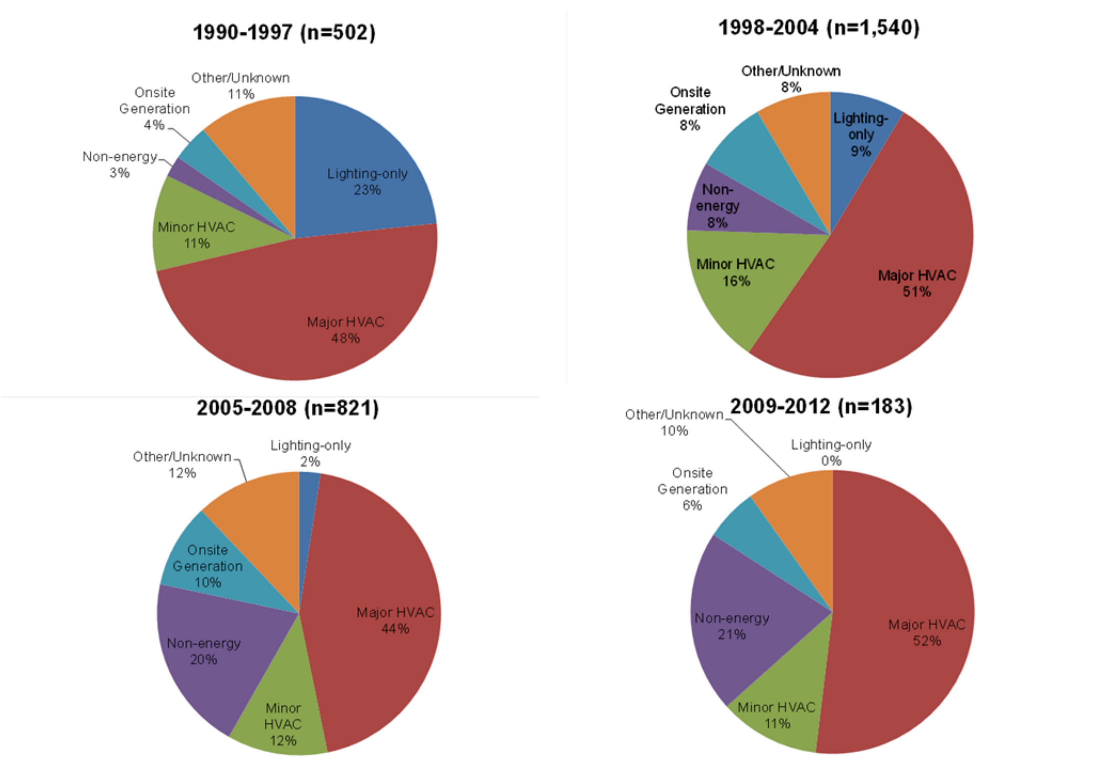

Figure 4. Prevalence of NEMs in public/institutional sector projects.

Summary of NEBs-Related Policies

The laws and regulations that govern the allowable use of NEBs in ESCO projects vary significantly across all levels of government. This section summarizes the current status of policies that allow for the incorporation of NEBs into ESPC projects.

Federal Policy

The Federal Energy Management Program (FEMP) methodology for incorporating NEBs into federal ESPC projects permits only three types of NEBs: (1) savings due to decreased water and sewer usage; (2) savings due to reduced Operations and Maintenance (O&M) expenditures; and (3) savings due to reduced Repair and Replacement (R&R) expenditures. The federal government calculates the value of these NEBs using a simple methodology prescribed by the Federal Energy Management Program (FEMP 2008).

State Policies

The extent to which NEMs explicitly allowed by states suggests that state agencies are generally more open to the idea of incorporating these types of benefits than the federal government agencies. This willingness to allow for other, non-energy savings allows customers to expand the potential size and scope of ESPC projects. It should be noted that some states do not allow NEBs inclusion, while others permit NEBs to comprise a majority of the annual project savings. Allowable NEBs include:

- Operations and maintenance (O&M) savings
- Water and sewer savings from devices that reduce water use and sewer charges
- Wastewater and storm water savings from measures to reduce storm water runoff
- Solid waste and hazardous waste savings from measures that reduce solid waste disposal and hazardous waste disposal costs
- Utilities procurement, billing, rates, rate-reduction savings from fuel switching, procurement of commodity energy from alternate suppliers and services to identify utility errors and optimize rate schedules
- Cogeneration; combined heat and power systems
- Vehicle operational savings from measures that reduce maintenance tasks, such as replacement of street lights
- Capital cost avoidance from measures that replace equipment at the end of its useful life and/or scheduled for replacement
- Training and education programs and services for staff and occupants
- Health and safety savings from measures that produce indoor air quality improvements, comply with building or fire codes or that remove hazardous materials (e.g., asbestos)
- Revenue enhancement (e.g., from new water meters)

Detailed Look at State Policies

We evaluated the state laws and regulations that allow for the inclusion of NEBs and installation of NEMs in ESCO projects, and organized the results.[11] Figure 5 is a U.S. map representing where NEBs are allowed—and to what extent. The dark blue-colored states represent places where the most number of non-energy benefits are allowed to be incorporated in ESPCs. States colored red represent places where no non-energy benefits are permitted in ESPCs.

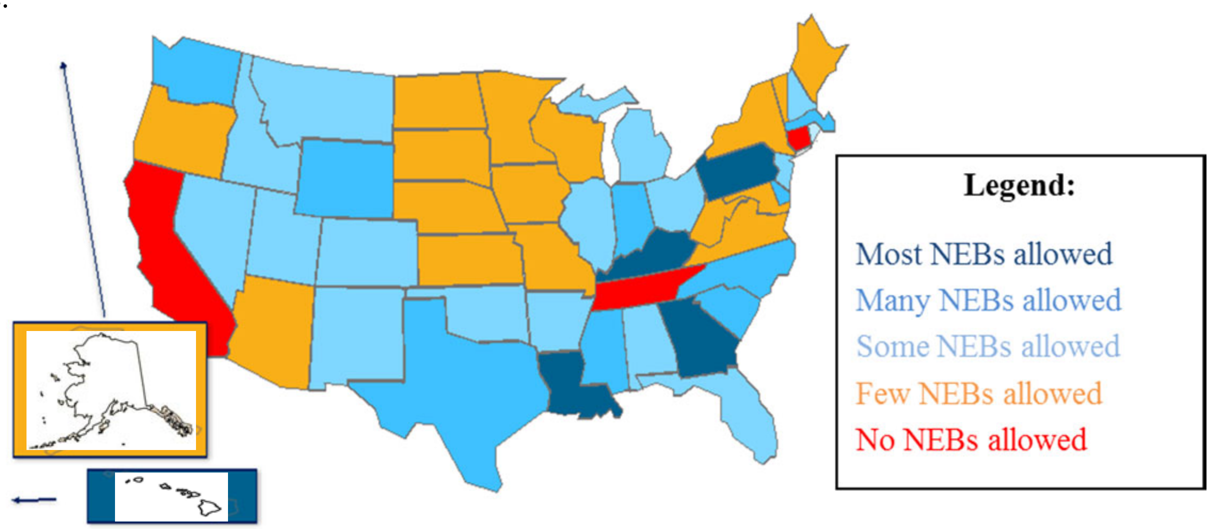

Figure 5. Extent of NEBs allowed (Smith 2014).

[11] Two expanded resources are available on a forthcoming LBNL ESCO resource website: (1) an expanded matrix listing all of the NEBs allowed in each state, and (2) a multi-tabbed spreadsheet (one tab for each state) with full descriptions of state statutes and regulations regarding NEBs and related resource information.

Next, we came up with a basic ranking method to evaluate the relative importance of NEBs in each state by assigning points according to which NEBs are allowed by legislation or administrative practice (see Table 4). We ranked the states from highest score to lowest score to determine which states were most willing to allow for inclusion of NEBs in ESPCs.

Table 4. LBNL scoring system for allowed NEBs

2 points for O&M	2 points for water savings
2 points for Capital Cost Avoidance	2 points for billable revenue increases
2 points for CHP or DG	2 points for allowing other NEBs
1 point for allowing any of the above on a project-by-project basis	-1 point for any restriction on potential NEBs

NEBS and States' Needs for Public Facility Capital Improvements

We also investigated whether states' allowances for NEBs were clearly related to states' needs for capital improvements in public facilities. We collected data on capital improvement needs in public schools (Crampton and Thompson 2008) and used findings on base need per student ($) and total need ($) as a proxy for the public building capital improvement needs of a state. Table 5 summarizes this data in the two columns titled "Crampton Base Need per Pupil" and "Crampton Total Need."

We used data from the most recent report from the National Association of State Budget Officials (NASBO) as an indicator of the annual capital investment that a state is making to meet the capital needs in its public schools (NASBO 2011). This is certainly a crude proxy, as the excerpted data is taken from a table that includes capital expenditures on schools, sporting arenas and other public facilities, but it shows, for most states, how little is being spent on public school infrastructure. This data is displayed in the Table 5 column titled "NASBO CapEx 2011 Est."

We detected no obvious pattern across states indicating that state legislatures are systematically using NEBs in ESPC projects to address outstanding capital improvements needs in public schools. Some states (e.g., Georgia, Kentucky) have a high numerical score for allowing NEBs even though their capital needs per pupil are relatively modest and their state annual capital expenditures are a reasonable fraction (10–20%) of the total capital need. Other states (e.g., California) are more restrictive on the use of NEBS even though their capital needs are high and their annual state capital expenditures are a negligible fraction (1%) of those needs.

Table 5. Matrix of NEBs allowed by state (with capital improvement need indicators)

	Market Segment NEBs Inclusion Scores							
State	State govt.	Univ./ Colleges	K-12 schools	Local govt., other	Total NEBs Score	Crampton Base Need per Pupil ($)	Crampton Total Need ($M)	NASBO CapEx 2011 Est. ($M)
PA	10	10	10	10	40	5,065	9,259	155
LA	8	8	10	10	36	10,070	7,294	728
GA	8	8	8	8	32	3,365	5,228	374
HI	8	8	8	8	32	18,373	3,366	0

	Market Segment NEBs Inclusion Scores							
State	State govt.	Univ./ Colleges	K-12 schools	Local govt., other	Total NEBs Score	Crampton Base Need per Pupil ($)	Crampton Total Need ($M)	NASBO CapEx 2011 Est. ($M)
WA	8	8	8	8	32	6,158	6,281	662
KY	5	6	10	9	30	1,505	1,016	291
DE	6	6	6	6	24	4,453	530	188
IN	2	2	10	10	24	9,726	4,652	109
MA	6	6	6	6	24	4,453	4,344	671
MI	6	6	6	6	24	6,943	3,439	408
NC	6	6	6	6	24	7,086	9,820	473
SC	6	6	6	6	24	10,070	7,087	0
TX	6	6	6	6	24	2,855	12,576	19
WY	6	6	6	6	24	4,257	361	24
CO	7	7	4	4	22	6,158	4,717	220
IL	4	6	6	6	22	3,807	3,888	154
OH	10	10	2	0	22	5,065	9,320	1,125
NV	5	5	5	5	20	6,158	2,463	32
AL	4	4	4	4	16	6,943	5,069	399
AR	6	6	4	0	16	9,726	4,504	102
FL	4	4	4	4	16	3,365	8,881	1,344
MT	4	4	4	4	16	6,158	903	0
NH	4	4	4	4	16	3,312	685	100
NJ	4	4	4	4	16	7,463	10,399	182
NM	4	4	4	4	16	6,158	2,008	0
OK	4	4	4	4	16	3,807	2,396	888
UT	4	4	4	4	16	6,158	3,101	150
ID	3	3	3	3	12	4,257	1,090	43
MI	4	2	4	2	12	5,065	8,868	145
MN	5	0	2	2	9	4,453	3,734	534
AZ	2	2	2	2	8	6,158	6,425	2
IA	2	2	2	2	8	3,909	8,200	270
KS	2	2	2	2	8	9,726	4,563	56
MO	2	2	2	2	8	9,726	8,806	126
NE	2	2	2	2	8	9,726	2,779	80
NY	2	2	2	2	8	7,463	21,167	1,793
ND	2	2	2	2	8	4,257	428	83
OR	2	2	2	2	8	4,453	2,459	211
SD	2	2	2	2	8	4,257	523	30
VA	4	0	0	4	8	7,086	8,537	193

	Market Segment NEBs Inclusion Scores							
State	State govt.	Univ./ Colleges	K-12 schools	Local govt., other	Total NEBs Score	Crampton Base Need per Pupil ($)	Crampton Total Need ($M)	NASBO CapEx 2011 Est. ($M)
ME	2	2	2	0	6	3,312	658	24
WV	2	0	2	2	6	4,257	1,193	127
WI	2	0	0	4	6	5,065	4,380	0
AK	1	1	1	1	4	5,834	775	813
MD	4	0	0	0	4	4,453	3,854	474
RI	1	1	1	1	4	4,453	697	74
VT	0	0	1	0	1	3,312	326	52
CA	0	0	0	0	0	3,943	25,400	361
CT	0	0	0	0	0	4,453	2,571	616
TN	0	0	0	0	0	3,807	3,583	70

Methods for Quantifying NEBs

Federal Methodologies

Federal ESPC projects permit three types of NEBs—Operations and Maintenance (O&M) cost savings, which are separated into two categories: (1) O&M (labor); (2) Repair and Replacement (materials); and (3) water savings. Federal ESPC projects use a straightforward methodology for determining O&M savings specified for use in the Federal Energy Management Program (FEMP) Indefinite Delivery Indefinite Quantity (IDIQ) contracts, also commonly known as the Super ESCO contracts. The method indicates that allowed savings are the difference between baseline O&M costs and actual O&M costs occurring as a result of the project implementation (FEMP 2008).

State Methodologies

While state ESPC laws permit a much wider range of NEBs than federal ESPC laws, states typically do not have defined methodologies for quantifying NEBs. In contrast to the FEMP procedure described above, *we were not able to identify any states that specify a procedure for calculating NEB savings*. Most states that allow NEBs in ESPC contracts also specify that the savings produced by the NEBs must be monitored and verified. However, we were also *unable to find any state laws or regulations detailing procedures for the monitoring and verification of these types of benefits*. The laws often refer to the general standards for the monitoring and verification of all project savings, which in turn often cite the IPMVP® (EVO 2010) or FEMP as standard methodologies to monitor and verify energy savings, without explicitly referencing the FEMP procedure for NEBs.

ESCO Methodologies

Given a general lack of specific requirements in state laws and regulations, ESCOs currently work with their customers to develop customized methodologies for incorporating two general types of NEBs into ESPC projects: (1) avoided O&M costs, and (2) avoided capital costs. A brief description of the current savings estimation methodology applied to each of these NEBs is provided below.

O&M savings. As noted above, Operations and Maintenance (O&M) savings in an ESPC result from the replacement of old equipment in a customer facility with new equipment. The old equipment is typically past the end of its useful life (e.g., a forty-year-old boiler) and has not been systematically maintained in accordance with manufacturers' recommended preventive maintenance schedules. Systems are kept operational by the extraordinary efforts of customer facility staff, supplemented with sizable maintenance contracts that often involve significant charges for emergency calls, when—for example—the boiler develops problems during continuous operations in a cold snap.

The new equipment installed by the ESPC project typically carries a multi-year manufacturer's warranty and/or service agreement from the ESCO that is part of the project contract. Thus, for a portion or the full life of the ESPC contract, the customer realizes savings by avoiding the labor and material cost of maintaining the old equipment. ESCOs normally calculate these savings by researching the customer's historical O&M costs and agreeing with the customer that these historical costs are the baseline costs that will be avoided for all or a portion of the project contract term. Annual avoided costs are often escalated over the term of the contract, using an annual inflation factor, such as the CPI for construction materials and labor.

Variations in the methodologies for calculating savings used by different ESCOs are typically the rigor with which the historical costs are documented, whether the savings are stipulated at the beginning of the contract rather than documented each year, and whether the savings include the value of the labor of customer maintenance personnel who are re-assigned to tasks other than the maintenance of the old equipment (rather than reducing customer maintenance employment through attrition or layoffs). The typical ESCO analysis, however, does not account for the full cost to the customer of doing nothing. Shonder (2013) discusses the fact that the costs of maintaining old equipment are typically not static, but rather increase over time. Avoiding these increased maintenance costs over the term of an ESCO contract can save the customer almost half again as much as the savings guaranteed in the ESCO contract.

Capital cost avoidance savings. The savings due to capital cost avoidance occur when the ESPC project installs equipment or other capital improvements (e.g., insulation) that the customer plans to install in the near future, and pays the cost of these capital improvements with future energy savings, rather than with funds appropriated or borrowed by the customer. For many public ESPC customers, appropriations in the current fiscal environment are not possible, and borrowing requires approval in a ballot vote, which today is difficult to obtain in many jurisdictions. Accordingly, customers use the allowable alternative of an ESPC project to pay for the capital improvements.

Conclusion

The U.S. ESCO industry has grown steadily over the past two decades, even through the most recent recession. The distinctive offering of ESCOs, the Energy Savings Performance Contract (ESPC), is particularly attractive to public sector customers in today's fiscal environment, because the capital costs of ESPCs are paid from savings, enabling public facilities to achieve energy savings and modernize facilities without the need to significantly raise taxes or other means of obtaining significant up-front capital.

It is important to note that the ESCO industry achieved a breakthrough to widespread customer acceptance (and access to third-party project finance capital) in the mid-1990s, when the industry moved from proprietary project energy savings calculations to transparent methodologies developed, maintained and updated by a respected third party. In an earlier paper, (Larsen et al. 2012b), we suggested that an effort analogous to the original development of the International Performance Monitoring and Verification Protocol (IPMVP) be undertaken by stakeholders. Ideally, the purpose of this independent third-party process would be to develop standardized and transparent methodologies for estimating and verifying non-energy-related savings.

In this paper, we discuss a number of key findings related to non-energy benefits including:

- *Non-energy Benefits (NEBs) are an increasingly important part of the value that ESCO projects deliver.* Analyses of projects in the LBNL/NAESCO project database indicate that ESPC projects provide significant non-energy benefits in addition to substantial energy savings. Selected case studies indicated that NEBs can be as much as 40% or more of the total savings generated by an ESPC project.
- *There is widespread variation in whether (or to what extent) NEBs are incorporated into ESCO contracts.* The federal government typically allows two types of NEBs in ESPC projects—O&M savings (which federal terminology separates into Operations and Maintenance labor and Repair & Replacement materials) and water savings. State governments, on the other hand, allow a range of NEBs (from zero to 10 or more general categories of NEBs) and NEMs that can repay their capital costs from savings. However, we found that there appears to be no correlation between state government infrastructure needs and the number of NEBs currently allowed.
- *There is no standard methodology to follow when measuring and monetizing non-energy benefits.* While FEMP has published a methodology for calculating and verifying O&M savings, no state agency appears to have an equivalent methodology for O&M savings or for the other types of NEBs and NEMs that are currently allowed. This lack of specified methodologies or guidance creates uncertainty about the validity of the savings,

especially when, during the long term of some ESPC contracts, the ESCO and new personnel who cannot reconstruct the original calculations replace customer personnel who negotiated the project contract and agreed to the calculation of the NEBs.

We suggest a three-phased approach to develop standardized and transparent methodologies for estimating and verifying non-energy-related savings:

Phase 1: Standardize and Promote Measurement and Verification of O&M Savings

The ESCO O&M methodologies described above are all similar to the methodology used in the FEMP Super ESPC program without specifically referring to the FEMP methodology. We recommend that the FEMP methodology be adopted as the industry standard and formally incorporated into the next revision of the IPMVP.

Phase 2: Standardize and Promote Measurement and Verification of Capital Cost Avoidance

The capital cost avoidance methodologies described to us by ESCOs consists of a simple calculation methodology that divides the capital cost over a term less than the expected useful life of the equipment—allowing the customer to take a savings credit each year equal to this fraction of the total capital cost. LBNL suggests that a simple, similar methodology be refined by incorporating the establishment of a baseline for savings calculations that approximate the actual planned replacement schedule for the capital equipment retrofitted in the ESCO project.

Phase 3: Standardize and Promote Measurement and Verification of Other Avoided Costs

Several types of standardization activities for NEBs could be based on methodologies that are derived from other parts of the energy industry. For example, Internal Revenue Service depreciation tables for building components could be used to calculate the terminal value of energy efficiency measures whose useful life is longer than the term of the ESCO performance contract. In addition, other methodologies could be used to determine and measure NEBs including methods used in the ISO-New England and PJM capacity auctions to verify energy efficiency resources or the verification of emissions reductions that are documented in state implementation plans for pending air pollution regulations.

Acknowledgements

The work described in this report was funded by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, Weatherization and Intergovernmental Programs under Contract No. DE-AC02-05CH11231. The authors would like to first and foremost thank Alice Dasek and AnnaMaria Garcia of the Department of Energy Office of Weatherization and Intergovernmental Programs (DOE-OWIP) for their ongoing support of our research into this topic. Finally, we thank Terry E. Singer (NAESCO), David Birr (Synchronous Energy Solutions), Linda Smith (9Kft Strategies in Energy) and Patricia Donahue (Donahue and Associates) for sharing their expertise on this industry.

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