Working Paper Series

Energy Performance Contracting and Cost Comparisons

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ABSTRACT

Since the Energy Policy Act 1992 became law, performance contracts have been authorized as alternative financing mechanisms for implementing energy and water conservation measures on federal facilities. These have included both Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs). Over the past decade, federal agencies have been increasingly using these contracts to supplement their direct budget obligations. However, UESCs have received less attention despite having similar goals and processes as ESPCs, with the investment ratio between them being as skewed as 1:10. This paper provides a cost comparison of three performance contracting models along with the tradeoffs that should be considered when choosing between the two to achieve similar scopes of work. UESCs are flexible and collaborative in nature, offer similar energy savings as ESPCs at reduced project costs, and represent a way to transfer technology in a public-private partnership. Overall, our analysis suggests that UESCs may offer a number of financial, contractual, and strategic benefits relative to ESPCs and deserve greater attention from federal agencies in the future.

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Table of Contents

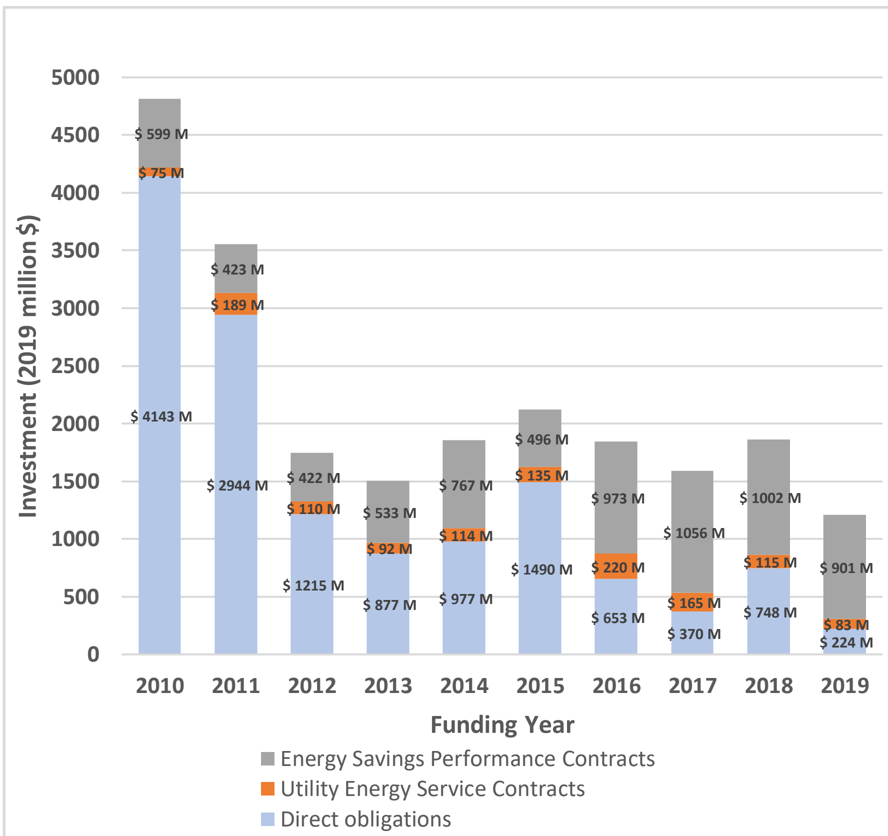
1. INTRODUCTION

Since the Energy Policy Act of 1992 became law, energy performance contracting has been an authorized alternative financing mechanism for implementing energy and water conservation measures on federal facilities. Energy performance contracting includes Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs). The Energy Policy Act of 2020 authorized additional mechanisms to increase the deployment of energy and water conservation technologies under the auspices of the Federal Energy Management Program, with the goal of increasing the deployment of energy resilience and decarbonization technologies at federal facilities. These tools are intended to accelerate investments in federal infrastructure improvements and increase the efficiency of energy and water systems.

This white paper is designed to provide a cost comparison of alternative performance contracting models along with the tradeoffs that should be considered when deciding between execution of requirements using an ESPC or UESC to achieve a similar scope of work. While seemingly alike, these two contracting tools have different cost and contracting implications. Federal agency decision-makers should be armed with unbiased analyses to make the best-informed decisions when obligating taxpayer dollars for long-term improvements.

Figure 1 compares and contrasts the investment in UESC and ESPC financing tools as mechanisms to offset the reduction in direct funding obligations. Without these programs, federal efficiency improvements would often be delayed or shelved permanently.

Figure 1. Federal Government Facility Energy Efficiency Investments (Source: Office of Federal Sustainability – Council on Environmental Quality)



ESPCs and UESCs have been designed to be transparent, collaborative, and flexible, allowing the government to drive the project requirements and the private sector to develop comprehensive solutions. In our review of government reports and academic literature, we find that UESCs can at times be more cost effective than ESPCs and can offer a range of additional benefits. Facility managers should consider UESCs and ESPCs to determine the appropriate financing tools best suited for their facility. Research suggests that the long-term collaborative nature of UESCs helps federal agencies meet a number of technical goals. Lachman et al (2011), based on a series of interviews with U.S. Army officers, finds that UESCs outperformed ESPCs across 8 different goals: saving money and decreasing energy consumption; increasing investments in energy efficiency; meeting renewable energy goals; improving energy security; improving installation operations and building performance; transferring technical assistance and information; creating positive spillover and learning effects for other energy efficiency activities; and enabling facilities to take on projects that they could not do on their own. However, historically ESPCs have been widely heralded as an effective way to increase investments in energy conservation, while UESCs have received less attention.

Despite common goals and processes, ESPC projects have received a greater volume of contracts (by dollar value) than their UESC counterparts, by as much as 10:1 in some recent years. This can be attributed to multiple factors, but a key reason seems to be that UESC programs are not as well known within federal agencies or offered by some utilities. This white paper is designed to help improve decision-making during the contracting process to facilitate increased investment in energy efficiency, renewable energy, and energy resilience services by obligating taxpayer dollars more efficiently.

Throughout the rest of the paper, we compare UESCs and ESPCs along several dimensions, with particular emphasis on highlighting characteristics of UESCs that may not be as well understood by acquisition officials. We examine the cost structure of each and the results highlight specific benefits of the UESC contract mechanism. We characterize the differences and similarities between UESCs and ESPCs as follows:

1. **Financial Comparison** – Self-performed UESCs (utilities that have self-build capability) may provide the lowest total cost over the life of the project.
2. **Contracting and Collaboration** – UESCs provide flexible contracting and execution, streamlined procurement process, and build collaborative relationships between federal agencies and serving utilities.
3. **Verified Energy Savings** – UESCs verify energy savings through a flexible PV/PA approach while ESPCs utilize more detailed, intensive, and costly M&V.
4. **Innovation & Strategic Benefits** – UESCs and ESPCs both enable innovative technologies that can improve resiliency and reduce carbon emissions.
5. **Technical** – UESCs enable technological transfer and training from highcapacity utilities to federal clients throughout the lifespan of the contract.

In this paper we analyze facility-level data from FEMP's Compliance Tracking System (CTS) Data Warehouse, which includes 33 projects exclusively funded through UESCs and 77 projects exclusively funded by ESPCs. The results show that ESPCs and UESCs invest in similar technologies. UESCs and ESPCs are associated with Energy Conservation Measures (ECMs) such as building envelope, lighting retrofits, steam distributions systems, and renewable energy systems. In addition, an analysis of 35 successful case studies documented by the FEMP indicates a relationship between UESC projects and energy resilience upgrades.

2. COMPARISON OF UESC AND ESPC PERFORMANCE CONTRACTING MECHANISMS

Over the past decade, ESPCs have been the dominant alternative financing mechanism for implementing energy and water efficiency projects at federal agencies, with investments totaling $7.1 billion, about six times the magnitude of UESC investments (Figure 1). Over the same timeframe, UESCs have been responsible for significant levels of financing activity every year since 2010. More than 2,100 projects with a construction value of $1.5 billion (averaging $715,000/project) and an annual energy savings of $100 million (averaging $48,000/project) have been implemented using the UESC contracting mechanism, saving over $1 billion in energy and maintenance costs for the federal government. ESPCs and UESCs have been effective vehicles for federal investment in efficiency improvements. Table 1 summarizes the similarities and differences between the two performance contracting mechanisms.

Table 1. Comparison between UESCs and ESPCs (Source: Authors)

COMPONENT	UESC	ESPC
Appropriated Funding	Appropriated dollars can be applied	Appropriated dollars can be applied
Contract Vehicle	GSA Areawide Contract, BOA, and separate contracts	Task Orders under an IDIQ (e.g., FEMP/DOE, Huntsville/DOD, GSA, etc.)
Authorization	EPAct, 42 USC 8256; 10 USC 2913; 10 USC 2866; 48 CFR 41; 48 CFR 16	EPAct 42 USC 8287; 10 CFR 436
Financing	Third-party financing is available	Third-party financing is available
Interest Rates	Lower interest rates may be available	Typically higher interest rates
Maximum Term	25-year	25-year
Payment	Utility bill or invoice	Invoice
M&V	PV/PA and annual energy audit negotiable	M&V and annual energy audit required
O&M	O&M negotiable	O&M typically included
Performance Protocol	Performance Assurance	IPMVP Savings Guarantee
Prime Contractor	Serving Utility Company with Areawide Contract	ESCO from pre-selected list of IDIQ participants
Savings Guarantee	No/Can be negotiated	Yes
Competition	Exempt from CICA, sole source to utility; utility competitively selects subcontractors	Competitive (Competition in Contracting Act (CICA) applies (SAM.gov)
Sole Source	Can sole source when there is only one serving utility - with Justification and Approval documentation; limited competition even with more than one serving utility	Rare to justify a sole source - other than a follow-on to an existing project at the same location; open competition to participants on the IDIQ
Time to Project Award	Streamlined Process	Multi-Stage Procurement

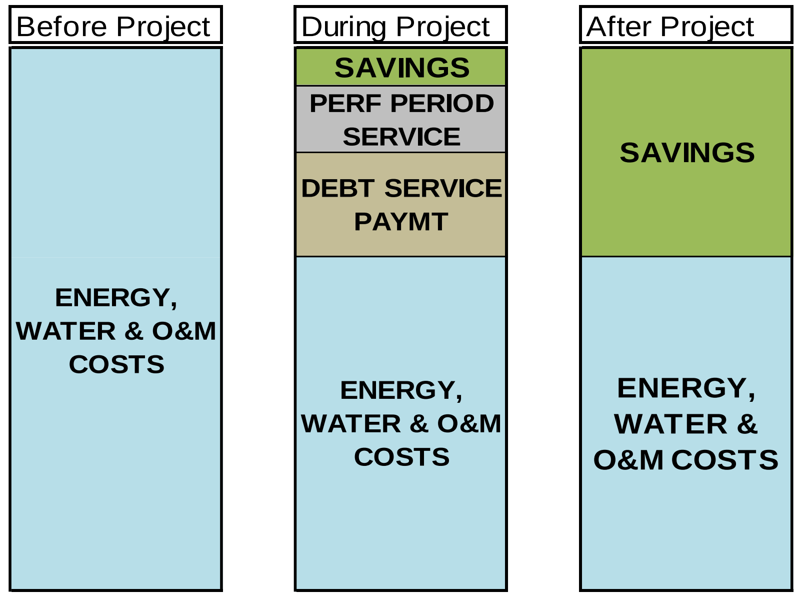
For both UESCs and ESPCs, upfront capital contributions can be applied to reduce the cost of the financed investment or pay for a requirement that does not generate energy savings. Conversely, this financing approach can be used to stretch limited O&M dollars. ESPCs can be performed with Indefinite Delivery, Indefinite Quality (IDIQ) Contracts. For ESPCs, it is rare to justify sole source, and the contractors are chosen from ESCOs that are selected from a pre-qualified list of IDIQ providers produced by a lengthy multi-stage procurement process. In contrast, the General Services Administration (GSA) Areawide Contract or Basic Ordering Agreement (BOA) is used to implement UESCs. It is common to justify a sole source when there is one serving utility, requiring justification and approval documentation. This streamlined procurement process, discussed below, means UESCs may be executed faster and with less regulatory burden. Both ESPCs and UESCs rely on third-party financing, though – as highlighted in the financial comparison, ESPCs command higher interest rates due to greater risk.

A second difference that may impact contracting decisions is the savings guarantee that accompanies ESPCs. It is important to understand that an energy-savings guarantee does not guarantee dollar savings. Rather, it guarantees that equipment will work by requiring a financial liability or insurance premium. While UESCs can utilize a Performance Assurance / Performance Verification (PA/PV) approach to measure energy savings, ESPCs are required to use a costlier and more intensive Measurement and Verification (M&V) approach. In a UESC utilizing a PA/PV approach, the federal government and the utility develop a PA plan for each energy conservation measure. This plan, embedded in the Task Order, includes details like the intervals of performance verification and key performance indicators. In addition, the plan is likely to place emphasis on staff training, operation and maintenance of equipment, and ensuring that installed equipment is functioning as intended, allowing energy savings to be deemed successful. In contrast, the M&V approach that is optional for UESCs though required for ESPCs, coupled with an energy savings guarantee, is designed to attribute savings to specific energy conservation measures for the purposes of ensuring that energy savings guarantees are met.

This approach requires doing detailed measurements of usage and performance at least once a year, if not more frequently. Because the technical complexities with the M&V approach are high, experienced ESPC practitioners recommend that the agencies retain a technical consultant for the M&V activities.[1] The 'whole facility' approach under M&V requires a considerable tracking of changes in the facility (including weather changes, utility charges etc.) and its operations. We discuss the financial implications of these distinctions further below.

UESC / ESPC Common Financial Model The UESC and ESPC contract vehicles use the same financial model, allowing initial up-front investment in energy-saving technologies. This model utilizes "avoided-costs and energy-savings" resulting from the project to cover annual debt service and performance period expenses, as shown in the figure below. After the term of the project financing is complete, the energy efficiency improvements and renewable energy continue to generate the annual "avoided-cost and energysavings" for the life of the measures and the savings can be used to complete more projects (Figure 2)

Figure 2 Energy Performance Contracting - Common Financial Model (Source: ORNL 99-06432A/abh)



3. FINANCIAL COMPARISON

A review of government reports and academic literature suggests that self-performed UESCs are the most cost-effective option available to the federal government; "ESPCs are generally considered more expensive than UESCs" (Lachman et al 2011). Below, we present an illustrative model to demonstrate the key sources of the cost difference between the two contracting mechanisms.

Table 2 presents an analysis of three different approaches to energy performance contracting based on the Atlanta Central UESC Pilot Project, a $10.3 million Self-Performed UESC project that provided energy and water efficiency upgrades to thElbert P. Tuttle US Court of Appeals building in Atlanta, GA, the Lewis R. Morgan Federal Building and Courthouse in Newnan, GA, and the Rome Federal Building Post Office and Courthouse in Rome, GA (see Figure 3).

[1] Schiller, Steve and Stuart, Elizabeth. "The Business Case for Conducting Measurement and Verification in State and Local Government Energy Savings Performance Contract Projects". Lawrence Berkeley National Laboratory. 2019.

Led by the GSA as part of the agency's Deep Energy Retrofit initiative, this renovation of three federal courthouses in Georgia involved upgrading the chilled water system, the heating system, the HVAC Control systems, transitioning to LED lighting, improving ventilation with CO_2 sensors, and a number of other energy and water efficiency upgrades. AGL Energy Services, a wholly owned subsidiary of AGL Resources (now called Southern Company Gas and owned by Southern Company) verified baseline energy use prior to construction. Together these energy and water cost savings were expected to cut utility costs by 44%, with $40,164 additional maintenance cost savings.[2]

Figure 3 Atlanta Central UESC Pilot Project

The project goals also aimed to improve the comfort and reduce the operating costs of facilities, modernizing equipment to reduce failures and improve operations, and streamlining the contracting and construction process by working with AGL Energy Services as a single point of contact. The project involved $7.5 million in direct costs related to equipment and mechanical, lighting, and water conservation contractors, and employed PV/PA in a way that validated predicted savings.

We compare this UESC project with PV/PA with an illustrative UESC project with guaranteed savings (M&V) and an illustrative ESPC project with guaranteed savings (M&V). While direct costs for subcontractors are equivalent acrossthe approaches, Table 2 demonstrates the impact of higher expenses related to IGA development and the higher cost of M&V associated with the guaranteed savings. The UESC with guaranteed savings (UESC M&V) and the ESPC with guaranteed savings (ESPC M&V) have significantly higher development and engineering costs than the UESC with PV/PA. In addition, Table 2 demonstrates how the guaranteed savings impacts profit and overhead margins on UESCs and ESPCs. Overhead and profit are typically higher when savings are guaranteed in either a UESC or ESPC approach. Further, self-performed UESCs are able to keep costs low by performing work in-house, though UESCs often subcontract with ESCOs, increasing their costs. Table 2 also demonstrates the impacts of higher interest rates associated with ESCOs working on ESPCs relative to utilities working on UESCs.

Table 2 highlights significantly lower costs for self-performed UESC contracts. These cost savings are due to differences in the contract vehicles. We next discuss the assumptions in the model and their implications for the cost of energy performance contracts.

3.1 Overhead and Profit

ESPC providers build greater overhead and profit (OHP) into energy performance contracts due to a risk premium charged by the ESPC provider.[3,4] In our illustrative project, we assume typical OHP rates of 35 - 45% for ESPCs and 20 - 25% for UESCs with guaranteed savings that lead to 24% higher project costs and a net cost to the federal government of an

[2] Payne, Tim and Chandler, Toby. General Services Administration and AGL Resources. "Atlanta Central UESC Pilot Project." FUPWG Presentation 11/3/15. https://www.energy.gov/sites/prod/files/2015/11/f27/fupwg_fall2015_payne_chandler.pdf

[3] Lachman, Beth, Hall, Kimberly Curry, Cuthright, Aimee E, Colloton, Kimberly. "Making the Connection: Beneficial Collaboration Between Army Installations and Energy Utility Companies." Rand Corporation. 2011.

[4] Conversations with industry participants.

additional $2.5 million. This higher OHP cost is due to the guaranteed savings nature of ESPC contracts.[5] This guaranteed savings represents a risk to the ESPC provider and the provider, in turn, charges a risk premium. "ESPCs have become a preferred means of making energy efficiency improvements…. However, ESCOs assume a certain risk in guaranteeing savings through ESPCs, the risk is factored into their cost."[6] The same is true of the UESC M&V case. In contrast, self-performed UESCs with PV/PA do not come with guaranteed savings, enabling lower costs that may translate to higher energy savings.[7] It is important to note that self-performed UESCs refer to contracts where the utility performs much of the work, and does not subcontract to other ESCOs. While we did not model UESCs that involve a number of ESCO subcontracts, it is possible that this approach drives up costs due to multiple providers requiring overhead and profit and greater coordination costs.

Based on the costs highlighted, implementing an ESPC is almost $1.6 million dollars more expensive than implementing a self-performed UESC with guaranteed savings (M&V) and more than $2.5 million dollars more expensive than a self-performed UESC with PV/PA during the development and construction period.

3.2 Measurement and Verification of Guaranteed Savings (M&V Requirements)

Guaranteed savings requirements drive up development (IGA) time and costs. M&V requirements associated with ESPCs are costlier than PA/PV approaches that are more flexible. As discussed earlier, M&V approaches with savings guarantees involve detailed calculations related to the energy use and performance of a facility, including weather patterns, changes in facility usage and the hiring of technical consultants. These measurements are likely to be done at least annually for the full term of the project, up to the full 25-year financing period. If the financing term runs the full 25-year period allowed (including construction), then M&V outlays can become significant. During the finance term these costs must be deducted from the savings available for debt service, further increasing financing costs.

The sample project in Table 2 represents these costs with additional $453,000 in "Direct Costs Subtotal" line item, which is due to the higher Investment Grade Audit (IGA) development ($151,000) and M&V of ($302,000). Lachman et al (2011) note that M&V are typically expensive portions of a project and suggest excluding or modifying these requirements to reduce project costs. And while UESCs can provide guaranteed M&V (reflected in the UESC M&V column), government reports suggest that the expenses associated with M&V may not be cost effective. The Government Accountability Office concluded that: "Measurement and verification reports for 14 projects in our sample overstated some cost and energy savings in that they reported savings that were not achieved".[8] Lachlan et al (2011) also note common problems with the implementation of M&V: "at another installation the M&V reports provided by the ESCO were not accurate, claiming higher energy savings than what the actual performance was. So even when M&V and O&M are part of an ESPC contract, they are still not always implemented properly."[9] The flexibility associated with UESCs and the PA/PV approach means that performance verification can be tailored to the needs of the specific project and costs can be held lower.

Based on Table 2, the increased costs resulting from ESPC Guaranteed Savings during Performance Period Service is over $2,100,000 versus Self-Performed UESC with PV/PA and over $700,000 versus Self-Performed UESC with Guaranteed Savings (M&V).

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[5] Andrews, Anthony. Department of Defense Facilities Energy Conservation Policies and Spending. Congressional Research Service. 19 February 2009.

[6] Andrews, Anthony. Department of Defense Facilities Energy Conservation Policies and Spending. Congressional Research Service. 19 February 2009.

[7] Andrews, Anthony. Department of Defense Facilities Energy Conservation Policies and Spending. Congressional Research Service. 19 February 2009.

[8] GAO, *Energy Savings Performance Contracts: Additional Actions Needed to Improve Federal Oversight*, GAO-15-432, June 17, 2015, p. 21, https://www.gao.gov/products/GAO-15-432.

[9] Lachman, Beth, Hall, Kimberly Curry, Cuthright, Aimee E, Colloton, Kimberly. "Making the Connection: Beneficial Collaboration Between Army Installations and Energy Utility Companies." Rand Corporation. 2011.

Table 2: Cost Comparison of Common Energy Performance Contracts (Source: Avid Energy Partners)

Price Model		**Self-Performed UESC PV/PA**		**Self-Performed UESC M&V**		**ESPC M&V**	**DELTA (ESPC M&V – UESC M&V)**
DIRECT COSTS	%		%		%		
Sub Contractors							
Mechanical		$6,100,000		$6,100,000		$6,100,000	
Lighting		$1,100,000		$1,100,000		$1,100,000	
Water Conservation		$350,000		$350,000		$350,000	
Subtotal		$7,550,000		$7,550,000		$7,550,000	$0
Development & Engineering							
IGA Development	3.0%	$226,500	5.0%	$377,500	5.0%	$377,500	
Design Engineering	4.5%	$339,750	4.5%	$339,750	4.5%	$339,750	
CX & PV/PA	1.0%	$75,500	5.0%	$377,500	5.0%	$377,500	$0
	8.5%	$641,750	14.5%	$1,094,750	14.5%	$1,094,750	$0
Direct Costs Subtotal		$8,191,750		$8,644,750		$8,644,750	$0
CM & PM (UESC or ESPC)							
Construction Mgt	3.7%	$279,350	3.7%	$279,350	4.0%	$302,000	
Program Mgt	2.0%	$151,000	2.0%	$151,000	10.0%	$755,000	
Subtotal	5.7%	$430,350	5.7%	$430,350	14.0%	$1,057,000	($626,650)
Costs Subtotal		$8,622,100		$9,075,100		$9,701,750	
Overhead	10%	$862,210	10%	$907,510	18%	$1,746,315	($838,805)
Profit	10%	$862,210	15%	$1,361,265	15%	$1,455,263	($93,998)
Subtotal	20%		25%		33%		
Total Project Cost to Gov't	34.2%	$10,346,520	45.2%	$11,343,875	61.5%	$12,903,328	($1,559,453)
Gross Margin to UESC or ESPC	25.7%	$2,154,770	30.7%	$2,699,125	47.0%	$4,258,578	($1,559,453)
Annual Performance Expenses	17 Yrs	$311,479	21 Yrs	$1,644,642	21 yrs	$2,415,746	($732,969)
Financing Costs	3.10%	$3,121,905	3.25%	$4,656,444	3.40%	$5,496,655	($840,211)
Total Cost w Financing & PV/PA		**$14,524,883**		**$18,542,404**		**$21,841,866**	**($3,299,462)**

3.3 Lower Interest Rates with UESC Contracts

Multiple studies note that interest rates can be lower for utility companies that typically have long-standing records of financial performance and rate-payer backing compared to ESPC providers, that are often backed by private capital.[10,11] Interest rates for UESC projects are typically 0.15 to 0.25% less than ESPC projects. One reason for higher interest rates associated with ESPC projects may be due to small business procurement requirements that are more likely to effect procurement from ESCOs and also translate into higher interest rates. With UESC projects, utilities typically receive better interest rates in capital markets than ESCOs, keeping the rate lower. Shorter finance terms also produce more favorable interest rates. With ESPC projects, the credit of the ESPC provider is involved in the credit of these deals because during the post-construction period, the financier considers the ability of the ESPC provider to pay back any potential shortfall, and this results in higher total finance costs over the life of the project.

Based on Table 2, the increased costs resulting from ESPC guaranteed savings during the financing term with the higher rate is over $840,000, relative to UESCs with a savings guarantee, and more than $2,300,000 relative to UESCs without a savings guarantee.

The total savings for a self-performed UESC based on illustrative example are as follows:
> ***Compared with an ESPC (Column 3 vs Column 1): over $7.3 million***
> ***Compared with Self-Performed UESCs with Guaranteed Savings (M&V) (Column 3 vs Column 2: over $3.2 million***

4. CONTRACTUAL AND COLLABORATION BENEFITS

An energy-efficiency project at a federal installation does not have to be competed among utility companies serving the facility for a UESC contract, as Federal Acquisition Regulation (FAR) 41 (40 USC 501) gives the federal government the ability to sole source with a utility serving the federal facility with an energy commodity. In contrast, ESPC contracts must be competed among potential ESPC providers (ESCOs) holding a DOE IDIQ, Army Multiple Award Task Order Contract (MATOC), or other ESPC contract. Presently sixteen firms hold DOE contracts and several companies have Army MATOC contracts. The greater number of contractors competing for ESPC work increases the procurement and evaluation efforts by the federal agency, adding to development time and cost. ESPC providers roll these sales costs into their overhead, further driving up the total costs.

UESCs traditionally have greater flexibility with appropriated funds and other sources of funding. Utilities often use an areawide contract for executing smaller projects, such as meter replacements due to the ease of execution and the sole source latitude. These smaller projects often lead to execution of larger UESC projects, once execution of the UESC contract vehicle is understood by the contracting office of the federal agency.

A study by Lachman et al (2011) points to the collaborative nature of UESCs as a clear advantage over ESPCs. UESCs help develop a collaborative close relationship between the utility and federal government that can produce a range of benefits that will be explored further below. In particular, however, utilities are more willing to take on phased, iterative, or smaller projects that results in greater flexibility of project scope. By developing a long-term collaborative partnership through UESCs, utilities enable the federal government to undertake additional activities that they could not do on their own, achieving a wide range of additional goals relating to energy security, reliability, resilience, and other performance goals. Further, this collaborative relationship results in significant technological skills transfer to the federal facilities and their

[10] Lachman, Beth, Hall, Kimberly Curry, Cuthright, Aimee E, Colloton, Kimberly. "Making the Connection: Beneficial Collaboration Between Army Installations and Energy Utility Companies." Rand Corporation. 2011.

[11] Shonder, John, Morofsky, Ed, Schmidt, Fritz, Morck, Ove, and Hinamen, Mervi. "Best Practice Guidelines for Using Energy Performance Contracts to Improve Government Buildings" International Energy Agency. Energy Conservation in Buildings and Community Systems Programme. May 2010.

staff. In contrast, ESPCs are described by Lachman et al (2011) as more transactional in nature with fewer mechanisms to transfer skills or develop as wide a range of benefits.

UESC projects benefit federal clients because the long-term partnership between the federal agency and the utility motivates both parties to create successful, mutually beneficial projects. Unlike almost all other federal/private relationships, the utility company will be present to serve the federal agency well beyond the duration of the project. The business models for UESCs recognize this dynamic. The UESC places a premium on delivering a quality product accompanied by excellent service to maintain and enhance the utility/agency relationship.

5. VERIFIED ENERGY SAVINGS

While one perceived benefit of ESPCs is the guaranteed savings, research suggests that these guarantees do not always mean more reliable energy savings.[12,13] Guaranteed Savings Contracts can become null and void after several years because the government changes the operation of the facility, thereby rendering the Guaranteed Savings Contract no longer valid. The GAO found that while many projects meet or exceed expectations, "some of these savings may be overstated" and that the overstated savings may be as much as half of a project's savings for a year. They note that ESPC providers would nullify energy savings guarantees because the agency might not have operated or maintained equipment as agreed when the ESPC was awarded or agencies might remove equipment or close facilities where energy conservation measures had been installed.[14] Changing the weekly schedule, facility use, function, etc., are also common occurrences that void the Guaranteed Savings Contracts.

It is typical for the government to make changes in a facility's functions during longer periods of operation, changing factors like operating hours or load profiles, potentially threatening energy savings guarantees. In practice, however, recent evidence suggests that reported energy savings shortfalls appear to be rare. A 2019 report by ORNL finds that 10 out of 187 M&V reports had recorded savings shortfalls. The guaranteed savings shortfalls for these 10 projects ranged from 0.4% to 26%. In 6 out of 10 cases the shortfall was resolved through reduced payment whereas in the remaining four cases the shortfall was deemed to be the agency's responsibility.[15] In a similar report in 2016, 14 out of 167 projects did not achieve guaranteed savings and the resolution for 12 cases was found through reduced payments to the ESCO.[16] Nevertheless, it is also possible that the threat of non-performance changes the amount or types of investments in ECMs when savings guarantees are in place.

The results of UESC PV/PA savings verification have improved in the industry at-large, motivated by legislation (2012) and the looming potential request for guaranteed savings by some federal agencies seeking to mimic ESPCs when implementing UESCs. This suggests that when savings verification is required for ECMs during post construction, the more expensive guaranteed savings M&V may not always be worth the investment for the return, especially with the growing confidence of PV/PA results.

6. RENEWABLE ENERGY, ENERGY RESILIENCE AND STRATEGIC BENEFITS

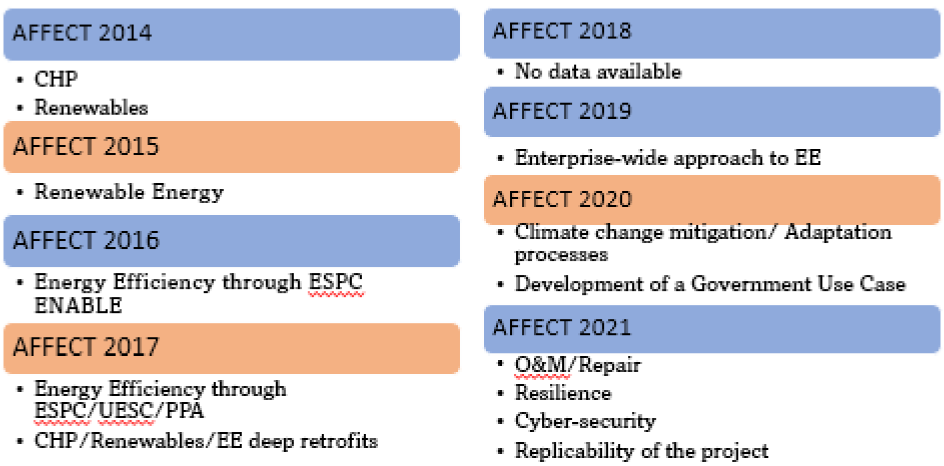
With President Biden's pledge to reduce carbon emissions in half by 2030, there is significant demand for strategies to deploy innovative carbon reduction and energy resilience strategies across the federal government, and to begin

[12] GAO, *Energy Savings Performance Contracts: Additional Actions Needed to Improve Federal Oversight*, GAO-15-432, June 17, 2017, p. 21, https://www.gao.gov/products/GAO-15-432.
[13] Lachman, Beth, Hall, Kimberly Curry, Cuthright, Aimee E, Colloton, Kimberly. "Making the Connection: Beneficial Collaboration Between Army Installations and Energy Utility Companies." Rand Corporation. 2011.
[14] GAO, *Energy Savings Performance Contracts: Additional Actions Needed to Improve Federal Oversight*, GAO-15-432, June 17, 2017, p. 21, https://www.gao.gov/products/GAO-15-432.
[15] Walker, Christine. "Reported Energy and Cost Savings from the DOE ESPC Program: FY 2019." Oak Ridge National Laboratory. 2020.
[16] Slattery, Bob. "Reported Energy and Cost Savings from the DOE ESPC Program: FY 2016." Oak Ridge National Laboratory. 2018.

incorporating improved cybersecurity practices throughout federal energy infrastructure. The 2020 Energy Policy Act bolsters statutory efforts to increase the impact of the FEMP program by mandating the implementation of lifecycle cost-effective ECMs, and mandating the implementation of at least 50 percent of measures identified in mandatory energy and water audits and reports. Further, the Act increases reporting requirements for ESPCs and UESCs including investment values, energy quantity, forecasts, and divergences. In addition, the Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) program has been employed by FEMP as a way to leverage investment in energy conservation – and increasingly – energy resilience and decarbonization technologies.

The AFFECT grant program has facilitated wider adoption of energy-savings contracts and has helped federal agencies to cover the initial project investment costs for 'year 0', that include but are not limited to: IGA costs, permits and agreement costs, geothermal studies cost, and more. Renewable energy projects have been able to reduce their initial costs by using AFFECT grants in conjunction with other renewable energy incentives. Figure 4 shows the evolution/yearly progression of the grant process and its award criteria with respect to technology adoption.

Figure 4: Summary of AFFECT grants criteria by year: technology topic areas & energy savings contracts



FEMP has added cybersecurity as a focus, per legal and regulatory requirements for federal agencies and has outlined considerations for integrating cybersecurity planning into each phase of the energy savings contracts (UESC/ESPC). While this might mean additional costs for projects that involve automation or building controls, agencies can utilize AFFECT grants to offset added costs and incorporate advanced technologies that increase their energy efficiency and resilience.

UESCs represent an effective way to implement a variety of energy technologies and help transfer those technologies to the private sector, as many utilities have dedicated internal R&D functions. In contrast, ESPC providers "have incentive to minimize risk on individual projects" which can lead "these entities to use older proven technology, rather than the kinds of innovative technologies coming out of the DOD and GSA test bed programs."[17] Further, recent research has highlighted the role that government spending has played in the uptake of innovative energy and environmental technologies in the private sector by helping build supply chains.[18,19] Demonstrating innovative technologies using public-private partnerships between the federal government and utility providers represents a promising way to speed the deployment and lower the cost of innovative technologies across the federal government and the private sector, by using federal projects to provide positive information spillovers to the private sector.[20] UESCs, because of their collaborative nature and ability to invest in all kinds of projects (including riskier ones) could prove to be an effective mechanism for implementing combinations of energy generation technologies, and efficiency technologies that have more uncertain returns.

[17] Clark, Corrie. Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs). Congressional Research Service R45411 November, 2018.

[18] Simcoe, T., Toffel, M.W., 2014. Government green procurement spillovers: Evidence from municipal building policies in California. Journal of Environmental Economics and Management 68, 411-434.

[19] Blackburn, C.J., Flowers, M.E., Matisoff, D.C., Moreno-Cruz, J., 2020. Do Pilot and Demonstration Projects Work? Evidence from a Green Building Program. Journal of Policy Analysis and Management 39, 1100-1132.

[20] Simcoe, T., Toffel, M.W., 2014. Government green procurement spillovers: Evidence from municipal building policies in California. Journal of Environmental Economics and Management 68, 411-434.

These technologies have significant benefits to the federal government and to utilities and they can help facilitate resilient energy systems and decarbonization technologies. Federal agencies need resilient and redundant systems to maintain their mission during times of utility service interruptions. Strategies such as combined heat and power systems, power generation using methane emissions at on-site buried waste sites, battery storage of electrical energy and thermal energy ground storage can reduce energy utility expenditures, minimize greenhouse gas emissions, and provide back-up energy reserves when service is disrupted. Conversations with FEMP program managers note an increasing emphasis to use both ESPCs and UESCs to pursue the deployment of advanced technologies and resilience.

Energy utilities are effective partners for these efforts as energy production and distribution are the core of their missions. Utility companies can coordinate on-site power generation with grid requirements and optimize micro-grid construction and operation. Additionally, many of the challenges facing federal facilities for securing and hardening their energy systems are identical to those being addressed by the utilities. Utilities are in a position to help lead de-carbonization efforts, increase deployment of energy resilience technologies, and help implement cybersecurity measures. Electric utilities are dealing with increases in electrical demand from federal installations.

Drivers of increased demand include new installations, the expansion of existing installations, electrification of transportation, and specialized military facilities with large intermittent power draw, rapid deployment of military personnel, intermittent loads from on-site generation applied by the facility under a separate contract vehicle, and finally, the variable demand on federal office facilities coupled with other facilities that have consistent energy demand for emergency services or housing. With significant pressure to speed efforts at decarbonization while minimizing direct costs to the federal government, the potential to leverage FEMP programs and UESCs and ESPCs to leverage additional decarbonization efforts in the public and private sectors is a promising area for future research and analysis.

Figure 5: Technologies by Contract Type (Source: Authors Assessment of FEMP Compliance Tracking System Data)

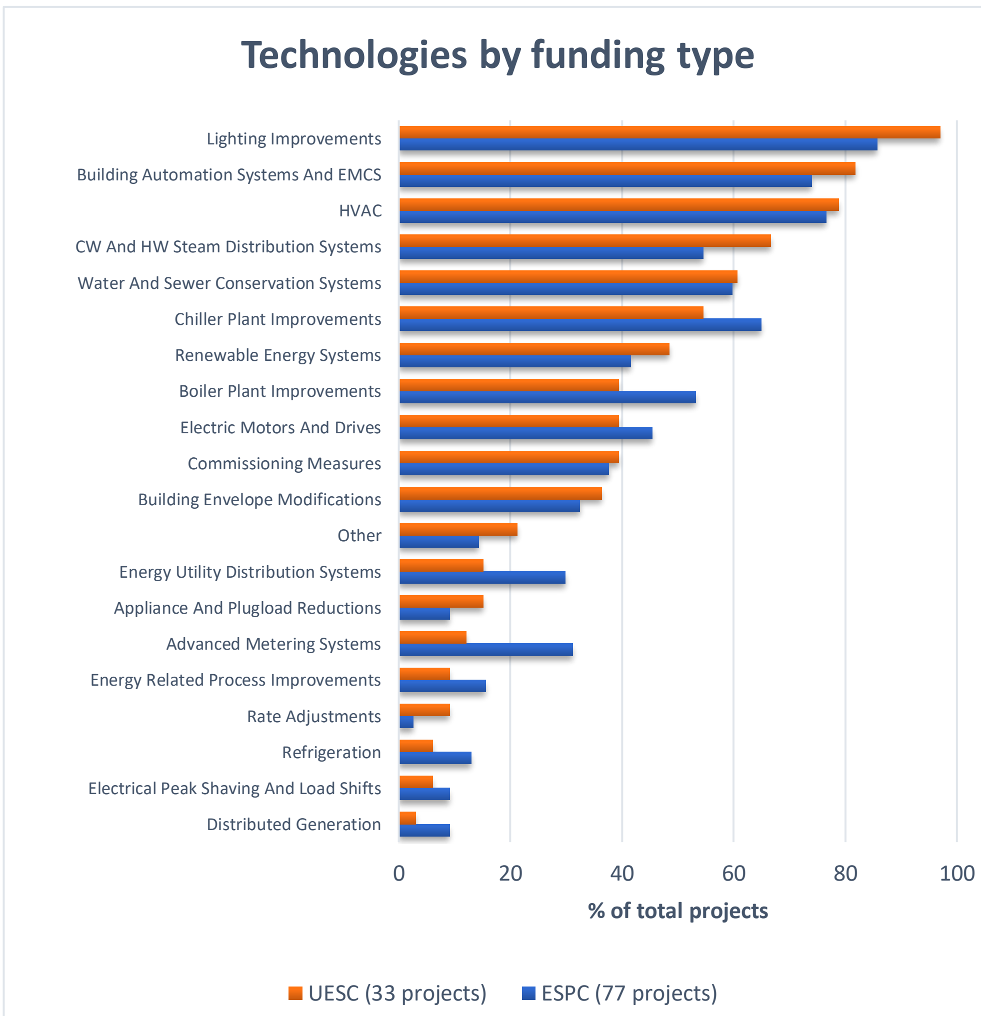


Figure 5 is based on the analysis of the facility level data (2008-2021) from FEMP's CTS. UESCs and ESPCs have similar portfolios of technologies. These data are limited, however, and UESCs did not have a reporting requirement prior to the 2020 Energy Act. Availability of additional data will lead to improved understanding not only of related technologies but also associated costs and savings.

7. TECHNICAL BENEFITS

Utilities are well positioned to fill some of the technical needs demanded by federal clients. Federal installations often require significant self-maintenance and ownership of complex energy systems such as natural gas distribution systems, substations, overhead and/or underground line service, metering, on-site power generation and delivery, supervisory control and data acquisition (SCADA) systems for facility-wide controls, and demand-side management and back-up generation, among others. A utility's technical capability is typically higher in their area of expertise than an ESCO has in-house. Army officials have noted that a partnership with the utility leads to having energy staff on-site who can provide technical assistance, knowledge transfer, and training. "A benefit of UESCs is that energy staff at some installations have found that it can be easier to work with a utility rather than an ESCO. The installation typically has had a long relationship with the utility company, and this relationship often becomes more of a partnership rather than just contracting out a project. Having the utility company serve as the single point-of-contact for the UESC makes implementation easier."[21]

8. DISCUSSION AND CONCLUSIONS

UESCs have not received as much attention from federal acquisition officials as ESPCs. It is unclear why federal acquisition officials have historically favored ESPCs. One possibility is that the savings guarantee is appealing due to the perception of minimized risk, though our analysis and extant literature suggests that this savings guarantee may not be a key factor in observed energy savings. Other sources suggest that there is less understanding of UESCs across acquisition commands and across utilities (Lachman et al 2011). Some smaller utilities and electric cooperatives may lack the capacity or interest to develop UESCs. Further, because UESCs require that the Agencies are in the jurisdiction of the utility, there may be cases where there is no utility interested or available to provide a UESC. Agency small business procurement requirements may also favor the use of ESPCs, where ESCOs that fulfill small business procurement requirements may be more prevalent and capable in the ESPC context. Conversations with FEMP officials note ongoing efforts to bolster capacity by smaller utilities to enable them to compete for and execute UESCs.

One additional possibility is that UESCs are executed from different acquisition offices than ESPCs. It is unclear why this delineation exists, but the result is non-centralized, non-standard expertise, and decision criteria that hinges on resourcing capability rather than technical or financial execution of requirements. Yet another possibility that may drive contracting authorities to lean towards EPSCs is the appearance of greater competition in the procurement process. However, it is unclear that this competition lowers costs because ECMs are often subcontracted through a bidding process. In all likelihood, the procurement process associated with ESPCs delays project implementation and increases total costs.

While there may be a number of reasons that acquisition, officials have favored ESPCs historically, our analysis suggests that UESCs may offer a number of financial, contractual, and strategic benefits relative to ESPCs and deserve greater attention from federal agencies in the future. A deeper look, highlighted by an illustrative example and supported by federal reports and analyses, and discussions with various stakeholders, suggests that ESPCs can be costlier due to a number of factors. These include the energy savings guarantee, which provides significant risk to the ESCO that results in risk-averse ESPC providers charging a financial premium, requiring higher interest rates from lenders, and requiring costly M&V throughout the lifetime of the project. Conversations with FEMP program managers suggest that managing risks associated with innovative energy resilience technologies is an area of current interest for FEMP. While UESCs offer similar energy savings benefits that are backed by PA/PV, significant savings is achieved by reducing project development costs, overhead and profit, and employing a simpler approach to energy savings assurance.

Our review of government and published reports, summarized in Table 3, highlight a number of other benefits to UESCs. Government officials have found UESCs to produce collaboration between the utility and the federal facility that results in an iterative collaborative relationship between the utility and the federal facility. They perceive additional technical benefits, such as technical skills transfer from having utility employees on base. It is worth noting that while UESCs have many advantages, there are some cases that UESCs present additional challenges. ESPCs have been employed in more multi-regional and remote or international sited projects due to a number of challenges associated with working in multiple utility territories or in areas without a capable utility provider, and many utilities in the US may not have the capacity to implement UESCs.

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[21] Lachman, Beth, Hall, Kimberly Curry, Cuthright, Aimee E, Colloton, Kimberly. "Making the Connection: Beneficial Collaboration Between Army Installations and Energy Utility Companies." Rand Corporation. 2011.

It is noteworthy that the FEMP program is currently attempting to expand upon agency utilization of UESC and ESPC contracting mechanisms. Going forward, it would be prudent to increase the consideration of UESCs as an alternative energy performance financing mechanism.

Table 3. Summary of UESC and ESPC Case Characteristics (Source: Authors Assessment of FEMP Case Studies)

	Characteristics	Scale	Success factors
Utility Energy Savings Contract	Flexibility, Holistic approach, Quick and effective working relation, single point-of-contact (utility)	single /multi-site, single /multi-phase	Flexibility of the UESC contract; Experience; Influence of the utility partner; Utility's familiarity with the local site
Energy Savings Performance Contract	Specific energy related expertise; Utilization of grants/ebates/tax credits, larger teams	single / multi-site, single / multi-phase, multi-region, remote, international	Agency's flexibility and experience with contracting; Networking with other facilities; Support and advice from FEMP

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10. ABBREVIATIONS

AGL	Atlanta Gas Light (now Southern Gas)
AFFECT	Assisting Federal Facilities with Energy Conservation Technologies
BOA	Basic Ordering Agreement
CTS	Compliance Tracking System
DOE	U. S. Department of Energy

ECM	Energy Conservation Measure
ESPC	Energy Savings Performance Contract
ESCO	Energy Services Company
FAR	Federal Acquisition Regulation
FEMP	Federal Energy Management Program
GSA	General Services Administration
HVAC	Heating, Ventilating, And Air Conditioning
IDIQ	Indefinite Delivery, Indefinite Quantity (Contract)
IGA	Investment Grade Audit
IPMVP	International Performance Measurement and Verification Protocol
M&V	Measurement and Verification
MATOC	Multiple Award Task Order Contract
OEM	Original Equipment Manufacturer
O&M	Operating and Maintenance
OHP	Overhead and Profit
PV/PA	Performance Verification /Performance Assurance
PAYMT	Payment
PERF PER	Performance Period
SCADA	Supervisory Control and Data Acquisition
UESC	Utility Energy Service Contract

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