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Christine E. Walker
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Buildings and Transportation Science Division

LEVERAGING OF FUNDS IN PERFORMANCE CONTRACTING PROJECTS

Christine E. Walker, PhD, PE
John Shonder

March 2023

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OAK RIDGE NATIONAL LABORATORY
Oak Ridge, TN 37831
managed by
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CONTENTS

ABBREVIATIONS

AFFECT	Assisting Federal Facilities with Energy Conservation Technologies
ECM	Energy Conservation Measure
ERCIP	Energy Resilience Conservation Investment Program
ESA	Energy Sales Agreement
ESCO	Energy Services Company
ESPC	Energy Savings Performance Contract
FEMP	Federal Energy Management Program
IDIQ	Indefinite Delivery, Indefinite Quantity
M&V	Measurement and Verification
MUSH	Municipal and State Governments, Universities, Colleges, K-12 Schools, and Hospitals
O&M	Operations and Maintenance
UESC	Utility Energy Service Contract

ABSTRACT

Performance contracts are widely used in the public sector (and to a lesser extent in the private sector) to implement energy efficiency, renewable energy, and energy resilience projects. Customers (e.g., federal agencies, municipal and state governments, universities and colleges, schools, and hospitals (i.e., the MUSH market), as well as commercial building owners, contract with an Energy Services Company (ESCO), which installs new or upgraded equipment such as boilers and chillers, control systems, interior and exterior lighting, and solar PV arrays consistent with the customer's requirements, using private sector financing. In a related contracting arrangement called a Utility Energy Service Contract (UESC) the customer contracts with a serving electric, gas, or water utility to obtain the upgrades. In both cases, the customer repays the project financing using the energy, water and operations and maintenance (O&M) cost savings that result from the new or upgraded equipment and facility improvements. While such projects can be accomplished at no up-front cost to the customer, capital contributions from the customer, when available, provide several advantages. First, they can reduce the finance term, which is of critical importance in cases where the project term would exceed the statutory limit in the absence of the contribution. Customer contributions can also increase the total investment of the project, allowing inclusion of measures with longer paybacks than would be possible without the contribution, or expansion of the size or scope of one or more measures. A performance contract allows the savings from additional scope to be capitalized and leveraged over the project term, thereby creating even more project investment. The objective of this report was to determine the amount of additional investment that is achieved by leveraging customer funding contributions to the project. Using a representative project based on 40 Task Orders awarded under the U.S. Department of Energy's Federal Energy Management Program (FEMP) energy savings performance contract (ESPC) indefinite delivery indefinite quantity (IDIQ) contract over the past five years, we found that the leveraging ratio of customer contributions ranges from 1.3 to 2.1. That is, given the assumptions made, a given contribution increases the size of the project (in terms of the quantity of measures that can be installed) by 1.3 to 2.1 times the size of the contribution. This result suggests that to maximize its buying power, available capital funding should always be used in concert with performance contracting.

1. INTRODUCTION

In a performance contracting project[1], a contractor (i.e., an Energy Service Company or a utility provider) uses private financing to implement an energy project at a customer facility. The installed project reduces the facility's energy and operations and maintenance (O&M) costs, and the customer uses these savings to pay off the financing (and to fund any performance period services included in the contract) over the contract term.

In addition to energy and O&M savings, avoided capital improvement costs are another important source of savings in performance contracting projects. In general, these are funds available to the customer for projects that will be made unnecessary by the performance contract. For example, a customer may have funds available for a project to upgrade an aging boiler plant, but the performance contracting project either includes that upgrade or calls for demolition of the plant and installation of distributed ground source heat pumps. Since the boiler plant upgrade will no longer be required, these avoided costs are considered a savings and can be applied to the performance contracting project.

[1] Performance contracts are financing vehicles that include energy savings performance contracts (ESPCs and ESPC ENABLE), utility energy service contracts (UESCs), and Energy Sales Agreements (ESAs). In general, the prime contractor in ESPCs are ESCOs, and the prime contractor in UESCs are utility providers.

Grants, rebates, renewable energy credits and other incentives are another important source of funding in performance contracting projects. When these funds are made available due to a federal energy savings performance contract (ESPC) or utility energy service contract (UESC), they are classified as savings, and as such can be applied to the project. Several types of rebate and incentive programs exist for the energy efficiency, renewable energy and energy resilience measures commonly installed under performance contracts. These include public purpose programs administered by utilities, state agencies, or other third parties; utility programs administered by local utilities and paid for by utility ratepayers; and programs sponsored by state agencies designed to promote energy efficiency and renewable energy. Federal agencies have access to additional sources of funding, including Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) grants and Energy Resilience Conservation Investment Program (ERCIP) funds. These federally funded programs are intended to assist agencies in making energy efficiency and clean energy improvements to their facilities.

Funds from avoided capital improvements, grants and incentives, and other capital budget funds can be used to purchase and install equipment implemented as part of the performance contract, thereby reducing the need for financing. Reducing financing costs provides several benefits to the performance contracting customer. One is to reduce the project term. In cases where the term of a performance contracting project is limited by law – such as in Federal ESPCs and UESCs and as specified in state legislation – such funding can sometimes make the difference between a non-feasible project and a feasible one with a term below the statutory limit.

Another important effect of funding contributions is their ability to provide leverage to generate additional project investment. As presented in Figure 1, there is assumed to be some original project with implementation price (IP_0). The funding contribution (C) results in an augmented project with a larger implementation price (IP_1), which includes the additional investment (Δ) because the energy and O&M savings from the energy (and water) conservation measures (ECMs) installed with the funding contribution are captured and capitalized over the term of the project. This can be expressed as $IP_1 = IP_0 + C + \Delta$.

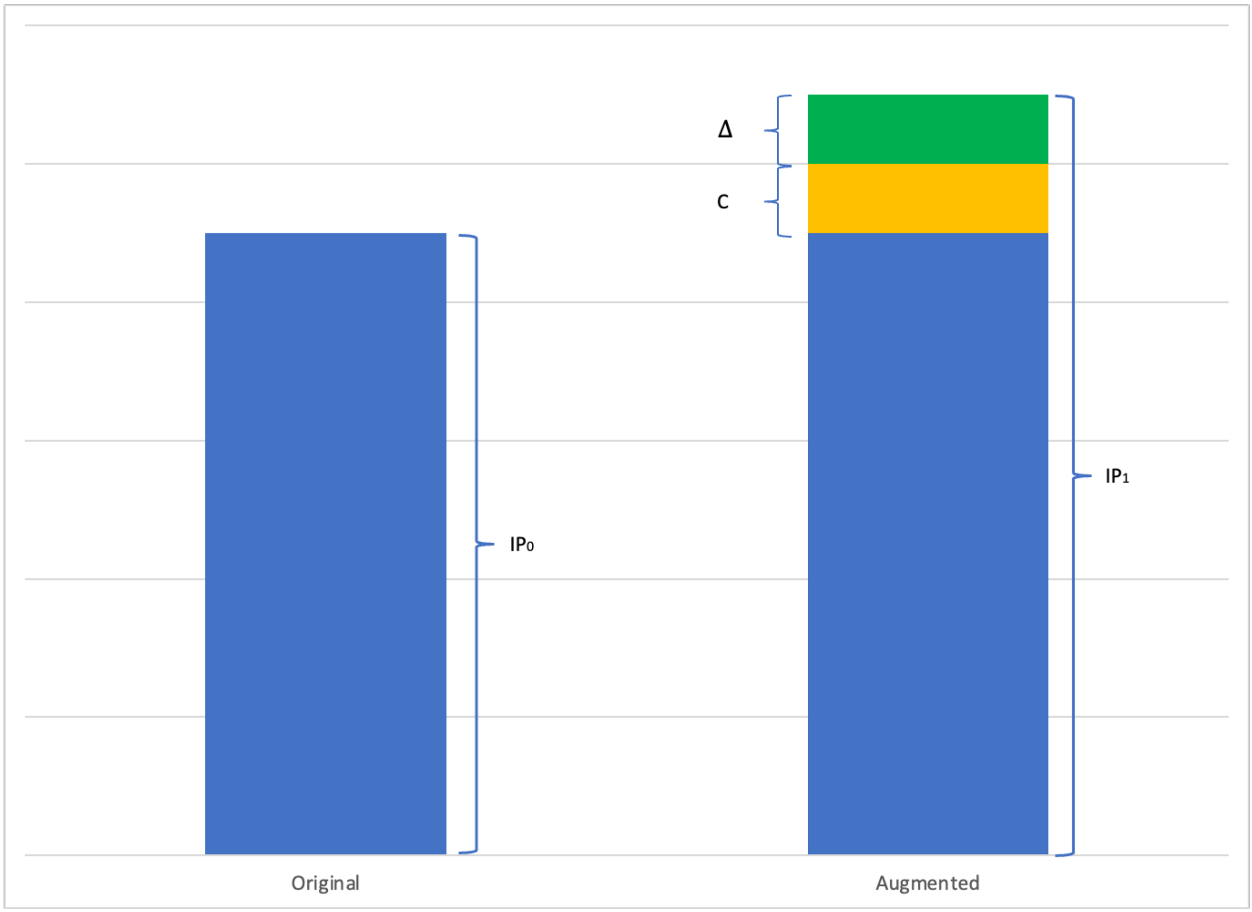

Figure 1: Because of leveraging, a funding contribution, C, increases the size of a performance contracting project by an amount of C +Δ, the additional investment due to capturing and capitalizing savings from ECMs installed with the funding contribution.

Conversely, as shown in Figure 2, when the customer uses the available funding to directly fund ECMs outside of the performance contracting project, the resulting savings cannot usually be capitalized to acquire additional energy saving equipment. The amount Δ is unrealized, and the amount of aggregate investment is lower that if the funding had been included in the performance contracting project. In addition, previous studies (Coleman et al, 2014; Coleman and Earni, 2022) have shown that the energy and O&M savings are far better sustained when a project is implemented via a performance contract than by directly funding traditional procurement.

A quantity of interest is the *leveraging ratio*, defined as the ratio of the total amount of new investment to the customer contribution, or (Δ+C)/C.

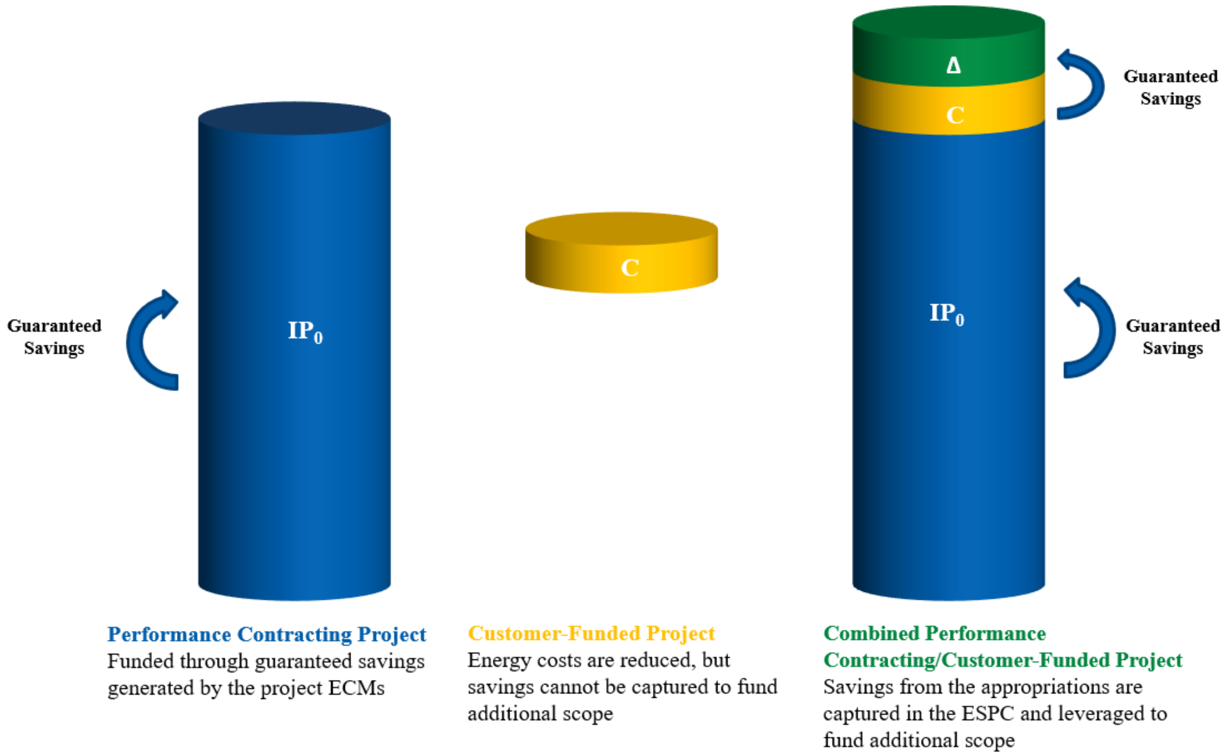

Figure 2: Energy savings can only be capitalized and leveraged to incorporate additional ECMs when available customer funding is incorporated into a performance contract.

2. REPRESENTATIVE PROJECT

We begin by considering a typical performance contracting project, based on 40 Task Orders awarded under the Federal Energy Management Program (FEMP) ESPC indefinite delivery indefinite quantity (IDIQ) contract over the past five years. The parameters of this typical project are as presented in Table 1. All parameters are based on median values from the 40 projects. For ease of reference, we rounded the implementation price and the funding contribution to the nearest hundred thousand dollars and rounded the project interest rate to the nearest tenth of a percent. The finance procurement price is made up primarily of interest on the financed amount that accrues during the construction period. The additional 4% above the capitalized construction period interest includes bonding and other costs.

Table 1: Parameters of representative performance contracting project

Parameter	Value
Investment Price	$33,600,000
Aggregate simple payback	14.95 years
Project interest rate	4.0%
Guaranteed savings	95% of estimated savings
ESCO annual payment	$1 less than guaranteed savings
Payment schedule	Annual, at beginning of year
Funding contribution	$1,500,000
Year-1 performance period costs	1.27% of implementation price
Construction period	24 months
Finance procurement price	1.04 times 24 months of interest on financed amount
Performance period cost escalation rate	3.0%
Savings escalation rate (accounts for both utility price and O&M cost inflation)	3.36%

Note that Table 1 shows the escalation rate of guaranteed savings to be somewhat higher than the escalation rate of performance period services. This is because the guaranteed savings include the price of energy, while the cost of performance period services is driven by the general rate of price inflation. Historically, the price of energy has increased at a rate higher than that of general price inflation.

A financial model of the representative project is presented in Table 2. The spreadsheet begins in year 3 to account for the 24-month construction period. In federal contracting, the contract term begins at Task Order award – which precedes final design and construction. This typically leaves about 23 years for the installed project to perform before the 25-year term limit is reached. While the term of federal ESPCs and UESCs is limited by statute to 25 years, different term limits apply in some state, local and institutional programs.

Table 2 assumes that payments to the contractor are made at the beginning of the year in which guaranteed savings are delivered[2]. The payment includes interest on the outstanding principal, principal reduction, and the cost of services the contractor performs during the performance period, including O&M and measurement and verification (M&V). Using the parameters of Table 1, the representative project has a contract term of just under 24 years.

[2] For this reason, the majority of the first year's payment goes toward principal reduction. Interest during the construction period is paid through the Finance Procurement Price. Interest on the project financing only begins to accrue during the first year of performance.

Table 2 also presents an annual amount of savings retained by the customer. During the performance period, this corresponds to the 5% of the savings that is not guaranteed by the contractor, and the savings that accrues after the end of the performance period (minus the O&M costs that are incurred by the customer to maintain the equipment upon completion of the contract). Previous FEMP reports have shown that actual savings to the customer can be significantly higher than the net savings shown here. These additional savings include, for example, avoided capital repair and replacement costs for the original pre-retrofit equipment, had it been left in place. Shonder (2013) estimates that these additional savings can be of the same order of magnitude as the guaranteed savings.

Table 2: Financial model of representative performance contracting project.

Investment Price: $33,600,000	Finance Procurement Price: $2,914,670.70
Financed Amount: $35,014,670.70	Pre–performance Payment: $1,500,000
Performance period (years): 21.89	Contract term (years): 23.89
Interest rate: 0.04	Simple payback: 14.95

Year	Interest Expense	Principal Reduction	Services Expense	ESCO Payment	Loan Balance	Net Customer Savings
3	$116,715.57	$1,591,680.49	$426,720.00	$2,135,116.06	$33,422,990.21	$112,375.58
4	$1,361,704.19	$405,630.20	$439,521.60	$2,206,855.99	$33,017,360.01	$116,151.37
5	$1,345,178.19	$483,120.95	$452,707.25	$2,281,006.38	$32,534,239.07	$120,054.02
6	$1,325,495.10	$565,864.67	$466,288.47	$2,357,648.23	$31,968,374.40	$124,087.80
7	$1,302,440.90	$654,147.23	$480,277.12	$2,436,865.25	$31,314,227.16	$128,257.12
8	$1,275,789.93	$748,268.59	$494,685.43	$2,518,743.95	$30,565,958.57	$132,566.52
9	$1,245,304.31	$848,543.47	$509,526.00	$2,603,373.78	$29,717,415.10	$137,020.73
10	$1,210,733.34	$955,302.06	$524,811.78	$2,690,847.18	$28,762,113.04	$141,624.59
11	$1,171,812.86	$1,068,890.68	$540,556.13	$2,781,259.67	$27,693,222.36	$146,383.14
12	$1,128,264.61	$1,189,672.61	$556,772.81	$2,874,710.03	$26,503,549.75	$151,301.58
13	$1,079,795.51	$1,318,028.82	$573,476.00	$2,971,300.32	$25,185,520.93	$156,385.28
14	$1,026,096.98	$1,454,358.79	$590,680.28	$3,071,136.05	$23,731,162.14	$161,639.79
15	$966,844.16	$1,599,081.41	$608,400.69	$3,174,326.25	$22,132,080.73	$167,070.86
16	$901,695.12	$1,752,635.83	$626,652.71	$3,280,983.65	$20,379,444.91	$172,684.40
17	$830,290.03	$1,915,482.42	$645,452.29	$3,391,224.73	$18,463,962.49	$178,486.56
18	$752,250.32	$2,088,103.74	$664,815.86	$3,505,169.92	$16,375,858.75	$184,483.68
19	$667,177.75	$2,271,005.58	$684,760.33	$3,622,943.66	$14,104,853.17	$190,682.30
20	$574,653.48	$2,464,717.98	$705,303.14	$3,744,674.60	$11,640,135.19	$197,089.19
21	$474,237.07	$2,669,796.40	$726,462.24	$3,870,495.70	$8,970,338.79	$203,711.35
22	$365,465.44	$2,886,822.85	$748,256.10	$4,000,544.39	$6,083,515.95	$210,556.02
23	$247,851.83	$3,116,407.10	$770,703.79	$4,134,962.72	$2,967,108.84	$217,630.67
24	$120,884.59	$2,967,108.84	$704,389.35	$3,792,382.79	$0	$661,739.96
25	$0.00	$0.00	$0.00	$0.00	$0.00	$4,241,181.74
Total	$19,490,681.28	$35,014,670.70	$12,941,219.34	$67,446,571.32		$8,253,164.26

3. ECM DISTRIBUTIONS

In order to quantify the additional investment that can be obtained through the use of customer contributions, we need to make some assumptions about the cost of the additional ECMs and the savings they deliver. Our approach was to aggregate all of the ECMs from the 40 recently awarded projects under the FEMP IDIQ and sort them from shortest payback to longest payback. This produced the curve of Figure 3, which plots the percentage of total savings vs. percent of total investment. The two vertical lines show, for example, that 20% of the total project investment delivers 40% of the total savings, and that 40% of the total investment delivers 62% of the total savings. We use this curve to model various scenarios, and assume that in every case, the ESCO begins by including the ECMs with the shortest paybacks and adds as many longer payback ECMs as possible, going from left to right, until the statutory term limit is reached.

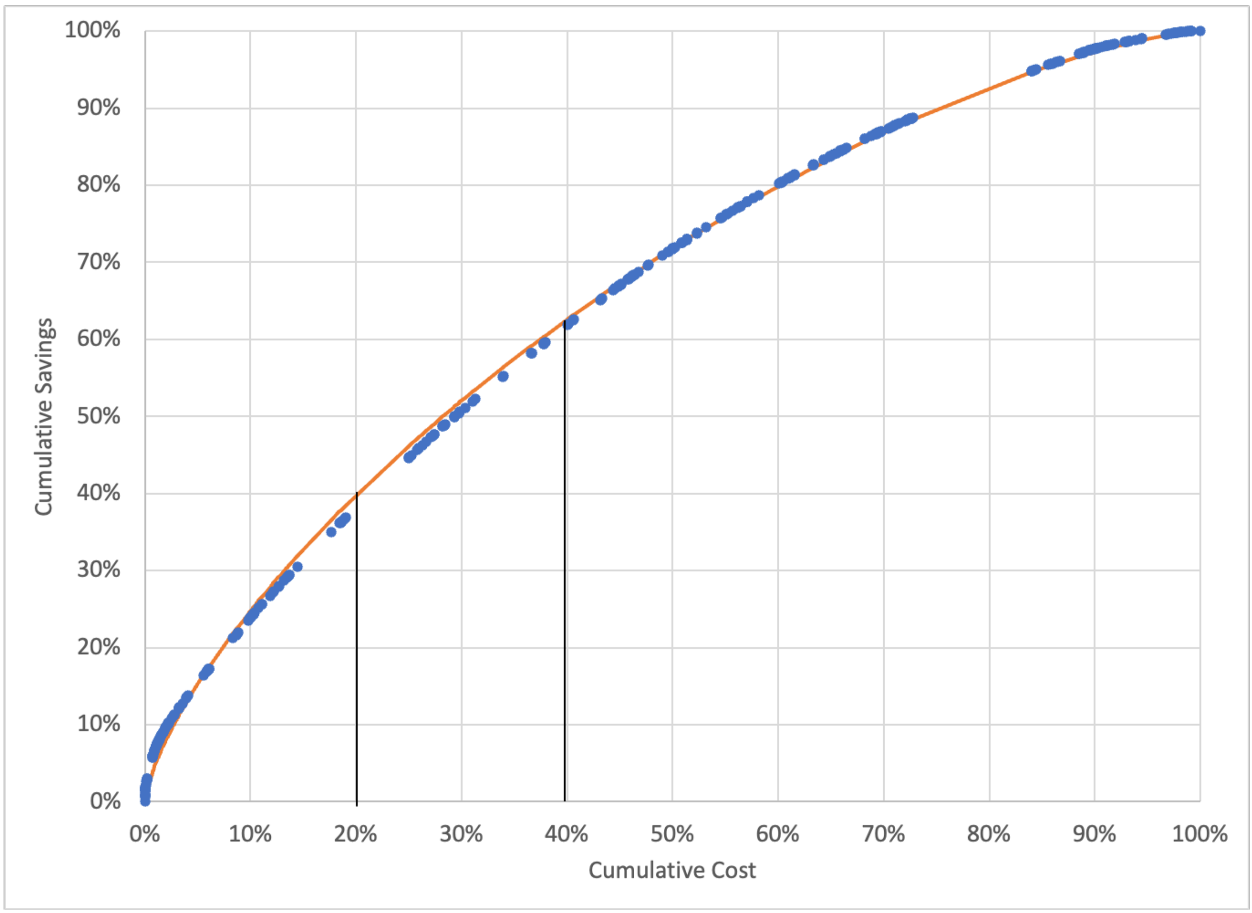

Figure 3:Cumulative savings vs. cumulative investment for all 400 ECMs included in the 40 most recently awarded projects under the FEMP ESPC IDIQ contract. Blue circles represent actual ECMs, and the orange line is the curve fit.

4. RESULTS

4.1 LEVERAGING AVAILABLE FUNDING

For the representative project, we assume that all $33.6 million in ECMs at the customer site can be implemented in a performance contract. That is, we assume that the project represents all of the ECMs of Figure 3. To determine the leveraging effect of contributed funding, we must assume that not all of the $33.6 million can be implemented within the 25-year statutory limit. We begin by assuming that with no contributed funding, only 60% of the total investment can be financed within the statutory limit. This is 0.60*$33.6 million = $20.16 million. The curve of Figure 3 shows that 60% of project investment delivers 79.8% of the savings. Through trial and error, we find that with a $20.16 million investment, a simple payback of 14.955 results in a project with contract term just under 25 years. The project cash flow is presented in Table 3.

In this case, with no funding contribution, the contractor is able to finance $20.16 million in project investment. What would happen if the customer provided $1.5 million in funding? This depends on the preference of the customer. Table 4 presents a scenario in which the project term has been reduced to 23.31 years, but the project investment did not change. This is certainly one way to use contributed funding, and it may be the choice of a customer who prefers a shorter project term.

Table 5 presents an alternative scenario. Here the contract term remains at just under 25 years, but now the $1.5 million has been used to obtain additional ECMs. Capitalizing the savings from the $1.5 million of new ECMs over the term increases project investment even further, resulting in a total of $2.587 million in additional ECMs. The total project investment is now $22.747 million. The leveraging factor of the $1.5 million in contributed funds is 2.587/1.5 = 1.725.

The case of Table 5 maximizes the additional project investment by adding new ECMs that have the shortest available simple paybacks. The situation is presented graphically in Figure 4. Given the original investment of $20,160,000 and simple payback of 14.96 (Table 3) and the new investment of $22,747,200 and simple payback of 15.79 (Table 5), the additional annual savings due to the new investment is (22,747,200/15.79) – (20,160,000/14.96) = $93,014. This means that the new ECMs have an aggregate simple payback of (22,747,200 – 20,160,000)/93,014 = 27.8 years.

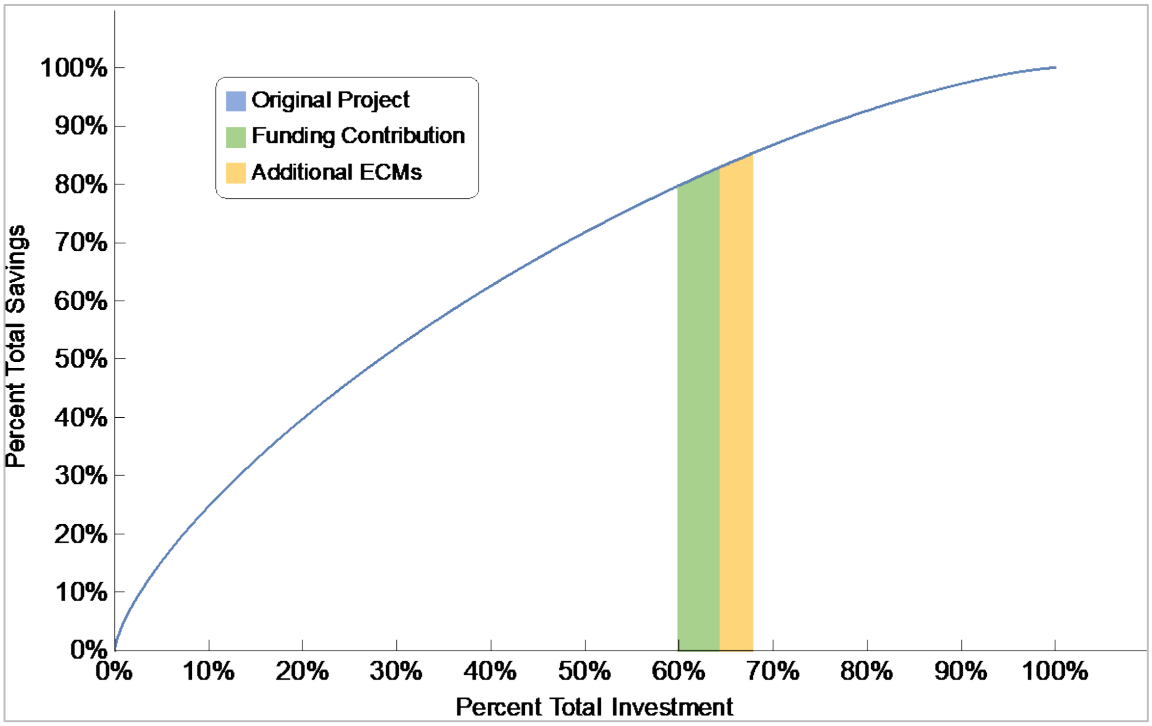

Figure 4: Due to the leveraging effect of the performance contract, in the baseline case a funding contribution increases total project investment by 1.725 times the amount of the contribution.

The leveraging factor of 1.725 for this case can be thought of as an average value. It would also be possible to augment the original project with one or more ECMs further to the right in Figure 4, that is ECMs with longer paybacks. An example would be a microgrid with on-site generation. While greatly enhancing site resilience, these types of ECMs usually provide minimal annual energy savings. The leveraging factor would be smaller in this case or would require a larger customer contribution.

It might also be possible to augment the project with shorter-payback ECMs, i.e., ECMs further to the left in Figure 4. While we assume the contractor has already included as much of the "low hanging fruit" as possible in the original project, it is sometimes the case that buildings and systems which were originally thought to be off-limits become available for inclusion in the project at later stages of the development process. If these new buildings and systems contain short-payback ECMs, their inclusion in the project will increase the leveraging effect of the customer contribution.

Table 3: Project cash flow for the case in which 60% of total investment can be funded within the 25-year statutory limit with no funding contribution.

Investment Price: $20,160,000.00	Finance Procurement Price: $1,830,522.16
Financed Amount: $21,990,522.16	Pre–performance Payment: $0
Performance period (years): 22.99	Contract term (years): 24.99
Interest rate: 0.04	Simple payback: 14.96

Year	Interest Expense	Principal Reduction	Services Expense	ESCO Payment	Loan Balance	Net Customer Savings
3	$73,301.74	$951,307.19	$256,032.00	$1,280,640.93	$21,039,214.97	$67,403.21
4	$857,170.08	$202,787.45	$263,712.96	$1,323,670.49	$20,836,427.52	$69,667.92
5	$848,908.21	$247,613.30	$271,624.35	$1,368,145.86	$20,588,814.22	$72,008.73
6	$838,820.06	$295,522.45	$279,773.08	$1,414,115.59	$20,293,291.76	$74,428.19
7	$826,780.02	$346,683.62	$288,166.27	$1,461,629.91	$19,946,608.14	$76,928.94
8	$812,655.59	$401,273.86	$296,811.26	$1,510,740.71	$19,545,334.29	$79,513.72
9	$796,307.08	$459,478.96	$305,715.60	$1,561,501.63	$19,085,855.33	$82,185.35
10	$777,587.19	$521,493.86	$314,887.07	$1,613,968.12	$18,564,361.48	$84,946.74
11	$756,340.73	$587,523.07	$324,333.68	$1,668,197.48	$17,976,838.41	$87,800.92
12	$732,404.13	$657,781.13	$334,063.69	$1,724,248.95	$17,319,057.28	$90,751.00
13	$705,605.12	$732,493.03	$344,085.60	$1,782,183.75	$16,586,564.25	$93,800.20
14	$675,762.22	$811,894.77	$354,408.17	$1,842,065.15	$15,774,669.48	$96,951.85
15	$642,684.37	$896,233.79	$365,040.41	$1,903,958.58	$14,878,435.69	$100,209.40
16	$606,170.43	$985,769.57	$375,991.62	$1,967,931.62	$13,892,666.12	$103,576.40
17	$566,008.65	$1,080,774.13	$387,271.37	$2,034,054.15	$12,811,891.99	$107,056.53
18	$521,976.25	$1,181,532.65	$398,889.51	$2,102,398.41	$11,630,359.34	$110,653.60
19	$473,838.78	$1,288,344.04	$410,856.20	$2,173,039.03	$10,342,015.30	$114,371.53
20	$421,349.66	$1,401,521.63	$423,181.88	$2,246,053.17	$8,940,493.67	$118,214.38
21	$364,249.51	$1,521,393.74	$435,877.34	$2,321,520.59	$7,419,099.93	$122,186.35
22	$302,265.58	$1,648,304.48	$448,953.66	$2,399,523.72	$5,770,795.45	$126,291.77
23	$235,111.11	$1,782,614.37	$462,422.27	$2,480,147.75	$3,988,181.08	$130,535.14
24	$162,484.65	$1,924,701.16	$476,294.94	$2,563,480.75	$2,063,479.93	$134,921.09
25	$84,069.36	$2,063,479.93	$487,975.10	$2,635,524.39	$0	$152,239.41
Total	$13,081,850.51	$21,990,522.16	$8,306,368.04	$43,378,740.70		$2,296,642.38

Table 4: Performance contract with funding contribution of $1.5 million. Project term is reduced to 23.17 years, with no increase in project investment.

Investment Price: $20,160,000.00	Finance Procurement Price: $1,694,322.59
Financed Amount: $20,354,322.59	Pre–performance Payment: $1,500,000
Performance period (years): 21.17	Contract term (years): 23.17
Interest rate: 0.04	Simple payback: 14.96

Year	Interest Expense	Principal Reduction	Services Expense	ESCO Payment	Loan Balance	Net Customer Savings
3	$67,847.74	$956,761.18	$256,032.00	$1,280,640.93	$19,397,561.41	$67,403.21
4	$790,286.58	$269,670.95	$263,712.96	$1,323,670.49	$19,127,890.46	$69,667.92
5	$779,299.77	$317,221.74	$271,624.35	$1,368,145.86	$18,810,668.72	$72,008.73
6	$766,375.67	$367,966.84	$279,773.08	$1,414,115.59	$18,442,701.87	$74,428.19
7	$751,384.13	$422,079.51	$288,166.27	$1,461,629.91	$18,020,622.37	$76,928.94
8	$734,187.96	$479,741.49	$296,811.26	$1,510,740.71	$17,540,880.88	$79,513.72
9	$714,642.55	$541,143.48	$305,715.60	$1,561,501.63	$16,999,737.40	$82,185.35
10	$692,595.53	$606,485.52	$314,887.07	$1,613,968.12	$16,393,251.88	$84,946.74
11	$667,886.38	$675,977.43	$324,333.68	$1,668,197.48	$15,717,274.45	$87,800.92
12	$640,346.01	$749,839.25	$334,063.69	$1,724,248.95	$14,967,435.20	$90,751.00
13	$609,796.40	$828,301.74	$344,085.60	$1,782,183.75	$14,139,133.46	$93,800.20
14	$576,050.11	$911,606.87	$354,408.17	$1,842,065.15	$13,227,526.59	$96,951.85
15	$538,909.84	$1,000,008.32	$365,040.41	$1,903,958.58	$12,227,518.26	$100,209.40
16	$498,167.96	$1,093,772.03	$375,991.62	$1,967,931.62	$11,133,746.23	$103,576.40
17	$453,606.00	$1,193,176.78	$387,271.37	$2,034,054.15	$9,940,569.45	$107,056.53
18	$404,994.14	$1,298,514.76	$398,889.51	$2,102,398.41	$8,642,054.69	$110,653.60
19	$352,090.64	$1,410,092.19	$410,856.20	$2,173,039.03	$7,231,962.50	$114,371.53
20	$294,641.31	$1,528,229.98	$423,181.88	$2,246,053.17	$5,703,732.53	$118,214.38
21	$232,378.86	$1,653,264.39	$435,877.34	$2,321,520.59	$4,050,468.14	$122,186.35
22	$165,022.32	$1,785,547.73	$448,953.66	$2,399,523.72	$2,264,920.40	$126,291.77
23	$92,276.35	$1,925,449.13	$462,422.27	$2,480,147.75	$339,471.28	$130,535.14
24	$13,830.58	$339,471.28	$80,623.34	$433,925.20	$0	$2,066,640.84
25	$0.00	$0.00	$0.00	$0.00	$0.00	$2,543,776.25
Total	$10,836,616.85	$20,354,322.59	$7,422,721.33	$38,613,660.77		$6,619,898.96

Table 5: Performance contract with $1.5 million funding contribution. Project term remains at 25 years, but project investment increases to $22.75 million.

Investment Price: $22,747,200.00	Finance Procurement Price: $1,929,239.60
Financed Amount: $23,176,439.60	Pre–performance Payment: $1,500,000
Performance period (years): 22.99	Contract term (years): 24.99
Interest rate: 0.04	Simple payback: 15.79

Year	Interest Expense	Principal Reduction	Services Expense	ESCO Payment	Loan Balance	Net Customer Savings
3	$77,254.80	$1,002,099.32	$288,889.44	$1,368,243.56	$22,174,340.28	$72,013.87
4	$903,416.84	$213,243.62	$297,556.12	$1,414,216.58	$21,961,096.66	$74,433.50
5	$894,728.96	$260,522.52	$306,482.81	$1,461,734.29	$21,700,574.14	$76,934.44
6	$884,114.87	$311,056.43	$315,677.29	$1,510,848.60	$21,389,517.70	$79,519.40
7	$871,441.95	$365,023.58	$325,147.61	$1,561,613.14	$21,024,494.12	$82,191.22
8	$856,570.33	$422,611.01	$334,902.04	$1,614,083.38	$20,601,883.11	$84,952.81
9	$839,352.50	$484,015.01	$344,949.10	$1,668,316.61	$20,117,868.10	$87,807.19
10	$819,632.99	$549,441.53	$355,297.57	$1,724,372.09	$19,568,426.57	$90,757.48
11	$797,247.89	$619,106.63	$365,956.50	$1,782,311.02	$18,949,319.94	$93,806.90
12	$772,024.53	$693,236.98	$376,935.19	$1,842,196.71	$18,256,082.96	$96,958.77
13	$743,780.99	$772,070.31	$388,243.25	$1,904,094.55	$17,484,012.65	$100,216.56
14	$712,325.65	$855,855.96	$399,890.55	$1,968,072.16	$16,628,156.69	$103,583.80
15	$677,456.76	$944,855.39	$411,887.26	$2,034,199.42	$15,683,301.30	$107,064.18
16	$638,961.89	$1,039,342.78	$424,243.88	$2,102,548.55	$14,643,958.52	$110,661.50
17	$596,617.46	$1,139,605.55	$436,971.20	$2,173,194.22	$13,504,352.97	$114,379.70
18	$550,188.18	$1,245,945.06	$450,080.33	$2,246,213.58	$12,258,407.91	$118,222.82
19	$499,426.45	$1,358,677.19	$463,582.74	$2,321,686.38	$10,899,730.72	$122,195.07
20	$444,071.85	$1,478,133.01	$477,490.23	$2,399,695.08	$9,421,597.71	$126,300.79
21	$383,850.43	$1,604,659.51	$491,814.93	$2,480,324.87	$7,816,938.20	$130,544.47
22	$318,474.12	$1,738,620.31	$506,569.38	$2,563,663.82	$6,078,317.89	$134,930.73
23	$247,640.05	$1,880,396.44	$521,766.46	$2,649,802.96	$4,197,921.45	$139,464.37
24	$171,029.80	$2,030,387.12	$537,419.46	$2,738,836.37	$2,167,534.33	$144,150.34
25	$88,308.69	$2,167,534.33	$548,321.87	$2,804,164.89	$0	$173,080.08
Total	$13,787,917.99	$23,176,439.60	$9,370,075.23	$46,334,432.82		$2,464,169.97

4.2 SENSITIVITY TO FUNDING CONTRIBUTION

In the analysis above, we assumed the contractor could finance 60% of available investment within the 25-year statutory limit and calculated the leveraging factor assuming a funding contribution of $1.5 million. Table 6 presents the leveraging factor for other combinations of initial percentage and funding contribution. The funding contributions are presented as a percentage of the total project investment, which, for the representative project, is $33.6 million. Table 6 provides an estimate of the leveraging factor of various funding contributions, given the percentage of the total project achievable without a funding contribution, assuming performance period service costs (as well as the finance procurement price) are proportional to the project size.

Table 6: Leveraging factor of various funding contributions, given percentage of total project achievable with no funding contribution.

Percent of investment achievable with no funding contribution	Funding Contribution as Percent of Total Project				
	1.5%	3%	4.5%	6%	7.5%
40%	2.08	2.03	1.98	1.93	1.89
50%	1.95	1.90	1.86	1.82	1.78
60%	1.78	1.76	1.72	1.69	1.66
70%	1.61	1.60	1.57	1.54	1.51
80%	1.44	1.41	1.39	1.37	1.34

4.3 SENSITIVITY TO INTEREST RATE

All cases presented in Table 6 were modeled with the project interest rate equal to 4.0%. To examine the sensitivity of the leveraging factor to interest rate, we reran all of the cases with interest rates of 3.5% and 4.5%. The results, presented in Tables 7 and 8, show that for any given combination of initial project size and funding contribution, the leveraging factor increases with increasing interest rate.

Table 7: Leveraging factor of various funding contributions, given percentage of total project achievable with no funding contribution. Project interest rate 3.5%.

Percent of investment achievable with no funding	Funding Contribution as Percent of Total Project				
	1.5%	3%	4.5%	6%	7.5%
40%	2.00	1.95	1.90	1.86	1.82
50%	1.86	1.83	1.79	1.76	1.72
60%	1.71	1.70	1.66	1.63	1.60
70%	1.55	1.53	1.51	1.48	1.46
80%	1.37	1.36	1.34	1.32	1.29

Table 8: Leveraging factor of various funding contributions, given percentage of total project achievable with no funding contribution. Project interest rate 4.5%.

Percent of investment achievable with no funding	Funding Contribution as Percent of Total Project				
	1.5%	3%	4.5%	6%	7.5%
40%	2.10	2.06	2.00	1.96	1.91
50%	1.97	1.93	1.88	1.84	1.81
60%	1.81	1.78	1.75	1.71	1.68
70%	1.65	1.62	1.59	1.56	1.53
80%	1.46	1.44	1.41	1.38	1.36

4.4 USING APPROPRIATIONS TO SELF-FUND ECMS

In all the cases analyzed above, we assume that the baseline performance contracting project includes all of the available short-payback ECMs, and that any available customer contributions are used to augment the project with longer-payback ECMs. We believe this is the most likely scenario, as it is always in the best interest of the customer and the contractor to include as many short-payback ECMs as possible. One of the advantages of performance contracts is that they can leverage shorter-payback ECMs to incorporate longer-payback ECMs, thereby maximizing project scope. However, if additional short-payback ECMs are available, the leveraging factor of customer contributions – which achieved a maximum value of 2.1 in the above analysis – can be much higher.

To illustrate this, consider the project in Table 2. We assumed that the $1.5 million in available funding was used to include additional longer-payback ECMs. What if, instead, the customer had decided to use this $1.5 million to directly fund the ECMs with the shortest payback? The curve of Figure 3 shows that the first $1.5 million (equal to 4.5% of project investment) delivers 14.1% of the savings. Given the aggregate simple payback of 14.95 years, the total annual year-1 savings from the $33.6 million investment is $33.6 million/14.95 years = $2.25 million. If the shortest payback ECMs are directly funded by the customer and therefore removed from the performance contracting project, the remaining 95.5% of investment ($33.6 million*0.955 = $32.1 million) delivers just 85.9% of the savings. The new simple payback is $32.1 million/(0.859*$2.25 million) = 16.6 years.

The longer simple payback, combined with the lack of contributed funding, drives the contract term beyond the 25-year federal statutory limit – i.e., not all of the $32.1 million could be implemented under a performance contract, and the ESCO would have to eliminate some longer-payback ECMs in order to reduce the term. Using the curve of Figure 3, and assuming the ESCO eliminates as many of the longest-payback ECMs as necessary to bring the contract term below the 25-year statutory limit, we calculate that only $27.4 million could be implemented in a performance contract. This amount plus the $1.5 million in direct-funded shortest payback ECMs results in a total of $28.9 million in project investment – a reduction of $4.7 million, or 14% of the original $33.6 million in project investment achievable through performance contracting.

Turning this scenario around, if we assume that the $28.9 million in investment represents the original project, then a contribution of $1.5 million generates $4.7 million in additional investment when it is possible to augment the project with short-payback ECMs. The leveraging ratio is (1.5 + 4.7)/1.5 = 4.13, more than double the maximum value obtained when the project was augmented with longer-payback ECMs.

This example shows that it is never a good policy to use available funding to implement short-payback ECMs directly. With these short-payback ECMs off the table, the size of any subsequent performance contracting project is reduced by much more that the amount of funding originally available, thereby reducing the total investment possible. The optimal policy is to use any available funding in concert with performance contracting.

5. DISCUSSION

This analysis shows that with the parameters from a representative ESPC project based on the last 40 FEMP project awards, the leveraging factor of funding contributions ranges from 1.29 to as high as 2.1. All other things being equal, the leveraging factor is higher when the additional ECMs incorporated into the project have shorter simple paybacks. Therefore, the leveraging factor decreases with increasing customer contributions: typically, customer contributions are used to include ECMs that will not cashflow with their own savings, thus, the higher the funding contribution, the longer the simple payback of the additional ECMs.

These conclusions assume that the initial, unfunded performance contracting project includes the ECMs with the shortest paybacks, and that available funding is used to incorporate the ECMs with the next-highest simple paybacks. If the funding can be used to incorporate more ECMs with shorter simple paybacks than those already included in the project, then the leveraging factor can be considerably higher.

For example, we showed in section 4.1 that with no funding for the performance contracting project, and the shortest-payback ECMs excluded from the project, the investment amount of the performance contract was $27.4 million. With the funding of $1.5 million and the shortest payback ECMs included, the project investment rose to $33.6 million. This implies a leveraging factor of (33.6 – 27.4)/1.5 = 4.13. We believe it is logical to assume that a performance contracting project already includes the shortest payback ECMs, thus limiting the leveraging factor to 2.1. However, one could envision a scenario where, for example, certain buildings containing short-payback ECMs were initially excluded from the project but were allowed to be included at a later date.

FEMP reports working with agency customers that have used funds (some special, like ERCIP, some ordinary) to implement the most attractive measures; that is, the ones with the shortest paybacks, before beginning an ESPC. As this paper shows, this is the worst scenario for maximizing a customer's buying power.

Likewise, our analysis assumed that the available funding was used to fund the ECMs with the next-highest simple paybacks, rather than (for example) the ECMs with the highest paybacks. Again, one could envision a scenario where a site requested that funding be used to incorporate renewable generation, or some other favored ECM that could not be included in the project without funding. In this case, the leveraging factor would be lower than the values presented here.

Interest rates affect the leveraging factor as demonstrated by the analysis. All other things being equal, a higher interest rate implies a higher leveraging factor. This is because higher interest rates drive the unfunded performance contracting project toward a lower percentage of total potential investment. With a lower percentage of investment in the unfunded project, the ECMs with the next-highest simple payback have a shorter simple payback than if the initial project included more of the total investment.

6. CONCLUSIONS

Applying funding contributions to performance contracting projects (in accordance with applicable rules and regulations) is always a benefit to the customer. This may be obvious for the short payback measures. But this paper shows that even for longer payback measures, agencies will acquire more by including those measures in a project as opposed to funding them separately. Funding contributions allow for expanded scope; the savings generated annually for the term of the contract by the new ECMs are capitalized to expand the scope even further and there is little or no need to finance the additional scope. For this reason, a funding contribution increases the size of the project more than the funding contribution itself. This paper has shown that a conservative (i.e., assumes funding used for long payback ECMs) estimate for the leveraging factor is 1.3 to 2.1. That is, a funding contribution of X increases the size of a performance contracting project by 1.3X to 2.1X. The leverage factor can be higher if shorter-payback ECMs can be included in the project.

The FEMP ESPC program cites other benefits of incorporating funded ECMs in a performance contract: ease of contracting; coordinated implementation; long-term performance guarantees; persistent savings; proper O&M, etc. This paper shows that it is always advantageous to incorporate available funding into a performance contract, as opposed to using the funding to implement the same measures using direct funding.

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