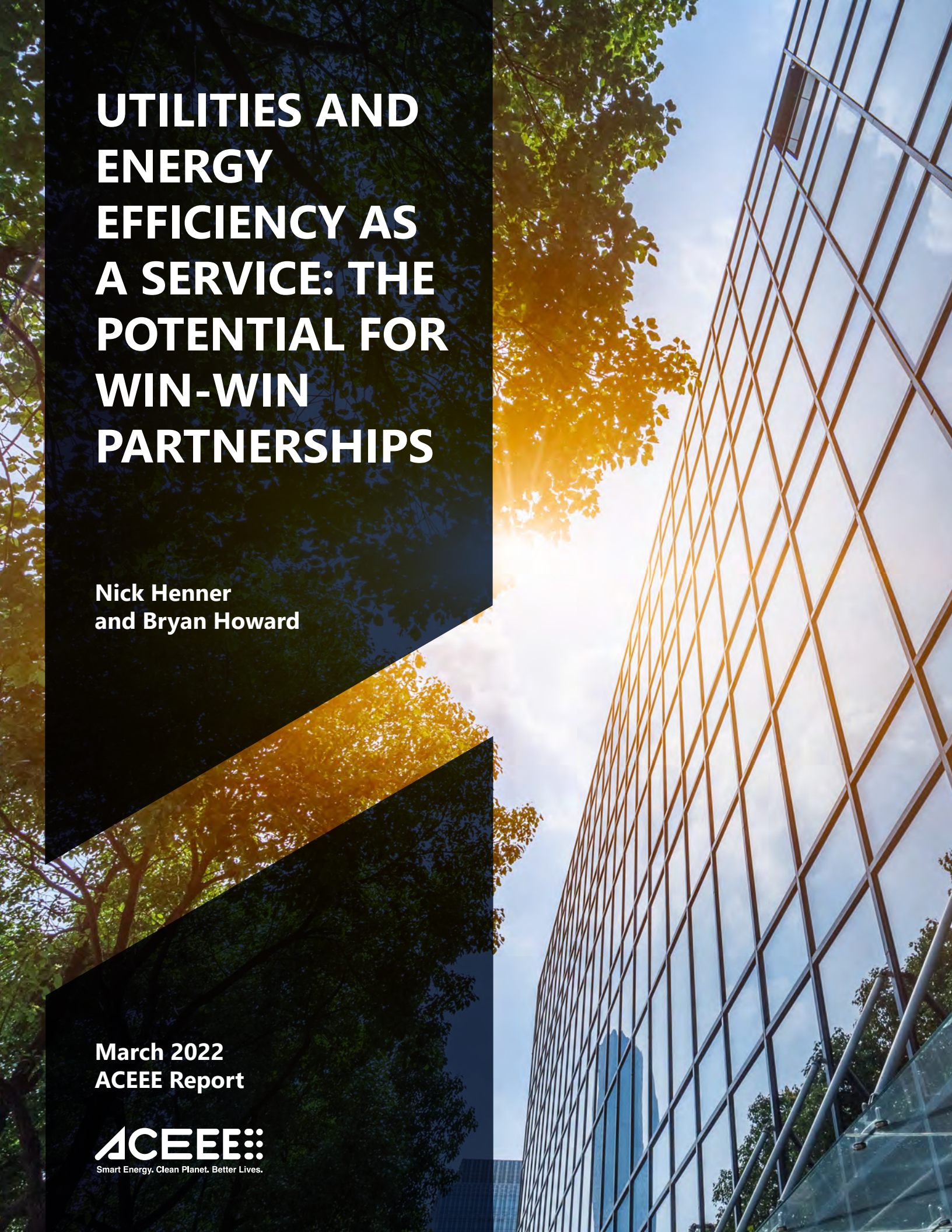

UTILITIES AND ENERGY EFFICIENCY AS A SERVICE: THE POTENTIAL FOR WIN-WIN PARTNERSHIPS

Nick Henner
and Bryan Howard

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ACEEE Report

ACEEE
Smart Energy. Clean Planet. Better Lives.

Contents

About ACEEE

The **American Council for an Energy-Efficient Economy** (ACEEE), a nonprofit research organization, develops policies to reduce energy waste and combat climate change. Its independent analysis advances investments, programs, and behaviors that use energy more effectively and help build an equitable clean energy future.

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Executive Summary

KEY TAKEAWAYS

- Energy efficiency as a service (EEaaS) has proven value for businesses and energy efficiency service providers, and our research shows that utilities can also benefit from involvement.
- EEaaS allows energy efficiency upgrades to be implemented as a service that underwrites the upfront costs of those upgrades via a long-term contract under which the upgrades are paid for by the future savings they will generate.
- Energy service companies, as well as other vendors, offer EEaaS-like products with a wide variety of brandings and slightly differing structures. A more standard product or approach could reduce customer acquisition and transaction costs associated with an EEaaS arrangement.
- EEaaS can help bridge the large gap between decarbonization goals and current/projected energy and carbon savings from utility programs and other existing policies and programs.
- There are a number of approaches utilities can take to get involved with EEaaS and expand energy efficiency program offerings to their customers, including administering an EEaaS program directly or partnering with existing EEaaS vendors.
- Utility programs that use EEaaS are mostly in the pilot phase but show promise as a strategy to reach substantial energy savings for customers.
- EEaaS has the potential to grow and to help deep retrofits succeed at scale across commercial and industrial facilities. Increased consumer awareness and education are necessary to help scale the EEaaS market.

Given the urgency of the climate crisis, long-term strategies have called for reducing total U.S. greenhouse gas (GHG) emissions by 80–100% by 2050. Fortunately, energy efficiency opportunities have the potential to cut U.S. energy use and GHG emissions in half by 2050.[1] Grants, rebates, and other incentives for energy efficiency from utility and similar programs will not be enough to reach efficiency goals and targets, and the upfront capital needed for

[1] S. Nadel and L. Ungar. *Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050* (Washington, DC: ACEEE, 2019). https://www.aceee.org/research-report/u1907.

energy efficiency investment often requires a financing solution, particularly for retrofits and other major energy equipment or system upgrades.

Much of the growth in the energy efficiency financing marketplace has come from private sources of capital and financial arrangements, such as energy service performance contracting (ESPC) and the evolving energy service agreement (ESA) market.[2] Energy efficiency as a service (EEaaS) is a partnership between a customer and a vendor that provides EEaaS; most commonly it incorporates an ESA structure to complete energy efficiency projects with no upfront cost to the customer

Under a standard ESA arrangement, a service provider installs and provides energy-saving equipment and services, taking on the subsequent performance risk for the equipment, and owns the equipment for the duration of the contract. In exchange for the service, the customer agrees to pay the service provider a monthly fee, which can be fixed or based on variable savings.

The municipal, universities, schools, and hospitals (MUSH) sector has traditionally been the primary market for ESPC via partnerships with energy service companies (ESCOs). ESCOs are companies that provide energy efficiency, among other value-added energy services, and ESPC generally makes up a core part of its energy efficiency services business.[3] Under an ESPC, an ESCO manages the installation and ongoing maintenance associated with energy efficiency equipment and is commonly paid upfront by a financial institution, which is repaid over the duration of the contract from the energy and operational savings associated with the energy improvements. Commonly the ESCO guarantees the savings to the financial institution and covers any shortfall via additional improvement measures or a direct payment covering the difference.

EEaaS have found success beyond the public and institutional client base and could serve as a complement to existing programming and expand energy efficiency offerings in commercial and industrial facilities. This report focuses on programs and products in these sectors. Both ESPC and EEaaS arrangements use a service agreement that guarantees some level of performance; this helps building owners overcome traditional barriers associated with energy efficiency projects, such as high upfront costs and performance risk. Beyond this, there are key differences between ESPC and EEaaS arrangements that that help determine

[2] N. Henner. *Energy Efficiency Program Financing: Size of the Markets* (Washington, DC: ACEEE, 2020). https://www.aceee.org/topic-brief/2020/12/energy-efficiency-program-financing-size-markets.

[3] E. Stuart et al. *U.S. ESCO Industry: Industry Size and Recent Market Trends* (Berkeley, CA: Lawrence Berkeley National Laboratory, 2021). https://emp.lbl.gov/publications/us-esco-industry-industry-size-and.

why one will work better than the other for a given customer. Some of the key differences include the project scope, ownership of the installed equipment, how the savings are measured and verified, the payment structure and guarantee of projected savings, and market standardization of the product (we elaborate in the body of the report).

As outlined in figure ES1 below, the contract between the EEaaS vendor and the customer often utilizes an ESA, while the contract between the EEaaS vendor and the contractor installing the upgrades (often an ESCO) resembles an ESPC arrangement.

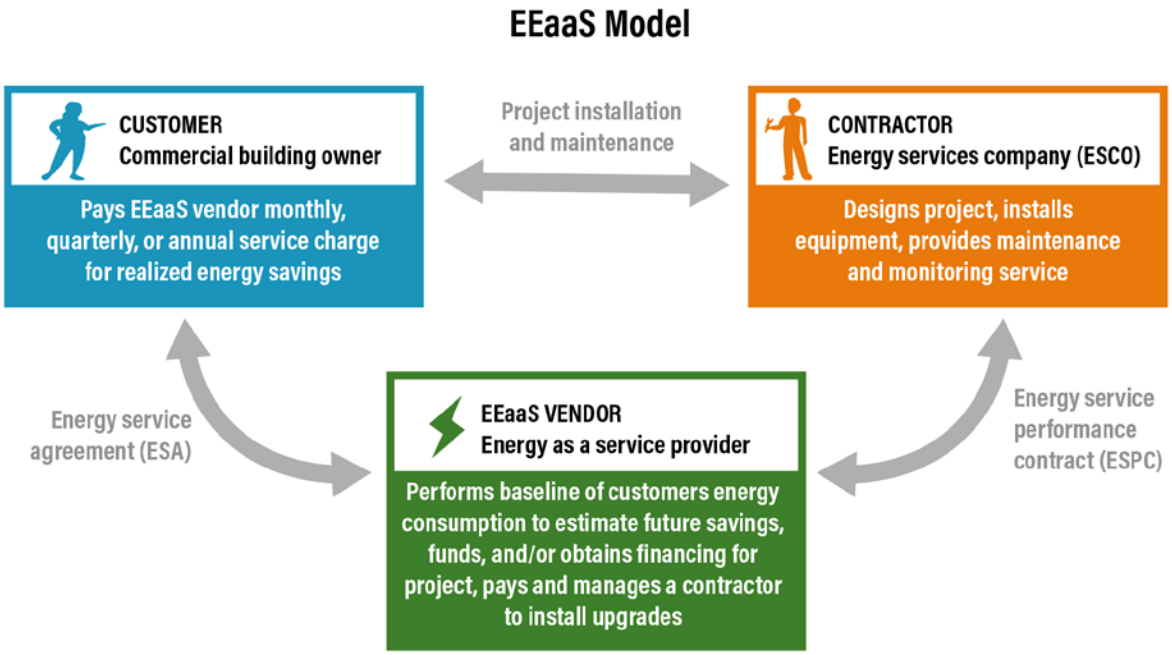

Figure ES1. Typical efficiency-as-a-service model[4]

Some of the key benefits or value propositions for a customer entering into an EEaaS arrangement to upgrade their facilities include:

- Off-balance-sheet designation
- Zero upfront costs
- Quick energy and operational savings

[4] *Emerging Opportunities: Energy as a Service* (Washington, DC: ACEEE, 2019). https://www.aceee.org/topic-brief/eo-energy-as-service.

- Ability to bundle short-payback measures (e.g., LED lighting) with longer-payback measures (e.g., building envelope) and still meet minimum payback for a bundled set of comprehensive upgrades
- Ability to combine energy efficiency, onsite generation, and other distributed energy resources (DERs) in a single project
- Outsourcing the management of projects
- Transferring performance risk of energy upgrades to a third party
- Faster project delivery
- Improved operational performance
- Wide range of improvements; more comprehensive retrofits for deeper savings
- Nonenergy benefits (e.g., improved indoor air quality)

Economy-wide, the last decade has seen the as-a-service model grow in popularity, changing the way people travel (ride sharing), consume entertainment (streaming services), and conduct business (cloud software services). Fundamentally, customers pay for a service instead of owning equipment. Energy efficiency can be employed in a similar model and may often be a good fit for such a model. Customers can utilize a service arrangement for their energy efficiency needs, ranging from lighting upgrades to the replacement of bigger-ticket items such as HVAC systems).

CHALLENGES TO SCALING ENERGY EFFICIENCY AS A SERVICE

Although the benefits of EEaaS are appealing, there are still many challenges to achieving scale with the EEaaS model. Through interviews with both EEaaS vendors and program implementors, we identified the following as primary challenges to scale:

- Lack of standardization of the model in the marketplace
- Opportunities limited primarily to larger projects
- Complicated contract structures that lead to lengthy transaction times
- Internal disconnects on the value proposition(s) associated with EEaaS that exist within organizational departments and teams

OPPORTUNITIES TO SCALE ENERGY EFFICIENCY AS A SERVICE

Despite the challenges outlined above, much opportunity exists in the market for further utilization of the EEaaS model across commercial and industrial facilities. Some of the key steps to tap these opportunities include:

- A more standardized approach to EEaaS
- Policy changes (e.g., mandatory building performance standards)
- Increasing market awareness and consumer education

- Tapping the potential for EEaaS to serve midsize commercial and industrial facilities

AVENUES FOR UTILITY INVOLVEMENT IN ENERGY EFFICIENCY AS A SERVICE

Despite their complementary services, reach, and expertise, utilities and ESCOs have not generally formed partnerships. Projects that utilize an ESPC for energy upgrades are larger in cost, scale, and energy savings than the programs and incentives traditionally offered by a utility.

EEaaS arrangements are able to target facilities that have historically been poor fits for ESPC, and they also open the door for utility involvement. Utilities are a logical partner in helping to bring EEaaS to the marketplace, as they are experts on providing energy services to customers (including efficiency programming). As states adopt more aggressive carbon reduction targets, EEaaS could offer utilities an additional structure to help meet their energy efficiency and GHG reduction goals. Although utility involvement in EEaaS is still new, our research indicates many ways utilities could help scale EEaaS in their service area. These include:

- Partnering with existing EEaaS vendors
- Administering an EEaaS program with ratepayer funds
- Offering EEaaS solutions to their customers directly

CHALLENGES AND BENEFITS OF UTILITY INVOLVEMENT IN ENERGY EFFICIENCY AS A SERVICE

There are different avenues that a utility can take to engage in EEaaS, but there are still barriers that will need to be addressed. Identified challenges include:

- Customer acquisition
- Attracting EEaaS vendors to the utility's service territory
- Complexities of contracts
- Need for accurate baseline data
- Opportunity costs associated with a customer not participating in other utility offerings

Some of the key potential benefits to a utility offering EEaaS include:

- Opens the door to reach deeper retrofits and expands product offerings available to customers
- Intuitive evolution in which a utility can apply incentive payments for realized savings instead of projected savings

- Leverages the utility's trusted brand recognition to reach customers
- Reaches previously underserved customers
- Can potentially lower administrative burdens relative to conventional utility efficiency programs

CONCLUSION

While obstacles remain, there are clear opportunities to reduce energy consumption in commercial and industrial buildings through the wider adoption of EEaaS—and, in doing so, to achieve more of buildings' energy efficiency savings potential and realize other benefits, such as carbon reduction.

Utilities have multiple pathways for using or supporting EEaaS programs. Their engagement with EEaaS and similar models ultimately depends on goals set by state and municipal governments or regulatory authorities, as well as internal commitments and priorities. EEaaS pilot and demonstration initiatives being offered by utilities are in the early stages but show promise and will inform future program development.

Both utilities and service providers can take concrete steps to advance market demand for these tools. Market consensus on the definition of EEaaS and standardization of the transaction structure would likely lead to significant reduction in transaction costs associated with an EEaaS agreement. Utilities can support broader utilization of these financing tools through education efforts that leverage their existing customer relationships.

Continued research, consumer education, and proof-of-concept case studies will help EEaaS solutions become more widespread across the marketplace.

Introduction

Given the urgency of the climate crisis, long-term strategies are needed to reduce current total U.S. greenhouse gas (GHG) emissions by 80–100% by 2050. Energy efficiency can reduce U.S. energy use and greenhouse gas emissions by 50% by 2050, getting us halfway to our national climate goals (Nadel and Ungar 2019).

Deep energy retrofits are vital to meeting energy use and GHG emissions goals over the next 30 years, but these projects are far more difficult to complete than conventional energy retrofits, which usually involve lower-cost projects with shorter payback periods (i.e., LED lighting). Typical building retrofits reduce energy use by 10–25%, but deep retrofits save at least 30% and sometimes more than 50% (Nadel 2019). The upfront costs and project complexities associated with large-scale deep energy efficiency can be a barrier to entry for many organizations, which is why some form of financing coupled with technical assistance can often be required.

Much of the growth in the energy efficiency financing marketplace has come from private sources of capital and newer financial instruments, such as through the evolving energy as a service market (Henner 2020). An energy service agreement (ESA) can be described as a pay-for-performance financing arrangement that allows customers to implement energy efficiency projects with zero upfront capital expenditure (IMT 2016). Under a standard ESA arrangement, a service provider installs energy-saving services with equipment it owns and operates, taking on the subsequent performance risk for the equipment. In exchange for the service, a customer agrees to pay the provider a monthly fee, which can be fixed or based on variable savings.

Energy efficiency programs funded and/or administered by utilities have been successful in bringing needed energy upgrades and other, nonenergy benefits to homes and businesses alike. While there has been considerable growth in the number of programs and the volume of options for energy efficiency, this increase is not commensurate with the financial investment necessary to achieve broader GHG emissions and energy reduction goals by states, local governments, and utilities. At current rates, for instance, it will take an estimated 60 years to complete whole-building retrofits on commercial buildings (Nadel and Hinge 2020). State and local budgets are still struggling with challenges associated with COVID-19, and this will likely impact energy efficiency program activity and hinder growth in the coming years. The energy efficiency job market shrank by 20.5% from December 2019 to June 2020, and the recovery from that point to June 2021 was just 10.5%, indicating that energy efficiency work is likely significantly below pre-pandemic levels (E4The Future 2021).

Energy efficiency as a service (EEaaS) is a subset of energy as a service (EaaS) that focuses on energy efficiency measures, though it can also include energy supply and/or other distributed energy resource measures. EEaaS is a partnership between a customer and a

company that provides energy efficiency services (the vendor) in which the customer outsources the development, financing, and operations of increasingly complex energy efficiency equipment, technology, and systems. The EEaaS vendor funds the entirety of the upfront costs associated with the energy upgrades. The vendor continues to own the equipment and ensures that it operates as intended for the entirety of the agreed-upon contract term, which commonly ranges from 5 to 20 years but can be as short as 1 year. This arrangement allows customers to assign their energy efficiency needs to an expert and focus on their core business, with the goal of increasing the number of energy efficiency projects across a single site or portfolio of facilities.

The municipal, universities, schools, and hospitals (MUSH) market has traditionally been the primary market for energy efficiency services via partnerships with energy service companies (ESCOs), mainly in the form of energy service performance contracting (ESPC).[1] ESPC is an arrangement between an ESCO and a building owner by which the ESCO manages the installation and ongoing maintenance associated with energy efficiency equipment and is commonly paid upfront by a financial institution. The financing is paid back over the duration of the contract from the actual energy and operational savings associated with the energy improvements; the ESCO guarantees the savings to the financial institution and covers any shortfall via additional improvement measures or a direct payment covering the difference.

Both ESPC and EEaaS arrangements use a service agreement that guarantees some level of performance, to help building owners overcome traditional barriers associated with energy efficiency projects, such as high upfront costs and performance risk. However, there are also key differences between an ESPC and an EEaaS arrangement that help determine why one will work better than the other for a given customer. Key differences include the project scope, ownership of the installed equipment, how the savings are measured and verified, the payment structure and guarantee of projected savings, and market standardization of the product, with the ESPC model being highly standardized (DOE 2021b). Further information on what differentiates an ESPC from an EEaaS will be detailed in a subsequent section.

Financing upgrades on the basis of actual performance instead of projected savings is not a new concept. ESCOs are the pioneers of the pay-for-performance (P4P) financing approach to fund energy efficiency projects via ESPC. A P4P approach allows customers to procure energy efficiency with payments tied to measured savings, and it often includes some form of guarantee in the contract with the provider. This approach differs from the conventional model of procuring energy efficiency, which uses an incentive to offset some of the upfront

[1] ESCOs provide energy efficiency and other value-added energy services. ESPC makes up a core part of their energy efficiency services business (Stuart et al. 2021).

costs and in which future financial benefits return to the customer by way of projected energy savings.

The market for ESPC has steadily matured since the 1980s and has seen continued year-over-year growth over the past two decades. ESCOs anticipated revenues of $9 billion in 2021, with 85% of that amount attributed to ESPC (Stuart et al. 2021). In 2018 public and institutional markets accounted for 94% of ESCO revenue, which is consistent with historical precedent (Stuart et al. 2021). ESCOs have a well-established track record of bringing energy and cost savings to the public and institutional building sector, but much of the market remains untapped and primed for growth. The remaining market potential of the U.S. ESCO industry is estimated to be between $92 billion and $333 billion (Larsen et al. 2017).[2] For comparison, national utility spending on energy efficiency programming totaled around $8.4 billion in 2019 (Berg et al. 2020). For many reasons, ESPC arrangements have not been widely used to fund energy improvements for industrial and commercial facilities; these sectors must be reached to meet the high end of the above ESCO market potential estimates.

Although ESPCs still account for the bulk of the performance contracting market, there are newer financing structures that can make a similar practice available to building owners outside the institutional market. Enter energy efficiency as a service.

Approaches such as EEaaS have found success beyond the public and institutional client base and could serve as a complement to existing programming while expanding delivery offerings to a wider market. EEaaS has been available since 2009 (DOE 2021b), and its growth since then is bringing new innovations in measurement and verification, data analytics, and financing structures from existing energy service providers while drawing new actors into the marketplace. Technological and analytical advances have facilitated market development and have created a new, data-driven approach to P4P. These advances have allowed private EEaaS companies such as Recurve and Redaptive to emerge and show energy savings in real time.

Despite complementary services, reach, and expertise, partnerships between utilities and ESCOs have not been widespread. There are regulatory, business model, and timing disconnects that have limited such partnerships, which could provide needed savings and benefits to utilities and ratepayers alike (Price and Scerbo 2019). Most projects that utilize an ESPC for energy upgrades are larger in cost, scale, and energy savings than programs and

[2] Larsen et al. define "remaining market potential" as the total sum of project investment that is technically possible for ESCOs to execute, based on the variety of projects ESCOs have historically completed in the public/institutional, industrial, and commercial sectors. The range of values is based on two different market scenarios.

incentives traditionally offered by a utility, and there are many reasons why this is the case. Utilities are generally not too invested in the business of financing and deep savings retrofits, areas that ESCOs specialize in. Deep retrofits are complex and ESCOs recognize that combining energy-saving measures is more efficient than a prescriptive or reactionary strategy to implement energy efficiency. Likewise, ESCOs are incentivized to focus on larger projects that can target deeper savings in order to cover extensive marketing and engineering costs, costs that can be recouped over the long-term duration of the ESPC.

The development of the EEaaS structure, and the subsequent emergence of new companies that offer this service, have the potential to help lessen the disconnect between ESCOs and utilities.

The goal of this research is to examine the current EEaaS market and recognize opportunities for—and challenges to—scaling up these services to provide further value to energy users, energy efficiency service providers, and utilities. This research can help planning efforts by utilities, regulators, energy efficiency service providers, and state policy actors as they consider expanding program offerings to meet energy reduction and climate goals.

METHODOLOGY

We conducted a literature review of recent research, drawing upon the U.S. Department of Energy's (DOE) Better Building Financing Navigator,[3] the Alliance to Save Energy's Active Efficiency Collaborative,[4] Guidehouse Insight's Energy Efficiency as a Service: Own the Solution, Not the Equipment,[5] and other sources that provided insights into policies, programs, and products utilizing an EEaaS-like structure. To supplement the literature review, we researched utility fillings to gain additional information on the size and scope of existing EEaaS programs and pilots.

To collect further data on EEaaS programs and products we also conducted 13 interviews with nongovernmental organizations that focus on clean energy solutions, utilities, companies that provide EEaaS products and services, and trade organizations that represent these companies and utilities. The interviews revealed barriers and policy solutions that might increase the reach of existing programs or help with the establishment of new ones.

[3] Please see betterbuildingssolutioncenter.energy.gov/financing-navigator/option/efficiency-a-service.

[4] Please see activeefficiency.org/.

[5] Please see naesco.org/data/industryreports/Guidehouse%20Insights%20-%20EEaaS%20White%20Paper%20-%20Metrus%20Energy_Final.pdf.

Our report builds on existing research by analyzing EEaaS programs and products to provide recommendations and market insights for regulators with oversight of utilities and program administrators as they consider options to potentially implement or expand an EEaaS or a similar program. Although this research focused on EEaaS applications for nonresidential buildings, we recognize that this financing solution shows promise in both single-family and multifamily properties as well.

WHAT IS ENERGY EFFICIENCY AS A SERVICE?

Economy-wide, the past decade has seen the as-a-service model take off. This model has changed the way people travel (ride sharing), consume entertainment (streaming services), and conduct business (cloud software services). As consumers and companies alike become more comfortable with the idea of not owning the assets being used, the opportunity arises for energy efficiency to be employed in a similar model. Customers can utilize a service arrangement for their energy efficiency needs, ranging from lighting upgrades to the replacement of bigger-ticket items like HVAC systems.

The value proposition of energy efficiency has historically been measured by projected savings accrued by the customer, usually the tenant or owner of a building, in dollars or units of energy. The idea behind most EEaaS structures is that savings paid out should be measured and verified to ensure that projected returns are realized and passed on to the customer. This is usually guaranteed in the contract.

EEaaS allows customers to implement energy and water efficiency projects with no upfront capital required and potentially with an off-balance-sheet designation. The off-balance-sheet arrangement is significant because it allows businesses and other entities to move energy efficiency projects from an expense asset, which must be purchased and depreciated in value over time, to an operating expense, no different from a monthly utility bill; this is not the case if the asset is purchased outright or leased by the building owner/manager. Entering an EEaaS arrangement can allow organizations to install efficient building performance upgrades without an associated capital expense (CAPEX) and can potentially lower their operating expenses (OPEX).[6] It also allows them to outsource the performance risk of their upgrades to a third party.

Although utility and publicly funded incentives have been successful at assisting organizations with the upfront costs of energy efficiency equipment, EEaaS offers an

[6] Capital expenditures are purchases made by organizations that are intended to be used over the long term. Examples include buildings, equipment, vehicles, and other physical assets. Operating expenses are associated with purchases made by an organization associated with day-to-day functioning. Examples include utility bills, salaries, and rent payments.

alternative that is well aligned with the goal of capturing long-term, deeper savings. With conventional incentives, the utility pays out a rebate, and then the customer is generally responsible for installing (or hiring a qualified contractor), operating, and maintaining the equipment. The EEaaS model is a way for organizations to focus on their core business and mission, while having energy efficiency responsibilities handled by an accredited third-party expert. Organizations often have limited capital budgets for facility improvements; eliminating this constraint has the potential to allow organizations to complete more energy efficiency projects at a faster rate and larger scale than would be possible without a service model.

To date, the vast majority of projects that utilize an EEaaS structure have had a project cost of at least $1 million. Although there are cases of EEaaS being viable for projects as low as $25,000, financing small and medium-size projects has proved to be difficult as a result of limited energy savings (relative to larger projects) and high transaction costs. As EEaaS becomes more widespread, these challenges could be reduced through technological advances, aggregation, and streamlined transaction and business model processes (DOE 2021a).

With an EEaaS arrangement, the service provider lines up the financing, installs the equipment, performs measurement and verification to ensure that projected savings are realized, ensures that the equipment is operating effectively, and takes on the performance risk associated with the upgrades. Figure 1 compares this arrangement to the traditional way of managing energy efficiency.

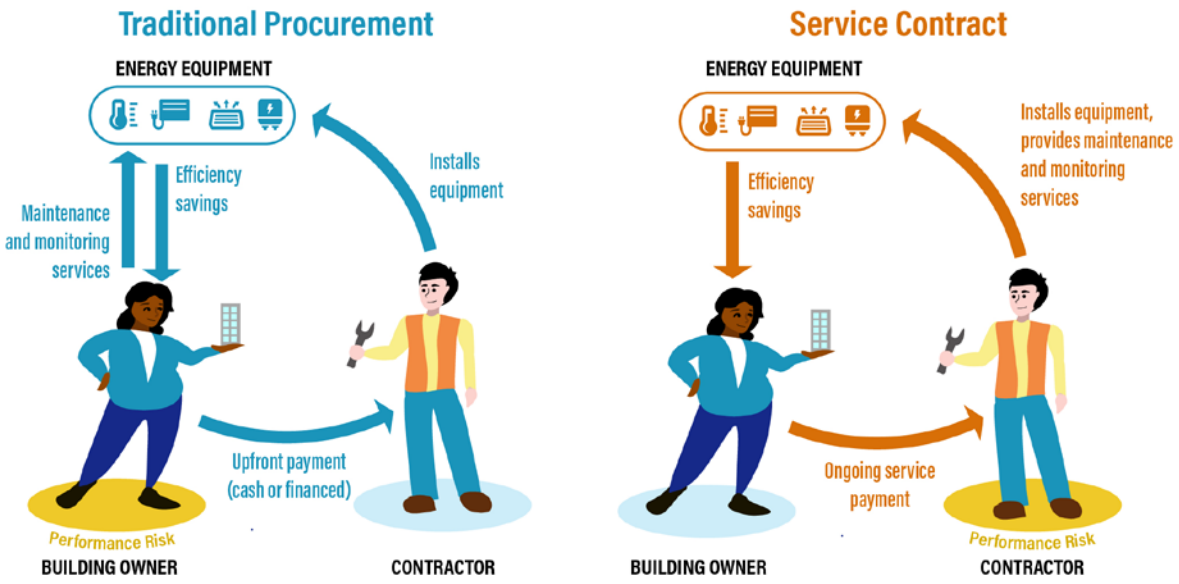

Figure 1. Procurement versus service contract. Source: DOE 2021b.

STRUCTURE OF AN ENERGY EFFICIENCY AS A SERVICE CONTRACT

The EEaaS structure is comparable to a power purchase agreement (PPA), which has become the industry-standard mechanism to finance renewable energy generation.[7] The major difference is that in a PPA the customer pays for each unit of generated energy, whereas in an EEaaS structure the customer pays for each unit of energy saved. As outlined in figure 2, the contract between the EEaaS vendor and the customer often utilizes an energy service agreement, while the contract between the EEaaS vendor and the contractor installing the upgrades (often an ESCO) resembles an energy service performance contract.

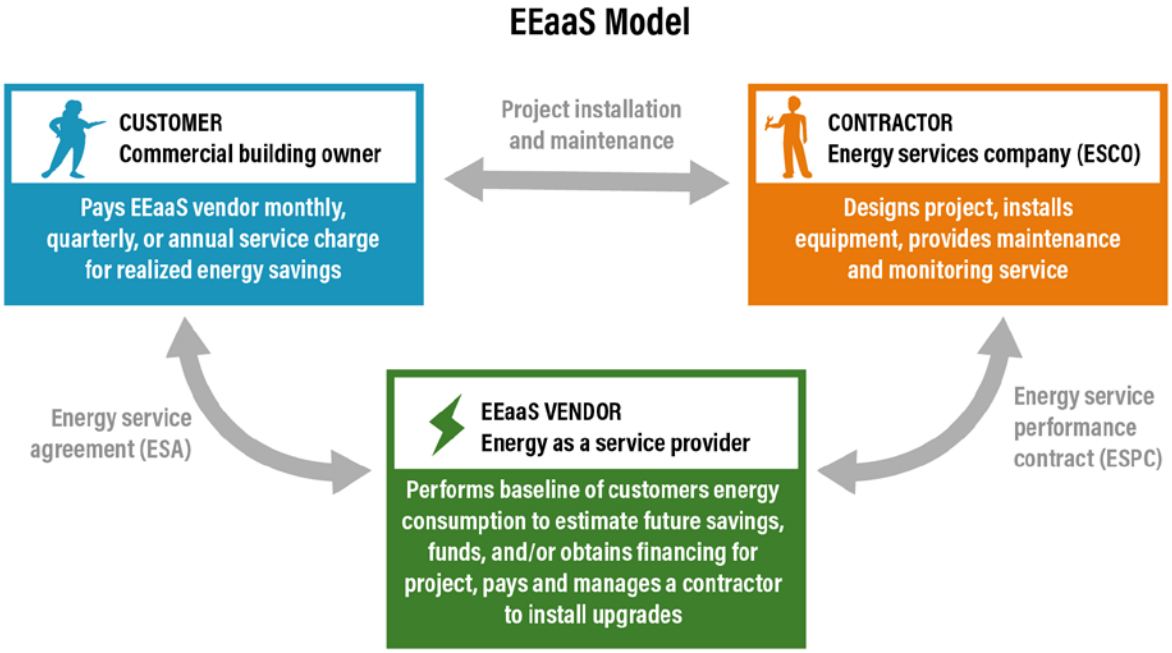

Figure 2. Typical efficiency-as-a-service model. Source: ACEEE 2019.

An EEaaS agreement should be designed so that customers incur no upfront costs and are cash flow positive from the onset. As outlined by Metrus, an EEaaS vendor, the process can resemble the following:

[7] A power purchase agreement is an arrangement in which a third-party developer installs, owns, and operates an energy system on a customer's property, and the customer agrees to purchase the electricity produced by the system for a predetermined price and length of time (DOE 2021c). Payment guarantees from a customer are often necessary for a developer to obtain the capital required to build the project.

1. The EEaaS vendor covers all the costs associated with project design and installation in year 0.

2. As a result of the upgrades installed, customers are cash flow positive from the onset and utilize the associated utility savings to pay the ESA service charge.

3. Over the lifetime of the ESA, the EEaaS is responsible for all project maintenance and monitoring costs.

4. Once the ESA contract expires, the customer receives all of the future savings from the energy upgrades (Hinkle 2020).

Normally after the EEaaS contract expires, the customer can elect to purchase the equipment at fair market value (accounting for depreciation), extend the contract, or, less commonly, return the equipment (DOE 2021a).

Guidehouse Insights estimates that the global market for energy as a service financing was about $5.4 billion in 2021, with North America accounting for 56% of the total market value, and predicts that the global market will grow at a compounding annual growth rate of 32.1% between 2021 and 2030.[8] If this prediction is correct, then the global market size will reach $66.0 billion by 2030 (Gonzalez and Wedekind 2021). Even with the challenges businesses have faced due to the COVID-19 pandemic, the energy as a service market has seen continued growth, which Guidehouse credits to aggressive sustainability targets and budget constraints that have forced organizations to reevaluate their capital spending. Likewise, the latest advancements in onsite energy supply and energy flexibility technologies have created more opportunity for EEaaS vendors to advance energy upgrades across a wider customer base. These advancements have also allowed many newer companies, beyond the traditional ESCOs, to enter the EaaS space.

ENERGY EFFICIENCY AS A SERVICE VERSUS ENERGY SERVICE PERFORMANCE CONTRACTING

There are many attributes that differentiate EEaaS from ESPC; as mentioned earlier, these differences have implications for which one will work better for a given organization or market segment. Table 1 lays out the key differences.

[8] The estimate for 2021 includes onsite generation, which can often be complementary and bundled with energy upgrades commonly associated with EEaaS (e.g., lighting and HVAC upgrades).

Table 1. ESPC versus EEaaS

Category	ESPC	EEaaS
Ownership	Customer typically owns the assets associated with the energy upgrades and can choose to pay for the installation with internal funds or financing.	Service provider owns the assets associated with the energy upgrades and pays for all installation costs.
Accounting implications	Commonly on-balance-sheet. The building owner can expense equipment depreciation and of the cost of financing.	Commonly off-balance-sheet. The building owner can classify 100% of service payments made to provider as an expense.
Contract complexity	High. Creating an ESPC often involves extensive negotiation to tailor the performance guarantee and define how savings will be measured. Time to complete the project installation may be a year or more.	Medium-high. EEaaS contracts can be simpler and faster to negotiate, though more complex than traditional financing such as loans or leases. Time to complete the project installation is typically 9 to 12 months.
Project size and contract length	Typically used for larger projects (>$1 million) with longer contract terms (10–20 years).	Can be used for both for large projects (>$1 million) and smaller ones (as low as $25,000) and can support shorter terms (5–20 years).
Common sectors	Most common in municipal, university, school, and hospital (MUSH) markets.	Most common in private commercial, higher education, and health care markets.
Standardization	Highly standardized. ESPC has a long operating history and federal procurement adoption.	Less standardized, with a variety of approaches and services available, as seen in table 2 below.
Common upgrades	Comprehensive, facility-wide upgrades.	Comprehensive, facility-wide upgrades or more prescriptive solutions (e.g., lighting).

Source: DOE 2021b

THE MANY VARIETIES AND PROVIDERS OF ENERGY EFFICIENCY AS A SERVICE

While ESPC has been utilized to upgrade MUSH market facilities since the 1980s, EEaaS-like structures have been attracting participation from the commercial and industrial sectors as well. EEaaS growth has brought traditional ESCOs and new service providers into the market

while creating many different structures and offerings that could be characterized as EEaaS. While there are many variations, most follow the ESA structure introduced earlier in figure 1.

Table 2 lists some of the many service providers and the different products they offer, all variations of the as-a-service model to implement energy efficiency projects.

Table 2. EEaaS market products and providers[9]

Organization	Product	Target customer market	Region
Allumia	Efficiency as a service	Small and midsize commercial and industrial	Nationwide
Alturus	Efficiency as a service	Industrial, manufacturing, commercial, and institutional	Nationwide
Ameren Illinois	Energy service partnership	Commercial and industrial	IL
Ameresco	Energy as a service	Commercial and institutional	Nationwide
BlocPower	Energy service agreement	Small and midsize buildings, including multifamily residences, commercial properties, and community spaces	NY, CA, WI, IL, and mid-Atlantic

[9] This is not intended to be a comprehensive list of every transaction that resembles EEaaS, but rather to showcase the variety of products and providers across the market. This list was created using DOE's Better Buildings Solution Center Allies as well as desktop research.

Organization	Product	Target customer market	Region
Budderfly	Energy efficiency as a service	Community centers, colleges, commercial properties, convenience retail, public schools, restaurants	Nationwide
Carbon Lighthouse	Energy savings as a service	Commercial and institutional	Nationwide
Duke Energy One	Direct efficiency	Businesses that vary in size and industry	Nationwide
JouleSmart	Infrastructure as a service	Commercial and industrial	Nationwide
Lime Energy	Lighting as a service	Small and medium-size businesses	All states except MT, ND, MO, AK, LA, and WV
Johnson Controls	Energy as a service	Commercial	Nationwide
Onsite Utility Services (OUS) Capital	Energy savings as a service	Commercial, industrial, and institutional	Nationwide
Metrus	Sustainable energy as a service	Large commercial, industrial, and institutional	Nationwide
New York City Energy Efficiency Corporation	Energy service agreement	Multifamily, commercial, industrial, and institutional	New York City
Redaptive	Efficiency as a service	Commercial and industrial	Nationwide
Sealed	Energy service agreement	Single-family residential	NY, NJ, and CT
Seattle City Light	Efficiency as a service	Commercial	Seattle

Organization	Product	Target customer market	Region
Schneider Electric	Energy as a service	Commercial and institutional	Nationwide
Southern Company	Technology subscription	Commercial and industrial	Nationwide

Most of the organizations listed above work with clients to design customized solutions and arrange financing within the EEaaS agreement. They then work with contractors (often traditional ESCOs) to install the upgraded equipment.

Unlike the more mature ESPC market, there is no standardized definition of an EEaaS product. (The challenges associated with this lack of standardization will be discussed in the "Challenges" section below.) Still, there is a unifying similarity to all the above offerings, in that they provide a service that allows businesses and other customers to install energy improvements at their facilities with no upfront costs.

VALUE PROPOSITION OF ENERGY EFFICIENCY AS A SERVICE FOR CUSTOMERS

EEaaS can unlock long-term, deep energy reductions for customers that would not be willing to take on similar projects with a more conventional approach. Benefits of EEaaS for building owners and/or managers include:

Decarbonization. Reducing an organization's GHG emissions via EEaaS can help it meet corporate sustainability targets without having to increase costs or purchase carbon offset credits.

Immediate savings. Traditional energy efficiency projects can be burdensome for an organization, largely because the upfront capital required can have lengthy payback periods and take years to deliver savings.[10] EEaaS allows customers to benefit immediately from operational cost savings due to reductions in energy and maintenance expenses and nonenergy benefits associated with the upgrades.

Performance improvements. Modern and improved energy technologies installed can improve performance output delivery of a facility.

[10] The payback period is the amount of time it takes for an investment to recover costs, or break even. Although many organizations use a more sophisticated approach, a simple payback period is calculated by dividing the amount of the investment by the annual cash flow it generates. In the case of an energy efficiency investment, this would be the initial cost of the equipment divided by the savings that result from reduced energy use.

Program management. Most EEaaS solutions are implemented by an expert company that continues to own and manage the asset for the duration of the project. This improves the likelihood that installed measures will be properly utilized and will meet the savings projected for the project. Many organizations do not have the internal expertise to install and manage advanced energy technologies, making an EEaaS provider a strong partner to advance their energy efficiency.

Nonenergy benefits. There are many EEaaS benefits that are not related to energy and not directly priced into an EEaaS agreement. These include improved indoor air quality (which is especially important in the time of COVID), higher levels of comfort, increased property value from upgrades, and local economic development.

Off-balance-sheet status: EEaaS structures are commonly off-balance-sheet solutions and treated as operational expenses (same as utility payments). This allows businesses and other entities to move energy efficiency projects from an expense asset, which must be purchased and depreciated in value over time, to an operating expense, no different from a monthly utility bill.

Risk transfer. Providers of EEaaS typically take on all risk regarding the performance of the facility upgrades and are responsible for ensuring that the upgrades, and corresponding technology, are performing optimally.

Speed of project delivery. Because EEaaS programs are delivered by teams with expertise, they can typically be implemented faster than a program managed internally.

Wide range of improvements. Service arrangements allow some organizations to make comprehensive upgrades that would likely not be possible otherwise because of restrictive payback and hurdle rate requirements.[11]

Zero upfront cost. Providers of EEaaS typically take on all costs associated with developing and implementing the energy efficiency upgrades. The energy and maintenance savings that result from the upgrades can allow an organization to be cash flow positive through the duration of their EEaaS contract.

CHALLENGES TO SCALING ENERGY EFFICIENCY AS A SERVICE

Although the benefits of EEaaS are appealing, there are still many challenges that affect the scalability of the EEaaS model. Through interviews with both EEaaS vendors and program implementers, we identified the following as challenges to scale:

[11] Hurdle rate is the minimum rate of return on an investment or project required by an investor or organization. If the hurdle rate is not met, an investor or organization cannot go through with the particular investment.

Building ownership limitations. Although the EEaaS structure can work in facilities that are leased, this arrangement would typically be viable only if the EEaaS contract term did not exceed the lease term. There are promising structures, such as the metered energy efficiency transaction structure (MEETS™), that address this issue, but implementation is still in the pilot phase.[12]

Complicated contract structure. The complex nature of EEaaS contracts can potentially make the legal process time consuming and expensive. Likewise, this structure can be difficult for contractors to sell to potential clients that are not already familiar with the value proposition. The differing protocols companies and organizations have for contracting and procurement only further this challenge.

Deal size. Though there are exceptions, most EEaaS vendors tend to focus on projects with a value of at least $1 million and will not consider smaller ones. There are many reasons for this, but primarily it is because the transaction costs associated with a smaller deal are not necessarily lower than those associated with a larger deal. Given that the value proposition to an EEaaS vendor is based on the savings that result from the upgrades, the vendor will favor larger deals that will result in larger savings. This problem can be alleviated if an organization can bundle together multiple sites across its portfolio of facilities.

Differing utility programs. Given the great variety of utility program designs, creating an EEaaS program across multiple customer sites and multiple utility service territories can be a complex process for a utility. For an ESCO or other EEaaS vendor, it can be a full-time job to track and be knowledgeable about developments in a utility's service territory and/or operation state.

Nonenergy and demand benefits. Cost reductions resulting from decreased energy use and peak load charges are, with a few exceptions, the only financial incentives that are measured and priced into an EEaaS agreement. There are many benefits to decarbonization that currently do not have a monetary value assigned to them. As one large ESCO told us during our research, placing a monetary value on carbon emissions or creating an incentive for carbon reductions would open more opportunities for EEaaS: Measures that would otherwise be difficult to pay for through energy savings alone could be included when factoring in a customer's desire to reduce GHG emissions as cost effectively as possible. Until

[12] MEETS™ is essentially a PPA for energy efficiency between a utility and a developer that values energy efficiency as a grid resource, addresses split incentives, opens the door for deep retrofits, and allows tenants to receive all the benefits of energy efficiency upgrades at no cost (Harmon 2021). MEETS aligns the three major players involved with a deep retrofit: the utility, the building owner or operator, and the investor (or developer of the project) (Smith 2020). Further information and examples of MEETS™ implementation can be found on the MEETS™ Accelerator Coalition website.

there is a price on carbon, the value proposition for deep energy efficiency projects based purely on the monetary value of energy savings will be difficult for most customers. For these instruments to truly become widespread, there may need to be some sort of additional value from decarbonization efforts that can be monetized, whether through some sort of carbon fee or through penalties from a mandatory building performance standard. The financial incentive of renewable energy credits (RECs) has been a huge driver for the growth of renewable energy production over the past decade plus; some similar sort of market and/or policy innovation may be needed to reach greater decarbonization efforts via energy efficiency.

Internal disconnect within organizations. In large organizations, energy efficiency initiatives are often first explored and proposed by the sustainability, real estate, or facilities team, but it is the legal or finance team that often ends up making the decision to enter into an EEaaS arrangement. The complicated nature of EEaaS can often require a long period of education among an organization's decision makers on the structure and value proposition of the arrangement. As more case studies, proofs of concept, and other resources are introduced to the market, this barrier will be gradually alleviated.

Lack of market awareness. Despite all the momentum EEaaS has seen over the past decade, there is still a wide lack of awareness of the product among potential customers. Publicizing benefits, case studies, and customer testimonials and using other market-education initiatives will be key to overcoming this challenge. Potential customers need to be able to trust that the benefits and savings involved in an EEaaS arrangement will actualize and that the long-term partnership with the EEaaS vendor will be a benefit to their operations.

Lack of standardization in the marketplace. As seen in table 2 above, there are many varieties and providers of EEaaS. And not all contracts are structured the same. Different vendors have prioritized different features of a service agreement, including embedded guarantees, comprehensiveness of the approach, flexibility and scalability of the contract, and energy savings, among others (Wedekind 2021).

Lack of standardization can lead to customer confusion, which only increases the cost and time it takes for EEaaS vendors to acquire customers. The successful scaling of products like ESPCs and PPAs (in the context of the solar market) was partly due to the standardization of these products across the industry.

Lengthy transaction times. For comprehensive retrofits with no preliminary energy audit data**,** EEaaS transactions can take 9 to 12 months to close (and sometimes longer). This is especially true when they involve complex negotiations between the EEaaS vendor and the potential customer.

Poor understanding of value proposition of energy efficiency. This is not a problem unique to customers thinking about EEaaS, but for many organizations the value proposition may not be clear or a priority. There are many reasons for this, but the largest is that energy

costs are usually not high enough to prioritize savings when compared with other cost-cutting or investment opportunities. As an industry standard, utility costs account for $3 per square foot of leased or owned space, compared with $30 for rent and $300 for employee salaries (JLL 2016). These numbers can be much higher in highly competitive rental and labor markets (e.g., New York City). EEaaS vendors should make sure their potential customers understand the many nonenergy benefits of energy efficiency improvements. The nonenergy benefits associated with energy efficiency improvements can yield greater comfort, air quality, and indoor aesthetics, among many other benefits. While these are not usually captured in the pricing of most EEaaS arrangements, they can lead to increased employee productivity and retention at little to no cost. An analysis by Pacific Northwest National Laboratory that examined how indoor environment impacts occupant outcomes (e.g., productivity, absenteeism) found a 5.7% increase in productivity and 37% reduction in absenteeism associated with indoor air quality and thermal comfort improvements (Wang and Rotondo 2020)

Performance risk. Some ESCOs remain uncomfortable about guaranteeing the performance of energy upgrades to an entire commercial building because there are variables related to energy usage (e.g., occupancy, plug loads) that can eat into projected savings. These performance risks have increased due to the uncertainty around commercial office space usage in the time of COVID (e.g., intermittent occupancy). This situation, in turn, can complicate measurement and verification, particularly for commercial and office buildings.

Tax and depreciation implications. Although the off-balance-sheet designation is one of the major value propositions of EEaaS, limited tax incentives or depreciation can be claimed because the upgraded equipment is owned by the EEaaS vendor for the duration of the agreement. The EEaaS vendor also takes ownership of any incentives associated with purchasing the equipment.

OPPORTUNITIES TO SCALE ENERGY EFFICIENCY AS A SERVICE

Despite the challenges outlined above, much opportunity exists in the market for further utilization of the EEaaS model across commercial and industrial facilities. Here are some ways in which that opportunity can be pursued:

Build partnerships between EEaaS vendors and utilities. Utility involvement is likely to be an important factor to truly scale EEaaS. There is a value proposition for utilities to embrace it; this will be discussed in the "Utility Involvement in EEaaS" section below.

Create policies to support EEaaS. Building performance standards and other policy trends that limit building energy intensity or put a price on carbon emissions will require many large energy users in the commercial and industrial space to upgrade their facilities and reduce their carbon emissions. Energy efficiency continues to be the lowest-cost resource to reach carbon reduction goals (Cohn 2021). For an organization wishing to reduce its energy consumption in order to avoid a carbon fee or penalties for noncompliance with a building performance standard, EEaaS can offer a portfolio-wide solution.

Create a standardized approach to EEaaS. Standardization for all customer segments and regions will likely be required to entice more organizations to enter into an EEaaS agreement. An EEaaS contract that is standardized across regions and sectors would reduce transaction times and customer acquisition costs, resulting in reduced costs for customers and more deals for EEaaS vendors. Part of the reason why transaction costs associated with EEaaS are so high is that it can be quite a complicated process for organizations to navigate. Also, as seen in table 2, the market currently has many service providers offering different brands of EEaaS that have subtle differences. This can make a competitive bidding process difficult, as an apples-to-apples comparison is not always possible. No matter what the branding of an as-a-service offering is, the market could benefit if all EEaaS arrangements included the following:

- **100% financing** of the project so the customer does not have to use internal funds or enter into a lease,
- **pay for performance** at an agreed upon cost per unit of energy saved,
- **third-party ownership** of the equipment for the duration of the agreement,
- **ongoing services** that the vendor will provide to ensure that the installed equipment operates as intended and is well maintained and to make sure that savings are measured and verified, and
- eligibility restricted to projects with **net carbon reductions** (Beckett 2021).

An EEaaS contract that is standardized and does not require extensive use of outside consultants and legal representation would ultimately be a win-win for customers and EEaaS vendors and contribute to greater decarbonization.

Emphasize the role of EEaaS in corporate social responsibility. Among Fortune 500 companies, 60% have committed to at least one reduction target related to GHG emissions, energy efficiency, and renewable energy; this represents a 12% increase since 2019. And 17% of Fortune 500 companies have made some variation of a carbon neutrality commitment (Cervantes et al. 2021). This sort of commitment creates an additional value proposition for an organization to reduce its energy use or carbon emissions, and this in turn has the potential to make an EEaaS agreement more enticing to an organization.

Create incentives for longer-payback items. Providing financial incentives for equipment with a longer payback (e.g., building envelope, HVAC equipment) could be the necessary means to reach deep facility retrofits. Incentives for these more expensive items could counteract the historical tendency to provide incentives for inexpensive items, such as LED lighting, that have shorter payback periods. Such a tendency limits the potential scope that a customer can achieve through EEaaS.

Increase market awareness and consumer education. As the market for EEaaS continues to mature, more research, as well as proofs of concept, will continue to reach and educate the market. This education should lead to more potential customers being comfortable with the product and willing to consider it.

Take advantage of corporate budget cuts. As a result of the COVID-19 pandemic, according to McKinsey & Company, 98% of the world's largest companies have announced some form of capital budget reductions ranging from 10–80% (Brinded et al. 2020). These budget cuts, for however long they remain, present more opportunity for EEaaS to offer organizations a creative solution to implement energy efficiency upgrades while reducing CAPEX. EEaaS also allows energy efficiency improvements to not be delayed until such time as CAPEX budgets return to pre-pandemic levels.

Take advantage of the midsize commercial market. Midsize commercial buildings offer a huge market opportunity, but they have not historically been targeted by ESCOs. This market is ripe for energy efficiency improvements, and EEaaS has the potential to overcome some of the historical challenges of serving it. Commercial buildings in the United States less than 100,000 square feet account for nearly 66% of total floor space, whereas commercial buildings larger than 100,000 square feet account for 34% of total floor space (EIA 2021). The latter is the typical type of building targeted for performance contracting due to the historical difficulty of approaching projects less than $1 million in size. This could be alleviated through bundling a portfolio of projects or pursuing greater standardization of the EEaaS arrangement.

Utility Involvement in Energy Efficiency as a Service

Utilities are a logical partner to help bring EEaaS to the marketplace, as they are generally experts on providing energy services and efficiency programming to customers. As states adopt more aggressive carbon reduction targets, EEaaS could offer utilities a creative structure to help meet their energy efficiency and GHG goals. Although utility involvement in EEaaS is still in the early days, our research indicates there are many avenues that utilities can take to help scale EEaaS in their service area:

Administer an EEaaS program with ratepayer funds. Using ratepayer funds, a utility can design and administer an efficiency program that leverages EEaaS solutions. One example, still in the pilot phase, is Business Energy Pro, a collaboration between NYSERDA, Con Edison, and energy efficiency service providers. Con Edison aims to transform the energy efficiency market for its customers in New York by using smart meter technology and partnerships with EEaaS vendors (NYSERDA 2022).

Begin metering savings from traditional energy efficiency programs. If a utility is not ready to commit to offering an as-a-service product to its customers, it can lay the foundation for a future program by metering savings from its current energy efficiency programs. These data could be extremely valuable in quantifying and assessing where a pay-for-performance model could be effective for the utility. A utility could begin by measuring

savings at a whole-building level, leveraging smart meters, or explore normalized metered energy consumption approaches.[13]

Partner with existing EEaaS vendors. Utilities can use their valuable brand recognition and relationship with customers to bring business to EEaaS vendors. A partnership with existing EEaaS vendors could potentially lead to reduced financial incentives. If the utility can help the EEaaS vendor find clients, then there is less need for the utility to invest directly in a similar product. Not only can a utility play a key role in customer acquisition, but it can also help with the design of energy efficiency packages that align with its current program offerings. For instance, Southern Company, a utility that covers much of the Southeast, offers EEaaS through its Technology Subscription service through a partnership with Sparkfund, an EEaaS vendor (Spark Community Investment Company 2019).

Offer EEaaS solutions to customers directly. Utilities can offer EEaaS to their customers by creating an EEaaS entity that leverages the trusted brand recognition and expertise of the utility. Duke Energy One, a subsidiary of Duke Energy Corporation, one of the largest investor-owned utilities in the United States, provides EEaaS to customers via its Direct Efficiency℠ product.

Duke Energy's EEaaS Solution Powered by Allumia

Duke Energy One's Direct Efficiency℠ is a service contract to install and maintain upgraded energy systems and is available to businesses of all kinds. Through its ally network, Duke Energy One funds, develops, and constructs energy efficiency upgrades for commercial and industrial customers with no upfront capital required. Advanced metering technology is installed to measure exactly how much energy the new system consumes. (Duke Energy One 2022).

Duke Energy One recently entered into an EEaaS agreement with a customer that sells products and services to the convenience store industry. The customer recognized the need to make energy efficiency upgrades to its warehouse facilities, and in July 2020 it had comprehensive LED lighting upgrades installed via the Direct Efficiency℠ program. The customer is projected to save approximately $117,000 in energy and maintenance costs over the next 10 years (Duke Energy One 2020). Although the scope of this project included only lighting upgrades, Duke Energy One will consult with the customer on

[13] Normalized metered energy consumption is an approach to measuring energy usage that analyzes interval data utilizing technological tools and standards. The goal is to provide quantifiable and statistically significant data on the energy savings achieved as a result of an energy upgrade (Murphy 2020).

possible future facility improvements (e.g., HVAC and refrigeration) to achieve even greater energy savings.

Duke Energy One partners with EEaaS vendor Allumia to manage the program, provide the associated technology, and build EEaaS solutions for its customers. The value proposition of this program for Duke Energy is to provide a service solution that delivers energy efficiency directly to their customers to spur decarbonization and energy savings, and to provide the grid with demand savings without the use of ratepayer or other programmatic funds.

Provide a form of credit backstop or guarantee. A utility could provide a credit backstop in the form of some type of insurance, reserve fund, or parent guarantee for customer payments. Conceptually, this could work like a loan loss reserve, where an EEaaS vendor takes on the first 10% or so of risk but there is a backstop to protect the vendor from further downside.[14]

As our research continues, more value propositions for utility involvement in EEaaS will be identified. As utilities continue to explore and engage in pilot opportunities to utilize an EEaaS structure, we encourage the prioritization of diversity and inclusion as service providers and site locations are considered.

CHALLENGES TO UTILITY INVOLVEMENT IN ENERGY EFFICIENCY AS A SERVICE

Despite the different avenues that a utility can take to engage in EEaaS, there are still many barriers that will need to be addressed. Challenges identified in our research include:

Attracting EEaaS vendors to a service territory. Many EEaaS companies are startups that do not have the bandwidth to expand to multiple service territories. This challenge was mentioned by a large investor-owned utility that was interviewed as part of this research.

Need for baseline data. To be able to predict, measure, and verify energy savings requires accurate baseline data of energy usage prior to the upgrades. Many utilities have not invested in advanced metering technology that can obtain the metered-interval data that are often needed. This issue has been compounded in the time of COVID-19 due to inconsistences around facility occupancy and energy usage.

[14] A loan loss reserve is a type of credit enhancement, or a strategy for improving the credit risk profile of a borrower, that reduces the risk associated with nonpayment of debt to a lender (Go Green Financing 2021).

Complicated contracts. At a minimum, there are three parties to an EEaaS project that involves a utility: the utility, building owner/manager, and EEaaS vendor. Having three parties in a single binding contract has the potential for some unforeseen problems if one of the three parties does not follow through on its commitments. One way to help alleviate this challenge, identified by Seattle City Light, is to require only two-party contracts. One contract, between the utility and the utility customer, could commit the customer to pay the utility for all savings at an agreed-upon market rate; the other contract, between the utility and the EEaaS vendor, could commit the utility to pay the EEaaS vendor for savings in the building at an agreed-upon rate for the term of the contract. The only item binding the two contracts is that if one fails, then so does the other. The main value of this solution is that if any problems arise between the EEaaS vendor and the building owner (i.e., the utility customer) that breach the contract, the utility is not legally involved because it is not in a contract between the building owner and EEaaS vendor.

Customer acquisition. To be a solid candidate for a utility EEaaS program supported by a utility pay-for-performance incentive, a customer needs to consume a large amount of energy inefficiently, and finding these customers is not always an easy task. Customer acquisition challenges include, but are not limited to, the following:

- The limited number of EEaaS-like utility programs that exist today have strict rules regarding customer eligibility.
- For a utility to pay out on the basis of energy savings, solid baseline data are needed (often a year or more), which can make customer acquisition more difficult.
- A large portion of eligible businesses closed during COVID.
- The traditional door-to-door sales process to acquire customers does not really work for a program that utilizes a P4P structure, as the proportion of eligible businesses is small.
- Small businesses are reluctant to agree to multiyear contracts and are commonly not interested in installing deep measures; instead, they generally think about installing new HVAC equipment and other expensive items only when something stops operating. Likewise, multi-measure, comprehensive retrofits tend to be disruptive to the operations of a business.
- Sales reps reach the decision maker of an eligible business only about 10% of the time, according to a utility interviewed in our research process.

The Business Energy Pro program, a pilot pay-for-performance collaboration among NYSERDA, Con Edison, and EEaaS vendors, is testing several strategies to overcome the customer acquisition challenges that it has encountered to date. These include purchasing better customer information to increase the odds that account managers will speak to the ultimate decision maker within an organization, and broadening eligibility requirements to

enlarge the pool of potential customers. Also, NYSERDA has been leading efforts to expand interest in the program by leveraging community partners to educate businesses about its benefits.

Market size. The number of viable participants eligible to receive performance-based incentives for an EEaaS program in a given utility territory can end up being vastly smaller than what was originally assumed by a utility or an EEaaS vendor. A number of factors can contribute to this assumption but can largely be attributed to inadequate baseline data.

Opportunity costs. If a customer is subscribed in an EEaaS program or one that pays incentives based on performance, there is potentially a lost opportunity for the customer to participate in other utility offerings (e.g., prescriptive programs, retrocommissioning). A utility account manager who is incentivized to sign a client up to participate in an EEaaS program is unlikely to spend much time discussing opportunities associated with other energy efficiency programs (Ihnen 2021).

Reporting requirements. As with most utility efficiency programs, the reporting obligations and evaluation requirements can be cumbersome for utility staff and customers alike.

BENEFITS OF UTILITY INVOLVMENT IN ENERGY EFFICIENCY AS A SERVICE

As outlined above, there are many approaches utilities can consider to work EEaaS into their program offerings or to support third-party organizations that focus on EEaaS. Our research identified the following potential benefits to utilities that do so.

Expands product offerings. EEaaS is another way for utilities to reach their customers and provide value; this is especially important in deregulated markets as a strategy for utilities to stay engaged and keep customers from taking their business to another energy provider.[15] Moreover, the long-term nature of an EEaaS contract involving third-party ownership of the technology and equipment, combined with the relative difficulty of breaking the contract, is an additional factor keeping customers with the utility.

Facilitates use of incentive payments for realized savings. Traditional energy efficiency programs offered by utilities pay an upfront incentive to customers regardless of how much energy is saved by the installed technology or equipment. A structure that pays the owner of the installed technology or equipment on the basis of actual savings eliminates the realization risk that exists in conventional programs. If service providers and program sales

[15] In a deregulated electricity market, electricity customers can select an electric supplier rather than being required to purchase electricity from their local electric utility. This introduces competition for retail electricity customers (Cleary and Palmer 2020).

teams are incentivized on actual savings, it is likely that they will place a high priority on seeking customers that will have the highest energy savings.

Opens the door to deep retrofits. Traditional utility energy efficiency programs are not doing enough to meet the immense challenge of mitigating the climate crisis (Gold 2021). The difficult task of achieving deep savings for customers is part of the puzzle. Utilizing an EEaaS model has the potential for deep savings projects to be undertaken without the utility, or ratepayers, having to foot the bill, other than for administrative costs associated with the program.

Seattle City Light's EEaaS Pilot Program

Seattle City Light (SCL) launched an Energy Efficiency as a Service Pilot Program based on MEETS™ in 2019. Despite challenges related to COVID-19, it received six applications in the project-solicitation round. The energy efficiency goals of SCL's EEaaS program are to:

1. "Unlock deeper energy efficiency in commercial buildings by paying for measured electricity savings over time instead of providing an upfront incentive."
2. "Test a mechanism to lessen the 'split incentive' between owners and energy users at scale in order to encourage production of greater energy efficiency to reduce City Light electricity production costs."
3. "Test a variety of use cases to build upon lessons learned from the innovative MEETS™ prototype project at the Bullitt Center" (Seattle City Light 2021a).

The first building to complete the application process is a 500,000-square-foot office building built in the 1970s that has a baseline annual energy use of 10.7 million kWh. The proposed upgrades for this building include a building automation system with fault detection, an upgrade of pneumatic controls to direct digital controls, LED lighting, floor pressure and stack effect controls, and a cooling loop heat-reclamation system. These measures are expected to save 3.4 million kWh annually—a 32% reduction relative to the baseline energy use. Over the 20-year term of the EEaaS agreement, SCL will pay the provider 11 cents per kWh saved, with a 2% per year escalator (Seattle City Light 2021b). These savings quite are impressive, especially considering that they are projected to be achieved without the use of upfront incentives or government support.

SCL's EEaaS program is unique because it has the potential to ease many split incentive concerns. SCL enters two different contracts: a participation agreement with the building owner and a PPA with the developer of the project (i.e., the EEaaS vendor). Through the participation agreement, the building owner agrees to pay Seattle City Light for actual energy use plus an energy efficiency service fee. The tenant is then billed for actual electricity consumed and an energy efficiency service fee, the same amount the tenant

would have paid had no improvements been made; this results in customers receiving all the benefits of the upgrades at no cost. Through the PPA, Seattle City Light agrees to pay the energy efficiency provider for the energy savings based on measured and verified data by a third party. The PPA also includes commitments to workforce development goals and reporting requirements (Seattle City Light 2021a).

Is not limited by minimum cost-savings requirements. Many utilities are required by their regulating body to subject proposed efficiency programs to a cost-effectiveness test (e.g., total resource cost) before investing in them using ratepayer funds. An EEaaS program can potentially bundle efficiency initiatives that are not historically cost effective to bring the aggregate costs down. In an interview with Con Edison, we learned that "there are lots of advantages, from the administrative perspective, to change from the technical resource manual (TRM) to a subscription service."[16]

Potentially lowers administrative costs. It is possible that a utility could incur lower administrative costs when paying out incentives based on actual savings than when administering a conventional energy efficiency program. This is because the payment process will be streamlined by an advanced, third-party provider responsible for measurement, verification, and determination of payouts owed by the utility. The ability to bundle energy efficiency measures into a single contract or program also could lower administrative costs, as customers will not need to apply for different programs (e.g., lighting, HVAC) separately to obtain the associated incentives.

Leverages trusted brand recognition. Utilities are big entities with familiar brands that their customers are already comfortable doing business with. Whether a utility offers EEaaS directly through a program or via a partnership with a third-party EEaaS vendor, its brand recognition is extremely valuable and can be used to lower customer acquisition costs for EEaaS vendors.

As the as-a-service model of doing business continues to disrupt how organizations adopt energy efficiency technologies, utilities have the opportunity to leverage this model to achieve demand cost savings, expand their product offerings, and provide a more comprehensive service to their customers.

[16] "The TRM provides a standardized, fair, and transparent approach for measuring program energy savings across New York State's energy efficiency programs. To do so, the TRM provides standardized energy savings calculations and assumptions at the measure level for estimating energy and demand savings" (New York DPS 2021).

Conclusion

Given the urgency of the climate crisis, long-term and innovative strategies will be required to complete necessary energy upgrades across the built environment. While obstacles remain, clear opportunities exist to reduce energy consumption in commercial and industrial buildings by increasing the use of EEaaS. Since the 1990s, the use of a performance-oriented service contract to facilitate comprehensive energy upgrades has been widespread in intuitional facilities via ESPC. Utilizing an EEaaS arrangement has enormous potential to scale a similar ESA arrangement to achieve deeper retrofits in commercial and industrial facilities, including smaller ones.

There is great opportunity to advance the market demand for EEaaS. There are currently many brands and products that offer an EEaaS-like arrangement. Standardization across the marketplace will go a long way toward reducing the transaction costs associated with an EEaaS agreement, in much the same way as standardization helped scale the onsite solar market via the PPA. A standardized solution will also have great impact in improving customer understanding and acceptance of the transaction. Other key approaches to advance market demand include:

- Making policy changes (e.g., mandatory building performance standards)
- Increasing market awareness and consumer education
- Tapping the potential for EEaaS to serve midsize commercial and industrial facilities

Utilities are a logical partner in helping to bring EEaaS to the marketplace, as they are experts on providing energy services (including efficiency programming) to customers. As states adopt more aggressive carbon reduction targets, EEaaS could offer utilities an additional structure to help meet their energy efficiency and GHG reduction goals. A utility engaged in EEaaS can expect some or all of the following benefits: a strategy for completing deep retrofits, expansion of product offerings, an intuitive way to apply incentive payments for realizing savings, the ability to leverage the utility's trusted brand recognition to reach customers, and potentially lower administrative costs relative to conventional utility efficiency programs.

Although utility involvement in EEaaS is still new, our research indicates that there are many ways for utilities to help scale EEaaS in their service area, such as offering EEaaS solutions to their customers directly, partnering with existing EEaaS vendors, and administering an EEaaS program with ratepayer funds. These efforts are still in the early stages but show promise and will inform future program development. Also, utilities can support broader utilization of EEaaS through education efforts that leverage their existing customer relationships and brand awareness.

Continued research, consumer education, and proof-of-concept case studies will help EEaaS solutions become more widespread across the marketplace.

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Appendix

RESEARCH QUESTIONS

The following questions were used to guide the research and eventual findings of this report.

1. Background questions
    a. What are the key components of EEaaS, and how do they differ from other service approaches?
    b. Who are the key players offering EEaaS and other innovative and scalable pay-for-performance (P4P) approaches?
2. What have been the results from current utility and government partnerships with EEaaS service providers?
    a. Best practices?
    b. Lessons learned?
3. Are there new business models that can encourage further project and program-level partnerships between utilities, government programs, and energy efficiency service providers?
4. Can the as-a-service model be a driver for greater utility involvement in performance-based deep retrofits (as well as involvement in new construction)?
5. Can utilities and governments leverage the EEaaS models to meet program goals such as beneficial electrification, decarbonization, and demand-side management goals?

ADDITIONAL RESOURCES

For more detailed information on the structure of EEaaS, visit the Better Buildings Financing Navigator's Efficiency-as-a-Service tool kit (DOE 2021a).

For more information on utility involvement in pay-for-performance initiatives, visit the Alliance to Save Energy's Active Efficiency Collaborative (Alliance to Save Energy 2020).