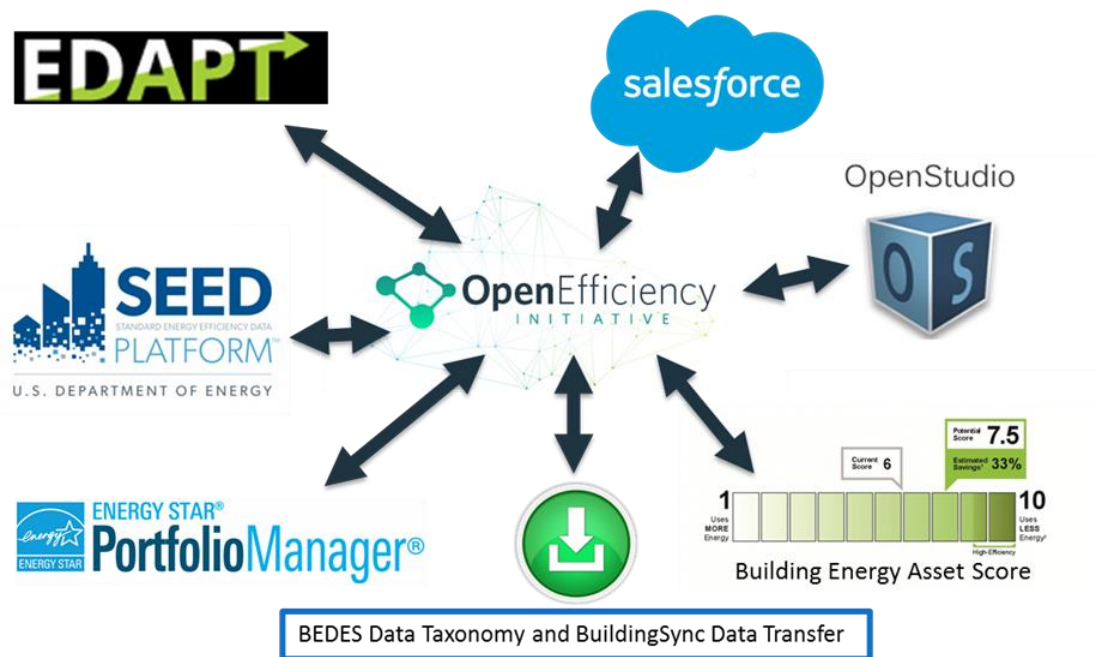


## Commons Energy Case Study: Energy Service Company Services

### Introduction and Overview

The U.S. Department of Energy (DOE) funded Performance Systems Development of New York, LLC (PSD) to develop an integrated open source platform under the Open Efficiency Initiative (OEI), and to evaluate it through a series of whole-building energy efficiency program pilots.

The Open Efficiency Platform (OEP) aims to integrate a suite of DOE and U.S. Environmental Protection Agency (EPA) tools and to expand their use in energy efficiency programs. The OEI's overall goal is to increase the range and depth of energy savings available from commercial whole-building energy efficiency programs through reducing program administrative costs and better aligning program operations with private-sector market experience. Ultimately, OEI seeks to make regulated, commercial, whole-building energy efficiency programs easier to implement and more cost-effective for administrators, with simplified and automated processes for practitioners and building owners.



Demonstration of the OEP occurred through pilots conducted by energy-efficiency program administrators (PAs) who designed each pilot to use relevant components of the OEP. Each pilot was evaluated as a case study based on interviews with key stakeholders and a review of pilot data. This case

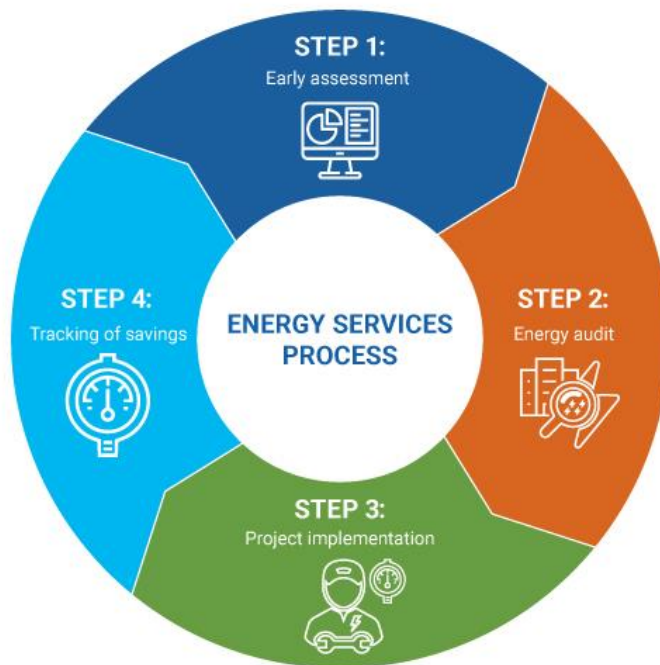
study of the pilot conducted by Commons Energy was prepared by Cadmus.<sup>1</sup> Commons Energy, a subsidiary of Vermont Energy Investment Corporation (VEIC), is a public purpose Energy Service Company (ESCO) that works with municipal and affordable multifamily housing clients to provide turnkey energy financing and services.

The overall purpose of each case study was to evaluate the specific application of the OEP. Being each project was a unique pilot and the number of pilots was limited, the case study approach was the most appropriate research methodology. For each pilot, the case study provided information on the issues OEP was implemented to address, how effective it was, what actions were least effective, lessons learned, and insights about other opportunities for applying OEP.

### **Pilot Description**

In addition to owning Commons Energy, VEIC operates Efficiency Vermont (EVT), an energy efficiency utility in Vermont and the District of Columbia Sustainable Energy Utility (DCSEU). Commons Energy and EVT utilize different databases and systems, but they share many of the same staff.

ESCO projects supported by Commons Energy move from early assessment, to an energy audit, to project implementation, and then tracking of savings. The early assessment is generally a free service, considered a cost of sales, and is an at-risk sunk cost for converting into the audit and then into a contract. The early assessment needs to collect enough information to allow Commons Energy to quickly and cost effectively qualify or disqualify a project. The credibility, cost, and efficiency of the early assessment are critical to Commons Energy because they need to balance their investment in selling the owner on paying for the full energy audit with the at-risk cost of performing the early assessment.



<sup>1</sup> VEIC is a non-profit energy services organization.

This pilot focused on using three of the federal tools shown in the OEP graphic--Asset Score, OpenStudio, and ENERGY STAR Portfolio Manager—to reduce the cost of the early assessment, while providing an OpenStudio energy model that can be expanded upon in the energy audit stage. The pilot aimed to

leverage these components of the OEP and federal tools primarily to increase the return on investment in the early assessments by decreasing their



costs and increasing the likelihood that clients would choose to have a full energy audit.

During the pilot project, PSD trained Commons Energy staff on the use of the Asset Score tool, the exporting of an OpenStudio model, and enhancement of that model with energy use and other operational information obtained from the ENERGY STAR Portfolio Manager.

As part of the pilot, PSD worked with Commons Energy to use the tools to evaluate a sample building. PSD also collaborated with Commons Energy to demonstrate the capabilities of the PSD Compass platform.

Commons Energy conducted audits of a small number of buildings during the pilot using these tools and techniques. The buildings included multifamily residential and office buildings. Commons Energy did not elect to adopt the Asset Score-based audit process for its future projects.

### Assessment of the Pilot

## BUILDING ENERGY ASSET SCORE

### OVERALL BUILDING SCORE

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**BUILDING INFORMATION**

<b>Multifamily Export</b> 124 Oak Street Jacksonville, FL 32099	Building Type: <b>Mixed Use</b> Gross Floor Area: <b>9,600 ft<sup>2</sup></b> Year Built: <b>1996</b>	Score Date: <b>02/12/2015</b> Building ID #: <b>1718</b>
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Current Score **2.5**

Potential Score **3**

Estimated Savings **36%**




Building Use Types	Estimated Source Energy Use (kBtu/ft <sup>2</sup> )	Energy Use Intensity by Fuel Type
Multi-family (4 floors or greater): <b>8,000 ft<sup>2</sup></b>	Current Building: <b>409</b>	Site Energy Use (kBtu/ft <sup>2</sup> )
Office: <b>1,600 ft<sup>2</sup></b>	Upgraded Building: <b>263</b>	Source Energy Use (kBtu/ft <sup>2</sup> )
This report includes a Score for the entire building as well as individual Scores for each of the separate use types.		
		Fuel Type [ Site EUI, Source EUI ] Gas [ 0.7, 0.7 ] Electricity [ 130.1, 408.5 ] District Heating [ 0.0, 0.0 ] District Cooling [ 0.0, 0.0 ]

The Building Energy Asset Score is a national rating system developed by the U.S. Department of Energy. The Score reflects the energy efficiency of a building based on the building's structure, heating, cooling, ventilation, and hot water systems. The building's Structure and Systems are individually evaluated and ranked. The Upgrade Opportunities page provides recommendations for how to improve the building's energy efficiency, increase the building's Asset Score, and save money.

<sup>1</sup>Savings reflect the reduction in source energy that would result from undertaking all of the efficiency improvements identified on the Opportunities page. Actual savings will depend on a variety of factors including actual operating conditions.

<sup>2</sup>A score of 10 represents lowest expected energy usage using current energy efficiency technologies. A score of 8.5 represents a high-efficiency building that uses approximately 30% less energy than a building built to the ASHRAE 90.1-2004 energy code.

This report is based on self-reported building information.  
<http://energy.gov/eere/buildings/commercial/building-energy-asset-score>



## Methodology

Cadmus conducted interviews with the VEIC representative responsible for the Commons Energy pilot project to assess the pilot application of the OEP.<sup>2</sup> We conducted one interview prior to the pilot and one after it was completed. The interviews followed detailed interview guides. The guide used to conduct the final interview addressed the following topics:

- What barriers the OEP and related federal tools helped the pilot project overcome
- What difficulties the pilot project had implementing the OEP and related federal tools
- What benefits OEP and related federal tools offered compared to the conventional approach to implement the pilot project
- What lessons can be learned from this pilot to help improve the OEP and support adoption of federal tools, such as the program's best applications and usefulness (including those for small buildings)
- Other potential OEP applications

In addition to the information we collected from the interview, the PSD project manager provided insights based on working with the Commons Energy team on the project. We integrated this information with findings from the pilot participant interviews.

## Program Barriers

In research based on an extensive literature review, Cadmus identified the following four categories of barriers that usually confront commercial building energy-efficiency programs:

- Uncertainties in energy savings estimates
- Lack of standardized methods for performing energy savings calculations
- Lack of methods to streamline data management
- Costs, especially those associated with estimating energy savings

In this and the other pilot project case studies, we used this taxonomy to structure our investigation of barriers that the project proponents sought to overcome by implementing the OEP.

The Commons Energy representative we interviewed indicated that the primary barrier they faced in providing their ESCO services was the uniqueness of each building. He indicated that the design of Vermont buildings tended to vary and there were not enough buildings constructed that designs would be repeated or similar in multiple buildings. These conditions were more pronounced in the municipal building projects that Commons Energy worked on than in the general population of commercial buildings. One example the respondent described was a complex with numerous small buildings that had to each be modeled because of their differences.

Because the financial viability of ESCO projects depends on reliable energy savings estimates, Commons Energy must take the details of each building into account in its early assessment savings analysis.

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<sup>2</sup> Cadmus also interviewed this project manager for another VEIC pilot project conducted by EVT.

Typically, detailed analyses require creating sufficiently complete building drawings and preparing these drawings is labor intensive. Consequently, modeling each building from scratch to minimize uncertainties in savings estimates is costly and, as noted earlier, Commons Energy does these analyses at-risk. Commons Energy's participation in the OEI was motivated largely by their desire to overcome the modeling cost barrier.

Commons Energy used the OEP in a few projects during the pilot. They had mixed results in trying to overcome the modeling barrier. They found using Asset Score worked very well on a standard office building and multifamily housing containing similar units; both can be simplified by starting with an



available prototype building. The Commons Energy spokesman said, "without Asset Score, we would be drawing the geometry of the buildings, which takes forever. Asset Score helps overcome that if the geometry is not complicated." He went on to note, however, that "if there are a lot of different blocks or shapes are complicated, then it's just as complicated as doing a drawing."

The interviewee envisioned a benefit of using OEP being consistency and

reduced complexity of modifying the original model during the evaluation stage. He believed that it would be possible to generate a model relatively quickly during implementation and then, when the savings estimates were confirmed during evaluation, the initial model could be modified and calibrated easily. They intended to use this approach, though no projects had gone far enough through the process to demonstrate it yet.

### Difficulties Implementing OEP

The major limitation Commons Energy encountered in conducting the pilot was their small project volume. The Commons Energy representative said, "We are only doing 2 to 3 projects per year, and there is not enough repetitiveness to work out the kinks. It's a slower learning process for that reason. If we had 10 to 12 projects per year, it would have been better." He also noted that the project lifecycle they deal with in ESCO projects is very long, so they were not able to test the whole process during the pilot. He said they had just started evaluation, so he was unsure how the Asset Score results would compare to the evaluated savings.

Using Asset Score did not allow Commons Energy to overcome the challenges created by the uniqueness of the buildings for which they provided ESCO services. Reducing the cost and effort required by the early assessment was a primary reason for their participation in the pilot. The small project volume contributed to the lack of success in this area; the Commons Energy representative said, "If we had more projects, we could probably figure it out sooner."

A specific technical issue Commons Energy encountered was in trying to model retrofit measures that affected only certain zones in a building. Asset Score creates a standard perimeter/core zone model. Running OpenStudio with this Asset Score default zoning would not capture most cases where only certain zones are affected. The modeler can create blocks in Asset Score to refine the zones, but this takes more time. PSD worked with Commons Energy to test OpenStudio measures that modified the Asset Score zoning, but results were mixed. PSD expects that, as OpenStudio measures become more powerful and libraries are expanded, creating a more representative model outside of Asset Score will become more cost effective for evaluating measures that impact individual zones.

### **Other OEP Benefits**

Overall, the Commons Energy representative believed participating in the pilot enhanced their staff's building analyses expertise. He noted that participation increased their capabilities using OpenStudio, bringing all the benefits of that tool, and improved their understanding of how to leverage the tool better, integrate external data, and connect to other tools.<sup>3</sup>

The Commons Energy representative noted that their application of OEP demonstrated that it could help them expand the energy-efficiency measures included in their projects. He said, “[with OEP] you can add new measures that would’ve been hard to estimate savings for before or go deeper on projects.”

PSD was able to leverage synergies between this project and other OEI pilot projects and PSD activities. For example, this project provided an opportunity to test some of the techniques for data integration developed through an earlier pilot project PSD conducted using Asset Score. Through outreach PSD conducted with providers of property assessed clean energy financing for commercial building energy-efficiency upgrades (commonly referred to as C-PACE), they found that the project workflow requirements were very similar to Commons Energy’s workflow. This finding suggested that the OEP model used by Commons Energy in their pilot might have much broader applications in the C-PACE and the ESCO markets.

As noted earlier, PSD collaborated with Commons Energy to demonstrate use of PSD’s Compass platform.<sup>4</sup> The demonstrations showed how Compass could take data from OpenStudio and Portfolio Manager and generate an energy audit in Microsoft Word format.

### **Other OEP Application Opportunities**

As suggested above, the OEP configuration tested in this pilot could have applications to other ESCO and C-PACE projects. The C-PACE market has grown exponentially since it was first instituted in California in 2007. As of early 2018, 33 states had passed legislation that allows local jurisdictions to create commercial PACE financing programs.

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<sup>3</sup> The VEIC staff who used OpenStudio for the Commons Energy ESCO projects also supported EVT and these benefits also applied to the services provided by EVT.

<sup>4</sup> Compass performs project tracking functions like those provided by the Energy Design Assistance Project Tracker (EDAPT) pioneered by Xcel Energy with funding from DOE. PSD’s Compass platform was used to integrate the data into a report for each building.

## ***Overall Conclusions and Recommendations***

Although a single case study does not provide enough evidence to draw many generalizable conclusions, this pilot project highlighted observations that can be applied broadly to other situations and programs.

Key conclusions from this case study include the following:

- Asset Score can simplify modeling of buildings with standard designs that can be easily represented in the software, but it may not be adequate for developing models of buildings with more complex designs.
- It is likely that an Asset Score model developed during the early assessment stage can be modified fairly easily during the evaluation stage to reduce the costs of calibrating the model and analyzing performance.
- Although applying OEP to integrate functionality of Asset Score, OpenStudio, and Portfolio Manager may benefit ESCO projects, the cost and disruption resulting from adopting an OEP approach that differs much from the existing approach can be best absorbed and managed in programs with relatively large project volumes; it may be too costly and disruptive to make this change in programs with small project volumes.
- The time required to test an OEP approach from program design through evaluation depends on the length of the life cycle of projects conducted in the program.
- Participating in a project to demonstrate an approach such as the OEP can enhance staff capabilities.
- Because the pilots in this DOE-funded test bed came on line at different times, PSD was able to use the learnings from early pilots in this and other later pilot projects.

Based on our review of this pilot project we make the following recommendations:

- Organizations providing 10 or more energy-efficiency upgrades annually through ESCO and C-PACE services should consider adopting an approach incorporating OEP and federal tools including Asset Score, OpenStudio, and Portfolio Manager.
- Organizations considering adopting OEP for ESCO projects should take into account indirect benefits such as improvements in staff capabilities and reduced costs of verifying energy savings.
- DOE and program administrators should draw upon the lessons learned from the set of case studies prepared for the OEI pilot projects.