# Xcel Energy Case Study: Improved Program Reporting

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.
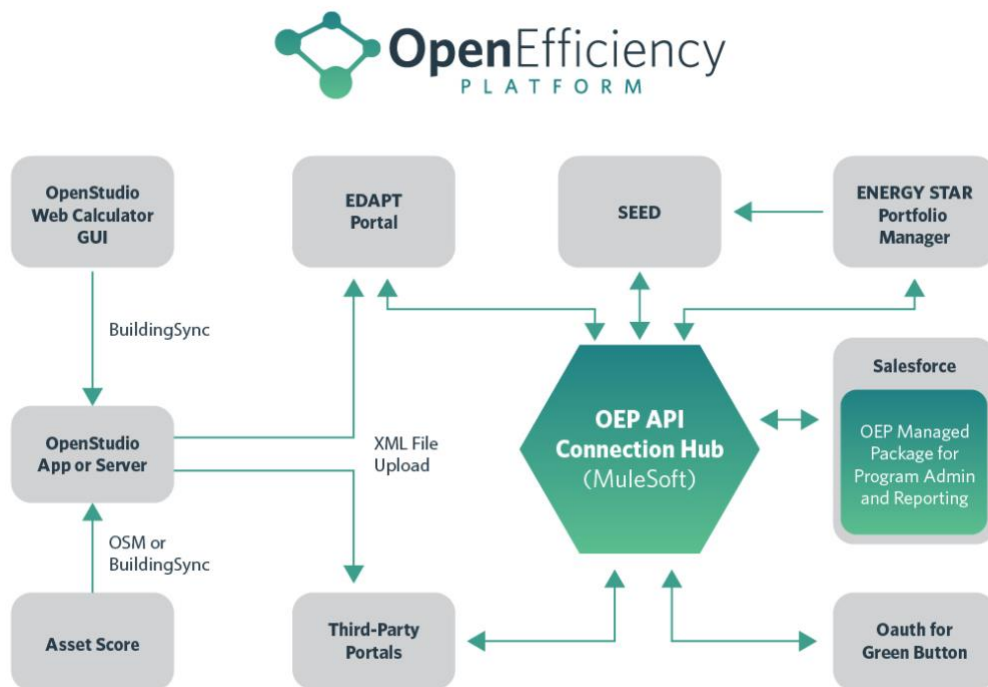
Demonstration of the OEP occurred through pilots conducted by energy-efficiency program administrators (PAs) who designed each pilot to use relevant components of the OEP. Each pilot was evaluated as a case study based on interviews with key stakeholders and a review of pilot data. This case study of the pilot conducted by Xcel Energy was prepared by Cadmus.[1] Xcel Energy is a utility holding company based in Minneapolis serving customers in eight states. Xcel Colorado (referred to as Xcel hereafter) conducted this pilot project.

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

Xcel implements four energy-efficiency programs for commercial buildings: a multifamily direct-install program, the Energy Design Assistance (EDA) program, the Energy Efficiency Buildings program for mid-size commercial buildings with an a la carte menu of energy-efficiency measures, and a data center program. Xcel applied the OEP to its EDA program. The program offers free services, rebates, and design team reimbursement to participating customers for new construction and major renovation projects.

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[1] VEIC is a non-profit energy services organization.

Xcel worked with PSD to investigate the tools incorporated in OEP and decided to focus on OpenStudio, EDAPT, and Salesforce. Xcel uses both EDAPT and Salesforce extensively.[2] While OpenStudio is a core

part of the savings calculation process for this program, Xcel does not run OpenStudio in house but has external contractors who perform the OpenStudio runs the utility requires.

This pilot project aimed to extend connectivity between the EDAPT platform and the Xcel Salesforce program tracking system. Xcel transfers data from EDAPT into the Salesforce system and had been doing this using a file import system. Staff in the EDA product management group found using this system that other associated parties within Xcel, such as engineering and account management, were having trouble keeping track of things affected by the EDA program like engineering tasks and forecasted project achievement.

When PSD reached out to Xcel about participating in the OEI, Xcel staff were very interested in using it for many different applications. Xcel saw the opportunity to use OEP to improve the connectivity between EDAPT, which they already used, and other tools in the OEI suite. They originally considered including Portfolio Manager in their pilot, but the most significant need they could identify was for their new buildings EDA program and when they decided to focus on new construction they narrowed the scope to Salesforce, OpenStudio, and EDAPT.

PSD worked with the Xcel program managers to investigate the option of using the Mule[3] application program interface (API) hub to provide the desired connectivity. They presented their assessment to the Xcel information technology (IT) managers. This approach was rejected, but Xcel did adopt the OEP managed package program data model to provide the functionality required for connecting with Salesforce.[4] This managed package provides a secure footprint for data to be loaded into Salesforce from external sources. The data model supports a wide range of program models and includes the EDAPT reporting fields. The managed package is composed of BEDES[5] terms and incorporates program

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[2] EDAPT is the Energy Design Assistance Project Tracker, pioneered by Xcel Energy and partly funded by DOE. EDAPT connects project data with model outcomes to streamline reporting.
[3] Mule is a lightweight enterprise service bus (ESB) and integration framework provided by MuleSoft.
[4] The OEI Managed Package is an OEI deliverable that was not in the original contract with DOE but emerged as PSD needed to make the connection to Salesforce more consistent and distributable.
[5] BEDES is the Building Energy Data Exchange Specification. It is a dictionary of terms, definitions, and field formats that was created to help facilitate the exchange of information on building characteristics and energy use. DOE funded its development and developed it in conjunction with the private sector.

reporting relevant elements of other data models including exports from OpenStudio, Asset Score, and ENERGY STAR Portfolio Manager XML,[6] in addition to EDAPT export.

PSD also had the opportunity to leverage outcomes from another OEI pilot project in the Xcel pilot. PSD worked with Xcel Energy Product Managers to model a range of Variable Refrigerant Flow (VRF) heating and cooling systems using the VRF OpenStudio calculator developed earlier in a different pilot.

Assessment of the Pilot

Methodology

Cadmus conducted an interview with the Xcel associate product portfolio manager who was involved directly in this pilot. We conducted this interview after the pilot had been implemented. Cadmus attempted to conduct an interview early in the pilot but was unable to schedule it with Xcel. The interview followed a detailed interview guide. 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 Xcel team on the project. We integrated this information with findings from the pilot participant interview.

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.

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[6] XML stands for Extensible Markup Language, which is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

The Xcel representative we interviewed indicated that the primary barrier they faced in their EDA program was related to data management issues involving internal program tracking and communications. As noted earlier, they found that other entities within Xcel were having trouble keeping track of things affected by the EDA program. Although Xcel was already using EDAPT and Salesforce, they were relying on a spreadsheet to provide connectivity between the two systems and the spreadsheet had to be updated manually, was not updated consistently, and occasionally contained errors.

steps in EDAPT processs

EDA and Construction Process

1 Applicaton

Pre-design Phase

- Fill out *on-line Application* on the Application tab. Information on the project, customer, design, team, certification plans, schedule, project details, design consideration options, and the terms and conditions are covered in the Application
- **Submit** • Submit Application for approval

◆ Xcel Energy Review   ▼ approval, move to next step   ▲ rejected, review notes from Xcel Energy

2 Introductory Meeting (Intro)

Design Phase

Tasks for the Energy Consultant (EC):
- Download the *Intro Meeting Report* template. It is pre-populated with information from the Application and the Project Info
- Hold Intro meeting
- Revise *Intro Report* based on details of Intro Meeting
- Upload Report
- Update Project Info
- **Submit** • Submit for approval

◆ Xcel Energy Review   ▼ approval, move to next step   ▲ rejected, review notes from Xcel Energy

3 Preliminary Energy Analysis (PEA)

Schematic Design

Tasks for the Energy Consultant (EC):
- Upload the *OpenStudio* modeled baseline and energy efficiency measures
- Download *PEA Report* template
- Revise *PEA Report*. Hold PEA meeting
- Upload Report
- Update Project Info as needed
- **Submit** • Submit for approval

◆ Xcel Energy Review   ▼ approval, move to next step   ▲ rejected, review notes from Xcel Energy

4 Final Energy Analysis (FEA)

Design Development

Tasks for the Energy Consultant (EC):
- Upload the *OpenStudio* modeled baseline and design alternatives
- Download *FEA Report* template
- Revise *FEA Report*. Hold FEA meeting
- Upload *FEA Report*
- Submit for Approval
- Upload the customer's final design alternative from OpenStudio
- Update Project Info as needed
- **Submit** • Submit for approval

◆ Xcel Energy Review   ▼ approval, move to next step   ▲ rejected, review notes from Xcel Energy

5 Construction Document (CD) Review

Construction

The construction document review begins with the Measurement & Verification Consultant (MVC). Tasks for the MVC:
- Download *CD Review* template
- ◆ Review the construction documents and check for all energy efficiency measures from final *design alternative*
- Revise *CD Review* template based on constructions document review
- Upload *CD Review*

Tasks for the Energy Consultant (EC):
- Upload the OpenStudio updated model based on *CD Review*
- Download *CD Report* Template
- Revise *CD Report* (include MVC's *CD Review*)
- Upload *CD Report*
- Update Project Info as needed
- **Submit** • Submit for approval

◆ Xcel Energy Review   ▼ approval, move to next step   ▲ rejected, review notes from Xcel Energy
EC and Design Team payment

6 Measurement & Verification (M&V)

Construction Complete

Measurement and Verification begins with the Measurement & Verification Consultant (MVC). Tasks for the MVC:
- Download *M&V Review* template
- Conduct field verification
- Revise *M&V Review* based on field verification
- Upload *M&V Review*

Tasks for the Energy Consultant (EC):
- Upload the OpenStudio updated model based on field verification results
- Download *M&V Report*
- Revise *M&V Report* (include MVC's field verification)
- Upload *M&V Report*
- Update Project Info
- **Submit** • Submit for approval

◆ Xcel Energy Review   ▼ approval, project complete   ▲ rejected, review notes from Xcel Energy
Customer and EC payment
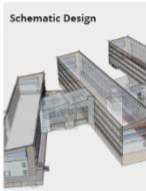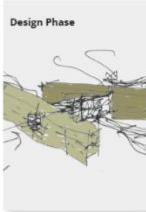
To resolve the problems transferring data from EDAPT to Salesforce, PSD worked with the Xcel program managers to adopt the OEP managed package program data model. As described earlier, the original intent was to provide the required connectivity using the Mule API hub, but Xcel opted to connect directly to OEP Managed Package instead. PSD worked with Xcel to overcome many challenges making the transition and the Xcel respondent we interviewed said that the adoption process is ongoing.

Xcel had also experienced issues in the EDA program with their energy savings estimates. The Xcel representative indicated it was "not so much a lack of confidence in energy savings, but an asymmetry between what is permitted under energy modeling standards and the regulatory requirements imposed by the [Colorado Public Utilities Commission]." For forecasts, they found the data was not being updated so they developed simplifying approaches to forecast savings opportunities using a percentage based on historical data. However, given the long life-cycle of projects, the portfolio contained projects of different vintages and changes in regulatory policies and rules over time affected how savings and other metrics were treated for different projects. Consequently, a simple percentage was not a very accurate predictor of savings.

The Xcel interviewee said, "Our work with the OEP helped to increase transparency of the EDA product's forecast achievement on a portfolio level in our CRM system. It

has also helped our account management team manage their forecast targets, and our engineering managers keep track of their team members' tasks/action items." He explained the increase in transparency resulted from the fact that "now that systems are linked, they have the project data coming in with a date attached so they know what year it will come in versus before it was a manual process. This has been a significant benefit; people are able to run reports quickly to get the information they need."

The program also had experienced some issues with lack of standardization in savings estimates. Project savings were estimated using various tools including OpenStudio/EnergyPlus, DOE2/eQUEST, and IES (developed by Integrated Environmental Solutions Ltd.). In addition to the lack of consistency, Xcel was uncertain about which tool would provide the best benefits in both the short and long term.

The Xcel representative did not indicate participating in the OEI had helped overcome any issues involving standardizing energy savings estimation. Xcel relies on local consultants to perform its OpenStudio/EnergyPlus analyses. However, he believed that Xcel's savings analyses had benefitted from the OEP because they continued to use the OpenStudio measure that PSD had developed for Xcel (as a result of another OEI pilot project) to calculate savings for VRF systems.

The Xcel respondent was not involved in the early stages of the OEP pilot so could not comment on cost issues during program design or implementation.[7] However, he stated that program costs present numerous barriers during program evaluation. He noted, "It can be costly to revisit buildings one, three, or five years after the first measurement and verification (M&V) analysis has been performed, though [updating this type of information] can be valuable for efforts such as benchmarking, recommissioning, and identifying changes in the energy performance of end-use equipment." Based on this observation, we anticipate that the tracking enhancements offered by Xcel's OEP implementation could reduce costs of these efforts over the project life cycle.

Difficulties Implementing OEP

The Xcel representative indicated that most of the difficulties they encountered in implementing the OEP centered around IT issues and data management. He described a fundamental challenge they had— they discovered internal cross-function process difficulties when they tried to implement OEP's data sharing capabilities. He noted, that, "Like many organizations, Xcel has many different groups that possess operational specialties. At times it can feel like a project can be 'tossed over the fence' to the next group as a project progresses without that next group understanding the greater project scope or the actions leading up to the tasks assigned in the next stage." According to the Xcel respondent, the nuances associated with the EDA products complicated this situation because of differences between this program and others, including the use of acronyms with different meanings to other groups. The result was it took effort to get the other parties and organizations at Xcel to see the big picture on what the goal was of implementing OEP and why the changes where needed to implement it.

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[7] A paper written about Xcel's experience with EDAPT by itself showed that the utility saw roughly a 15% reduction in administrative costs, more projects given the increase in energy consultants, and quality modeling results. See Elling, J., L. Brackney, and A. Parker. "Energy Design Assistance Project Tracker (EDAPT): A Web-Based Tool for Utility Design Assistance Program Management." 2014 ACEEE Summer Study on Energy Efficiency in Buildings.

Another challenge they encountered was how to accommodate the scope of capabilities offered by the OEP. With the full suite of tools and capability offered by the OEP, Xcel found that it required more resources than they had available to realize the benefit of its full implementation. The Xcel respondent said, "we had to 'pick and choose' which tools to implement in order to provide maximum benefit in the EDA product given our resource constraints." Initially, Xcel worked closely with DOE, NREL, and PSD, but ended up moving away from PSD and the full OEP portfolio when they realized they needed something smaller in scale.

Xcel had already been using EDAPT and, based on internal business needs, they focused on the opportunity to include EDAPT, Portfolio Manager, and Salesforce. They dropped Portfolio Manager because it required a large IT implementation activity and they wanted to take the adoption in smaller, more manageable pieces.

When they tried to create a data map between EDAPT and Salesforce they found that many fields in EDAPT either did not need to be transferred to Salesforce or did not have a corresponding field in Xcel's Salesforce design. This produced numerous errors during their initial tests, leading Xcel to scale down the data mapping to essential data. Xcel is continuing to work on this.

A similar challenge was reconciling the difference in units used in the two systems. For example, Xcel's systems, including Salesforce, track energy use in kWh but EDAPT uses Joules to record energy. Xcel has introduced some conversion factors in the transfer process to resolve this inconsistency, but these changes are not complete yet.

One relatively minor difficulty they had was when Xcel encountered minor IT security issues in trying to implement the data transfer. These were caused by Xcel's firewalls and they were overcome easily.

One overall sentiment expressed by different groups at Xcel was that the they would have wanted the adoption of OEP to be a turnkey process for integrating their databases. This view reflects the various challenges described above that they had adopting it.

Other OEP Benefits

There were a few benefits of Xcel's participation in the OEI pilot in addition to the direct benefits described above. The Xcel representative indicated that the pilot led to automation of project update data and the strengthening of Xcel's Salesforce system as it related to Xcel's demand side management (DSM) portfolio in Colorado.

The Xcel representative also said that the OEP, in consultation with Xcel, offered the opportunity for customers to identify efficiency measures that they might have missed initially.

As noted earlier, Xcel was able to use a VRF measure developed in OpenStudio during another OEI pilot to calculate energy savings. The Xcel representative believed that this tool was still in use.

Other OEP Application Opportunities

The Xcel manager we interviewed identified several possible opportunities for applying OEP at Xcel and possibly other utilities. He indicated that they are in the process of launching the next phase of their

DSM plans and he had an interest in exploring other OEP tools and leveraging OEI further with the change in program design.

One area the representative indicated he would like to explore was related to their challenges tracking EDA project performance and savings over several years. He said, "Ideally we would like to see these EDA projects' performance stats to be integrated into tools such as Portfolio Manager so that we can track how a building's performance X years after M&V compares with the as designed model/as verified building." This process would allow real-time comparisons that can help identify qualitatively where discrepancies are taking place. He noted that this would help them identify future building energy intervention opportunities at both the whole-building and equipment level.

Another opportunity he mentioned was retrocommissioning and benchmarking. He said that tools such as Asset Score and Portfolio Manager could provide valuable data for prospective retrocommissioning and benchmarking projects by providing a standardized means for comparing a single building's energy performance to groups of similar buildings determine prospective project potential.

When we asked about opportunities to apply OEP in small commercial buildings, the Xcel representative mentioned as potential targets custom lighting and envelope measures. He also suggested applying it in programs for small building tune-ups and measure direct installs

The Xcel representative also noted that the OEP might be able to help optimize the energy modeling process for a utility with a large amount of wind in its generation mix.

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:

- EDAPT can be an effective tool for tracking energy-efficiency programs and its usefulness can be significantly enhanced by developing connectivity with other utility data systems.
- OEP can provide connectivity between legacy systems, such as EDAPT and Salesforce, but challenges are likely.
- The implementation of OEP with EDAPT and Salesforce is likely to benefit performance tracking after initial M&V is conducted.
- There are likely to be IT issues that must be resolved when inserting OEP tools and connectivity into a system of legacy tools.
- Although several of the tools in OEP may provide benefits to a utility, it may be challenging to adopt more than a few at one time.
- The existing organization structure within a utility may present a challenge for adopting OEP if internal communications are limited and each unit is somewhat isolated.
- OEP does not provide a turnkey adoption process and the tools may need modifications to allow successful integration.

- OEP could be useful in retrocommissioning, benchmarking, and small building programs with custom measures.

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

- Program administrators not using EDAPT for program tracking should investigate its features and applicability.
- Program administrators using Salesforce that adopt EDAPT should consider using the OEP to develop connectivity between the two tools.
- Organizations considering implementing OEP should prioritize the available tools and select only those that can be adopted manageably with minimum disruption.
- Program administrators that adopt OEP should maintain effective communication and record keeping ensuring all affected parties are looped in throughout the entire process.
- DOE and program administrators should draw upon the lessons learned from the set of case studies prepared for the OEI pilot projects.

One comment of the Xcel representative provided an encouraging snapshot of his experience with the pilot. Although this pilot encountered obstacles, he said, "my experience so far with EDAPT and OEI has been fantastic, so I'm surprised not many other utilities have adopted it because it's a great tool…it's an amazing treasure trove of information and tools within OEI." He went on to qualify his observation by noting that he works in a niche corner of DSM, the new building area, and observing that "maybe it's underpromoted."