Auto M&V Industry Brief: How Fast is the EM&V Paradigm Changing?

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Acknowledgements

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About NEEP

NEEP was founded in 1996 as a non-profit whose mission is to serve the Northeast and Mid-Atlantic to accelerate energy efficiency as an essential part of demand-side solutions that enable a sustainable regional energy system. Our vision is that the region will fully embrace next generation energy efficiency as a core strategy to meet energy needs in a carbon-constrained world.

Disclaimer: NEEP verified the data used for this white paper to the best of our ability. This paper reflects the opinion and judgments of the NEEP staff and does not necessarily reflect those of NEEP Board members, NEEP Sponsors, or project participants and funders.

Introduction

The Regional EM&V Forum has been tracking the emergence and evolution of the auto M&V industry and summarized some observations in the white paper released in December 2015, The Changing EM&V Paradigm[i]. As this industry continues to evolve, we find continued opportunities to learn about these tools and their potential roles in EM&V from tracking the growing number of applications and case studies.

Background

The purpose of The Changing EM&V Paradigm study was to characterize the trends in tools and services pertaining to data collection and analytics that provide automated, ongoing analysis of energy consumption data, a process referred to here as "auto M&V." It also explored if and how these tools can be leveraged for EM&V – to speed up delivery of results, or reduce costs – and whether they can maintain or improve the accuracy and reliability of EM&V. The paper included two case studies of experience with use of auto M&V tools, as well as descriptions of several automated M&V products and vendors.

Among the broad themes emerging from the study was the finding that advanced data collection and analysis tools and systems offer new opportunities for understanding and engaging customers, offering value to project and program delivery as well as to evaluation. One of the key recommendations from the study was to track emerging product and service offerings for auto M&V, and continue exploring the benefits and costs of incorporating the new capabilities into program delivery and evaluation.

Objectives

The objective of this brief is to provide a high level scan of the auto M&V industry as a partial update on The Changing Paradigm to increase our understanding of the evolution of auto M&V. Specifically, it provides an inventory and overview of vendors - companies and software tools - on the market currently. It also provides case studies illustrating the information publicly available about various types of experience with use of auto M&V tools. The information contained in this brief was obtained by a combination of web searches and telephone interviews conducted in summer through early September of 2016.

Industry Overview and Vendor Profiles

Our industry scan identified 19 vendors that provide auto M&V products and services nationally or internationally. These 19 vendors were organized into a table (see Appendix A) with the following fields: name of company, utility customer sector, type of platform or service, type of data used, vendor clients, and geographic region. The vendors in this Table are listed below:

- Aclara
- Agentis Energy
- Apogee Interactive Inc.
- Bidgely
- BuildingIQ
- Ecova
- Energy Orbit
- Energy Savvy
- EnerNOC
- FirstFuel
- Gridium
- Lucid
- Nexant
- Onzo
- Open Energy Efficiency
- Opower
- Performance Systems Development
- Tendril
- Terracel Energy

Given that this industry is constantly evolving, growing in size and types of applications of auto M&V tools, it is important to recognize that this brief is illustrative rather than comprehensive. See Appendix B for a list of vendors identified but not included in the research covered in this brief.

High level review of information from the table is provided in the following takeaways:

Key Takeaways

- *Focus is on commercial*. Overall, the companies in the table work with commercial customers 84 percent of the time. However, the residential sector is not far behind with half as many companies working with residential customers.
- *Majority of SaaS vendor's clients are utilities*. Eighty nine percent of vendors serve some type of utility customer – IOUs, cooperatives, or public utilities. Other clients of the platforms include energy service providers, businesses, and government with 21 percent, 16 percent, and 11 percent of SaaS vendors serving these clients respectively.
- *SaaS vendors are having impacts across the globe*. Fifty two percent of the vendors serve multiple countries including Africa, Europe, Asia, and Australia.
- *Granularity is key.* Eighty nine percent of the SaaS vendors in the table use intervals that can be as granular as sub-hourly. In addition, 71 percent of the sub-hourly capable vendors augment the interval data with other types of data such as weather data.

Utility Customer Sector: *Currently the industry provides more market offerings for commercial and industrial applications than for residential. Our scan identified:*

- Forty two percent of companies work with commercial customers (eight commercially focused platforms);
- Sixteen percent of companies work only with residential customers (three strictly residential platforms);
- Forty two percent of companies work with commercial and residential customers (eight residential and commercial platforms);

- Big focus on commercial customers as 84 percent of companies' products are focused on commercial needs.

Public or Proprietary: *The overwhelming majority of vendors identified in the industry scan operate under a proprietary model:*

- Seventy nine percent of companies are proprietary (15 companies operate under proprietary models, the most common form of ownership out of those companies in the table);
- The remainder of the companies are some form of public or transparent models.

Geographic Region: *Vendors operate across a broad geographic range pointing to the success and effectiveness of SaaS companies in managing energy use.*

- Six companies operate strictly in the United States;
- Fifty two percent of companies serve multiple countries. Seven companies have expanded their operations to include North America and parts, if not all, of Europe. Two of the seven companies have expanded operations further to serve Australia;
- Three companies operate globally;
- A majority of companies focus their operations close to home, with 68 percent serving the United States.

Vendor Clients: *The utility is the most commonly served clientele*:

- The focus of the SaaS vendors is on the utility sector with 89 percent of vendors serving some type of utility customer (IOUs, cooperatives, public utilities).

Type of Data: *Interval data is utilized by nearly all of the vendors and more than half supplement interval data with other types of data like weather or building type:*

- Eighty nine percent of the SaaS vendors make use of interval data that is more granular than monthly billing data. Much of the granular data was sub-hourly.
- More than half of the vendors in this table use other types of data to supplement the interval data. Other types of data include weather, square footage, and building type.

Case Studies

The Value of Case Studies

Case studies are beginning to provide evidence for some elements of the value proposition that was identified for auto M&V in The Changing EM&V Paradigm report. While it is evident that there are many auto M&V software tools, it is difficult to generalize on the nature of the applications of these tools, beyond that they largely serve utility customers in both sectors. From research findings summarized by Lawrence Berkeley National Laboratory (LBNL)[ii], we know that the tools:

- Often focus on benefits to program administrators;
- Vendors often are not yet addressing use of tools to claim/evaluate savings;
- Tools may or may not be public, which poses challenges for synthesizing some research results across cases.

LBNL also observed:[iii]

- Proprietary commercial tools are generally as accurate (or more so) as industry standard models for characterizing existing use baselines. Currently the industry provides more market offerings for commercial and industrial applications than for residential;
- M&V is often bundled with other analytics for site operational efficiency;
- C&I applications for M&V typically rely on whole-building and submeter-based approaches and also some calibrated simulation;
- Residential applications for M&V typically rely on comparison group and building-level approaches.

When it comes to impact evaluation, the industry has the smallest amount of cases and experience. Going forward, a combination of pilot projects and case studies in which M&V tools are used in evaluation or compared to historical evaluations holds promise for increasing knowledge in this area.

Overview of Case Studies

Six vendors with case studies are presented here. Three address commercial or industrial applications and three are residential.

Commercial/Industrial Case Studies	Residential Case Studies
FirstFuel	OPower
Gridium	EnergySavvy
EnerNoc	Resi Speak

The cases illustrate that these tools are serving a wide variety of clients and needs. Cases include applications involving between one and three buildings to programs or clients with thousands or hundreds of buildings. The interval data being used ranges from five-minute to bi-monthly. The clients range from utilities to environmental organizations to large individual C&I customers. The applications of the tools vary; they include quantifying energy program impacts, process impacts to optimize program delivery, identifying peak demand savings opportunities, other diagnostics or identifying opportunities for savings, as well as one research case comparing tools' performance with respect to accuracy in building simulation. In all but the research example, data analytics, automated M&V, early and continuous feedback and/or customized reports were used to engage customers to take actions to improve energy efficiency and to keep them engaged in energy efficiency actions and behaviors over time.

Commercial Case Studies

FirstFuel[iv]

This case study examines Southern California Edison's (SCE) Preferred Resources Pilot (PRP), a "multiyear study designed to determine if clean energy can be used to offset increasing demand for electricity" (Energy Efficiency Impact Study for the Preferred Resources Pilot, Feb 2016). SCE is interested in measuring the resulting savings from energy efficiency projects in the PRP, both at the individual customer level and on the grid level. To accomplish this type of analysis, SCE contracted FirstFuel to analyze the energy use of 62 commercial customers that installed energy efficiency measures in the PRP area. In order to perform this level of analysis, FirstFuel had to first generate a baseline model for each building based on customer smart meters, Advanced Metering Infrastructure (AMI) data. The models took into account a variety of conditions that the building would face throughout the year and built a weather-normalized "business as usual (BAU)" prediction. The difference between BAU and the actual metered consumption provides estimates for the change in usage over time. This in turn will provide an estimate for the grid-level impacts of implementing the efficiency measure.

FirstFuel selected customers to analyze based on the following parameters: those that had installed energy efficiency measures after September 30, 2012 and also had demand savings claims of at least 15 kW, or those that had reported savings of at least five percent of their total peak kW. These parameters returned a total of 62 customers. Out of the 62 customers, only 54 customers' energy use patterns could be modeled with statistical confidence.

Across those 54 customers, FirstFuel found that there is a net decrease in total consumption and demand after implementing energy efficiency measures, with almost half of the customers appearing to have made behavioral changes as well as the efficiency measures. FirstFuel calculated an estimated 531 kW of power savings.

Gridium[v]

Gridium's software tool, which predicts building energy consumption, was one of many products included in research conducted by Lawrence Berkeley National Laboratory (LBNL) to test the predictive accuracy of automated M&V tools[1]. The research assessed the predictive accuracy of ten M&V baseline models, against a set of interval electric meter data from 537 commercial buildings.

For each of the buildings, 15 minute whole-building electric meter interval data was gathered. The data was divided into periods of 12 months, nine months, six months, and three months of hypothetical training periods and prediction periods of 12 months. The meter data was hidden from the model in the prediction period. The trained model would then forecast the building's load throughout the prediction period, and this prediction was then compared to the actual meter data that had been hidden.

The study concluded that "overall, the interval data baseline models that were tested were able to predict whole-building energy use with a high degree of accuracy for a large portion of the 537 buildings in the test dataset." When compared to one another, "the magnitude of the difference in [median] errors between models was quite small." Figure 1 shows an excerpt of the findings, for the case in which 12 months of training data was used to predict 12 months of consumption.

[1] Granderson, J, Touzani, S, Custodio, C, Sohn, M, Jump, D, Fernandes, S. 2016. Accuracy of automated measurement and verification (M&V) techniques for commercial buildings. Applied Energy 173: 296-308.

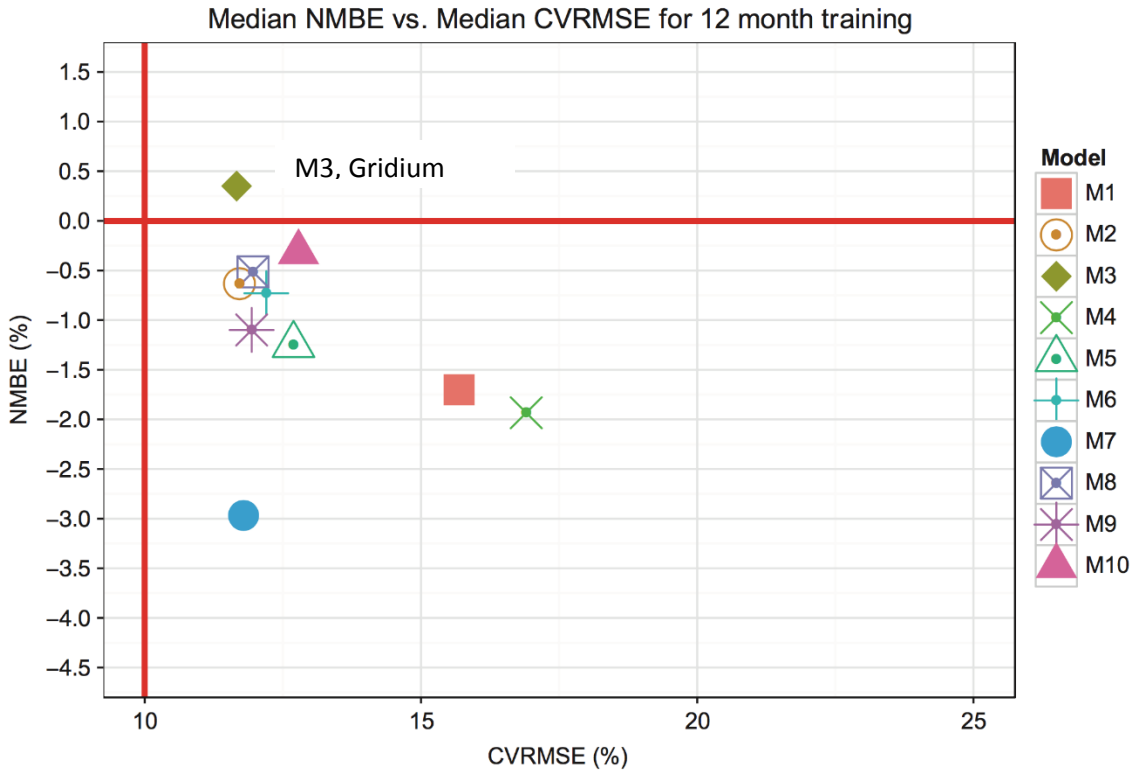

Figure 1: Median accuracy for daily energy totals, for each model tested, for a 12-month training and 12-month prediction period.

In Figure 1, two metrics for accuracy are represented. The normalized mean bias error (NMBE) indicates the total percent difference between model predicted energy use and actual metered energy use, with intuitive implications for the accuracy of avoided energy use calculations. The coefficient of variation of the root mean squared error is reflective of the model's ability to predict the overall load shape that is reflected in the data. It is a principal metric in ASHRAE Guideline 14, a recognized industry standard for calculating energy, demand, and water savings, and may be used to calculate the uncertainty or precision (due to model error) in the savings that are calculated using the model.

EnerNOC

EnerNOC is a large provider of services and software designed to apply to the commercial and industrial sector. Sites using their products include commercial buildings, supermarkets, industrial sites, and universities. Their software helps maximize customer engagement and the value of demand-side resources, including demand response and energy efficiency. The cloud-based Energy Intelligence Software (EIS) for enterprise includes budgeting and procurement, utility bill management, facility optimization, visibility and reporting, project tracking, demand management, and demand response. In this case study we profile four examples illustrating how EnerNOC's EIS solutions serves different clients: EMD Millipore, the Commonwealth of Massachusetts Government, a Mid-Atlantic supermarket chain, and a lumber manufacturer in Maine.

EMD Millipore[vi]

In 2007, EMD Millipore, a global life sciences leader, decided to pursue the goal of reducing energy use. As is the case with many labs, the HVAC system and energy inputs into the lab are very sensitive, making energy draw significant and energy efficiency challenging. With this in mind, Millipore deployed EnerNOC's energy intelligence software to manage energy consumption.

Millipore already had a building management system (BMS) in place, but even so, the building faced energy efficiency challenges. The BMS provided many data points, but Millipore required software that could filter and mine the raw data to identify new energy efficiency opportunities. With EnerNOC's energy intelligence software deployed, Millipore and EnerNOC collaboratively identified efficiency upgrades including: replacing malfunctioning components, addressing filter and complex building pressure issues, optimizing scheduling, and adjusting seasonal scheduling. Addressing these issues helped Millipore realize $75,000 in annual savings.

Commonwealth of Massachusetts Government[vii]

The Massachusetts Department of Energy Resources (DOER) sought to deploy an Enterprise Energy Management System to assist its energy management team monitor the vast array of buildings under control by the Massachusetts government. The DOER selected EnerNOC's Software-as-a-Service energy intelligence software platform as the foundation of the Energy Management System and were soon saving $2.6 million dollars in annualized savings. EnerNOC was able to achieve such high annual savings by focusing on: project planning across entire groups of buildings to identify good targets for investment; operational savings using diverse data inputs to identify operational process adjustments and demand savings; persistent savings through continuous monitoring and spotting of potential energy waste; maintenance cost avoidance through fault detection; and measurement and verification to show "compare-to-past" operations and provide timely feedback on program impacts.

EnerNOC's energy intelligence software has helped the Commonwealth of Massachusetts Government save money, identify projects that will have the biggest return on investment, free up staff to use their time more effectively, and better compare energy use by building.

Mid-Atlantic Supermarket Chain[viii]

Faced with high operational costs and thin profit margins, a regional supermarket sought to control energy use and pad profit margins by deploying EnerNOC's energy intelligence software. Utilizing EnerNOC's software allowed the supermarket chain to realize $375,000 in annual savings via participation in PJM's demand response market and fine-tuning operational expenses.

Today, more than 150 of this chain's supermarkets stream real-time data into the EnerNOC platform, which is integrated with the stores' building management system. This allows EnerNOC's software to

automatically initiate the stores' energy reduction plans when PJM initiates a demand response event, generating over $200,000 in annual payments to the supermarket chain.

An added benefit of the 150+ stores streaming data is that the supermarket's management team can quickly identify which stores were using energy in the least efficient, most costly manner. With the poorly performing stores identified, management deployed EnerNOC's professional energy intelligence software package and were then able to quickly identify significant energy savings opportunities that required little or no capital investment. Furthermore, EnerNOC's five-minute interval energy consumption analysis enabled EnerNOC to optimize operational schedules to reflect the best practices for holiday operational schedules and setback practices.

Maine Lumber Manufacturer[ix]

To help reign in energy costs and control peak demand charges, a Maine lumber manufacturer deployed EnerNOC's energy intelligence software. EnerNOC helped the company save $80,000 annually by bringing peak demand charges under control, and assess whether previously implemented energy control measures were effective.

Despite having energy saving practices previously implemented, there was no way for the company to determine the success of those practices. EnerNOC was able to determine how effective those practices were and if there were opportunities for additional savings. Once those practices were adjusted, EnerNOC was able to track the improvements in real-time using a feature called "compare-to-past".

In order to control peak demand charges, EnerNOC first had to provide the company with visibility into which equipment was causing demand spikes. EnerNOC's software was able to pinpoint the equipment that was responsible for the demand spike and determine the reason why the equipment would suddenly spike. Additionally, the software was able to tell by the minute whether or not the peak demand reduction strategy that was implemented was being adhered to, allowing the Company to communicate the importance of sticking to the demand reduction plan to its employees.

Residential Case Studies

Oracle/Opower[x]

This case study focuses on a type of program commonly known as Home Energy Reports (HERs). HERs programs use either monthly billing data or AMI meter data to deliver customized information on energy consumption to participating households. The report compares the household's energy consumption to that of similar neighboring homes and provides personalized tips on how to save energy and encourage participation in other utility energy efficiency programs.

Since 2008, Puget Sound Energy (PSE) has included an Opower-administered HERs program in its energy efficiency portfolio. For the 2013 year, PSE wanted to measure what impact its HERs program was having on its customers. To determine the programs savings impact, a randomized controlled trial was implemented. In total, around 84,000 dual-fuel, single family homes were selected to participate. Of those 84,000, only around 40,000 families received the HERs reports. The remaining families did not receive the reports, thus establishing the treatment and control groups. The treatment households received the HERs reports on a monthly basis or on a quarterly basis. Two years after the treatment and control groups were established, 10,000 random homes were selected out of the treatment group to stop receiving the reports, effectively testing the persistence of the program.

Over the course of the study, the average credited savings for households receiving HERs reports were 325 kWh and 13 therms. Credited savings for those households that were suspended averaged 166 kWh and 11 therms per household.

Table 1a. Summary results per household of 2013 Puget Sound Energy HERs program impact evaluation

Treatment Groups	HER Measured Savings (Per Household)	Credited Savings (Per Household)
Electric (kWh)		
Current	334.3 (+/- 53.4)	325.3
Suspended	184.3 (+/- 70.9)	165.7
Gas (therms)		
Current	14.8 (+/- 3.2)	13.4
Suspended	11.9 (+/- 4.0)	11.2

Table 1b. Summary aggregate results of 2013 Puget Sound Energy HERs program impact evaluation

HER Treatment Group	Electric (kWh)			Gas (therms)		
	Consumption	Savings	Percent	Consumption	Savings	Percent
Current	10,703.90	325.3	3.00%	890.7	13.4	1.50%
Suspended		165.7	1.50%		11.2	1.30%

With respect to average savings, those same households produced credited savings at three percent and one and a half percent for electric and gas respectively. The suspended treatment group incurred nearly 50 percent less electric savings when compared to the treatment group, but did not show any difference with gas savings.

EnergySavvy

EnergySavvy is a company that delivers cloud software and services to utilities for the purpose of customer engagement and streamlining operations**.** The following two examples describe applications of two different tools for two different EnergySavvy customers: its M&V 2.0 software utilized in the PSEG Long Island pilot and its Program Optimization software used by Arizona Public Service.

PSEG Long Island[xi]

The lack of regular feedback on energy savings is a common challenge that utilities face. This lack of feedback can lead to lower than expected realization rates, dissatisfied customers, and lack of visibility into developing trends. In an effort to alleviate this problem, PSEG LI partnered with EnergySavvy to explore whether automated measurement could address these challenges.

The purpose of the pilot was twofold: first, to determine if EnergySavvy's M&V 2.0 software could generate a reliable indication of program performance with bi-monthly data and second, to determine if continuous measurement software could provide faster insights into program performance. In order to assess the ability of EnergySavvy's tool, PSEG LI analyzed around 1,100 residential retrofit projects from the Home Performance Direct program for the 2013 year.

At the conclusion of the pilot, EnergySavvy's M&V 2.0 software was able to provide program-level results that were within a six percent margin of error when compared to existing evaluation results. The tool was also able to provide statistically significant year-end program performance estimates after three bi-monthly meter reads. Furthermore, the results yielded statistically significant findings at a more granular level, enabling mid-program corrections, pro-active planning, and providing data to inform evaluation research.

Arizona Public Service[xii]

The Arizona Public Service's (APS) Home Performance with ENERGY STAR and Duct Test and Repair programs are both residential retrofit programs that relies on high quality work in order to drive program participation through referrals from satisfied customers. To ensure high quality work was being received, APS would perform random physical inspections which were both costly and time-consuming. To reduce cost and free up time, APS integrated EnergySavvy's Program Optimization software into its day-to-day operations.

With EnergySavvy's ability to continuously monitor all the programs, APS has begun to issue quarterly scorecards to its contractors. These scorecards rank the contractors against one another based on an "achievement rate," which is derived by comparing the savings achieved at the meter level to the deemed energy savings. This metric is then given directly to the contractors providing them with feedback and enabling the contractors to better serve their customers.

Secondly, EnergySavvy's software has allowed APS reduce the number of physical inspections by 50 percent. The Program Optimization software provides continuous granular data from all projects. This allows APS to determine which projects are underperforming and target those underperforming projects for physical inspection. The time and cost savings provided to APS by EnergySavvy's Program Optimization software allows APS to shift the resources from the inspection budget directly to improvement of the Home Performance with ENERGY STAR and Duct Test and Repair programs.

Resi Speak[xiiixiv]

Appalachian Voices, an environmental organization based in Western North Carolina, hosted a contest designed to show how effective residential retrofits can be for saving money and energy. To evaluate the results of this contest, Appalachian Voices contracted ResiSpeak, a software analytics tool focused on residential applications. ResiSpeak's analysis calculated that the winners of the contest saved, on average, 13 percent on their energy bills over a one year period with simple upgrades like insulation and air sealing.

This analysis was completed using data compiled from the homeowner's online electric utility accounts from the local utility, Blue Ridge Electric Membership Corp. The hourly consumption data was downloaded from the Green Button[xv], which was also provided by Blue Ridge EMC. Additional data on non-electric fuel consumption was provided by Appalachian Voices through consultation with the homeowners. The full results of the analysis done by ResiSpeak are provided below.

	Home #1	Home #2	Home #3
Retrofit Date	2/17/2015	3/2/2015	2/27/2015
Number of Post-Retrofit Billing Months Analyzed	13	13	13
As-Of-Date	3/17/2016	4/4/2016	3/20/2016
Savings to Date (kWh)	1939	1339	845
Savings to Date ($)	$196	$136	$84
Weather-Adjusted Electricity Savings %	15%	15%	8%
Est. Annualized Savings (kWh)	1790	1236	780
Annualized Savings ($)	$181	$125	$78
Cost of Retrofit	$3,200	$1,300	$800

Return on Investment, Cumulative	6.10%	10.40%	10.50%
Return on Investment, Annualized	5.70%	9.60%	9.70%
Est. Annual Operating Cost Reduction ($/sqft)	$0.08	$0.08	$0.08
Pre-retrofit Electrical Use Intensity (kWh/sqft/yr)	5.5	5.2	9.9
Post-retrofit Electrical Use Intensity (kWh/sqft/yr)	3.9	4.4	9.2
12-Month Electrical Use Intensity Improvement	28%	16%	8%

**The energy savings measurement detailed below is fully compliant with IPMVP Option C and ASHRAE Guideline 14 M&V procedures

Summary and Conclusions

As illustrated in the list of vendors and in the variety of case studies presented here, experience with SaaS products and vendors has increased in the past year. The use of auto M&V to determine energy and demand savings is increasing. Vendors with valuable experience range from smaller start-ups to large companies. The tools range from single or limited focus products to broad spectrum tools that deliver many services from customer segmentation, tracking vendor performance, building simulation, and billing, to building diagnostics or 'prospecting' for savings opportunities. While utilities are the primary customers for SaaS tools, individual companies and energy organizations are among the customers that use the tools. Demand response is a particularly large application for SaaS tools. Most of the tools and cases, however, are geared towards commercial building analysis and towards achieving, rather than evaluating, savings at this point.

The case studies point to various strengths of auto M&V, including its ability to provide process evaluation insights, the value of granular data, and the ability to diagnose opportunities for savings, and to examine persistence of behaviors over time. For example, these tools are useful in monitoring and comparing performance across implementation contractors within a given program and utility, as discussed in the PSEG LI case study. The OPower case study illustrates their ability to provide abundant, granular data for randomized control trial evaluation of behavioral programs – programs which could not be evaluated rigorously without whole facility-level data. Also demonstrated is the potential of AMI data and SaaS to provide information about persistence of savings that would be either difficult or costly to research without these tools. While the increased granularity, frequency, and access provided by advanced metering data and software tools are likely to impact how evaluation is performed, very few case studies address the evaluation application directly. More research is needed to demonstrate how auto M&V can and should be deployed in order to evaluate savings, accuracy and cost of auto M&V for this purpose. In addition to collecting more case studies, research in the form of comparing the performance of various auto M&V tools and pilot studies comparing auto M&V tools with traditional EM&V would be helpful.

A variety of types of information would help build our understanding of the value of auto M&V. Recommendations include:

- More documented third-party verification or examination of program results (EM&V) based on SaaS tools;
- Consideration of what, if any, additional information is needed as inputs in addition to SaaS tools for EM&V (for example targeted metering, other tracking data, non-routine adjustment guidance);
- A set of consistent criteria for reporting results to enable more comparative study (for example, savings as percentage of consumption, sample size, accuracy and precision estimates, persistence);
- Documentation of the amount of pre- and post-implementation data used, time between implementation and evaluation results, and the disposition of expenses associated with the evaluation needs to be assembled (this is needed in order to assess cost and labor impacts of auto M&V relative to traditional EM&V practices);
- Investigation into additional lessons learned from case studies to understand the range of programs and sectors for which auto M&V is suitable

Appendix A: SaaS Vendors Research Table

The Software as a Service Vendors Research Table prepared for this brief is publically available by clicking here, or going to http://bit.ly/saasindustryscan

The Table is downloadable and sortable and includes the following fields:

- Company
- Utility Customer Sector
- Type of Platform/Service
- Type of Data Used
- Vendor Clients
- Geographic Region

Appendix B: SaaS Companies Not Included in Vendors Research Table

The following are companies that were not identified during the initial research phase, but provide a viable option to explore in a second round of research.

- Advanced Energy Intelligence
- Autodesk
- Bidgely
- Brightergy
- Building IQ
- C3
- Cascade Energy
- Cimetrix
- EEM Suite (Ministry)
- Eeme
- Energent
- Energy Ai
- Energy Lens by BizEE Software
- EnergyWitness by Interval Data Systems
- eSight Energy
- Facility ConneX
- Goby
- IntelliSOURCE by Converge
- JLL
- KGS Buildings
- kWIQly
- Outsmart Power Systems
- PacRat
- Panevo
- Panoptic (JCI)
- PlotWatt
- Portfolio Manager
- Powerhouse Dynamics
- Retroficiency
- RtTech Software
- Schneider
- The Tracer Summit by Trane
- UrjaNet
- UT3
- Wegowise
- Yardi (Pulse Energy)

[i] http://www.neep.org/sites/default/files/resources/NEEP-DNV%20GL%20EMV%202.0.pdf
[ii] http://www.neep.org/sites/default/files/2016EM%26V2.0WorkshopPurposeofPilots.pdf, slide 6
[iii] Ibid.
[iv] https://www.sce.com/wps/wcm/connect/5b0de293-4a61-472b-a32b-ed9c2cd6aea2/EEImpactStudy_SCEWhitePaper.pdf?MOD=AJPERES
[v] https://gridium.com/the-amazing-state-of-automated-mv-models/
[vi] https://www.enernoc.com/resources/case-studies/emd-millipore
[vii] https://www.enernoc.com/resources/case-studies/commonwealth-massachusetts
[viii] https://www.enernoc.com/resources/case-studies/supermarket-chain
[ix] https://www.enernoc.com/resources/case-studies/lumber-manufacturer
[x] http://www2.opower.com/l/17572/2014-07-31/fbg5c/17572/81742/PSE_HER_Report_April2014.pdf
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[xii] http://assets.cdnma.com/7083/assets/EnergySavvy_Case_Study_APS_Program_Optimization_FINAL.pdf
[xiii] http://appvoices.org/images/uploads/2016/06/ResiSpeak-Report-June8-2016.pdf
[xiv] http://appvoices.org/2016/06/08/reports-show-need-for-energy-efficiency-financing-in-western-nc/
[xv] The Green Button initiative is an industry-led effort that responds to a White House call-to-action to provide utility customers with easy and secure access to their energy usage information in a consumer-friendly and computer-friendly format. To learn more, visit http://energy.gov/data/green-button.