Advanced Measurement & Verification (M&V) Brief: An Evolving Industry

August 2017

Table of Contents

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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 brief 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

Northeast Energy Efficiency Partnership's (NEEP) Regional Evaluation, Measurement, and Verification (EM&V) Forum has been tracking the evolution of the advanced measurement and verification (M&V) industry through projects and publications, including the December 2015 white paper titled *The Changing EM&V Paradigm*[1] and the December 2016 brief titled *Auto M&V Industry Brief: How Fast is the EM&V Paradigm Changing?*[2]. As this is a fast-moving field, our research did not stop with the release of these publications. We continued to research new vendors, technologies, and services offered in advanced M&V. This brief is an extension of our previous work and picks up where the 2016 brief left off.

Objective

This brief seeks to provide an inventory and overview of advanced M&V vendors—companies and software tools—currently on the market. It also presents case studies of specific projects from several applications that have used advanced M&V tools for a variety of end goals, from evaluating impact to operational efficiencies and businesses reducing their energy costs. The information in this brief and associated vendor table was obtained by a collection of web searches, correspondences with vendors, and telephone interviews. This information is intended to provide insight into the often-invisible world of advanced M&V by providing key information on vendors as well as diving into some real-world applications. There are many companies working to design advanced M&V solutions; it is NEEP's intention that this information can help utilities, evaluators, and the greater efficiency community to make more informed decisions around selection of advanced M&V vendors and the range of potential services that could be provided.

Industry Overview and Vendor Profiles

In 2016, NEEP conducted a high-level industry scan of 19 advanced M&V companies and their respective products. Since then, we have expanded our study and have increased that number to 31. Appendix A: Vendor Table is a reproduction of the table of 31 advanced M&V companies which is hosted on the NEEP website. We indicated the vendor information collected in 2016 and 2017.[3]

For seven of these vendors, we prepared short case studies to highlight several applications. Interestingly, beyond the typical split between residential and commercial applications, we noted that the commercial case studies clustered around two applications: food service or production and university. Food service/production, with refrigeration and spoilage as critical business considerations, is an application for advanced M&V in which the primary goal may not be energy efficiency or verification of savings, but rather a non-energy benefit, real time information to help preserve the end product. Universities, on the other hand, are in a unique position to make long-term investments in their facilities. Advanced M&V will not only help them ensure they realize the efficiency investments they make, but also provide other benefits such as help with fault detection and optimization of systems for the long-term benefit of the university.

Case Study Summary

Case studies continue to serve as a useful tool to provide evidence for the value proposition of advanced M&V. One observation consistent across our research is that there is very little publishable case study experience with

[1] http://neep.org/changing-emv-paradigm
[2] http://neep.org/auto-mv-industry-brief-how-fast-emv-paradigm-changing
[3] Complete table with additional fields available online at: http://neep.org/initiatives/emv-forum

applying advanced M&V tools for energy program impact evaluations. NEEP is participating in an advanced M&V pilot research project that will help advance that application in both the residential and commercial spaces.[4] In the meantime, experience is growing with other applications of advanced M&V; vendors provide diverse examples of the value their products provide and the types of customers and customer segments served, as the following case studies demonstrate. The seven case studies are organized as follows:

Food Service/Production	University	Residential
PowerHouse Dynamics: SiteSage	Advanced Energy Intelligence (AEI)	EEme
Plotwatt	KGS Buildings: Clockworks	Cadmus
Cascade Energy		

Food Service/Production Case Studies

PowerHouse Dynamics: SiteSage[5]

In 2012, Arby's, the second largest quick service restaurant company in the U.S., increased efforts to improve its energy efficiency and reduce energy costs. Arby's installed multiple remotely-controlled thermostats from four different energy management service companies into several of its corporate-owned restaurants. During the process, one product that caught the interest of Arby's management was Powerhouse Dynamic's SiteSage.

SiteSage is a web-based platform that enables asset and energy management for portfolios of small facilities. It offers a multitude of functionalities, including: equipment monitoring, enterprise-level benchmarking of facilities and equipment, and patented analytics to find hidden inefficiencies. After initial and secondary testing, SiteSage was able to show that Arby's HVAC and refrigeration systems had been regularly experiencing technical difficulties. Because of the efficient and quick diagnosis, Arby's decided to further its partnership with Powerhouse Dynamics and implement SiteSage across all 860 company-owned restaurants in the U.S. in 2013.

The SiteSage system delivered HVAC controls and diagnostics as well as food safety alerting and reporting through algorithms. Managers were notified when temperatures approached or exceeded food safety limits. Powerhouse Dynamics also identified problems in HVAC and refrigeration equipment at many locations, in most cases leading to the replacement of those units. In March 2016, Arby's revealed that it had saved a total of $20 million dollars in energy costs, including a reduction of over 20 percent in electricity usage across all company-owned restaurants.

Plotwatt[6]

Plotwatt, a technology company that provides software that creates algorithms to take data from smart meters and translate it into energy-saving insights and energy management solutions, recently partnered with Dunkin' Donuts in Wallingford, Connecticut. The software serves a range of customers, from multi-location businesses to

[4] A very brief description of the pilot research being conducted in Connecticut is available at: http://neep.org/emv-quarterly-update-q2-2017.
[5] https://powerhousedynamics.com/resources/case-studies/arbys-energy-savings-food-safety-case-study/
[6] https://www.plotwatt.com/2015/06/11/case-study-dunkin-donuts/

residential homeowners. Customers can receive usage messages and updates daily through their web app and email inbox.

In 2013, five Wallingford Dunkin' Donuts restaurants installed Plotwatt to assess their operational systems and reduce monthly energy usage. In one of the stores, Plotwatt identified refrigeration equipment issues and found that the store had improperly installed refrigerant pipes, causing a buildup of ice that obstructed the door seal. After the repair, refrigeration cycles returned to normal. Below is a table indicating the amount of dollar savings experienced by the five Dunkin' Donuts restaurants prior to and after Plotwatt implementation. The table shows Dunkin' Donuts was yielding $3,650 savings annually across the five stores.

Dunkin' Donuts Energy Savings[7]	
Electric bill before Plotwatt	$36,869
Electric bill after Plotwatt	$33,219
Year One net direct savings avg.	$3,650

Cascade Energy[8]

Zirkle Fruit, an agriculture company headquartered in Washington, had long sought to modernize its aging facility in Prosser, Washington. When the facility was conceptualized and designed, however, energy efficiency and sustainability not been a central component of the building's structure. In order to help realize potential energy savings, Zirkle Fruit requested the help of Cascade Energy, an energy management company that had previously helped the company realize potential energy improvements at its Selah, Washington facility. Through implementation of a strategic energy management approach, Cascade metered and measured energy use to understand the impact of the intervention. In the end, though, traditional efficiency measures offered the most benefit to Zirkle Fruit operations.

Zirkle requested that a team of Cascade engineers and energy experts visit its Prosser facility to determine what measures could be implemented to experience greater energy efficiency. There, Cascade conducted a detailed study involving data collection, baseline modeling, and in-depth analysis.[9] Cascade discovered 12 potential energy efficiency measures that qualified for incentives through Zirkle's local utility's energy efficiency programs. Bonneville Power Administration's Energy Smart Industrial Program (ESI) incentives allowed Zirkle to experience a greater reduction in energy consumption and costs.

With Cascade's help, Zirkle Fruit implemented an array of energy efficiency upgrades to its Prosser facility including: (1) the replacement of Freon compressors, equipment commonly used in commercial facilities, with large ammonia compressors designed for industrial environments, (2) installation of new control valves to reduce system pressure, and (3) a complete overhaul of the facility's controlled atmosphere rooms, which provide precise year-round temperatures for produce to maintain freshness through any condition.

These upgrades resulted in an overall energy reduction of about 35 percent, representing nearly 3.5 million kWh per year. Energy costs were cut by nearly $185,000. Though the upgrades of the Prosser facility proved to be

[7] https://www.plotwatt.com/wp-content/uploads/2016/08/plotwatt-case-study-DD.pdf
[8] http://cascadeenergy.com/wp-content/uploads/2012/12/CascadeEnergy_cs_zirkle.pdf

costly at $1.2 million, Zirkle Fruit determined that with an ESI rebate of $880,000 dollars, the upgrades would pay for themselves within two years.

University Case Studies

Advanced Energy Intelligence (AEI)[10]

This case study examines Advanced Energy Intelligence (AEI) partnership with the University of Massachusetts Dartmouth. AEI is an energy management company that provides its users with energy mapping software to help solve energy problems and optimize energy efficiency. AEI collects building automation system (BAS) data and, with that data, is able to identify the typical inefficiencies that occur in commercial and public buildings. Some of these problems include issues with simultaneous heating and cooling systems, excess ventilation, and variable frequency drives (VFDs) in override. UMass Dartmouth was in the final stages of a rather expensive campus-wide energy savings performance contract, but was unable to quantify any potential energy savings. In order to determine whether the campus achieved or maintained the savings for which it had contracted, UMass Dartmouth contacted AEI.

AEI's approach involved integrating multiple data streams into its advanced M&V tool to find additional insights. AEI gathered energy usage data from UMass Dartmouth's utility, Eversource Energy, and applied it to its energy analytics software. AEI also reviewed the BAS data collected through JCI Metasystem and used analytics to quantify and determine greater opportunities for efficiency at the school's location. After this process, AEI revealed that through better control of the heating, ventilation, and air conditioning systems, the school would be able to save upwards of $150,000 a year in energy savings. UMass Dartmouth's partnership with AEI has allowed the school to discover new ways to maximize its energy saving potential.

KGS Buildings: Clockworks

To help control costs and reduce potential energy inefficiencies, a 450,000 sq. ft. research laboratory at a university in Massachusetts implemented KGS Buildings' building performance management Clockworks software. Clockworks is a cloud-based fault detection and diagnostics (FDD) software system that provides its users with prioritized and comprehensive diagnostics to improve facility performance and reduce HVAC costs. KGS's Clockworks software offers automated diagnostics, meaning that energy data is automatically analyzed every day. This allows its users to identify opportunities to repair costly malfunctioning equipment and diagnose potential problems at any time. KGS Buildings, a partner of Schneider Electric,[11] is an energy management company that offers its customers building performance management software and services to building operators, engineers, and service providers. The company collects and stores building performance data and information to help facilities improve their efficiency and reach their energy goals.

After Clockworks was implemented, the five-year-old laboratory was able to identify several operational issues, including: (1) a leaking and malfunctioning cooling valve that was causing simultaneous heating and cooling, (2) a leaking preheating coil valve in an air handler, and (3) leaking from nearly 200 terminal unit reheat valves

[10] http://www.aeintelligence.com/files/UMass%20Dartmouth.pdf
[11] http://www.kgsbuildings.com/blog/kgs-buildings-announces-2-million-strategic-investment-by-partner-schneider-electric

caused by corroded valves from untreated hot water and failed actuators. As the table below shows, each operation issue yielded significant energy savings. The repairs identified through Clockworks also resulted in a $50,000 incentive through the university's utility efficiency program.

University Energy Savings	
Leaking cooling valve	$61,400
Leaking preheating coil valve	$137,000
Terminal unit reheat valve leaking	$87,600
Total Energy Cost Savings	$286,000 per year

Residential Case Studies

EEme[12]

In 2015 EEme, a Pittsburgh-based energy analytics company, wanted to identify energy consumption from individual end uses in homes through analysis of whole-home smart meter data from 264 Texas homes. In this study, EEme also sought to evaluate its own disaggregation algorithm. In order to do so, EEme enlisted the aid of Pecan Street, a non-profit research and development organization located at the University of Texas at Austin. Pecan Street provided EEme with two sets of input data from the 264 Texas residential home sample. Pecan Street collected both the whole-home electricity use data for 12 months collected at 15-minute intervals, and historical weather data corresponding to the 12-month period, which it ran through EEme's disaggregation software. EEme processed this data using its proprietary algorithms and tracked the energy usage rates for four individual appliances (HVAC, refrigerators, clothes dryers, and dish washers). At the conclusion of this study, EEme provided the findings to Pecan Street for further assessment.

Pecan Street then calculated the absolute and relative error for each household and individual appliance. Below are the formulas used in this study:

$$\text{Absolute Error} = \frac{Inferred\ appliance\ use - actual\ use}{Actual\ use}$$

$$\text{Relative Error} = \frac{Inferred\ appliance\ use - actual\ use}{Total\ home\ use}$$

Pecan Street used these metrics to identify the accuracy of EEme's disaggregation algorithm. Below are the results found from these calculations.

EEme Study Results[13]		
Appliance(s)	Absolute Error	Relative Error
HVAC	-0.31	-0.11
Refrigerator	-0.28	-0.02
Clothes dryer	-0.45	-0.02
Dishwasher	0.33	0.003

[12] http://www.energyefficiency.me/publications#download-15-min
[13] http://www.energyefficiency.me/publications#download-15-min

The table above shows the median monthly error ratios calculated by EEme for the individual end-use appliances at the 264 home sample. Negative values mean the algorithm underestimated the actual use, while positive values show an overestimation. As shown, the software underestimated consumption by major appliances (HVAC and refrigerator) by roughly 30 percent.

Cadmus

The Cadmus Group, an energy management and consulting firm that provides full energy analytics support to energy utilities throughout North America, wanted to improve its ability to turn around solutions and results of studies based on collected data to its customers (government, commercial clients and utilities) more quickly. Traditionally the method they used for collecting energy data for analysis was to place recording sensor devices at places of interest, collect them at the metering period, then analyze the data. Though this method is effective and commonly practiced throughout the energy industry, Cadmus believed it could be improved. Moreover, analysis for this method generally cannot begin until the study is concluded, which delays results and increases chances of error during data collection.[14]

Cadmus teamed up with Math Works and its ThingSpeak product to develop a solution in which data from meters is sent to a cloud-based system several times within an hour during a study, thus reducing chances of error. ThingSpeak, an Internet of Things (IoT) energy analytics service, allows users to collect, visualize, and analyze live streams of power consumption data in near-real time in a cloud-based software system.[15] In one of its projects, Cadmus developed a system of cloud-connected sensors for the near-real time analysis of energy data for an energy efficiency study of over 150 residential homes. The custom sensors sent temperature, relative humidity, and device battery voltage measurements to ThingSpeak in five-minute intervals. Cadmus was able to monitor the quality of data coming in from the study, which helps increase the accuracy of study results. Another advantage to this web-connected system is that data is not lost when homeowners move during long-term studies. Costs are also reduced because meters can be mailed back at the end of the study, eliminating the need for a meter-removal visit. Data is retained even when meters are not sent back at the study's conclusion.

Cadmus is applying a similar system to a study of over 90 homes in the southeastern United States for a private client. Power is metered for the whole home and for a series of 240-volt and 120-volt panel circuits and for plug loads. In all, over 500 loads are monitored over a one year period at one-minute intervals. Data are checked at intervals and interim analyses and reports are generated based on the cloud data.

Conclusion

As illustrated in the list of vendors and in the variety of case studies included in this brief, experience with advanced M&V software tools and vendors continues to accumulate and evolve. Consistent with information from NEEP's 2016 scan of the industry, the majority of the tools currently available are geared toward serving the commercial and industrial sector. That said, eight of the 31 companies just consider industrial or large commercial or "MUSH" – municipal, universities, schools, and hospitals – as sectors of focus and three

[14] https://www.cadmusgroup.com/our-company/

[15] https://www.mathworks.com/company/user_stories/cadmus-collects-and-analyzes-energy-data-in-near-real-time-using-matlab-and-the-thingSpeak-internet-of-things-platform.html

exclusively serve the residential sector. The descriptions of type of platform or service shown in Appendix A: Vendor Table are based on self-reported vendor information.

Also consistent with information from our 2016 report, the focus of the vendors profiled here is more on customer engagement and achieving savings rather than evaluating savings. Fifteen of the 31 companies include customer segmentation and targeting and/or customer engagement as a service. The most common suite of services provided by these companies is: "customer segmentation and targeting, customer engagement, tracking and benchmarking, measurement and verification." Education, facility management, and problem-solving or diagnostics are among other more custom-oriented services that are highlighted by some vendors. It is interesting to note that a few vendors are including and calling out other services in support of the distributed energy industry, for example information about greenhouse gas emissions, demand response or demand management, and community solar among the list of services.

The case studies included in this brief illustrate a range of sectors benefitting from advanced M&V as well as a range of functionalities, applications, and benefits of the use of advanced M&V tools. One benefit of advanced M&V tools illustrated in this brief is the ability of a corporation to introduce company-wide consistency in building operational efficiency and benchmarking, as illustrated by Dunkin' Donuts and Arby's use of software tools in multiple establishments. The case studies also suggest that the customers' impetus for use of advanced M&V tools extends far beyond energy impacts to include non-energy benefits. These include production improvements and operational efficiencies pertaining to food safety, comfort, and productivity. Tracking or quantifying such impacts of advanced M&V would help to more comprehensively illustrate and document the range of values and the business case for some of these tools, and may ultimately help inform cost-effectiveness assessments.

Vendors of advanced M&V range from small start-ups to large companies, and from specialized to diversified companies. The case studies included here show that advanced M&V vendors may team up in order to fully meet a customer's need for energy efficiency services, as illustrated in the case studies of Advanced Energy Intelligence, EEme, and Cadmus, for example.

The case studies included here illustrate the following applications of advanced M&V: detection and diagnosis of faulty equipment or inefficient operations in large facilities, quantifying potential opportunities to increase efficiency, disaggregation of whole-home electricity use by end-use, and reducing the turnaround time for energy program data analysis in a utility residential energy efficiency program impact assessment. Consistent with NEEP's 2016 scan of the industry, there are no cases published by vendors on the use of advanced M&V as a tool for formally evaluating program savings. While advanced M&V holds promise for operational behavior and maintenance programs and whole-building multi-measure programs, as suggested by some of the case studies, use of advanced M&V as an evaluation tool has not been fully vetted; none of the tools reviewed in this brief were designed with the principal intent of savings estimations.

The advanced M&V industry is linked to the increased availability of energy consumption data, in particular, to the deployment of Advanced Metering Infrastructure (AMI). AMI has not yet comprehensively penetrated the Northeast region[16] and local experience with advanced M&V software is expected to continue to evolve and expand with further penetration of AMI. Currently, NEEP is working with Connecticut DEEP, Eversource, United Illuminating and Lawrence Berkeley National Lab to pilot the use of commercial and residential advanced M&V tools to more comprehensively test the value proposition for advanced M&V and determine which of the

[16] http://neep.org/advanced-metering-infrastructure-utility-trends-and-cost-benefit-analyses-neep-region

potential benefits can be demonstrated in field tests side by side with traditional approaches to M&V. Several states from the Northeast are supporting the work and will serve as an audience for the transfer of lessons learned, pilot findings, and resource and application guides that grow out of the field tests. In addition, NEEP is beginning to explore if or how advanced M&V tools are being applied as part of energy efficiency programs being delivered in the Northeast as a way to acquire more information about the range of applications.

For NEEP, understanding different purposes for measuring savings is important for assessing the value of advanced M&V tools with different capabilities. As noted in a recent Rocky Mountain Institute report, "[U]sing M&V methods that capture load shapes together with automated processing can determine savings in near-real time to provide stakeholders with more timely and detailed information. This information can be used to inform ongoing building operations, provide early input on energy efficiency program design, or assess the impact of efficiency by location and time of day. Stakeholders who can make use of such information include regulators, energy efficiency program administrators, program evaluators, contractors and aggregators, building owners, the investment community, and grid planners. Although each stakeholder has its own priorities and challenges related to savings measurement and verification, the potential exists for all to draw from a single set of efficiency valuation data."[17]

Highlighted in the 2016 industry scan, several recommendations still persist:

- More research is needed to demonstrate how advanced M&V can and should be deployed in order to evaluate energy program savings.
- In addition to collecting more case studies, more research comparing the performance of various advanced M&V tools and pilot studies that compare advanced M&V tools with traditional measurement and verification would be helpful.
- Additionally, there is relatively limited and inconsistent types of performance or impact information available across case studies, so comparisons between projects or case studies are not possible. Moving forward, the efficiency community would benefit from the ability to test M&V tools against a set of consistent performance criteria.

Additional key needs identified by LBNL researchers include:

- Expansion of the methods in the current tools to handle baselines other than existing conditions;
- Standard software testing procedures;
- And consistent, transparent methods to handle adjustments necessary to ensure that meter-based savings are not an artifact of activities other than the efficiency measures and behaviors.

There is a strong level of activity in research pertaining to advanced M&V involving utilities, state and federal government, and non-profit organizations. The goal of these research efforts includes developing general methodologies to establish performance criteria and evaluate software capabilities by evaluating model performance and prediction accuracy. The development of other standards that can support advancement, such as those that address data access and confidentiality issues, is also needed.

In conclusion, while there are ways in which the industry has not changed significantly, in terms of the range of vendors and applications, the market for information about advanced M&V tools is growing. Discussion is ongoing about areas of anticipated future development relating to performance testing, to refinement or

[17] https://eta.lbl.gov/sites/all/files/publications/lbnl-1007125.pdf, p5

development of the advanced M&V tools' capabilities (machine learning), and to policies and protocols that may lead to increased use of advanced M&V. NEEP will continue to track this developing market and bring information back to the Northeast and Mid-Atlantic.

Appendix A: Vendor Table

More complete information available at: http://neep.org/initiatives/emv-forum

Company	Utility Customer Sector	Type of Platform / Service	Year Added
Aclara	Residential and Commercial & Industrial	Customer segmentation & targeting, virtual energy assessments, customer engagement, tracking & benchmarking, measurement & verification	2016
Advanced Energy Intelligence	Municipal, universities, schools and hospitals	Large-scale energy mapping to help building owners solve energy problems to optimize efficiency	2017
Agentis Energy	Small, medium, and large commercial	Customer segmentation & targeting, virtual energy assessments, customer engagement, tracking & benchmarking, measurement & verification	2016
Apogee Interactive Inc.	Residential and small to mid-size commercial, school programs, low-income, contact center	EMPOWER Platform includes proactive, personalized messaging (energy summary reports, personalized video messaging, personalized energy progress reports, mid-cycle bill alerts), Energy Advisor Online residential & commercial energy assessments/audits, customer engagement (consistent communication with customers through all channels from website to call center to field auditor), tracking & benchmarking, customer segmentation & targeting, iPad/Field audit software. Call center applications include Instant Insights bill analysis for CSRs, IVR automated bill explanation avoiding CSR contact, and CSR quick-explanation tools. In 2015, Navigant names EMPOWER the most comprehensive in the industry.	2016
Bidgely	Residential	Customer segmentation & targeting, virtual energy assessments (disaggregation technology), customer engagement (mobile app that communicates with customers), tracking & benchmarking (real time metrics), measurement & verification. Demand response and energy efficiency program enablement.	2016
BuildingIQ	Commercial	Bidirectional communication with any BACNet-enabled BMS for the purposes energy savings, demand management and comfort control, meter connection or energy data stream, O&M savings tracking & benchmarking, measurement & verification	2016
Cascade Energy	Industrial and agricultural	Data collection, education, and software development to help industrial, utilities and agricultural facilities manage and reduce energy costs	2017

Ecova	Commercial and Industrial (SMB and large commercial customers; provides residential energy efficiency program implementation services as well)	Customer segmentation & targeting, virtual energy assessments, customer engagement, tracking & benchmarking, measurement & verification	2016
EEme	Residential	Data collection, use machine learning to provide appliance level consumption. This can be done pre and post measure installation	2017
Energy Ai	All sectors: residential, commercial, institutional, etc.	Data collection and energy monitoring. Automated service that provides business owners and facility managers potential savings in energy, costs, and greenhouse gas emissions in clear non-technical language	2017
Energy Lens by BizEE Software	Utility/energy facilities	Energy management software tool used by energy managers, facility managers, energy consultants, and building-services engineers for charting and analyzing energy consumption.	2017
Energy Orbit	Commercial & Industrial	Customer segmentation & targeting, virtual energy assessments, customer engagement, tracking & benchmarking, measurement & verification	2016
Energy Savvy (EM&V 2.0 tool is called Quantify)	Residential and commercial (small to mid-size businesses)	Customer segmentation & targeting (three platforms for utility customers: residential, businesses, direct). Energy Savvy enables utilities to more easily segment & target their customers based on customer-reported data, virtual energy assessments (easy to learn online auditing tool), customer engagement (assists customers throughout the entire process), tracking & benchmarking, measurement & verification	2016
EnerNOC	Large commercial and industrial	Energy Intelligence Software (EIS): Virtual energy assessments, tracking & benchmarking, measurement & verification, demand response. (EnerNoc is selling off its utility software business, which included customer segmentation, engagement, and behavioral EE for small & medium businesses.)	2016
First Fuel	Small, medium, and large commercial	Customer intelligence and engagement; utility sales acceleration; segmentation & targeting; virtual energy assessments; tracking & benchmarking; measurement & verification; custom analytics	2016
Gridium	Small, medium, and large commercial	Customer segmentation & targeting, virtual energy assessments, customer engagement, tracking & benchmarking, measurement & verification	2016

KGS Buildings	Corporate, industrial	Cloud-based software that provides automated diagnostics. Collect and store building performance data and information to help facilities improve their energy efficiency and reduce energy costs	2017
Lucid	Commercial	Customer segmentation & targeting, virtual energy assessments, customer engagement, tracking & benchmarking, measurement & verification (ROI on efficiency)	2016
Nexant	Residential and Commercial & Industrial (small, medium, and large commercial)	Customer segmentation & targeting (four categories: finance, government, oil & gas, utilities/retailers) , virtual energy assessments (mobile assessment customer engagement (iEnergy is the customer engagement platform), tracking & benchmarking, measurement & verification	2016
Onzo	Residential and commercial	Customer segmentation & targeting (target sales campaigns based on consumer behavior), virtual energy assessments, customer engagement (personalized messaging, goals, and challenges for residential customers; comparison with peers; data insight consultants on hand for customer support), tracking & benchmarking, measurement & verification	2016
Open Energy Efficiency (product is Open EE Meter)	Residential and commercial	Distributed open-source platform to enable tracking of energy efficiency and load shape (where interval data is available) at the meter to enable tracking and trading of energy efficiency as a distributed energy resource.	2016
Opower	Residential and commercial	Customer segmentation & targeting (allows utilities to tailor programs to reach specific customer groups), virtual energy assessments (from gathered energy data), customer engagement (Opower partners with FirstFuel to help utilities engage customers), tracking & benchmarking (program managers can track results)	2016
Outsmart Power Systems (Brand name owned by eFacto LLC)	Industrial and commercial	Web-based software that provides energy analytics and M&V. Proprietary w/API for third-party access/integration.	2017

PacRat by Facility Dynamics Engineering	Commercial, industrial, government buildings, and hospitality	Software program that utilizes recorded system operational data to improve facility operations and planning	2017
Panevo	Industrial, food and beverage, and general (commercial, healthcare and public sector)	Data collection and software program that supply meters, telemetry and software to collect, analyze and report utility, process, environmental, and business metrics	2017
Performance Systems Development (PSD Consulting)	Residential and commercial	Customer segmentation & targeting, virtual energy assessments, customer engagement, energy audits (walk through audits), tracking & benchmarking, measurement & verification, project management and workflow.	2016
PlotWatt	Commercial	Proprietary software company that creates algorithms to take energy data from smart meters and translate it into savings opportunities for multi-site businesses	2017
Powerhouse Dynamics	Commercial	Software with enabling hardware, a web-based platform that enables asset and energy management for portfolios of small facilities	2017
Sagewell, Inc.	Residential, commercial, industrial	SageSightSM is an AMI meter data management and analytics SAAS platform used for energy and customer profitability analysis, emissions reduction monitoring, rate analysis and program EM&V.	2017
Tendril	Residential	Home energy management, behavioral energy efficiency, customer engagement, customer segmentation & targeting, customer acquisition, community solar, home energy reports, virtual energy assessments, tracking & benchmarking, measurement & verification	2016

Terracel Energy (product/service is Resispeak)	Predominantly residential (some commercial building work is done more for facility evaluation and less for EM&V)	Customer segmentation & targeting (homeowners, program administrators, contractors), virtual energy assessments (for public programs with the data coming in online (e.g. green button) and also for utilities themselves who provide the data to analyze), customer engagement, tracking & benchmarking (tracking client progress, utility usage, and home improvements), measurement & verification (savings measurement; fully automated and compliant with standard protocols)	2016