

Evaluation, Measurement and Verification as we Reform the Vision

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ABSTRACT

The Energy Industry is changing. An aging infrastructure mixed with heightened needs for system security and resiliency, a diverse renewable energy resources market and technological innovations, are all leading to revolutionary changes in how electric energy in New York State is produced, distributed and managed. To meet these challenges, the NY Public Service Commission (PSC) initiated a restructuring of New York State's energy industry and regulatory practices, called Reforming the Energy Vision (REV). Con Edison's Energy Efficiency and Demand Management (EE&DM) programs which support their industry objectives are also "reforming" and the traditional strategies of evaluating those programs must adapt to these changes. Con Edison's Evaluation, Measurement & Verification (EM&V) group has been directed to focus evaluation funds and efforts on activities that better position the company and NY for a post-2015 REV environment. By working in close collaboration with program implementation staff, program managers, marketing staff, building engineers, etc. (stakeholders) to develop a list of proposed evaluation activities that are forward looking and would add value to REV, EM&V developed objectives which include: real-time feedback to program managers, testing and quantifying innovative technologies, measures, systems and processes for inclusion in to existing programs and those slated for the future environment. We expect that by identifying these areas we will facilitate improved customer and Market Partner engagements, and add a holistic review of improving customers' usage, i.e. energy and power. The results shall benefit our programs by providing information that will aid in a successful conclusion to the existing programs, inform the transition period between the old programs and REV, and add value to the end product of REV programs (long term). Additionally, by focusing EM&V in this manner, the goal is to provide customers with better available information, so that they can utilize it to make better and more informed decisions about their energy usage in the present and future.

Introduction

The energy industry is in transition. Technological innovation and increasing competitiveness of renewable energy resources, combined with aging infrastructure, extreme weather events, and system security and resiliency needs, are all leading to significant changes in how electric energy is produced, managed and consumed. New York State must lead the way to ensure these trends benefit the State's citizens, whose lives are so directly affected by how electric energy is manufactured, distributed, and managed (Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, 2014).

To meet this challenge, the Commission commenced its Reforming the Energy Vision (REV). This initiative will lead to regulatory changes that promote more efficient use of energy, deeper penetration of renewable energy resources such as wind and solar, wider deployment of “distributed” energy resources, such as micro grids, on-site power supplies, and storage. It will also promote greater use of advanced energy management products to enhance demand elasticity and efficiencies. These changes, in turn, will empower customers by allowing them more choice in how they manage and consume electric energy.

The Commission has identified six core policy outcomes relating to customer knowledge, market animation, system-wide efficiency, fuel and resource diversity, system reliability and resiliency, and carbon reduction. A Staff Report and Proposal sets forth a vision for how to accomplish the Commission’s objectives (Reforming the Energy Vision - NYS DPS Staff Report and Proposal, 2014). The proposal describes how customer-side resources can become a primary tool in the planning and operation of the utility system, which will improve system efficiency and enable the deployment of cleaner and more resilient technologies. The Report further explains how reforms in the utility ratemaking process will be necessary, to provide the correct incentives for utilities and markets to develop a cleaner and more efficient electric system.

In order to facilitate a more responsive suite of energy efficiency programs intended to promote market animation, market transformation, customer engagement, and wider deployment of DERs, the utility will have more flexibility to react to market indicators and customer needs. Utilities will have more flexibility and responsibility in designing and managing our portfolios. This includes maintaining Utility specific data in NY’s Technical Resource Manual (TRM), Benefit Cost Analysis (BCA), and other guidelines to assist in program design and operations. In response, Con Edison’s Evaluation, Measurement & Verification (EM&V) group is re-focusing collective efforts to provide valuable results in a timely and productive manner. Several initiatives are underway to accommodate the new focus of EM&V, including:

- Communicating with stakeholders during planning to identify EM&V objectives,
- On-going data collection during the program cycle,
- Reporting mechanisms to establish real-time feedback to stakeholders, and
- Establishing an integrated measurement & verification (M&V) process.

Communicating with Stakeholders

Traditional impact evaluations measure a program’s performance by assessing gross realization rates, net-to-gross ratios, and net savings. Other than obtaining the data necessary for performing the evaluation, this requires little interaction with program staff during the evaluation planning stage. When a program is evaluated with less than 100% realization, evaluators come under fire from program staff questioning the methodology and validity of the evaluation. This also hinders future evaluation efforts because no one wants to hear how poorly the program is performing.

The re-focus of evaluation activities puts a new emphasis on maintaining open communications within the early evaluation planning stages to lay new ground work for what evaluation would comprise of.

Such proactive planning will better position the evaluation work to focus on evaluation work that informs future program planning. To facilitate stakeholder engagement, Con Edison's EM&V team scheduled individual meetings with program staff to inform the direction of evaluation activities. The intended result was to keep stakeholders more engaged and make them advocates of the planned evaluation work, as opposed to apprehensive and defensive when receiving realization rates of less than 100%. This will promote a positive environment that will make the evaluation a valuable resource for program improvements.

All of the meetings resulted in a productive discussion that provided us with valuable insight for the direction of evaluation. For instance, a common theme heard from our meetings was the need to obtain feedback earlier in the process. With evaluation activities more aligned to REV objectives, program managers are eager to start seeing the results of the evaluation.

On-going Data Collection and Real-time Feedback

One of the important feedbacks obtained through discussions with stakeholders was that evaluations were slow and were obsolete by the time a final report came out. Many of Con Edison's most recent impact evaluations had been approved in 2014. This was an issue for stakeholders considering the evaluation period was for 2009 through 2011. The project samples were primarily from that time period, so if there was an issue in program delivery found as a result of the evaluation, program staff have commonly indicated changes have already taken place that would address such concerns.

It became obvious that fundamental evaluation methodologies must evolve to accommodate our need to obtain results faster. This also aligns with a recent REV related order indicating that EM&V must be planned to yield timely information that shall be incorporated into the annual iterations of utility programs, resource manuals, and guidance (Order Adopting Regulatory Policy Framework and Implementation Plan, 2015). EM&V activities will be expected to provide useful information that will further improve resources available to the program (i.e. TRM, BCA, etc.). With this in mind, Con Edison's EM&V group can no longer wait until after the completion of a program cycle to start collecting data. In order to keep evaluation results current and useful, we must plan to implement evaluation activities during the program cycle. For this reason, certain data collections will require unconventional methods that align with more on-going data collections. Among these methods are:

1. Conducting quarterly surveys with participants to obtain valuable program data to:
 - a. Assess customer satisfaction and NTG real-time;
 - b. Analyze market perception of the programs (i.e. customer confusion, barriers, etc.);

- c. Identify customer needs/interest for new technologies; and
 - d. And other objectives that may be determined as needed.
2. Developing a mechanism for communicating results to inform and improve program design, TRM, and BCA models.
3. Making M&V an integral part of program delivery (further discussed below).

Conducting Quarterly Surveys

Contacting participants after a year or more, which is typical in evaluations, make the information collected unreliable. Customer recollection of the events that took place leading to a purchase, or what may have taken place absent the program, leaves serious doubt on the validity of the survey results. In addition, the information obtained may no longer be applicable to the current program design. Con Edison's second round of energy efficiency programs have undergone many programmatic changes that make survey data collected outdated.

By establishing a recurring survey that aims to collect survey data on a quarterly basis, we minimize the concerns mentioned above and also gain other advantages that include:

1. Keeping a pulse on customer perceptions and market indicators;
2. Making useful information available during the active program cycle; and
3. Providing the opportunity for program staff to react to customer needs in a timely manner.

Communication and Reporting Mechanisms

One important aspect of supporting the objectives of REV is to provide timely feedback. Even with on-going data collection, it would do little without a vehicle to communicate the results. Providing current and useful information will be critical to stakeholders in supporting programs as they evolve into REV like programs. To promote real-time feedback, Con Edison's EM&V will make it a best practice to:

1. Continue to provide ad-hoc memos that will discuss important findings requiring immediate attention, including a Red-Flag Analysis (Steven Mysholowsky, 2013);
2. Establish a quarterly evaluation status report to help inform stakeholders of findings, on-going activities, completed activities, timelines, and results. This can be in the form of a memo, newsletter, or any other type of document that would effectively relay this information; and
3. Develop an annual report to formally document evaluation activities, results and findings. The annual report should align with program planning so that results and new information would be a useful resource for program improvements.

Measurement and Verification

The New York market is shifting to a paradigm focused on providing customers with accurate insights about their energy use, system resiliency and distributed resources. REV dictates that Energy Efficiency and Demand Management programs start to plan for integration with grid optimization. If Network Forecasting and Planning are to include energy efficiency and demand management programs into their framework, utilities will rely more on capturing verified savings as opposed to depending on technical reference manuals and white papers for quantification of achieved savings. Measurement and Verification (M&V) will need to be incorporated on a department portfolio level in some fashion, whether it is full assimilation requiring 100% of projects be verified, or a partial integration based on defined parameters.

Currently program managers and other stakeholders must wait on impact evaluation results, which may take years to surface to properly identify the “true” ex-post savings associated with measures and projects. Experience shows that this can lead to incorrect reporting of savings to the Department of Public Service staff (DPS staff) and inaccurate forecasting of electric loads and curtailment within the distribution networks. M&V allows for the metering, ex-ante and ex-post, of various energy conservation measures (ECMs) included in various projects, technologies, and sectors leading to the determination of proper energy baselines and the verification/determination of projected/actual savings achieved (acquired).

Presently, Con Edison provides 100% M&V for their Demand Management Program (DMP) and Neighborhood Programs (Consolidated Edison Company of New York, Inc., 2015), while performing selective M&V for new technology pilot support and Research and Development (R&D) support. With these examples of programmatic M&V, a level of acumen has been achieved on the challenges, success factors, and future strategy of implementing portfolio wide M&V. For M&V to be ultimately successful within an energy efficiency and demand management department it must follow the S.M.A.R.T goals of project management, it must be Specific, Measurable, Assignable, Realistic and Time-Based.

Specific M&V Goals

To meet the challenges of the Indian Point Power Plant potentially going off line and to relieve areas of forecasted network constraints, Con Edison was tasked with creating programs aimed at the curtailment of specific electrical loads. Unlike their predecessors, these new programs are a combination of distributed resources, demand response and energy efficiency. These programs are a window into potential programs in a REV environment; the goal of the M&V conducted on these programs is not only the quantification of realized savings but also the planning and forecasting of future programs, network conditions and measure offerings. It is crucial to understand the data that are available through the access granted by the customer for M&V services, the acquisition and utilization of these data will not only validate the cost of the M&V but promote its usefulness in large.

The goal of the acquisition of data should be to collect as much data as possible with as little burden on respondents as possible. While access has been granted by the customer, every effort should be made to place loggers and meters at all locations that are not intrusive to the customer. In some cases, incentives may be needed for the customer to participate in such extensive metering; the values attained will prove to be worth the investment.

The goal for utilization of data should be to inform the program and the service territory as a whole. Historically, utility load shapes and profiles for sectors, measures and networks are created from data acquired through educated approximations or regional iterations and not from metered data. In this new approach we see it as imperative to build upon the unverified data with metered data. With this in mind, before any M&V effort can begin, a concerted effort should be made to determine all the data currently “in-house”, this will facilitate the creation of M&V goals that are defensible and whose results are actionable.

Measurable M&V Goals

The goal and strategy of M&V is set depending on the level of rigor sought (Bonneville Power Administration, 2012). With the programs mentioned above, 100% of the projects are to receive M&V. This will be the first time Con Edison customers and market partners¹ are subjected to such rigorous M&V within the programs, therefore the length of time required for M&V and its deliverables are key goals in success of the effort. Standardizing M&V deliverable estimates restricts unrealistic expectations from stakeholders, and establishes accountability with the M&V staff².

Analogous with goal setting is the cost management of M&V. M&V is costly, at least when compared to traditional non-meter quality assurance/verification services. Using DMP as an example, we are starting to realize not only the costs of doing M&V work but also the resulting programmatic financial savings from reduced overblown applicant savings estimates. As of the date of this paper, 175 buildings within the program have received a pre-installation M&V, this has resulted in a 27% decrease of projected demand reduction (kW) between the applications and Pre-Install M&V. This equates to approximately \$2.5 million in avoided committed³ incentive dollars. Meanwhile, to date of this paper, M&V costs account for less than 2% of the programs costs, when compared to the year-to-date committed incentive dollars. We anticipate that this will increase to a little more than 3% after more projects move to post M&V phase.

¹ Market Partners are the contractors and vendors familiar with Con Edison’s energy efficiency and demand management programs.

² Con Edison conducted 100% pre and post install surveys during their DSM programs in the 1990’s and its Targeted DSM program which ran from 2005 to 2011, although no metering was conducted.

³ Committed projects are projects for which the applicant has received an incentive offer and has subsequently signed the M&V plan, allowing Con Edison to perform M&V services.

Assignable M&V Goals

M&V in the Con Edison energy efficiency program is still relatively new, new to the program managers, support staff, internal and external stakeholders. For the M&V to be successful, it requires input and assistance from multiple sources.

- **Program Managers:** The program managers of the programs receiving M&V must enforce strict program technical requirements while managing the expectations from program participant. The goal here is to limit the amount of missing applicant and measure information during M&V analysis.
- **Support Staff:** It is important to get the buy-in of the support staff to initiate a programmatic M&V.
 - The forecasting group's goal is to provide the M&V staff with research areas, identifying data needed for the planning of future networks, programs and measures.
 - The Engineering groups goal is to identify the measures prone to irregular realized savings or measures whose savings are based on subjective references such as out of region white papers and technical reference manuals.
- **Internal Stakeholders:** The results from the M&V effort will be used to accurately assess the network impacts of the program. Distribution Engineering has the goal of informing the M&V staff the level of precision required in the M&V analysis for the data to be incorporated into distribution infrastructure design.
- **External Stakeholders:** The M&V process should be improved as the program progresses. A key contributing factor to improvements are Market Partners, consistent feedback from market partners helps the M&V staff make changes to the process beneficial to all, such as changes to the requirements document or time frame estimates.

Realistic M&V Goals

The Demand Management Program and Neighborhood program are unique in that they both have start and end dates. The goals set for these programs took into account the timeframe given, the goals are challenging yet attainable within the program constraints. Goal deliverables affecting major stakeholders such as forecasting may require a modification of the programs constraints. If the allotted timeframe is not sufficient for the proposed deliverable, depending on the significance of the research the timeframe/constraint may be modified.

Time-Based M&V Goals and best practices

As mentioned above, M&V is fairly new to the Con Edison programs. The biggest complaint so far is the amount of time required to conduct appropriate M&V and provide deliverables. The key is setting an appropriate yet challenging timeframe, this is vital in achieving the customer and Market Partner buy-in. To support the timeframes set in place, M&V staff initiated:

- Standardized reporting templates: Reporting templates for all phases of M&V (plan, pre report, post report) (Efficiency Valuation Organization, 2002) increases the time to produce deliverables and review documents.
- Strict communication management: M&V is grudgingly accepted by the Market Partners at best. Questions and complaints are directed through the proper communication channels. Constant communication between the Program team and the M&V team is invaluable.
- Selecting appropriate personnel: Depending on the difficulty of the task, M&V can be accomplished by multiple stakeholders. Inspections can be accomplished by in-house sales team or customer service personnel. If pre-M&V required documentation is missing, if it can be attained by program staff using customer service information systems, it would eliminate the time to acquire information from customer.

The overall goal is to incorporate M&V into the fabric of all the programs. With REV, traditional Impact Evaluations will be relegated to a supplemental role in lieu of real time and consistent programmatic M&V efforts. M&V on a portfolio level hopes to achieve:

- Live Continuous Program Design: M&V will allow for the true accounting of measure savings, measures whose savings are primarily based on white papers and best guesses. Furthermore the information attained will be live and continuous, used to inform the program through quarterly reports for mid-course adjustments of savings, incentives and overall measure strategy.
- Forecasting and Load Shapes: Forecasting currently includes EE/DR estimates, M&V will strengthen this process even further, adding a layer of legitimacy and accuracy. M&V must have a concurrent role in all programs for uniformity, providing real-time impact (kW/kWh). This real time data as it becomes more robust will be used to construct realistic load curves instead of theoretical, with enough metered data an accurate representation of customer usage can be constructed by measure, equipment, facility and space types.
- Adoption Curves: The natural adoption of measures by the customers is pivotal information needed for the proper initiation, planning and execution of programs. M&V across the different programs will be used to acquire adoption curves, giving the program real-time insight into market transformation and an educated measure potential assessment.
- Market animation and customer engagement: M&V will be used in a proactive approach towards customer facing solutions. Utilizing M&V findings to inform and develop case studies, engaging the customer on the actual performance of their measure.
- Audits with M&V: While on site conducting M&V, the staff will utilize the opportunity to conduct audits to bring to light additional opportunities for incentives and measures.
- Customer surveys with M&V: while on site conducting M&V, M&V staff will utilize the opportunity to conduct surveys that will provide real time pertinent insight to program

managers of changes that could be made that will impact market effects such as free ridership, snapback and spillover.

- Technology integration: M&V will allow for the integration of new technologies through pilots and M&V specific studies. M&V will also allow for the authentication of deemed savings within the New York Technical Manual through M&V analysis of future installs within the respective programs.
- M&V for Demand Response: The purpose of Measurement and Verification for Demand Response programs is to provide determination of the demand reduction quantities achieved (Miriam L Goldberg, 2013). M&V will analyze the reductions achieved by individual program or market participants, and of the subsequent financial payments or penalties. M&V will also work to determine program-level demand reduction that is projected to be achieved, which will be crucial for ongoing program planning and forecasting. M&V staff will be reviewing the verification documents of customer/aggregators who seek pledge reductions based on energy efficiency measures executed by the applicant. Measurement and Verification aims to provide meaningful measurement of DR performance which will serve as the basis for fair and transparent financial flows to and from market participants.

Conclusion

This paper discusses the various methods that Con Edison's EM&V team plans to tackle the new regulatory landscape. REV, at a distance, seems to be a daunting task for regulators, implementers, and evaluators as a whole; only through prudent planning will we be able to position ourselves for success. In a setting where obtaining valuable data in a timely manner will be critical to program success, and ultimately a sustainable business model, EM&V must evolve. The tradition post-evaluation is quickly becoming obsolete, therefore, by incorporating methods to collect and report data real-time, stakeholders will have the necessary resources to improve program delivery, measure savings, and forecasts.

By taking available funds allocated for evaluation and dedicate more of the funds to M&V, we will be able to develop more nimble program evaluation related assessments while managing the costs of the additional M&V. Coupled with increased data collection of M&V, we see this as the future for assessing on-going program operations while informing the development of more innovative EE&DM programs that will be ready to support the proposed REV landscape.

If energy efficiency and demand management are to be taken seriously in the integration of grid optimization, the quantification of savings must be conclusive. M&V must find a way to be integrated into the portfolio without sacrificing significant cost, time, and stakeholder satisfaction.

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