

Workforce Training: The Surprising NPV in M&V

Vanessa Frambes, Adam Knickelbein, and Marshall Keneipp, Navigant Consulting

ABSTRACT

Due to cost and time constraints, all too often, staff training in measurement and verification (M&V) is overlooked on energy efficiency program evaluation projects. Two key areas, the need for field safety and lack of energy systems equipment recognition and operation experience, provide compelling and mutually reinforcing reasons that companies should invest in their employees who conduct field research and data collection to support energy efficiency measure impact analysis. Teams conducting M&V on diverse buildings and equipment types are exposed to a wide variety of situations and potential safety hazards in the field, making training even more essential in this industry. Workforce training is a good investment for evaluation companies because of decreased worker injury or accident costs from safety trainings, higher quality data collection results stemming from increased understanding of the field characteristics of building energy systems, and greater overall worker confidence in the field.

Due to the need for extensive data collection in the M&V process, there is a clear necessity for standardization and proper training with regards to capturing accurate data and managing crews safely and professionally. Navigant Consulting (formerly Summit Blue Consulting) has implemented a program of safety trainings for its field staff who are engaged in data collection activities around operating mechanical equipment, live electrical systems and HVAC systems, and installing data logging equipment on operating building and industrial energy systems. For this purpose, the company has prepared a comprehensive safety manual and conducted several safety and equipment orientation training courses that involved both classroom and in-field study. The manual acts as a useful future reference and supplement to the training courses, informing specific safety decisions such as which type of personal protection equipment (PPE) to use around high voltage or other dangerous equipment, and field safety protocols such as roof and ladder safety.

Equipment and technology trainings have also educated employees in equipment component identification and proper data collection and data logger placement techniques. These courses, typically taught in the field, look at the specifics of various systems and how to work safely around operating equipment and systems. The capacity to appropriately identify equipment and systems in the field and understand the operation of complicated and often poorly documented systems in the field, is an important aspect of field data collection and measurement activities during business hours.

Measurement and verification training has served as an asset to the field workers as well as the company as a whole. These trainings help maintain consistency in field data collection standards and practices. This training also provides a base for future breakout trainings that would pertain to specific projects and data collection requirements. Implementing a comprehensive safety and field training program has allowed Navigant to collect quality field data with a consistent record of no field injuries.

Introduction

Recent trends within the energy market and the proliferation of energy efficiency programs across the country are driving the need for credible and quantitative analysis of the performance of energy efficiency measures for building and industrial energy systems. Measurement and verification (M&V) of energy-efficiency projects can work to fill these and many other information needs when it comes to having independent and transparent data and reliable estimates of savings for energy efficiency projects. As Dr. W.L. den Heijer and Prof. L.J. Grobler (den Heijer & Grobler 2008, 2) point out, M&V can provide for:

- Increased energy savings: Accurate determination of project impacts gives operators valuable feedback on the operation of their systems.
- Operations and maintenance troubleshooting: M&V provides performance feedback to operators and managers regarding their systems.
- Project Engineering: M&V provides the most acceptable validation vehicle for energy efficient and DSM design strategies and facilitates better project engineering.
- Quantification of emissions impacts: M&V allow for the quantification of not only cost and energy impacts, but of emissions and other environmental factors as well.

In recognizing the need to fulfill these work demands it is essential to implement a systematic method for conducting M&V for energy-efficiency projects. Recommended trainings for this should be designed to develop consistent safety awareness and procedures, in-depth equipment, controls and system comprehension, and comprehensive understanding of data logger applications, capabilities and limitations for accurate data collection. While often overlooked, this investment in employee safety and accurate, usable data can create long lasting benefits.

Safety Training

Safety training is a key component of measurement and verification (M&V) training. Specific safety trainings provide consistent and systematic guidelines for working around live electrical systems, operating HVAC equipment, fans and motors, and live lighting and other electrical systems. Some of the key components to these trainings include (Leonardi):

- Knowledge of proper attire and personal protection equipment (PPE)
- First aid procedures and essential equipment
- Electrical and mechanical safety protocols - fundamentals of working around live equipment
- Access to equipment and meter operations
- Ladder and roof safety

The Navigant safety manual was created specifically as a field safety manual and acts as a reference for employees after trainings are complete. This type of training cultivates a culture of safety and quality data collection procedures in the field, assures employees of the commitment of the company to their safety and wellbeing, and affirms within the industry that employee safety in the field supersedes all other project considerations.

Navigant Consulting (NCI) incorporated these ideas into its field protocols because of a recognized need to deal with varied and often unpredictable working conditions in the field, and for employees to have a greater understanding of the idiosyncrasies of in-field performance of operating energy systems on many of the work engagements that NCI was leading. These trainings were effective because of the emphasis put on them and the time commitment and investment made by the company. In choosing seasoned and knowledgeable trainers and planning sufficiently in advance of the field data collection work and tasks ahead, the company was able to tailor the trainings so that everyone involved felt like they were getting the most out of the experience. This was important because attention to detail and experienced and knowledgeable trainers are critical when you are dealing with hazardous equipment and situations in the field. In addition, offering hands-on field exposure for staff that are typically oriented to working in an office environment ensured employee attention and interest.

Not only did these trainings improve the confidence of employees in the field, it also demonstrated our commitment to the well being of our workers and to our clients. The obvious benefits notwithstanding, it must be noted that this kind of training is rather time consuming and represents a substantial financial investment. However, experience has shown that the benefits of comprehensive field training far outweigh the costs. First, the company recognizes its obligation to its employees when sending them into the field to perform potentially risky and dangerous field work. It can be said then that through safety training and ensuring the well-being of its employees, the company is demonstrating its commitment to meeting this obligation. Through this employees recognize their value and importance to the company and feel comfortable and confident while working on the sometimes dangerous tasks at hand.

Secondly, in recognizing the benefits of field training, there are also returns for the company and its clients. A number of factors can contribute to these benefits including reduced worker's compensation claims, manageable insurance premiums from reduced healthcare expenses from accidents, avoidance of lost productivity, and higher quality data collection for projects. Employers with fewer claims and good safety records pay less in premiums than do employers with many claims and undesirable safety records (OSHAcademy). An example of financial savings includes the University of California Risk Services Division, which between 2005-2008 saved the university approximately \$101 million, in large part through implementing loss-prevention programs such as its Be Smart About Safety program (Ward 2008). Navigant Consulting staff while with Summit Blue Consulting did not have a single field safety related worker's compensation claim in the history of the company in spite of conducting extensive field data collection activities over many years. This is attributable at least in part to the proactive approach the company took in ensuring the wellbeing of its employees.

Technical Training

The objective of measurement and verification activities is to collect accurate data for quantitative analysis of the actual as-built performance of building and industrial energy systems. With this goal in mind it is essential that field teams who are conducting the research are able to understand the equipment they are inspecting, metering and monitoring as well as the application and operation of measurement devices that they are putting into place.

Equipment training for M&V can be very technology specific and thus it is essential to use training contractors or in-house personnel who have an in-depth understanding of the equipment and systems being assessed. Even if all personnel will not be engaged in every aspect

of field data collection, trained to this level, the education needs to be comprehensive and the instructor able to present and explain the field operation of complex mechanical and electrical systems in a way that is comprehensible to all levels of field staff. This is particularly true for HVAC systems in commercial buildings and process applications industrial settings. While in residential settings the equipment may often be smaller and easier to understand, it is still necessary to have a solid comprehension of residential building science, the interaction of the building envelope with HVAC systems, and the operation and control of still complex HVAC systems is required. For these trainings the company strived to provide a sound hands-on familiarity with key energy systems that provided the foundation for more detailed, specific trainings when particular projects required it.

Equipment knowledge is imperative in order to accurately place data logging devices. Accurate and reliable data collection activities are essential for minimizing the amount of time processing and analyzing field data. In addition, a higher percentage of the data collected is typically able to be used when systematic and well thought out field data collection procedures are followed helping project managers to better manage their projects and produce more reliable and defensible results for their clients.

For example, field staff training for a recent project to conduct M&V on lighting system energy efficiency retrofits resulted in lower overall costs to that project. The amount of data to be collected at each site necessitated a thorough and hands-on training regimen, and field training activities were directly responsible for reducing overall analysis costs and time spent in the field. The upfront investment in training was saved several times over in savings on the back end during data processing and analysis.

Conclusion

The utility DSM industry has expanded exponentially in recent years, and the American Recovery and Reinvestment Act of 2009 awarded \$16.8 billion dollars to the Office of Energy Efficiency and Renewable Energy (U.S. DOE 2010). These large investments are delivering energy efficiency projects across a broad spectrum of market segments and end-use applications. To ensure that these investments are being wisely made, the performance of these programs and projects will be required to demonstrate proven energy efficiency savings or capabilities. In order to meet these requirements it will be imperative that accurate data is gathered and presented. Due to these high demands there is likely to be a dramatic increase in the need for professionals who can efficiently, quickly and accurately perform measurement and verification activities that will withstand the scrutiny of regulators, program managers, and peers in the industry. A key component of this will include having trainers prepared for these stringent data validation requirements.

This call to action requires access to trainers who are capable of creating comprehensive courses that are engaging and thought provoking to the class, cost effective to the company, help ensure the safety of field personnel, and the most accurate and reliable data possible for the client. Other factors to consider when developing a training program include frequency of training activities, training location, required trainer skill set and experience, and correlation of training activities to detailed project requirements or idiosyncrasies.

The energy industry is rapidly growing and changing and with this, the approach to training people within this field is ever more crucial. The M&V guidelines put forth by the US DOE they state that, "Since the M&V approach calculates and documents energy savings, it is one

of the most important activities associated with implementing performance contracts and is a crucial issue in contract negotiations” (US DOE 2008). Achieving multifaceted training approaches can be daunting and requires that management recognize the need and commit the resources to complete a training program. In order to meet this demand, experienced trainers who may have formerly focused on other industries, may need to be called upon to develop curriculums and training programs that are tailored to the needs of the energy field in an effort to stay ahead of the curve and provide the best safety and equipment training courses possible.

Developing these training programs can help present credible, objective, and independent findings on the actual as-built performance of energy systems and energy efficiency improvements based on data that is collected via transparent and accurate methodologies (den Heijer & Grobler 2010, 42). This disciplined approach not only benefits the company and its staff, but also their clients and other stakeholders as well. With an upfront investment in the safety and education of employees, companies can expect to see long term, lasting results and benefits.

References

- den Heijer, Dr. W.L. and Prof. L.J. Grobler. 2010. “**Methodology to Measure and Verify the Impacts Obtained from Energy Efficiency Activities**”. Energy Engineering 107 (2): 41- 51.
- den Heijer, Dr. W.L. and Prof. L.J. Grobler. 2008. **The Measurement and Verification Guideline for Greenfield Projects** (*Draft*). Eskom and North-West University v2ro. South Africa: North-West University.
- Lawrence Berkeley National Laboratory. March 29, 2010. **Measurement and Verification Site**. <http://mnv.lbl.gov/training>.
- Leonardi, Don (Leonardi Heating & Air Conditioning-Trainer). 2010. Personal communication. March 5.
- OSHAcademy. 2010. “**All About Calculating Workers’ Compensation Premiums**”. <http://www.oshatrain.org/notes/4anotes05.html>. Portland, Ore.: Occupational Safety and Health Training.
- Ward, Jennifer. February 29, 2008. **University of California Realizes Key Financial Savings With Innovative Risk Services Programs**. <http://www.universityofcalifornia.edu/news/article/17408>. California: University of California.
- United States Department of Energy (U.S. DOE). April 21, 2010. **Energy Efficiency and Renewable Energy**. <http://www1.eere.energy.gov/recovery/>.
- United States Department of Energy (U.S. DOE). April 2008. **M&V Guidelines: Measurement and Verification for Federal Energy Projects**. http://www1.eere.energy.gov/femp/pdfs/mv_guidelines.pdf. Prepared by Nexant, Inc.