What is the Future of M&V? End Use Metering, Embedded M&V and Virtual Monitoring
Tuesday, November 1 | 8:30am – 12:30pm | $185

Instructors: Amit Kanungo, Jarred Metoyer and Mimi Goldberg, DNV

This workshop will reprise the highly successful workshops from several past IEPEC, with updates to address recent developments in end-use metering and evaluating non-traditional energy efficiency measures. Consistent with the successful 2017 and 2019 workshops we will update attendees on the latest developments in Measurement and Verification embedded evaluation methods and virtual data collection techniques.

End-use metering is an important evaluation tool. It can support detailed estimates of energy savings and provide good evidence on reasons for higher or lower than expected savings. However, it could be expensive and time consuming, and sometimes does not address all sources of error - e.g., baseline misspecification. While other techniques may be more cost-effective for traditional measures such as lighting retrofits, one must review all available options when considering new use cases with limited previous study – such as electric vehicle charging, energy storage for load shifting, and indoor agriculture lighting and HVAC.

This workshop will provide practical strategies based on long experience to: 1. Determine if end-use metering is the best available strategy for evaluation issue; 2. design a cost-effective approach to the evaluation challenge; and 3. implement it effectively. A key component of the workshop involves examining a wide range of experimental design, monitoring equipment options, reviewing real world M&V examples, various load monitoring methods including virtual monitoring techniques and discuss embedded evaluation techniques vs. traditional evaluation methods. The workshop will emphasize the practical solution aspects of the process and the knowledge necessary for the successful implementation of a monitoring project.

The workshop focuses on a review of M&V methods and equipment and state-of-the-art options and reviews applications including traditional EE and emerging use cases such as vehicle charging and load shifting controls. Instructors will discuss the basics of M&V, the application of end-use metering, pitfalls of implementing a metering project, as well as the problems of baseline determination. The workshop will review key components of a successful M&V project and will provide exposure to various tools and techniques to perform effective M&V. The workshop will show methods of virtual data collection and how the combination remote and in-person data collection can assist in performing effective high rigor M&V. We will also review embedded evaluation techniques against traditional evaluation methods and how embedded evaluation strategy could be used to mitigate the risks associated with delivery of energy efficiency programs. We will also review practical examples of how M&V techniques are applied to various energy efficiency measures including non-traditional measures such as Electric Vehicles (EVs), energy and thermal storage, and technologies in the indoor agriculture sector. Other workshop topics include the estimation of delivery, and evaluation of both energy efficiency and demand reduction projects and technologies. Finally, the workshop will discuss the quantification of Greenhouse Gas (GHG) reduction for GHG reduction programs.

Originally offered at IEPEC 2007, this course has been updated and administered in 2009, 2010, 2011, 2013 ,2015, 2017 and 2019. The instructors of this workshop are in thick of new developments in field data collection and analysis and help participants make good decisions for the state-of-the-art M&V techniques. These workshops have been well attended by utilities, energy policy makers, regulators and consultants in the US and abroad, and received positive feedback on the great content, and how the workshops were very insightful, interesting, and readily applicable in their jobs.

Workshop outline:

- Current M&V practices and protocols (IPMVP, ASHRAE, FEMP, etc.)
- Assess metering objectives
- Develop monitoring plan to inform objective
- Review, respect and adhere to established protocols
- Establishing baselines
- Measurement hardware and data acquisition/transmission/storage?
- Virtual data collection approach vs In-person data collection approach
- Review embedded M&V vs traditional M&V
- Installation demo for typical metering equipment
- Tips, tricks, strategies and potential traps
- Methods for compiling and analyzing large amounts of data
- Analysis techniques and insights
- Review analysis examples with end-use data
- Review M&V techniques for non-traditional EE measures
- Methods of quantifying GHG reduction

Who should attend:

Recommended attendees include managers, planners, policy makers, evaluators and researchers interested in a broader knowledge of how monitoring is used and applied in energy efficiency, baseline estimation and demand resource determination studies. Attendees will leave with a solid understanding of how to identify, implement and evaluate a successful monitoring project.

About the instructors:

Amit Kanungo is a Senior Engineering Consultant at DNV. Mr. Kanungo is currently managing the CPUC's Custom Impact Energy Efficiency Programs for the California IOUs where he has focused his skills on providing engineering insight to a wide variety of custom energy efficiency projects. As a project manager and a lead engineer for the custom evaluation project, Mr. Kanungo is responsible for developing monitoring plans, training field engineers, developing field strategy and performing metering. In this process, he has completed various complex metering projects, which required multiple and advanced instrumentation. Mr. Kanungo has worked extensively with metered data and has performed advanced analyses with interval metered data. Mr. Kanungo has keen insight and knowledge of the complex interactions of energy systems in commercial buildings and is skilled in isolating and assessing interactive energy savings. Mr. Kanungo also has an in-depth

understanding of energy usage in industrial facilities. His experiences included waste water treatment, manufacturing facilities, industrial refrigeration and wide variety of industrial facilities. Mr. Kanungo has presented various technical papers reflecting different energy efficiency technologies and methods. Mr. Kanungo holds a Master's degree in Electrical Engineering from California State University, San Francisco.

Jarred Metoyer is a Vice President and Head of Energy Systems department at DNV. He is an engineer with a demonstrated expertise in energy efficiency and residential and commercial heating and cooling (HVAC) systems. Some of his responsibilities included managing evaluation, measurement, and verification studies (EM&V), including overseeing residential and commercial data collection, end-use energy consumption analysis, and providing technical support for energy-efficiency program planning and potential. His recent work has consisted of significant research to model building energy use and climate change-induced disaster resilience with an emphasis on using whole-building AMI data with advanced analytics and simulation tools to perform complex analysis beyond energy efficiency.

Jarred serves his clients by directing, mentoring, and overseeing the quality of the work of 30+ analysts, consultants, and engineers across the West Coast. He collaborates with colleagues locally and globally to define analytical, service, and digital solutions across Energy Efficiency, Decarbonization, Resilience, Smart Grid, Distributed Energy Resources, and Renewable so they are accessible to all communities including Disadvantaged Communities.

Miriam Goldberg, Ph.D. leads DNV - Energy's evaluation practice. She received the 2009 International Energy Program Evaluation Conference Lifetime Achievement Award for contributions spanning data collection strategies, econometric analysis, net-to-gross calculations, policy frameworks for valuation of energy savings, and measure life estimation. Her major focus is the joint application of statistical and engineering methods to energy studies. She was a co-developer of the Princeton Scorekeeping Method (PRISM™). Her work has laid foundations for methods in ASHRAE, IPMVP, and UMP guidance for savings estimation using utility metering data. Her current work includes assessments of advanced M&V methods relying on AMI data and machine learning. She holds a B.A. in Mathematics from Harvard University, and an M.S.E. in Mechanical and Aerospace Engineering and Ph.D. in Statistics from Princeton University.

Content Providers:

John Stoops, Ph.D. - DNV, Pacific Northwest (2007, 2009, 2010, 2011 trainer)

Steve Carlson - DNV, Middletown, Connecticut (2009 trainer)