End Use Metering, Non-Intrusive Load Monitoring and M&V 2.0: When to Use What and How?

Instructors: Amit Kanungo and Miriam Goldberg, DNV GL

Monday, August 19 │ 9:00am – 5:00pm

$165 │ Includes 2 breaks and lunch

Description:

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 techniques and discuss advanced data analytics like M&V 2.0 and Non-Intrusive Load Monitoring (NILMs). 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 has two parts: half of the day focuses on a review of M&V methods and equipment and state-of-the-art options and the other half of the day reviews applications including traditional EE and emerging use cases such as vehicle charging and load shifting controls. In the first half, instructors will discuss the basics of M&V, the application of end-use metering, pit falls 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 how advanced data analytics with AMI whole premise data could improve current EM&V practices, and where whole premise pre/post analysis is appropriate to use for savings determination. We will also review Non-Intrusive Load Monitoring (NILM) techniques and how NILM is used to parse load signatures of various end-use applications and discuss how simple matching algorithms can be employed to identify larger loads. The second part of the workshop will 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.

The key objectives of the workshop are:

- 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
- Pre/post analytics and baselines
- Measurement hardware and data acquisition/transmission/storage?
- 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
- M&V 2.0
- Review M&V techniques for non-traditional EE measures
- Non-Intrusive Load Metering (NILM) techniques

Intended Audience: 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.

Workshop Format: Lecture; case study examples; some group activities with interactive group tasks at least twice in the session

About the Instructors:

Amit Kanungo is a Senior Engineering Consultant at DNV GL. 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.

Miriam Goldberg, Ph.D. leads DNV GL - 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.