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# FUNCTIONALITY OF THE MEASUREMENT AND VERIFICATION SPECIALIST

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ONLINE TRAINING BY KRISHNAJI PAWAR

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MODULE

14

## Data Accessibility, Communication, and Valuation

KRISHNAJI PAWAR - CEO & FOUNDER

LEED AP(BD+C),GSAS CGP,GCP,ISO 14001

[WWW.BEYONDSMARTCITIES.IN](http://WWW.BEYONDSMARTCITIES.IN)



# FUNCTIONALITY OF THE MEASUREMENT AND VERIFICATION SPECIALIST

Data accessibility, communication, and valuation are essential components in energy management, particularly in measurement and verification (M&V). Accessible data is crucial for accurate measurement and verification of energy savings, enabling informed decisions and reducing costs. Examples of data accessibility include smart meters in residential settings and health monitoring systems. Challenges include data silos, standardization issues, and privacy and security concerns.

# Learning Objectives

- Instrument metering and calibration
- Fieldwork: formal accreditation, safety, OSHA, and NFPA
- Data accessibility, communication, and valuation
- Reporting on Measurement and Verification (M&V) Projects
- Definitions of IPMVP Options
- The future of measurement and verification
- Sample M&V Plan
- Sample M&V Report
- ESCO's Guide to Measurement and Verification
- Summary and Resources



## INTRODUCTION

- Refers to the ease of obtaining, manipulating, and utilizing data related to energy consumption, generation, and efficiency.
- Crucial for accurate measurement and verification of energy savings.
- Examples include smart meters in residential settings and health monitoring systems.
- Challenges include data silos, standardization issues, and privacy and security concerns.

# DATA AVAILABILITY CHALLENGES IN METERING AND VOLATILITY (M&V)

## Data Availability Issues:

- Lack of metering infrastructure: Facilities lack adequate metering infrastructure to measure energy consumption.
- Data inaccessibility: Even with metering infrastructure, data may not be easily accessible due to communication protocols, meter incompatibilities, or data in different formats.
- Incomplete or inaccurate data: Even when available, data may be incomplete or inaccurate, affecting the accuracy of M&V analysis.
- Data quality issues: Factors such as meter calibration issues, incorrect settings or configurations, or data transmission errors can affect data quality.
- Limited historical data: Historical data is essential for accurate M&V analysis, but often only available for a limited period.
- Privacy concerns: Data may be inaccessible due to privacy concerns, such as sensitive information in metering data.



# MITIGATION STRATEGIES

- Establish clear data requirements and communicate them to stakeholders.
- Develop contingency plans in case necessary data is unavailable.
- Ensure high-quality data collection through quality control checks and addressing missing or erroneous data.
- Use advanced data analytics such as machine learning and artificial intelligence.
- Collaborate with stakeholders to understand their needs and goals and align the M&V process with these objectives.



# TYPES OF DATA NEEDED FOR M&V

- Energy consumption data: Includes the amount of energy used of facilities or systems.
- Weather data: Includes information on temperature, humidity, and other weather conditions.
- Operational data: Details how facilities and equipment are used.
- Facility characteristics data: Includes facility size, construction time, and other relevant physical characteristics.
- Financial data: Includes data on project costs and targets.



# CHALLENGES IN ACCESSING DATA



- Data availability: Data may not be available if stored in different systems or owned by different stakeholders.
- Data quality: Data may not be of sufficient quality to support M&V.
- Data integration: Data often requires combining data from multiple sources.
- Privacy and security: Data used in M&V may be subject to privacy and security concerns.
- Cost: Collecting and analyzing data for M&V can be expensive.

# OPEN-SOURCE SOFTWARE IN ENERGY EFFICIENCY

- Open-source software provides access to various tools, allowing users to customize their needs.
- It promotes transparency and standardization, allowing users to verify model and calculation accuracy and reliability.
- Collaboration in open-source development allows the M&V community to establish common standards and practices.



# OPEN-SOURCE SOFTWARE IN ENERGY EFFICIENCY+

## Jupyter Notebook

- Known for its flexibility, Jupyter Notebook supports multiple programming languages and allows users to write and execute code in a web-based environment.
- The FLEX Market project uses Jupyter Notebook to develop a platform for flexible demand response in the electricity grid.

## CalTrack Methods

- OpenEE developed CalTRACK, an open-source tool that uses the Time-of-Week and Temperature (TowT) model from the Lawrence Berkeley National Laboratory (LBNL).
- CalTRACK aims to standardize M&V methods and foster a culture of data sharing and best practices among stakeholders in the energy efficiency industry.



# ENERGY MODELING SIMULATION SOFTWARE

- Open-source software is not limited to data analysis.
- EnergyPlus, OpenStudio, Design Builder, TRNSYS, and DOE-2 are examples of energy simulation software programs.

## Open-source Software for Statistical Software

- R is a free and open-source programming language for statistical computing and graphics.
- Python is a high-level, general-purpose programming language used for various purposes, including data analysis and statistical models.
- OpenBUGS is a free and open-source software package for Bayesian statistical analysis.
- Stan is an open-source probabilistic programming language for Bayesian inference.



# COMMUNICATION

- Involves the transfer of information regarding energy consumption, savings, and performance metrics between various stakeholders.
- Crucial for promoting collaboration, fostering transparency, and driving behavioral change among stakeholders.
- Examples include a corporate energy management team communicating quarterly energy performance reports to all employees.
- Challenges include the complexity of data and the frequency of updates.



# EFFECTIVE COMMUNICATION IN M&V PROJECTS

- Emphasizes the importance of soft skills in M&V projects.
- Teams of specialists, including engineers, analysts, managers, and legal and financial professionals, contribute to project success.
- Communication should be accessible and comprehensible, avoiding jargon and using plain language.
- A clear communication plan should be established from the start, outlining team members' goals, objectives, roles, responsibilities, timelines, and communication channels.
- The goal is to ensure all stakeholders are informed about the M&V process and progress.
- Tasks include educating stakeholders about the M&V process, issuing regular updates, and facilitating collaboration.





- Target audience includes key managers, facilities managers, data analysts, project managers, building occupants, and senior leadership.
- Communication channels include regular meetings, email updates, status reports, presentations, and the project website.
- Visual aids like diagrams, charts, and graphs can be used to illustrate technical concepts and depict the project visually.
- Strategies for smooth transitions include a "warm" handover, ongoing training, and updating the communication plan.

# VALUATION



- Quantifies the economic benefits of energy efficiency measures, demand response programs, and renewable energy initiatives.
- Essential for justifying energy investments and securing funding or incentives.
- Examples include a commercial building undertaking a lighting retrofit project.
- Challenges include uncertainty in projections and non-economic benefits.

# VALUATION CHALLENGES IN ENERGY MANAGEMENT ACTIVITIES

## Factors Affecting Valuation:

- **Baseline uncertainty:** Uncertainty in defining baseline energy usage and corresponding energy cost, especially if seasonal or weather-related variations affect energy prices.
- **Market uncertainty:** Significant fluctuations in energy prices over time.
- **Measurement and verification uncertainty:** Errors may arise during the measurement and verification process.
- **Non-energy benefits:** Energy efficiency measures can provide non-energy benefits such as improved comfort, indoor air quality, and reduced maintenance costs.





# VALUATION CHALLENGES IN ENERGY MANAGEMENT ACTIVITIES +

## Mitigating Challenges:



- Define a clear, consistent methodology for quantifying and assigning value to the impacts of energy management activities.
- Establish a well-defined baseline energy usage and average for all energy usage.
- Use market data and projections to estimate utility energy prices and incorporate sensitivities to account for uncertainty.
- Implement robust M&V procedures.
- Conduct cost-hearing analyses for hot energy and non-energy.
- Involve stakeholders in the valuation and provide them with clear and transparent information about the methodologies and assumptions used.



### Rates, data, and avoided costs:

- The combination of rate structures can create difficulties for valuation.
- To properly value the impacts of energy management activities, the marginal price to both the adjusted base line and actual energy use must be considered.



### Savings load shapes:

- The shape of the load profile or energy use pattern before and after a retrofit can affect the impact of an energy management activity.
- The concept of duck curves and negative pricing can affect energy management in several ways.

# CONCLUSION

- Data accessibility, communication, and valuation are interdependent pillars of effective energy management.
- The ongoing development of technology and methodologies in these areas will shape the future of energy management.



# CONTACT US



+91 6363032722



info@beyondsmartcities.in



learn.beyondsmartcities.in



#55,HMR Layout ,Bengaluru ,India



# THANK YOU

