



Northeast Energy Efficiency Partnerships

M&V 2.0 Experience, Opportunities, and Challenges

Wednesday, March 30th

11:30am – 12:30pm



Northeast Energy Efficiency Partnerships

Changing EM&V Paradigm - Landscape of New Tools & Data Analytics

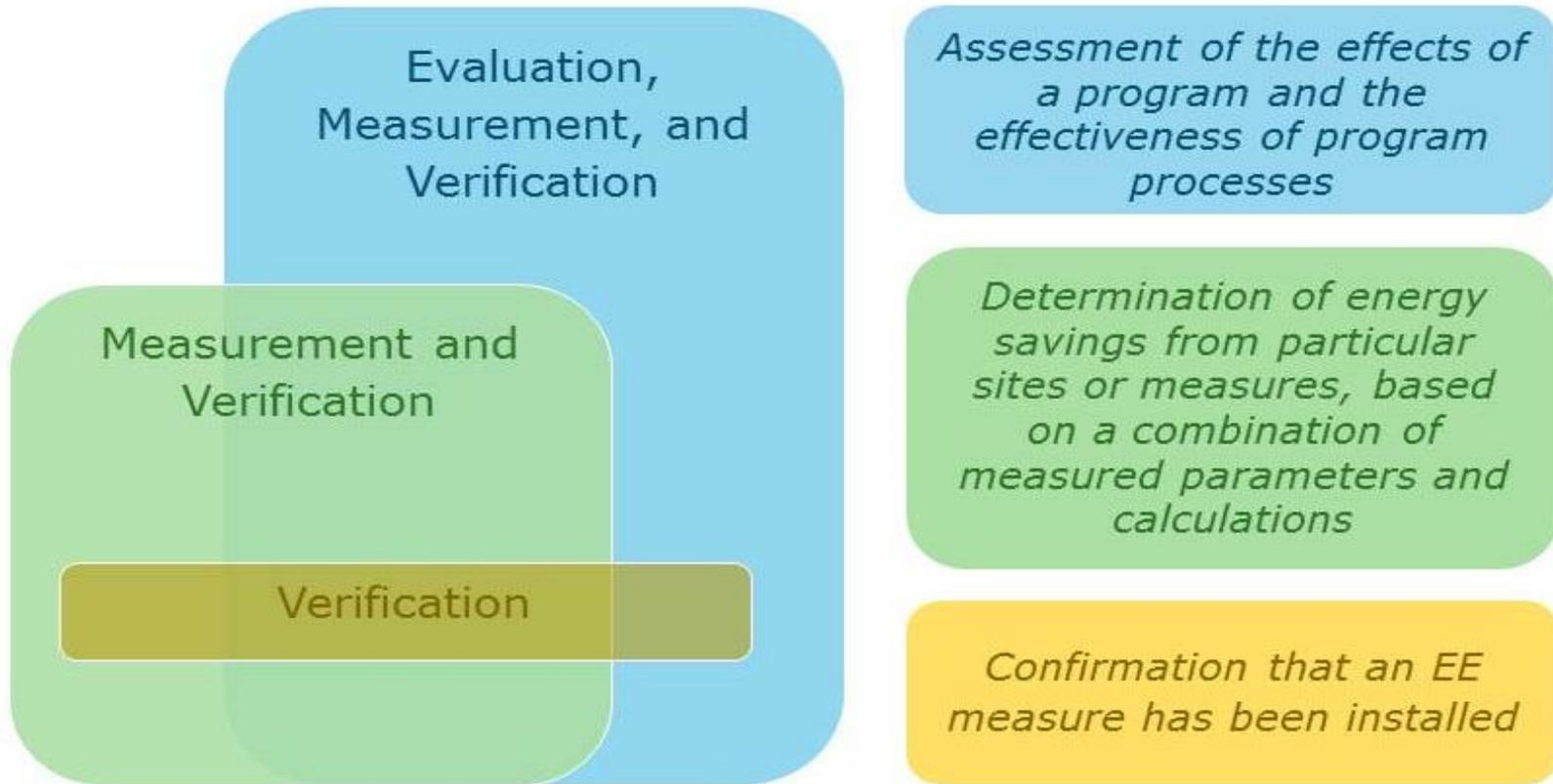
A Review of Key Trends and New Industry Developments, and
Their Implications on Current and Future Practices

Elizabeth Titus and Julie Michals (NEEP)
March 30, 2016 / M&V 2.0 Workshop

CONTENTS

1. Definitions and Current EM&V Practices
2. Challenges to EM&V Practices
3. EM&V Advancements
4. Emerging Technologies and Services
5. Opportunities
6. Barriers

Overview of EM&V Function



Broad Categories of EM&V Approaches

- M&V
- Deemed Savings (with verification)
- Large-scale consumption data analysis (using a comparison group)

Traditional Evaluation Timeline



Planning & Scoping	Recruiting & Data Collection	Data Analysis	Reporting
Stakeholder engagement	3-6 months of metering	Site data analysis	Stakeholder engagement
Data cleaning & Sampling	Recruitment, installation & retrieval	Site reporting	Reporting & review of results

Key Challenges for Common Evaluation Techniques



Deemed Savings

- Currency, relevance
- Comparability across programs and states

Engineering Desk Review

- Sources of assumptions
- Choice of formulas or models
- Comparability across programs and states

Surveys

- Response rates
- Length vs. survey fatigue
- Post survey data cleaning
- Reliability of responses
- Interpretation and scoring
- Program planning that may not facilitate surveys

End-use Metering

- Data quality
- Data access
- Customer access and scheduling
- Access to plans, schedules, info on baseline equipment

On-site Inspection

- Customer access and scheduling
- Access to plans, schedules, info on baseline equipment
- Availability of consumption data

Billing Analysis

- Data collection for the pre- and post-periods
- Data cleaning requirements
- Signal-to-noise ratio
- Comparison group specification

Raising the bar on EM&V

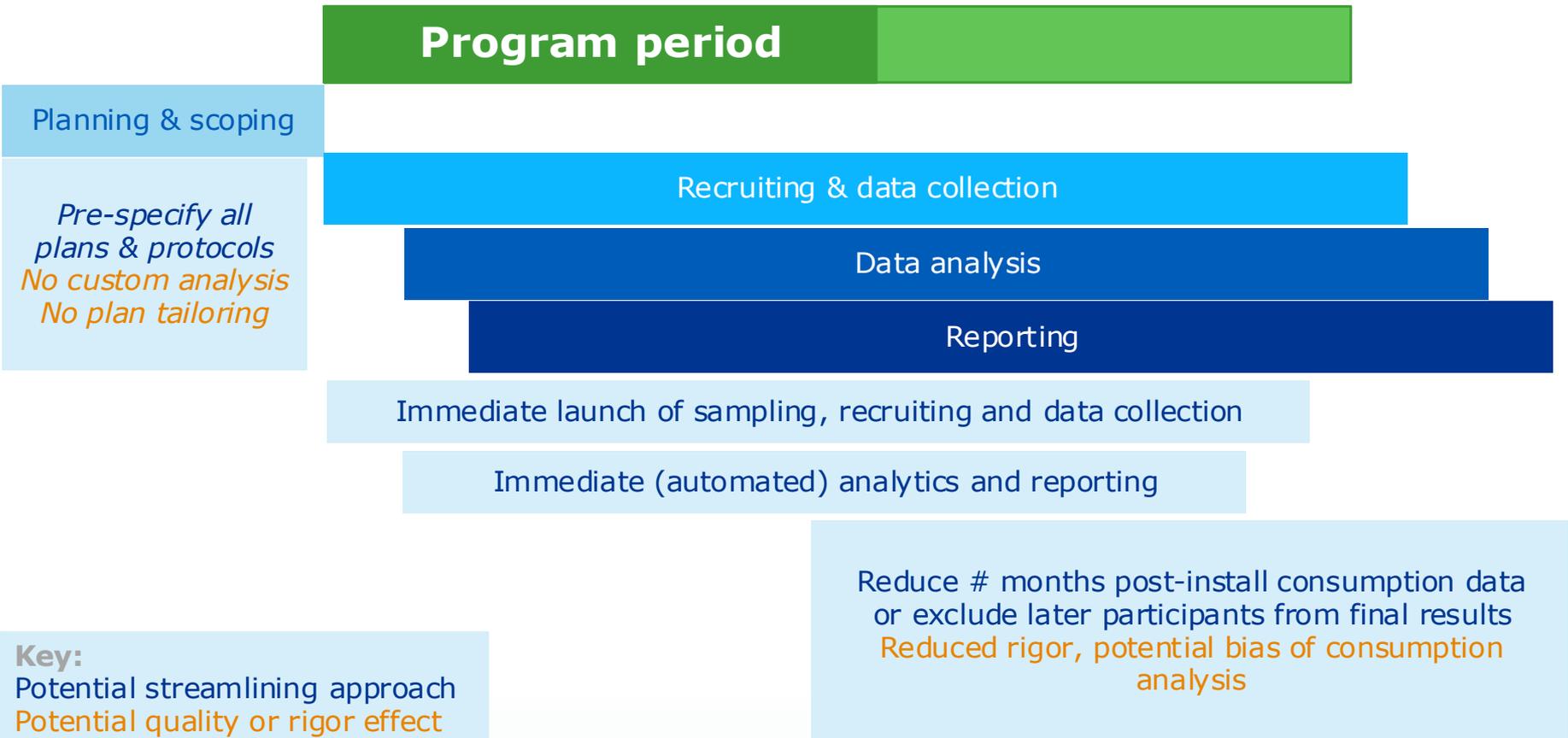
- Data collection and data processing are bottlenecks to producing timely evaluation results.
- Enhanced data collection technologies and analytics may accelerate the process and reduce costs.
- Pilots and ongoing projects can help identify and address some challenges and barriers.



EM&V Advancements ('M&V 2.0')

- Advanced Data Analytics
 - Data Analytics
 - Machine Learning
- Automated M&V
- Utility Software as a Service
- Improved Data Collection Tools and Enhanced Data Availability
 - Smart meters, nonintrusive Load monitoring
 - Smart thermostats, devices and HEMS

Evaluation Streamline Potential



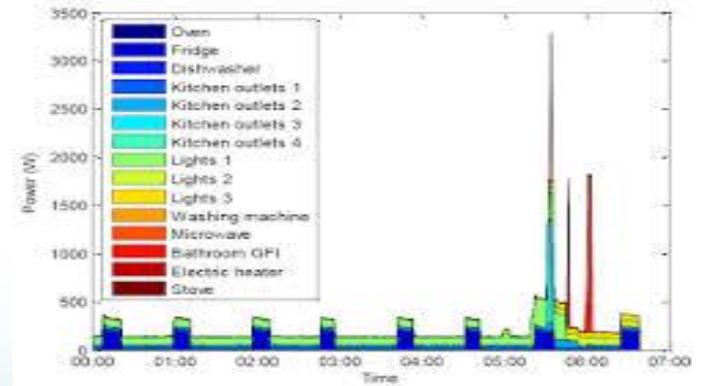
Smart Meters & Nonintrusive Load Monitoring



Smart meters provide interval usage info to utilities and consumers.

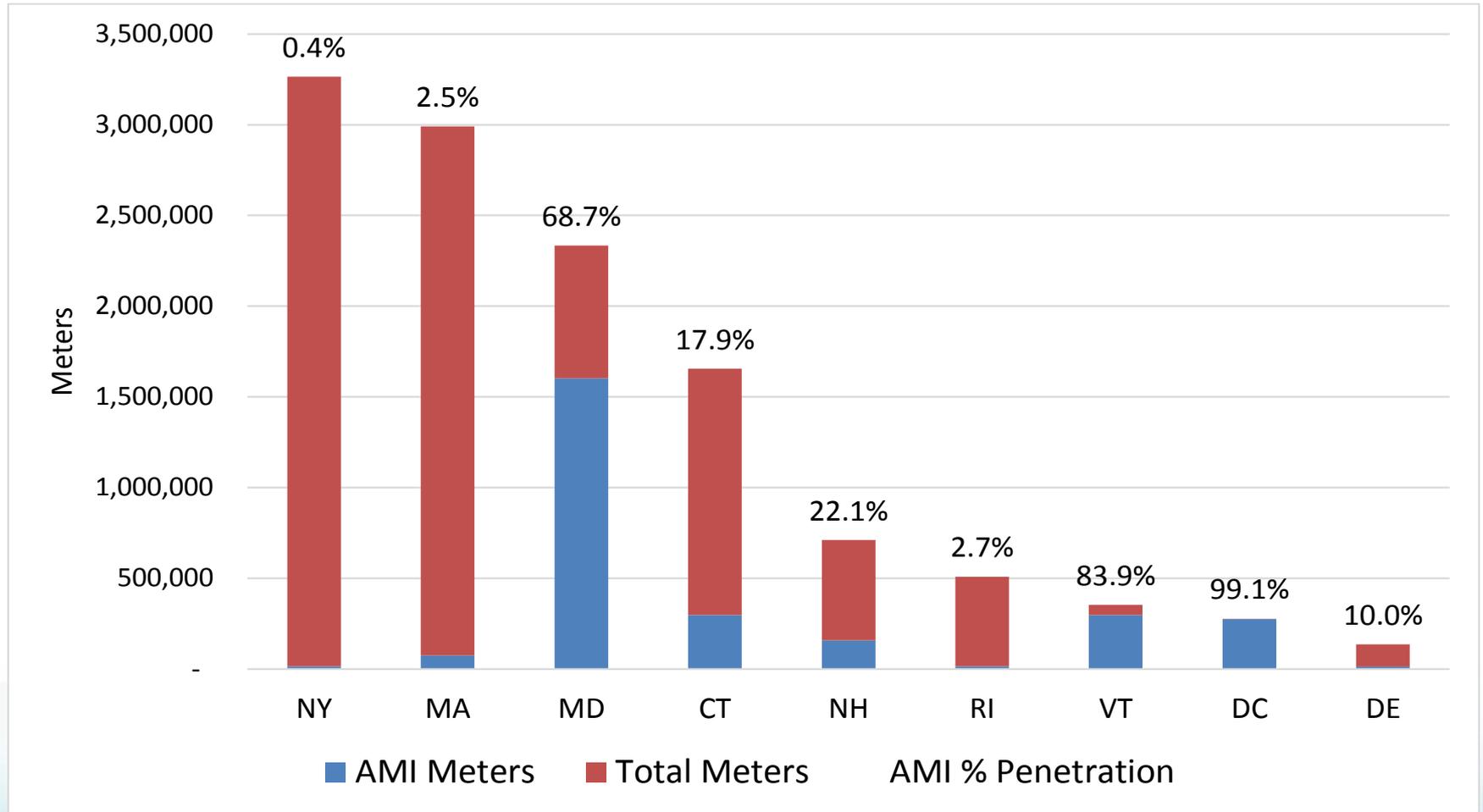


NILM deduces home and appliance energy consumption.



AMI Penetration in Region

EIA – 2014 (approx. 40% across US)



Smart meters and Non-intrusive LOAD metering (NILM)



Advanced Metering (AMI) contributes to big data stream, increases precision under some conditions.

AMI increases the visibility of EE behavior

The ability to estimate overall changes in kWh use by time of day will help inform baselines.

Load captured for multiple end uses could be captured from a single device, for multi-measure evaluations, e.g., behavioral programs at lower cost



Data ownership.

AMI requires increased IT infrastructure for data access, storage and processing.

Requires supplementing with surveys and other parameters to support richer, more granular analysis.

NILM – limited applications and accuracy, predictability of end uses captured

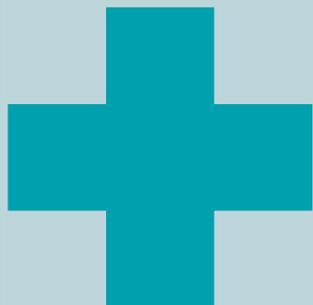
Smart thermostats, Devices & HEMS



Home Energy Management Systems (HEMS) serve many functions, including HVAC or lighting control and home security



Smart Thermostats, devices & HEMS



After data cleaning, traditional analytics should suffice

Potential greater volume and more specific-to-device usage data than sampled data options. If no systematic data loss, population level estimates rather than samples

Potential for less expensive data collection.

HEMS systems can interact with and report on a wide range of measures (lighting, plug load, appliances, HVAC) at no added cost.

Multiple vendors with different protocols and contracting policies.

Efficiency an afterthought.

Privacy, Data ownership

More but less reliable data – requires more automated cleaning

Data collection dependent on vendors

Need to analyze patterns in missing data.

Validation of savings, emerging technology, data access, protecting consumer data (not an actual challenge, but public perception is concern)

SOFTWARE AS A SERVICE - SaaS

A short sample of providers



ENERGYSAVVY



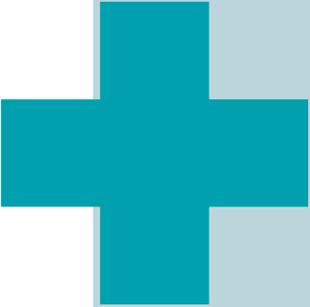
GRIDIUM

wegowise

FIRSTFUEL



SOFTWARE AS A SERVICE - SaaS



Timeline to report tracking data or deliver M&V results is shortened.

Data cleaning is rule based and automated and can be cleaned overnight.

Loss of data during cleaning does not impede the objectives these products.

Meets multiple needs – M&V, benchmarking, segmentation/targeting energy audits, customer engagement programs, visualization, spatial analytics, etc.



Monthly data still most common interval but is sufficient to provide results (residential in particular)

Faces the same data quality and availability challenges.

New Opportunities

- Program Delivery
 - Project identification, program planning
 - Rapid and ongoing feedback to customers and programs
 - Continuing customer engagement and problem solving
- Program EM&V
 - Early indicators of project and program effect
 - Finer resolution analysis of customer loads
 - New bases for customer segmentation
 - Monitoring program performance vs claimed savings

Potential Roles – M&V 2.0

- Automated energy consumption data analysis for an individual facility as a form of M&V
 - Consistent with whole-facility analysis under IPMVP option C.
- Automated energy consumption data analysis for a group of facilities as a form of large-scale consumption data analysis.
- Automated Metering Infrastructure (AMI) incorporation into whole-facility M&V, or into large-scale consumption data analysis.
- End-use energy or demand metering, or estimated end-use decomposition of AMI data incorporation into end-use M&V.

'EM&V 2.0' Challenges

- Estimation of appropriate baselines
- Analysis of measure specific and complex programs
- Assessment of market conditions
- Assessment of program influence
- Data ownership and privacy issues

Conclusion

- New EM&V capabilities can offer value for project identification and delivery, program planning and operations, and evaluation.
- Under current EM&V framework, there remain important evaluation challenges
 - Program design alignment with EM&V 2.0 (whole building vs measure specific)
 - Estimation of appropriate baselines, analysis of complex projects and processes, and assessing market conditions and program influence.
- Ability to reduce overall evaluation timelines is limited
- Cost effectiveness is currently unknown.

THANK YOU