DNV·GL

VA EEAC

Overview of Key Trends in, and Applications of, Technology in Measurement and Verification

October 13, 2016

Summary of Presentation

- EM&V perspectives
- Technology enablement
- Applications
- Barriers
- Industry pilots

DNV GL Engagement with NEEP

REGIONAL EVALUATION,
MEASUREMENT & VERIFICATION FORUM

THE CHANGING EM&V PARADIGM

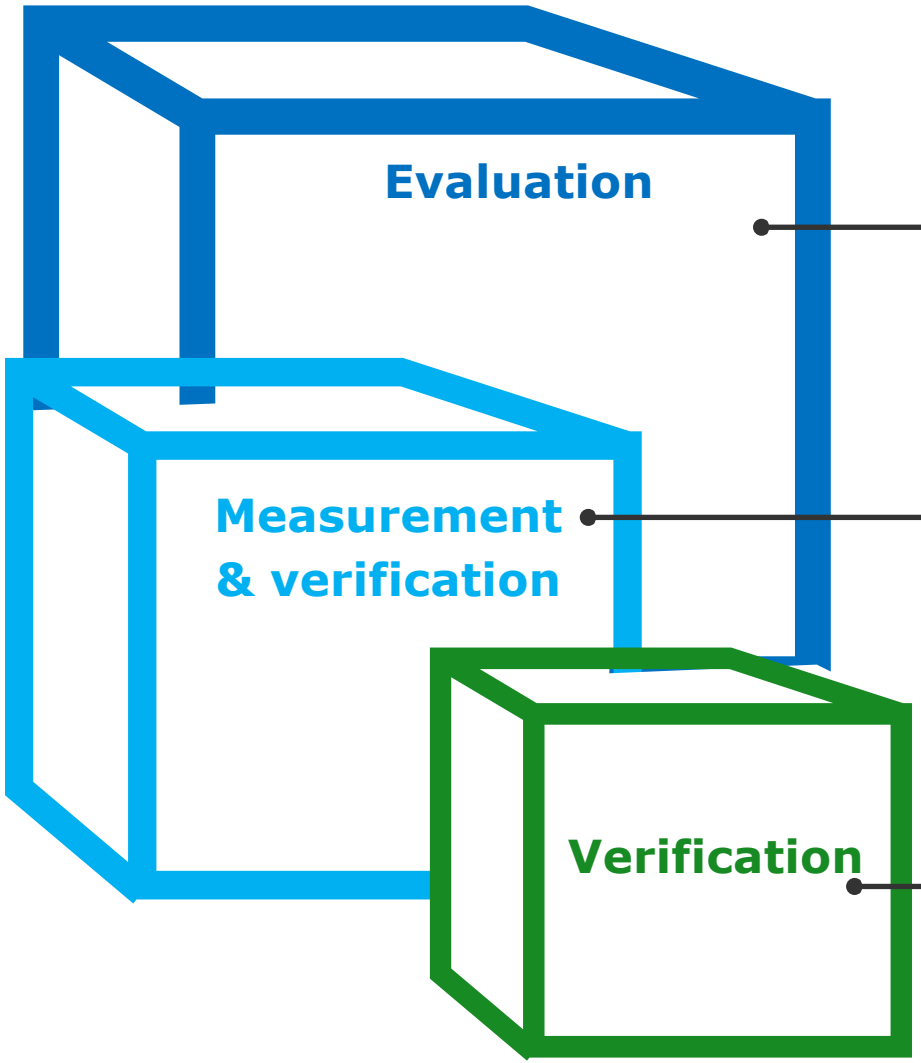
A Review of Key Trends and New Industry Developments, and Their Implications on Current and Future EM&V Practices

A project of the Regional Evaluation, Measurement and Verification Forum

DECEMBER 2015

Facilitated and Managed by Northeast Energy Efficiency Partnerships

What are E M & V?



Assess effects of program & effectiveness of program processes

Determine energy savings from site/measure based on combination of measured parameters/calculations

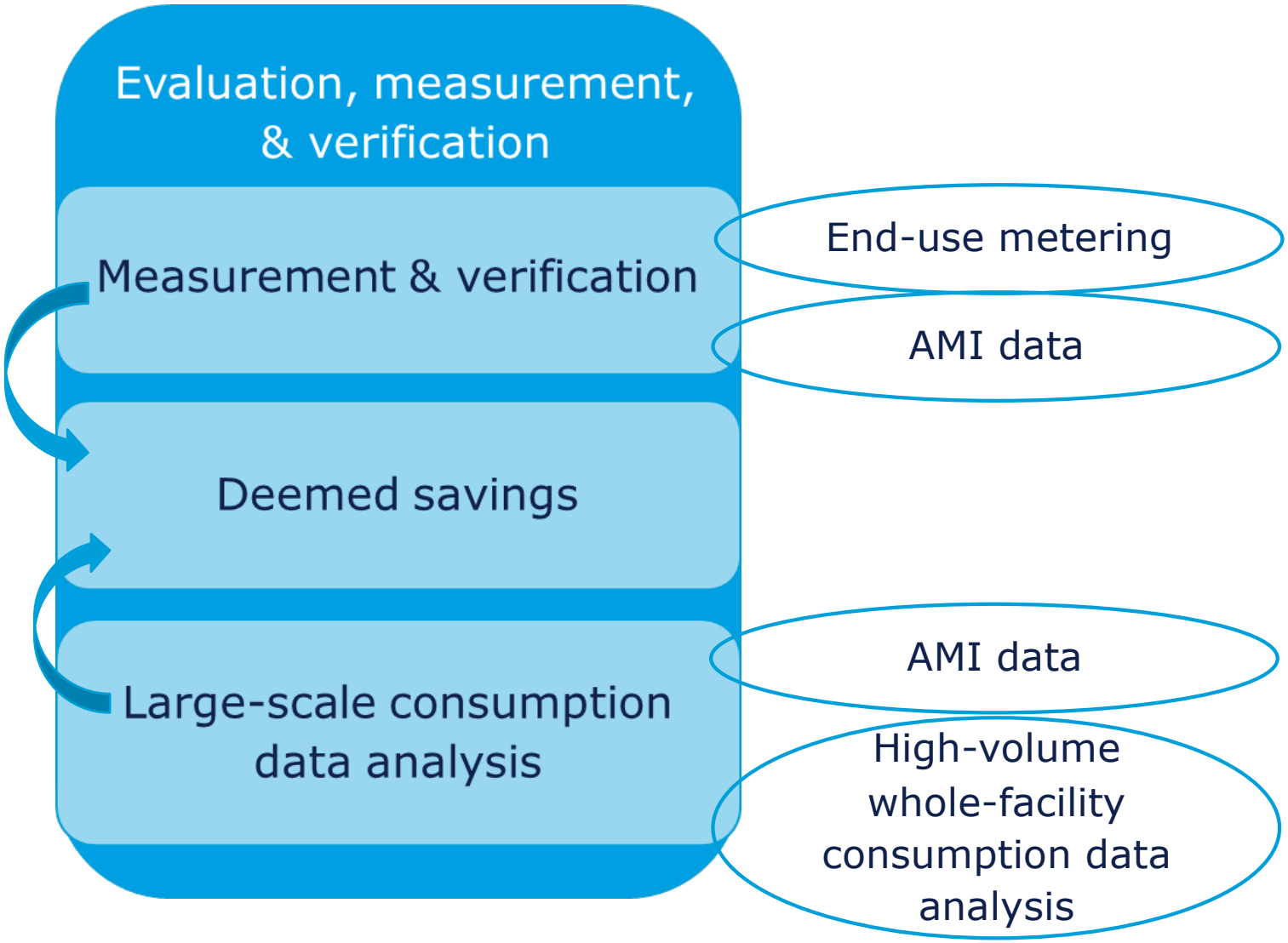
Confirm EE measure installed

Assessment of MASS EEAC Consultants

CLEARLY AN IMPORTANT TOPIC. BUT IS "EM&V 2.0" A USEFUL TERM?

- **On the plus side, it is a lot catchier than "technological progress"**
- **On the minus side,it:**
  - Ignores the fact that much of what is being called EM&V 2.0 is actually program implementation support
  - Tends to imply that technological progress in EM&V is both entirely new and a binary issue (i.e., either driving everything or not happening at all)
    - Technological progress has actually been continuous for 30 years
  - Tends to suggest that EM&V can be reduced to a simple matter of hardware and software
    - The "E" is an important part of EM&V, draws on multiple disciplines, and involves substantial judgment
  - Tends to suggest that approaches classifiable as EM&V 2.0 can be expected to sweep away all other EM&V activities
- **We therefore suggest using this term with caution**

Where do new tools fit into evaluation?



Technology: What's new, what's existing?

Energy analytics

Software

Potential to analyze higher volume & higher frequency data collection

Cloud-based platforms & products for rapid high-volume processing

Improved data collection tools & more data availability

Hardware

Smart meters, smart thermostats, wireless submetering, NILM

New ways to collect existing and new types of data at increased volume and frequency.

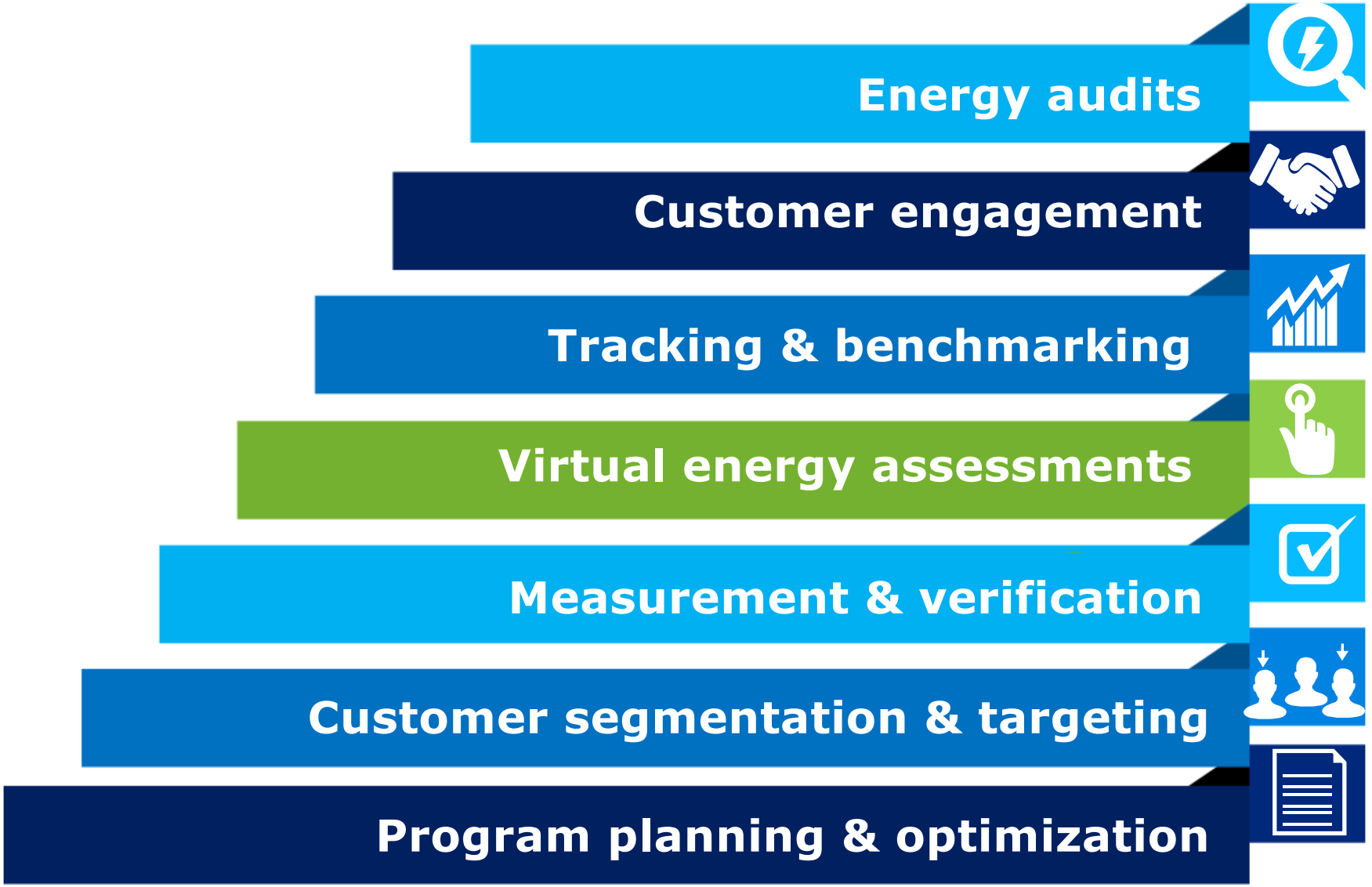
Hardware: Data collection opportunities

Term	New key features
 AMI/ Submeters	• Large-scale, high-volume interval data • 2-way communication
 Smart(er) thermostats and HEMS	• Machine learning • Customer side of the meter • 2-way communication, monitoring, feedback • Cloud platform
 NILM	• Non-intrusive load monitoring • Customer side of the meter • End-use metering at high frequency at appliance level

Software: Analysis trends

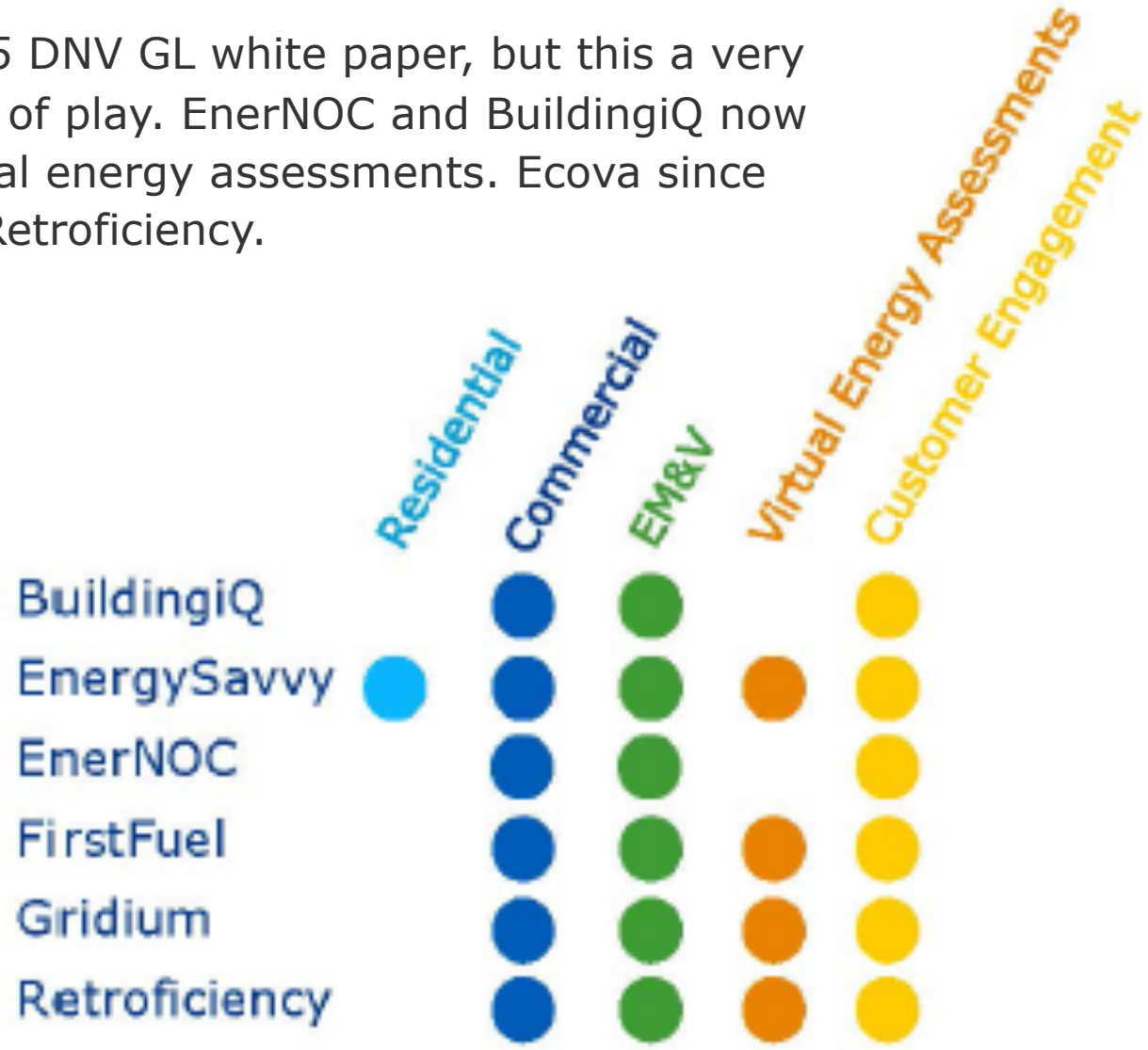
Term	New key features
Expanded energy analytics	• **Tools, systems and technology to take advantage of high volume data** • Combine predictive & conventional analytics • Machine learning • Big data • Cloud platform for high-volume processing
Automated M&V	• **Automated processing of whole premise consumption data** • High-volume • Cloud platform • Rapid turnaround and routine • Machine learning • Software as a Service –SaaS

Technology: Current EE delivery applications of advanced data collection & analytic tools



Applications of automated billing analysis

From 2015 DNV GL white paper, but this a very fluid state of play. EnerNOC and BuildingiQ now offer virtual energy assessments. Ecova since acquired Retroficiency.



Barriers to broader roll-out

- Still requires independent verification of analytical approaches.
- Concerns about management of Personally Identifiable Information to State and Company standards in the cloud.
- Broad energy efficiency portfolios require more programs than just those which are conducive for this type of evaluation research (e.g. upstream to manufacturer programs, midstream to distribution network programs, code compliance programs, new construction programs, or quality installation effectiveness programs).
- Different variables are required for some measure-specific programs—especially in the medium to large non-residential building or industrial sectors.
- Cannot answer all evaluation research questions.

Testing Savings Estimates: DOE

US DOE GRANT SOLICITATION DE-FOA-0001415:
Summary for Public Release Submitted by CT DEEP | March 31, 2016

- Test the use of automated billing analysis and compare to traditional EM&V practice in terms of savings certainty, timeframe, and other aspects
- Assess how these tools are best integrated or coordinated with supplemental evaluation
- Support efforts to build transparency of EM&V methods used by states and national efforts (e.g., US DOE Uniform Methods Projects).

Testing Savings Estimates: CalTrack.org

- The CalTRACK Technical Working Group will operationalize the analysis of project performance data to provide ongoing feedback on gross savings, realization rates, and other performance metrics.
- The Technical Working Group includes representatives from all California IOUs, program implementers, the CEC, the CPUC, program evaluators, software vendors, and other technical assistance providers.
- The goal is to develop a specification for incorporation of auto-M&V tools in selected residential pilots.
- Beta testing is underway (DNV GL, OpenEE Meter and Energy Savvy).

Thank you for your time.

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