American Council for an Energy-Efficient Economy

The Role of Information and Communication Technologies in Energy Efficiency EM&V

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American Council for an Energy-Efficient Economy

The American Council for an Energy-Efficient Economy (ACEEE)

- ACEEE is a nonprofit 501(c)(3) founded in1980. We act as a catalyst to advance energy efficiency policies, programs, technologies, investments & behaviors
- 50 staff; headquarters in Washington, D.C.
- Focus on energy efficiency in industry, buildings, & transportation sectors
- Research in economic analysis & financing, behavior, energy efficiency programs, national policy, utilities, state, & local policy, and some international work
- Diverse funding sources, including foundation grants, contracts and government grants, and conferences & publications

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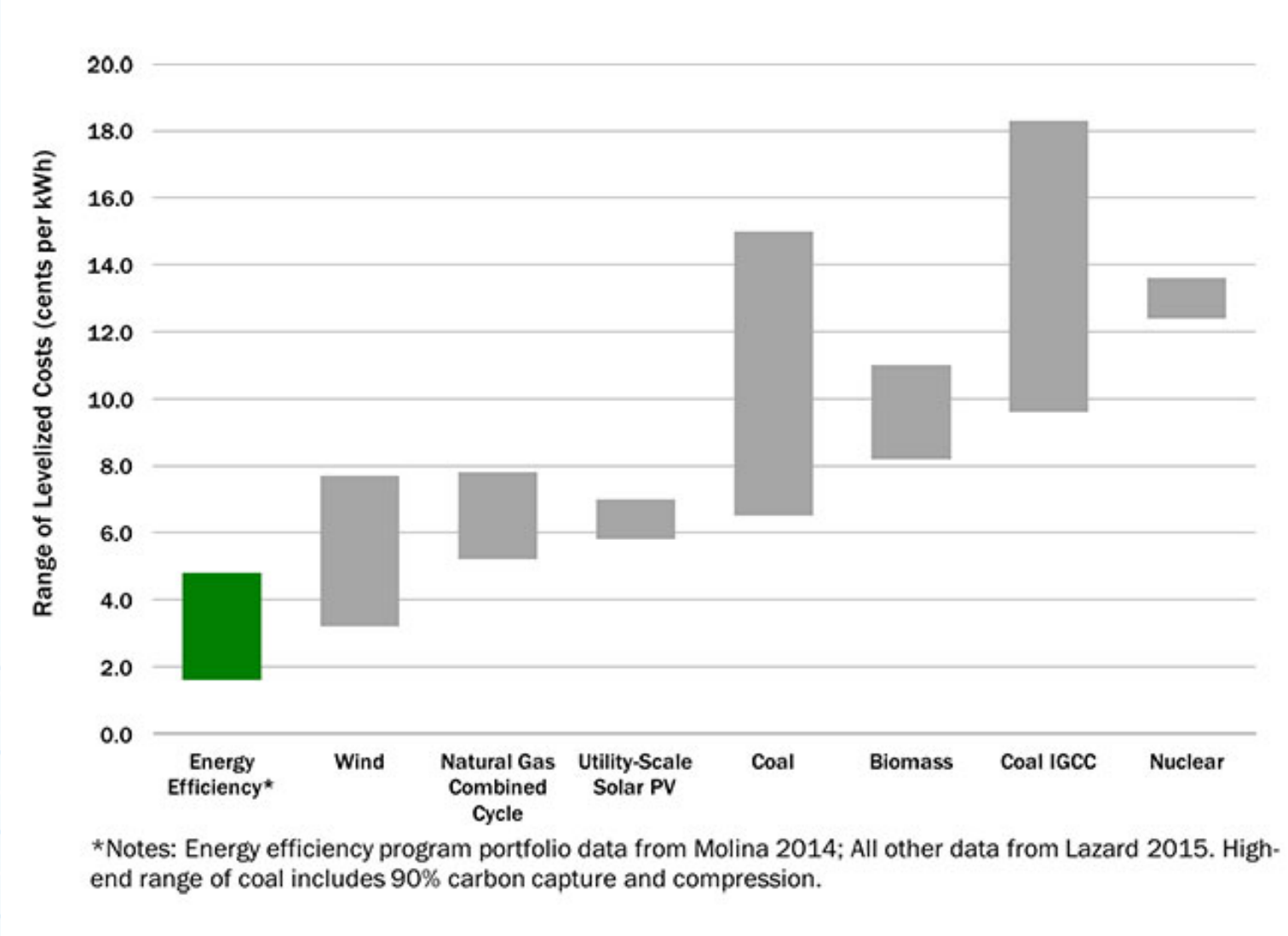
Overview

- Energy efficiency as a utility system resource
- Evaluation, Measurement & Verification
- Using ICT within EM&V process (& more!)
- Examples
- Conclusions & Recommendations

Energy Efficiency – A Low-Cost Utility Resource



Source: Energy efficiency data represent the results from Molina 2014 for utility program costs (range of four-year averages for 2009-2012); supply costs are from Lazard 2015.

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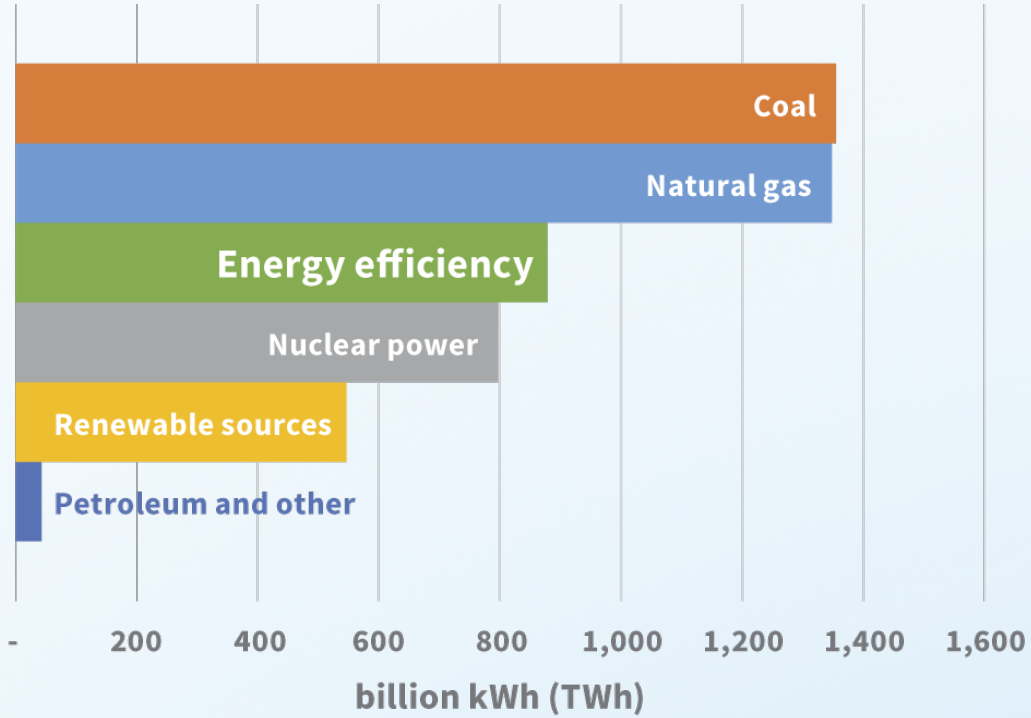
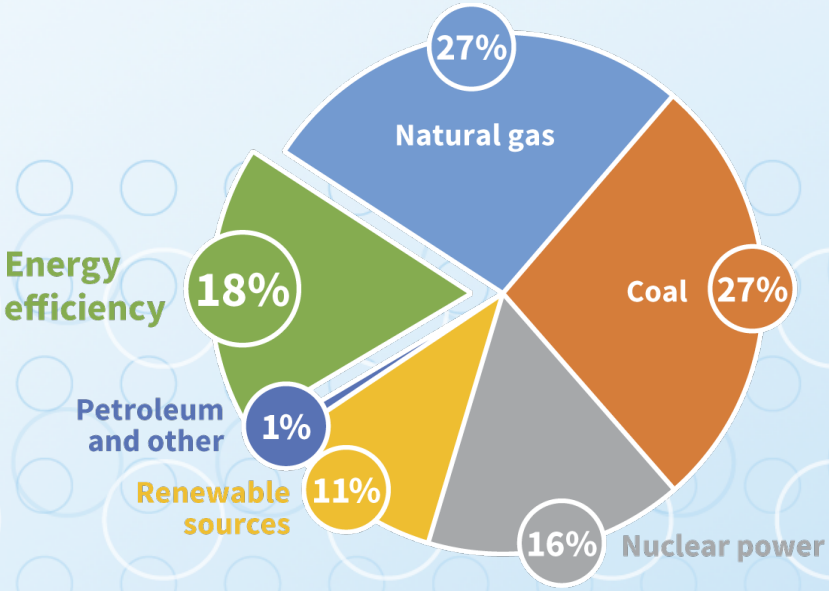
In the electricity sector, efficiency is now our 3rd largest resource…





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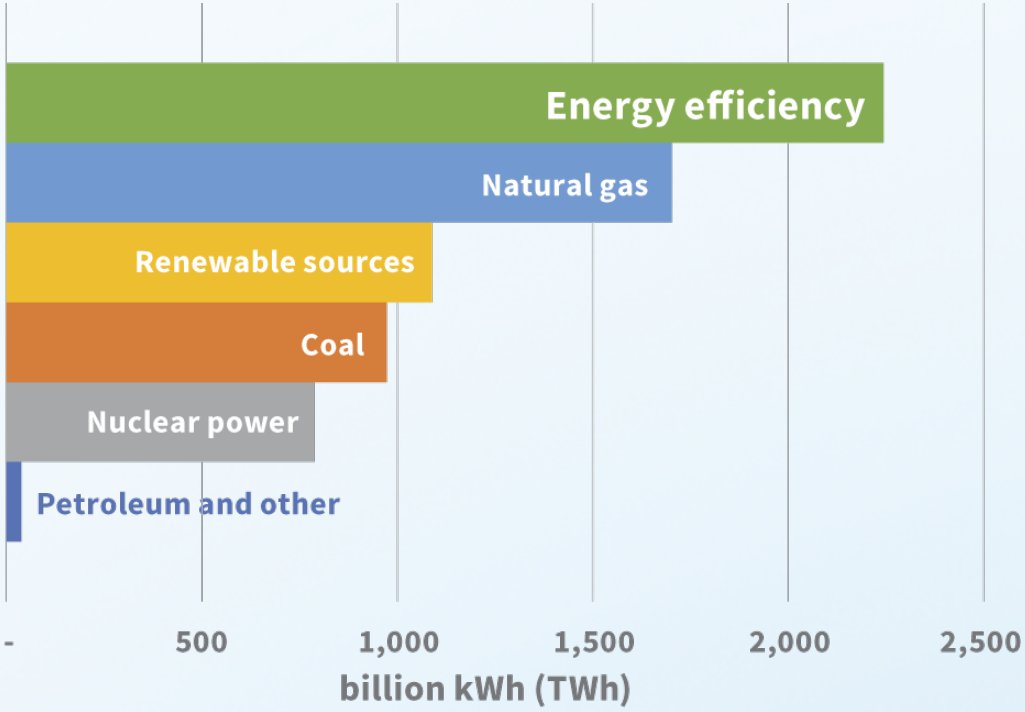
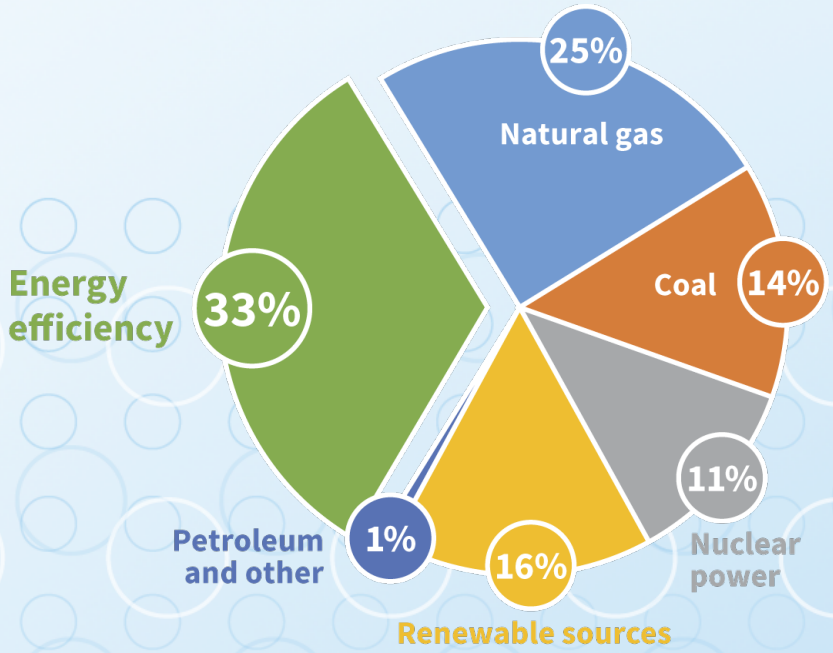
Source: ACEEE 2016. *Greatest Energy Story You Haven't Heard.* http://aceee.org/research-report/u1604

…and could become our largest resource by 2030





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Source: ACEEE 2016. *Greatest Energy Story You Haven't Heard.* http://aceee.org/research-report/u1604

Multiple benefits of efficiency

- Brings a return on investment of 200% or more
- Lowers energy bills for households and businesses
- Increases community and grid resilience
- Decreases greenhouse gas emissions and other forms of pollution
- Reduces energy burdens for those most in need
- Improves health, safety, and comfort
- Creates jobs and expands economic development

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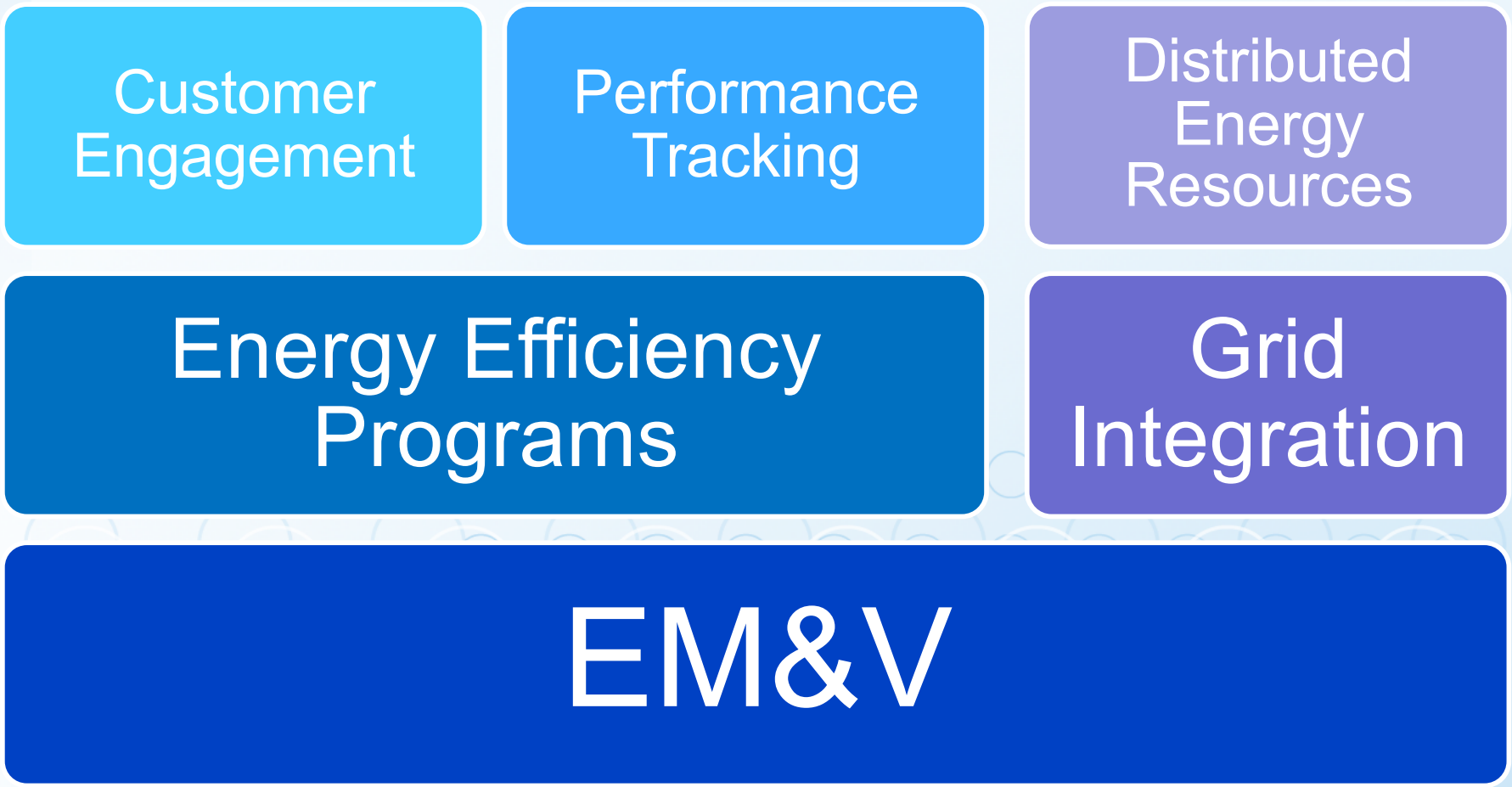
EM&V: Foundation for the Future



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Evaluation Types

Analysis Type	Description	Examples of use
Impact (M&V)	Quantifies direct and indirect changes associated with the subject program(s)	Determines the amount of energy and demand savings
Process evaluation	Indicates how the procedures associated with program design and implementation are performing from both the administrator's and the participant's perspectives	Identifies how program designs and processes can be improved
Market effects evaluation	Analyses how the overall supply chain and market for energy efficiency products have been affected by the program	Characterizes changes that have occurred in efficiency markets and whether they are attributable to and sustainable with or without the program
Cost-effectiveness evaluation	Quantifies the costs of program implementation and compares them with program benefits	Determines whether an energy efficiency program is a cost-effective investment compared with other program and energy supply resources

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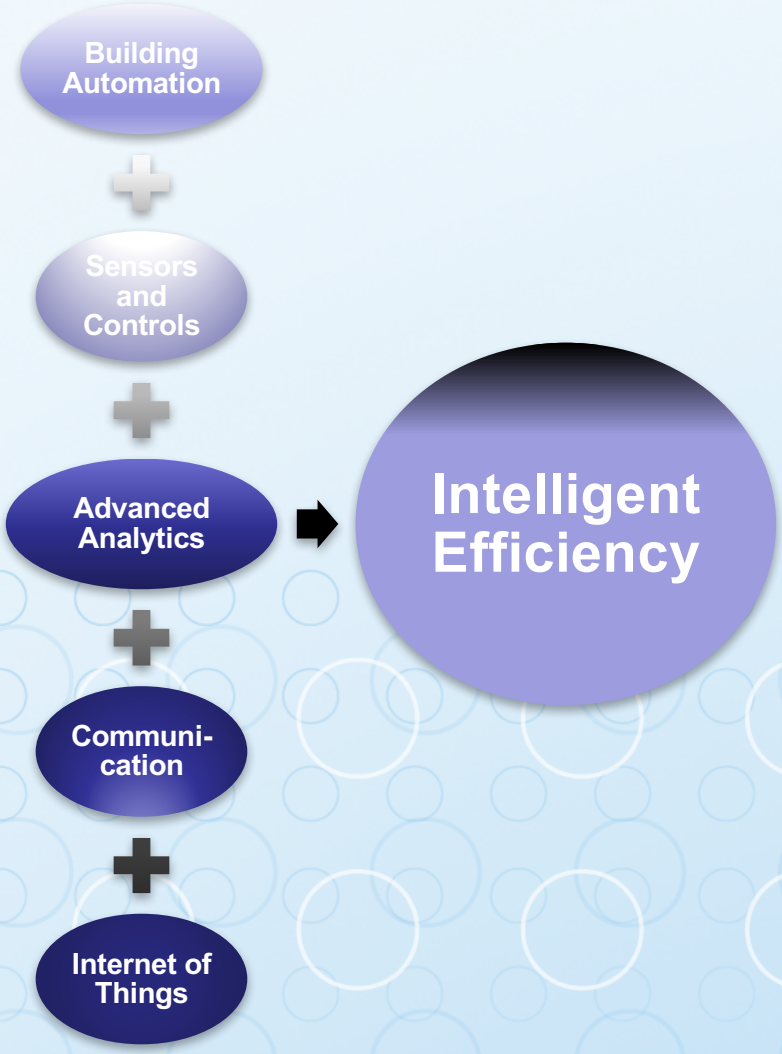
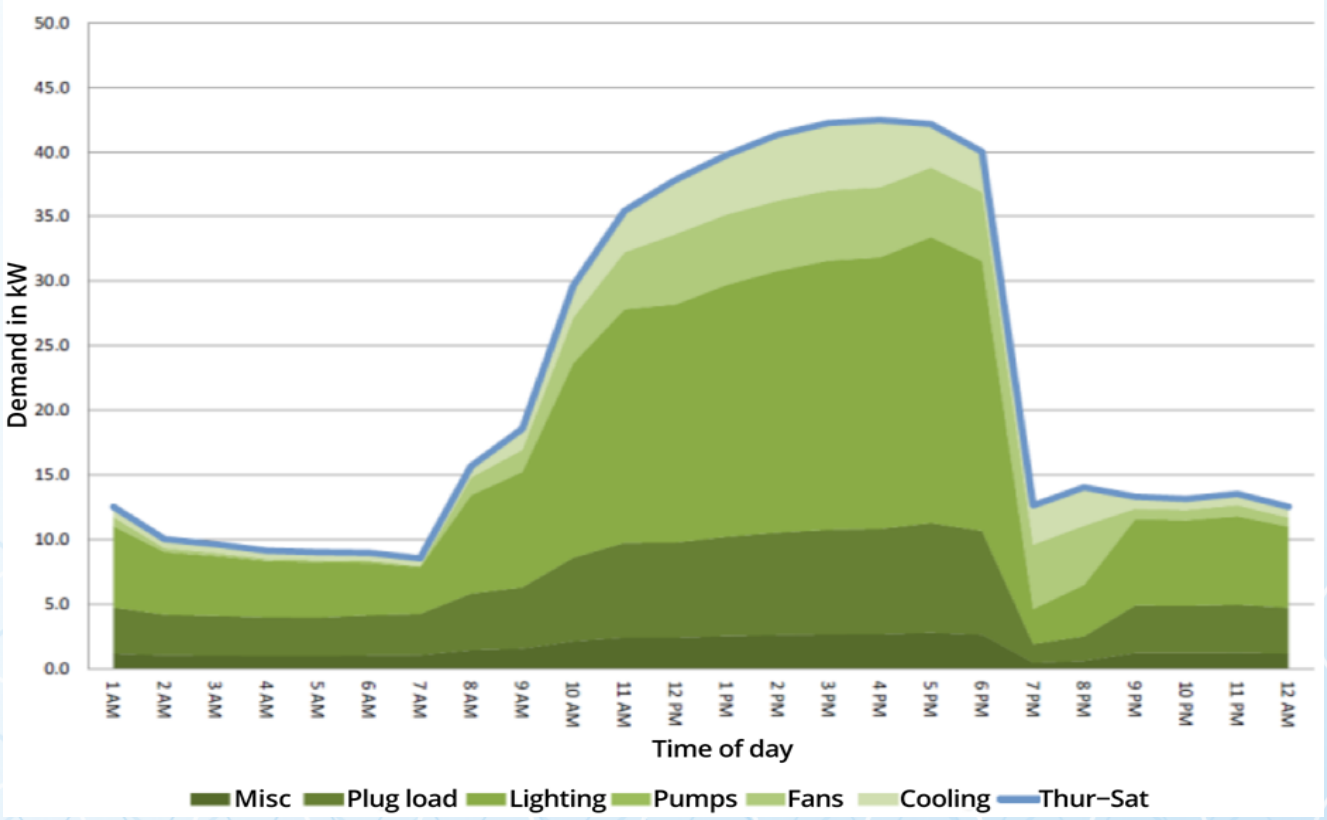
Why energy data for energy efficiency?

- Intelligent efficiency
- Energy usage data trends can help identify energy efficiency opportunities
- Data access → analysis → action
- Growing area of opportunity, but still emerging and evolving



Role of ICT within EE EM&V & Programs

- Customer identification
- Project identification



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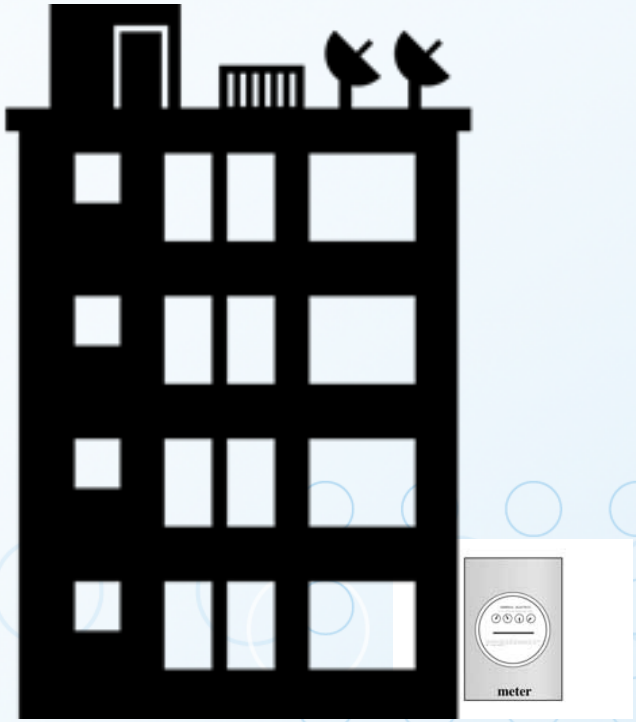
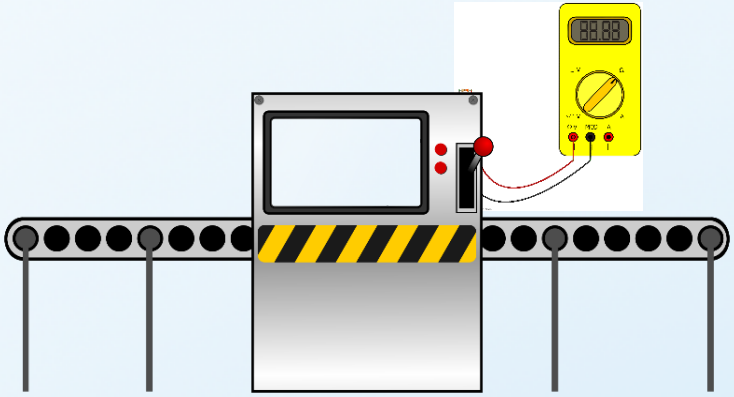
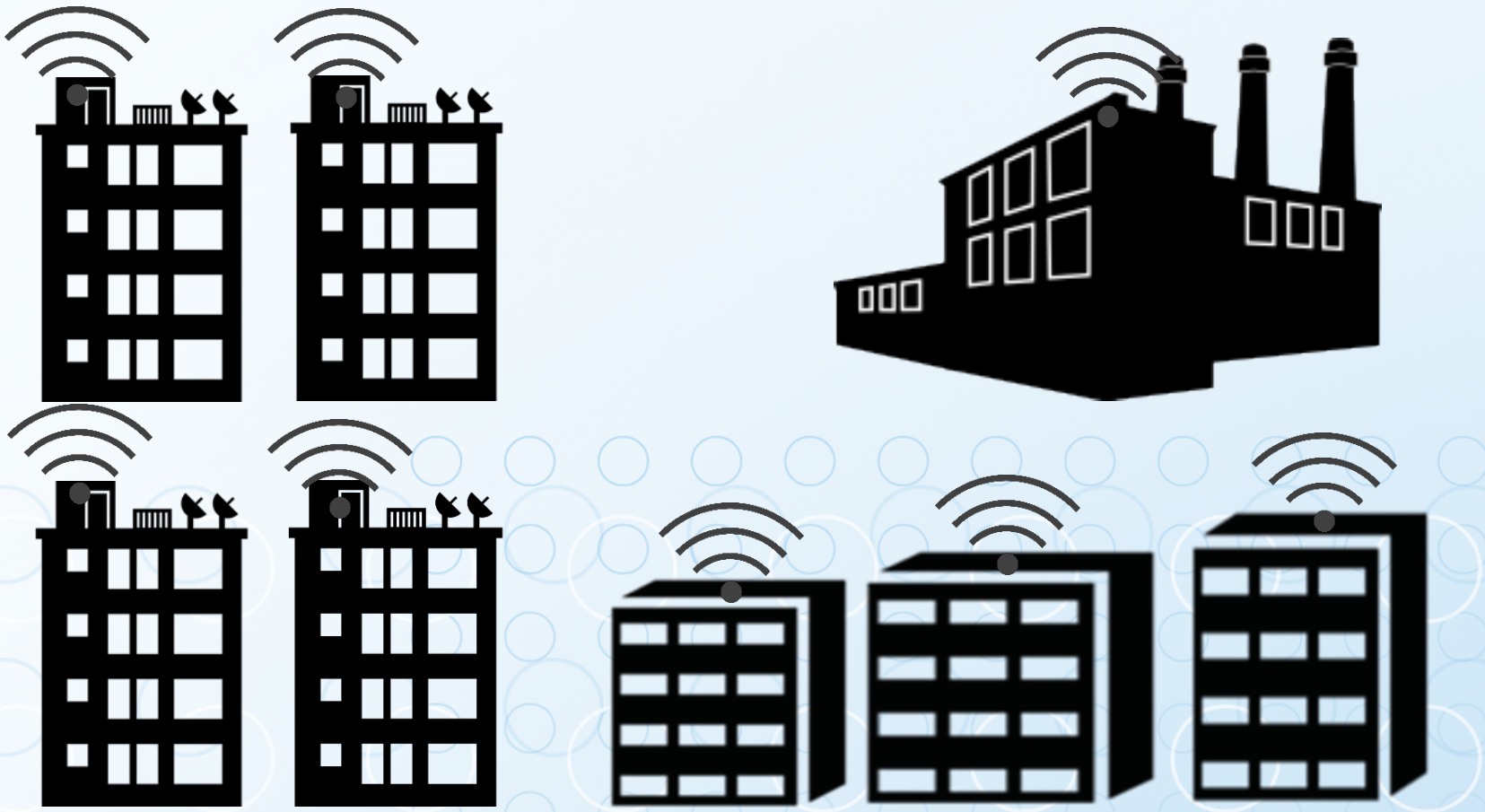
Conventional M&V





Manual collection and comparison of pre- and post-energy consumption

Remote Tracking of Energy Use



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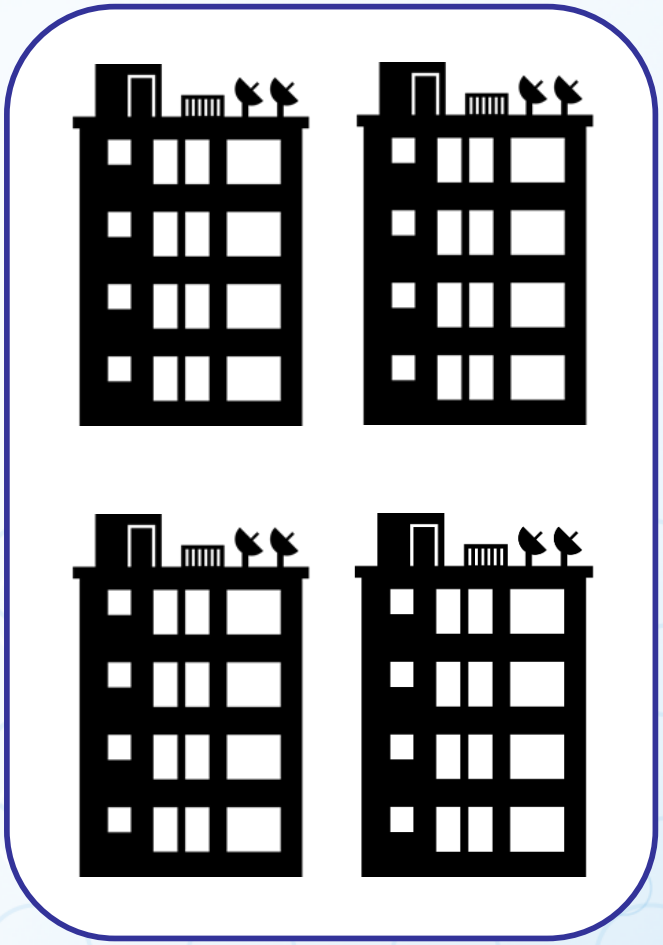
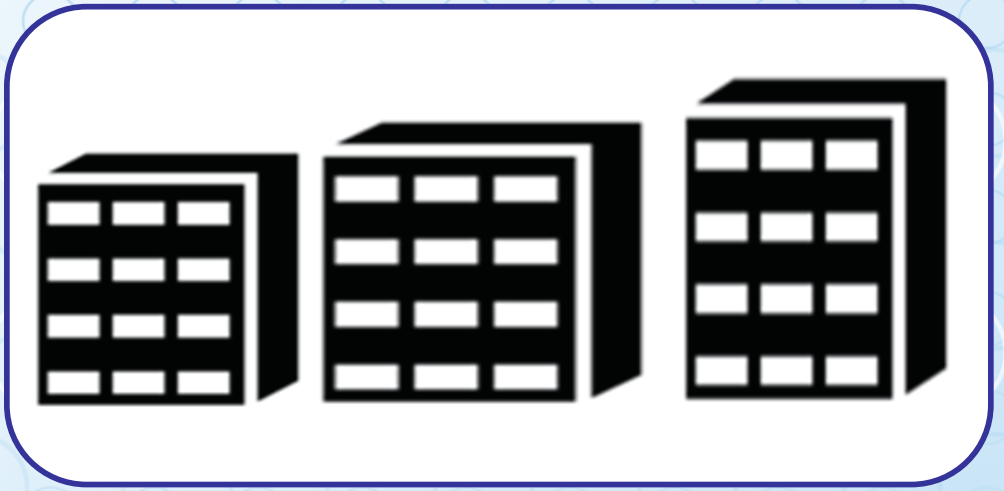
Remote Analysis and Comparison

Using control groups to establish a baseline for a building





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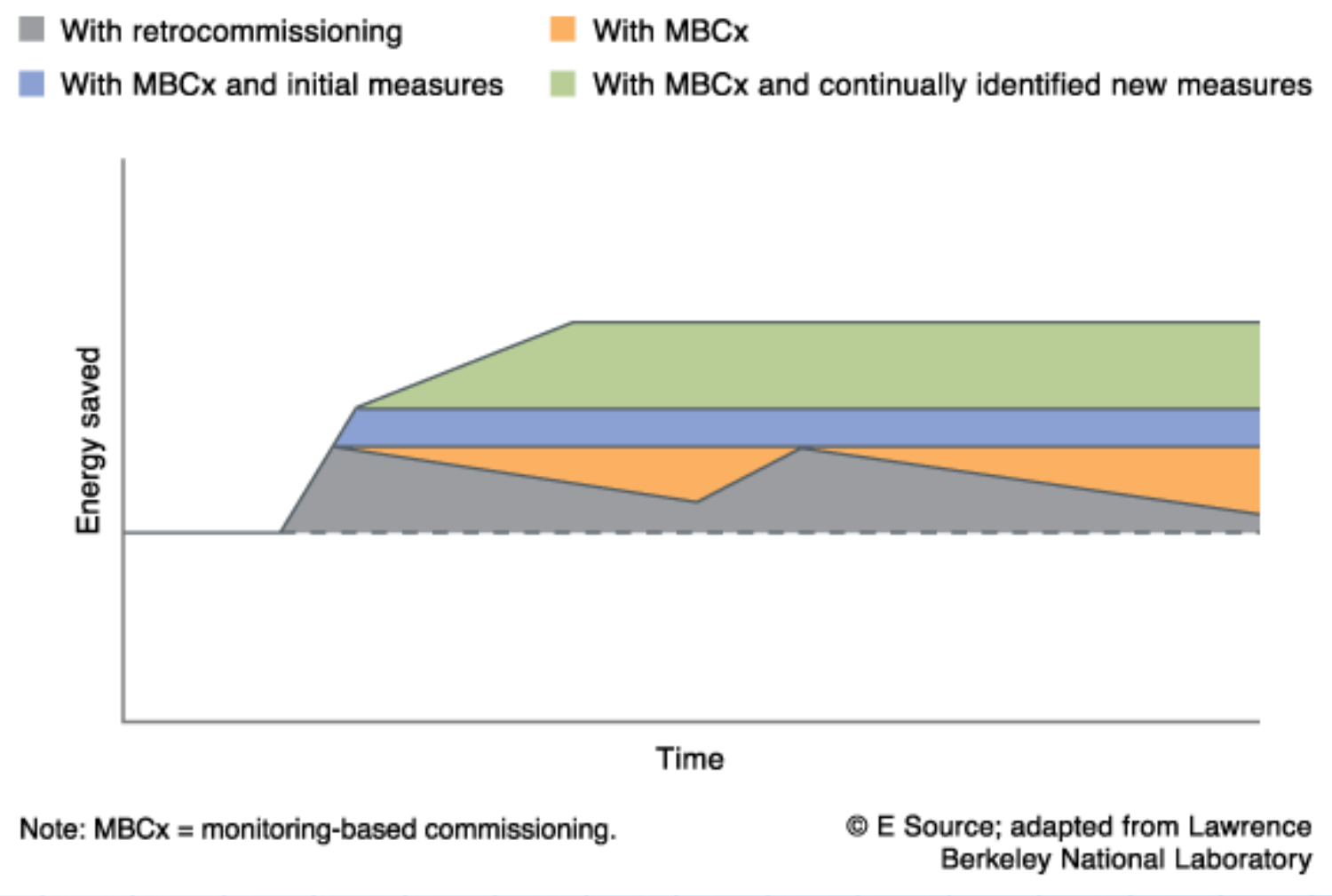
Monitoring-Based Commissioning (MBCx)



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Source: Esource

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Commonwealth Edison
Custom Incentive Program

Project M&V

Silver Beauty Warehouse and Digital Lumens

- 177,000 sq. ft. warehouse
- Replaced metal halide with LED system controlled by a reactive and predictive intelligent control system
- Document savings of 1.2 million kWh/year
- 92% of previous annual consumption
- Results confirmed by third party evaluator

Efficiency Nova Scotia
Energy Management Information System

Facility M&V

- Efficiency Nova Scotia offers financial incentives to cover up to 50% of the cost to develop, design, and implement an EMIS.
- Program includes a training program and developing a management protocol for entering data into the EMIS,
- EMIS translates various data streams into actionable information that operators and management can use to develop and carry out operational energy efficiency measures and optimize facility energy use.
- Savings reported by the EMIS program, which, after three years, total more than 4.5 million kWh

Pacific Gas & Electric Company
Commercial Whole Building Demonstration

Program Evaluation

Comprehensive, performance-based program designed to deliver 15% post-installation energy savings.

- Remote tracking and analysis
- Parallel conventional on-site analysis
- Up-front incentive payable after implementation
- Performance incentive 1-year later based on achieved savings

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Ameren Missouri Residential CoolSavers program savings measurement

Program EM&V

Savings measurement software

- Remote billing analysis with comparison group
- Automatic and continuous updates of calculations
- Continuous monitoring and program improvement
- Use data to update the TRM deemed values

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Summary

- ICT is changing how energy efficiency programs:
  - Engage customers
  - Identify opportunities
  - Track savings
  - Project M&V
- ICT provides program administrators with the potential to collect energy savings data in near real-time.

Conclusions

Using ICT in energy efficiency programs can:

- Simplify project M&V
- Add context to energy savings data
- Enable harmonization of energy data with other information
- Improve analysis of program effectiveness
- Provide greater transparency
- Remove barriers to greater adoption of energy efficiency measures

Recommendations

- Analyze and update policies to eliminate barriers to innovation and market growth
- Allow experimentation and demonstration
- Conduct research on performance measurement
- Establish guidance for best practices
- Set goals for cost-effectiveness, accuracy, and precision

Thank you!

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Upcoming conferences

2016 Behavior, Energy and Climate Change
October 20-22 in Baltimore, MD
http://aceee.org/conferences/2016/becc

2016 ACEEE Intelligent Efficiency Conference
December 4-6, 2016; Hilton Austin, Austin, Texas
aceee.org/conferences/2016/ie

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Related Resources

(forthcoming) King, J. et al. 2016. *Smart Buildings. ACEEE*

Lovett, Ameren Missouri. 2015.

http://aceee.org/sites/default/files/pdf/conferences/ie/2015/Session3C-Lovett-IE15-12.7.15a.pdf

Rogers, et al. 2015. *How Information and Communications Technologies Will Change the Evaluation, Measurement, and Verification of Energy Efficiency Programs*.

aceee.org/research-report/ie1503

Goldberg, et al. 2015. *The Changing EM&V Paradigm*. Northeast Energy Efficiency Partnership, Regional Evaluation Measurement & Verification Forum. Prepared by DNV GL.

http://www.neep.org/changing-emv-paradigm