How Information and Communication Technologies will Change the Evaluation, Measurement and Verification of Energy Efficiency Program Performance

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American Council for an Energy-Efficient Economy (ACEEE)

- ACEEE is a nonprofit 501(c)(3) that acts as a catalyst to advance energy efficiency policies, programs, technologies, investments & behaviors.
- 50 staff in DC, DE, MI, WA & WI
- Focus on end-use efficiency in industry, buildings, utilities & transportation
- Other research in economic analysis; behavior; national, state & local policy.
- Funding:
  - Foundation Grants (52%)
  - Contract Work & Gov. Grants (20%)
  - Conferences and Publications (20%)
  - Contributions and Other (8%)

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Overview

- Structure of North American Energy Efficiency Programs
- Evaluation, Measurement & Verification
- Using ICT to perform EM&V
- Case Studies
- Conclusions & Recommendations

Structure of North American Energy Efficiency Program Sector

- State Public Utility Commissions
- Utilities
- Energy Efficiency as a Resource
  - Prescriptive Programs
    - Deemed savings values
  - Custom and Standard Offer Programs
    - Measured savings values
  - Education, Technical Assistance & Training

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Program 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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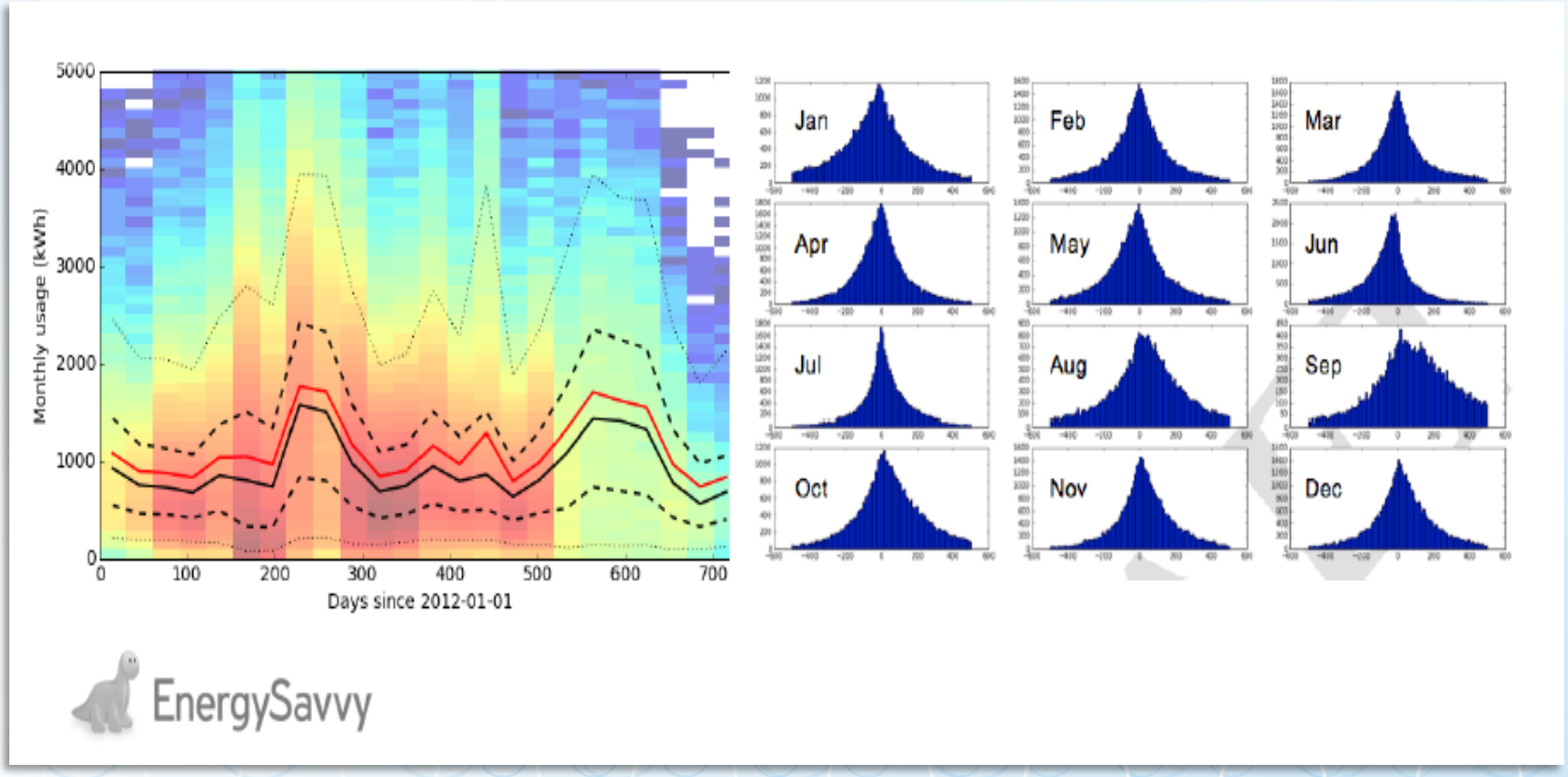
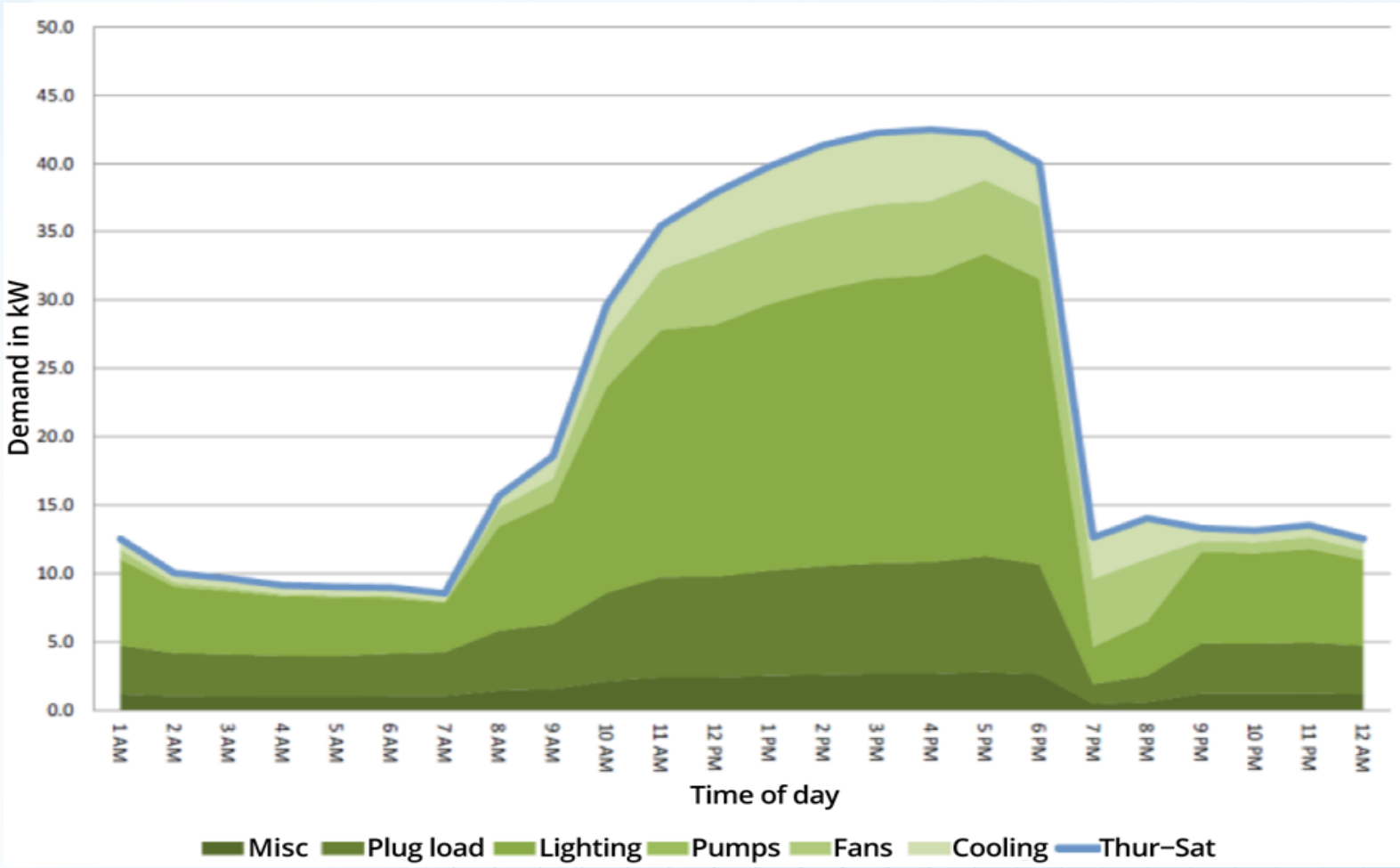
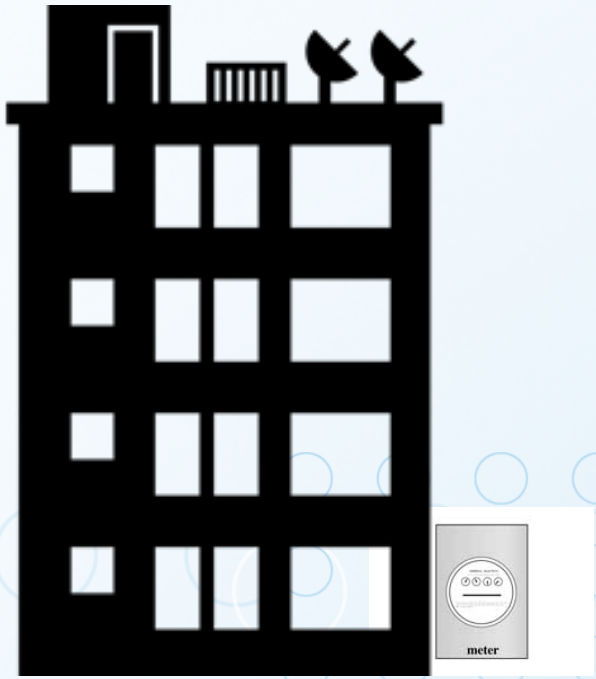
Customer Identification

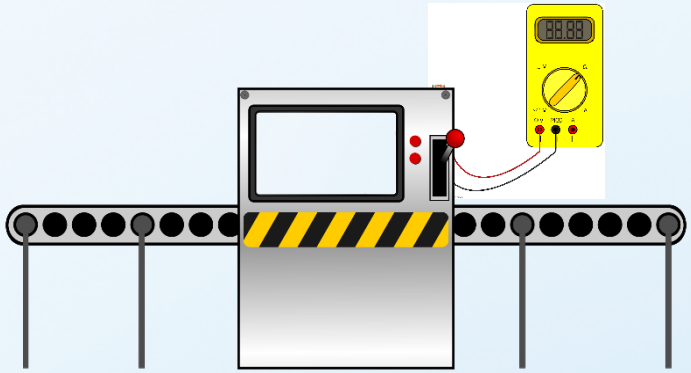


Project Identification



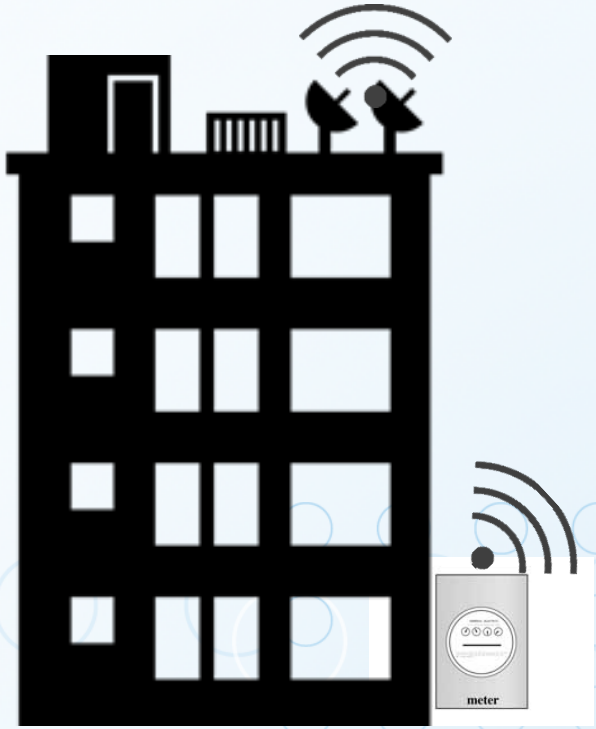
Conventional M&V

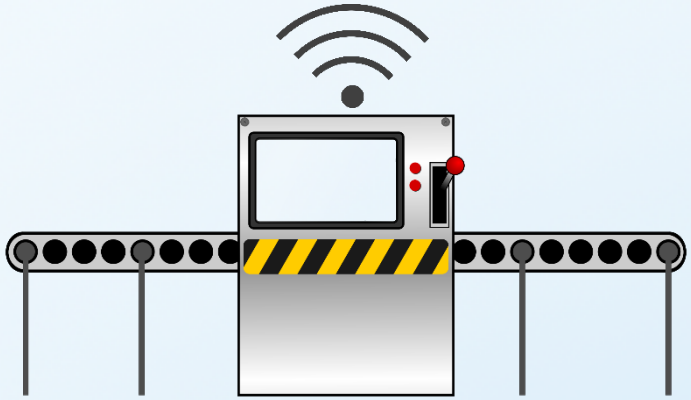




Manual collection and comparison of pre- and post-energy consumption

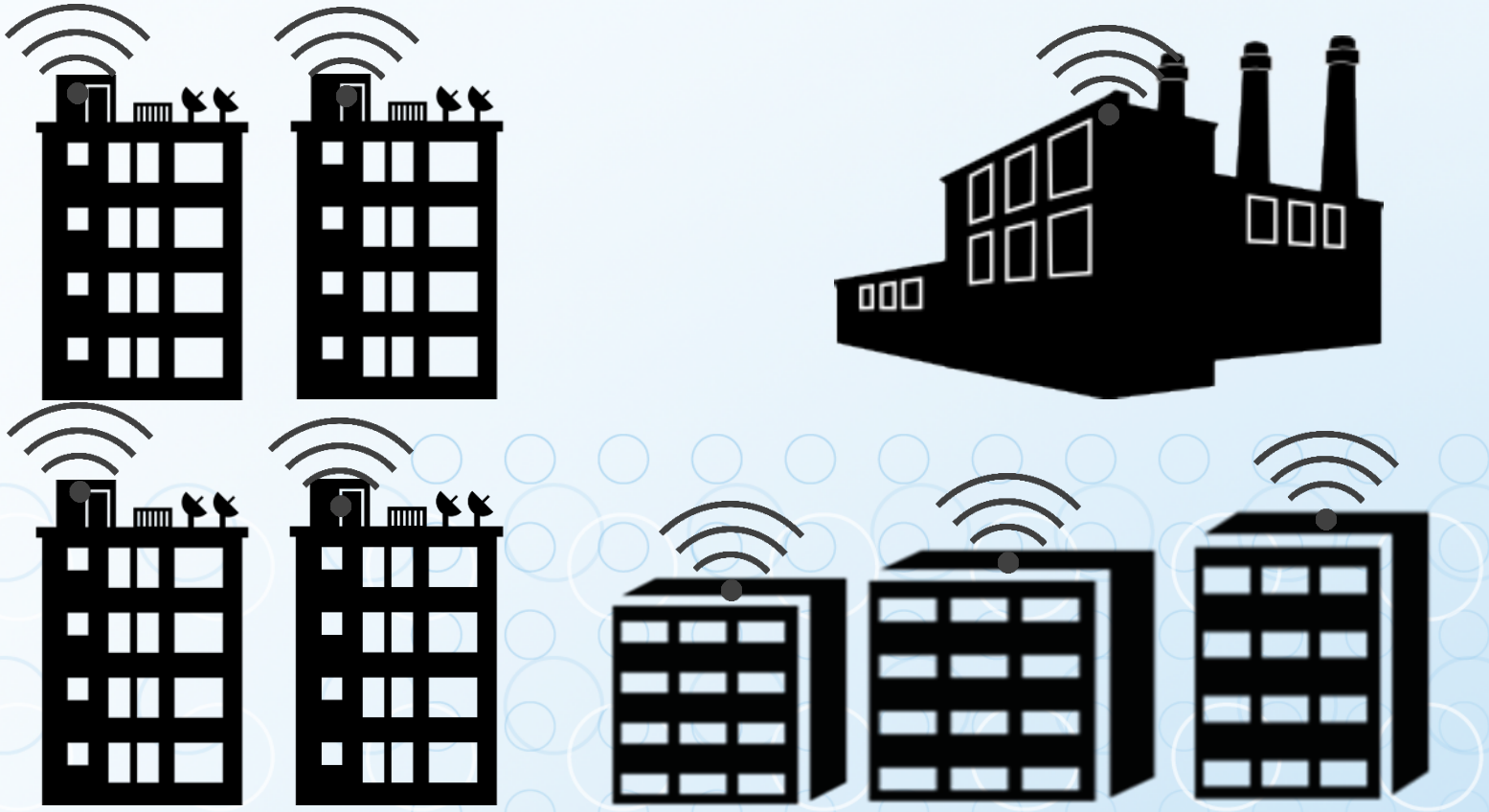
Sensors and Wireless Networks





Automated collection of energy consumption

Remote Tracking of Energy Use



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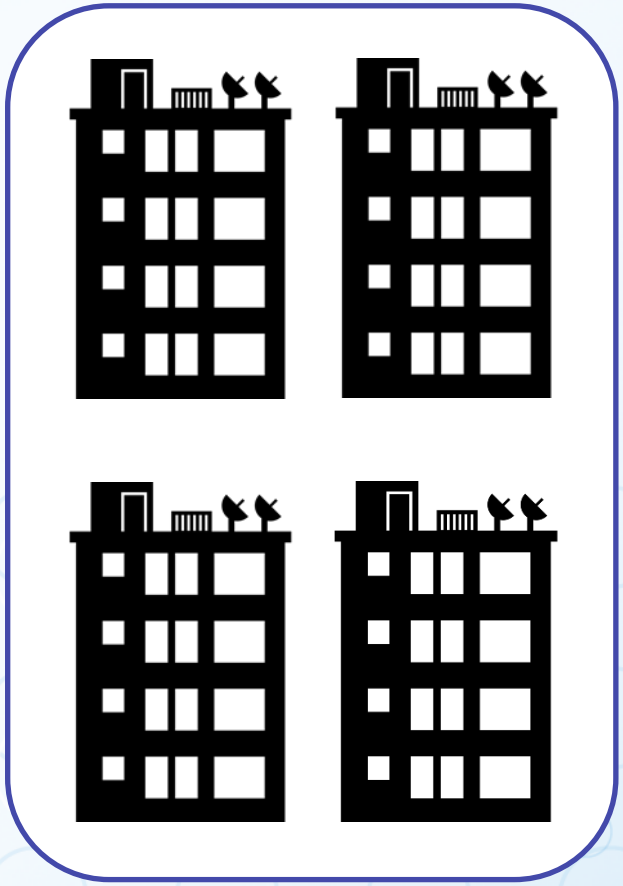
Use of Comparison Groups



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Commonwealth Edison
Custom Incentive Program

Project Energy Savings 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

Manufacturing Facility Savings 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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Summary

- ICT is changing how the programs
  - Engage customers
  - Identify opportunities
  - Track savings
  - Evaluate projects
  - Evaluate programs
- ICT provides program administrators with the potential to collect energy savings data in near real-time.

Conclusions

Using ICT in energy efficiency programs can:

- Increase the scale of 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 into the accuracy and specificity of performance measurement
- Establish guidance for best practices for:
  - Making assumptions
  - Data cleaning and interpreting
  - Integrating external data sources
- Set goals for cost effectiveness, accuracy, and precision

Thank you!

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

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Related Reports

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

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