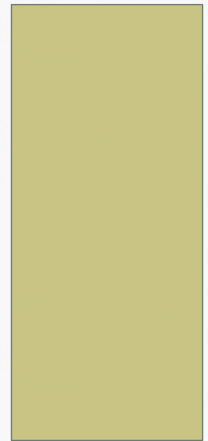


EM&V: AN INTRODUCTION TO KEY CONCEPTS AND MAPPING A PATH FORWARD

PRESENTED TO:

DELAWARE ENERGY EFFICIENCY
ADVISORY COUNCIL

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QUESTIONS ABOUT ENERGY EFFICIENCY PROGRAMS

- How did we do? (*Ex Post*)
 - How much energy and demand were saved, how confident are we that savings occurred?
 - How much generation is avoided?
 - How much of the savings is attributable to the program intervention?
 - What other benefits did program produce? What were the costs? Is program worth continuing?
 - Is intervention still needed (Is the market transformed)? What changes are needed if we do it again?
- How are we doing?
 - Is program performing as expected?
 - Why isn't the program saving what we expected it to? What can be done to increase performance?
 - Are products, trade allies, markets behaving as expected?
 - Is participation happening as we expected? Who are the participants?
 - Who are the non-participants and why are we not reaching them?
- What should we be doing? (*Ex Ante*)
 - What do we need to know to design this program?
 - What market failure necessitates our intervention?
 - How does market work, and how does our intervention affect market?
 - What do we expect the program intervention to do?
 - What external factors may effect performance?
 - What are the uncertainties and risks?
 - How will this program fit into the portfolio of programs?

TYPES OF EVALUATION STUDIES

- **Impact:** Determines and documents direct and indirect benefits of an EE program
 - Energy and demand savings, non-energy benefits
 - Supports cost-effectiveness analyses
 - Real time or retrospective
- **Process:** Formative, systematic assessment of a program
 - Documents program operations
 - Identifies and recommends improvements
- **Market:** Assesses structure or functioning of a market, behavior of market participants, and/or market changes that result from program efforts
 - Includes market baselines, potential, and market effects studies

IMPACT EVALUATION APPROACHES

- Verification: Is equipment installed and in use?
- M&V: Project-by-project estimate, via
 - End-use metering: pre vs. post, isolated savings component (e.g.; hours of use)
 - Billing analysis: pre vs. post
 - Building or system simulation
- Deemed savings: stipulated estimates
 - Technical Reference Manual
- Large-scale data analysis
 - Randomized controlled trials
 - Quasi-experimental designs
 - Component metering

IMPACT EVALUATION CONCEPTS

- Saving estimate based on counterfactual scenario
 - *Def'n: the difference between energy the participant would have used without the program and energy consumed after participating*
- First-year and/or lifetime estimates
- Gross vs. net savings
 - *Def'n: net savings are changes in energy consumption or demand that are attributable to an energy efficiency program*
 - Adjusts for free-riders and spillover

IMPACT EVALUATION CHALLENGES

- Identifying a control
 - Need to control for external factors
 - Biases: self selection, recruitment
 - Hawthorne effects: does act of studying affect the outcome?
- Determining the correct baseline
 - Existing conditions, codes & standards, or common practice
- Estimating persistence
 - How long do savings last?
 - Do savings degrade ?
- Accounting for rebound: do participants take back savings?
- Data collection cost constraints
 - Results are estimates with uncertain distributions
 - Measurement errors
 - Scope vs. intensity

QUESTIONS ANSWERED BY IMPACT EVALUATIONS

- How did we do?
 - How much energy and demand were saved, how confident are we that savings occurred?
 - How much generation is avoided?
 - How much of the savings is attributable to the program intervention?
 - What other benefits did the program produce? What were the costs? Is program worth continuing?
 - Is intervention still needed (Is the market transformed)? What changes are needed if we do it again?
- How are we doing?
 - Is program performing as expected?
 - Why didn't the program save what we expected it to? What can be done to increase performance?
 - Are products, users, trade allies, markets behaving as expected?
 - Is my participation as expected? Who are the participants?
 - Who are the non-participants and why am I not reaching them?
- What should we be doing?
 - What do I need to know to design my program?
 - What market failure necessitates our intervention?
 - How does market work, and how does my intervention affect market?
 - What do we expect the program intervention to do?
 - What external factors may effect performance?
 - What are the uncertainties and risks?
 - How does program fit into portfolio and long-term plan?

PROCESS AND MARKET STUDIES

- **Tools**

- Interviews, surveys, focus groups, ride-alongs, stocking studies, mystery shoppers, data analysis of tracking information, metering,

- **Studies**

- Baseline, potential, equipment saturation, market research, market characterization, market adoption, benchmarking, equity distributions

- **Objectives**

- Provides feedback, gauges progress, provides market intelligence, checks QA/QC and satisfaction

WHY EVALUATION PLANNING IS SO IMPORTANT

- At Portfolio Level
 - Money is never enough — budgeting and planning a necessity
 - Need balance of impact, process, and market studies
 - Need both short and longer term perspective
 - Need to consider all portfolio objectives
- At the Program Level
 - Need to understand program objectives
 - Need to understand how to measure success
 - Need to know data requirements and ensure availability
 - Need to design feedback to gauge progress

WHAT SHOULD BE INCLUDED IN PROGRAM PLAN DEVELOPMENT

- Statement of objectives
 - Why are we inserting ourselves in this market?
 - What barriers exist that need intervention?
 - How does current market work and who are the actors?
- Logic model
 - What is expected outcome from my intervention?
 - What are the risks to my success?
 - What are the expected outcomes? How will we measure success, what are the *metrics*?
 - What feedback will we need to gauge progress?
- Define evaluation plan to monitor progress and to measure success
- Define data collection needs, availability, and analysis approach

CONSIDER MORE PILOTS

- Test concepts that we are uncertain about
 - Less at stake
 - Quicker way to start
- Pilots can test individual components: e.g. incentive amount, delivery approach, market messages
- Evaluation planning even more important for pilots
 - Answers to most important questions before committing everything
 - Builds in rapid feedback
 - Can establish testable experiments

RESOURCES

- IEPEC-search Evaluation Conference papers
https://www.iepec.org/?page_id=4715
- North East Energy Partnership reports
<http://www.neep.org/resources>
- Calmac searchable database of all CA reports
<http://www.calmac.org/search.asp>
- **Energy Efficiency Program Impact Evaluation Guide, DOE**, Evaluation, Measurement, and Verification Working Group, December 2012

QUESTIONS?

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