

Emerging Issues in the Evaluation of Energy Programs: The US Experience

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Topics

- EM&V History in the U.S.
- Key EM&V Issues:
 - Technical
 - Policy
 - Infrastructure

EM&V History in the U.S.

- ❑ Since the late 1970s – 4 decades
- ❑ Initially federal and state government
- ❑ Since then: state utility programs
- ❑ Most recently: federal “economic stimulus” \$\$
- ❑ Primary EM&V focus: program (not policy)

I. EM&V Technical Issues

- ❑ Net energy savings calculation
- ❑ Market transformation evaluation
- ❑ Carbon emissions calculation

Net Energy Savings Calculation (1)

- ❑ What were the true effects produced by a program, separated out from what would have otherwise occurred absent the program?
- ❑ Definitions vary by state
 - ❑ Net savings = gross savings – free riders
 - ❑ Net savings = gross savings – free riders + participant spillover + market effects
 - ❑ Definitions can result in large and significant differences in reported energy savings and carbon reductions!!

Net Energy Savings Calculation (2)

□ Technical measurement

- Measure changes in decision behavior => how has the program changed end users' decision behavior?
- Self reports [surveys/interviews]
- Econometric modeling
- Market share [market sales]
- Quasi-experimental research design

Net Energy Savings Calculation (3)

- ❑ Should we care about net energy savings?
 - ❑ Past context: precise quantification of energy savings and demonstration of cost-effectiveness (burden of proof scrutiny)
 - ❑ Current context:
 - ▲ EE has proven itself as a cost-effective resource & is a least-cost utility system resource
 - ▲ Climate change is overriding policy objective: reduce GHG emissions!
 - ▲ Impossible to source out the net effects of a program due to mosaic of public and private programs

Net Energy Savings Calculation (4)

- ❑ Should we care about net energy savings?
YES!!!
 - ❑ EM&V is important for improving the effectiveness of programs
 - ❑ For targeting non-free riders
 - ❑ Where financial incentives are tied to energy savings
- ❑ States will decide: gross savings or net savings
- ❑ National level: is a dual approach viable?

Market Transformation (MT) Evaluation

- ❑ MT programs: education, info, training, incentives, working with manufacturers, etc.
- ❑ Market characterization: describing specific market or market segments
- ❑ Market assessment: examining changes in market structure and functioning and in the behavior or market participants
 - ❑ Market theory, program theory (logic models and market indicators)
- ❑ Sustainability
 - ❑ How does a changed market sustain market effects?

Carbon Emissions Calculation (1)

- ❑ Four approaches:
 - ❑ Average carbon multiplier effect (carbon emissions factor)
 - ▲ Uses average fuel source(s) for generating kWh
 - ❑ Hourly weighted average carbon multiplier approach
 - ▲ Uses average carbon reductions for each hour of the year
 - ❑ Hourly dispatch carbon emissions calculation approach
 - ▲ Uses generator-specific dispatch data and hourly savings load shapes over the EUL of the measures
 - ❑ Oxidation reduction equation approach (heat-rate approach) [non-electric]
 - ▲ Carbon emissions via combustion process or emitted to the atmosphere

Carbon Emissions Calculation (2)

- ❑ Lots of uncertainties and possible estimation errors
- ❑ Best to estimate carbon impacts using the least expensive approach for the accuracy desired
 - ❑ Carbon emissions factors: least expensive (least accurate)
 - ❑ Hourly based approaches (more expensive and more accurate)
 - ▲ Hourly load shapes – current? available?

II. EM&V Policy Issues

- ❑ Evaluation metrics
- ❑ Evaluation practice
- ❑ National EM&V protocols

Evaluation Metrics (1)

- ❑ Metrics have historically focused on efficiency, net savings and Total Resource Cost (TRC) test of cost-effectiveness
- ❑ Need to reconsider these metrics if one wants to reduce GHG emissions
 - ❑ Need to measure absolute GHG reductions
 - ❑ Need to focus on markets, not programs (too narrow) and how the market is changing over time
 - ❑ Need to revisit net savings

Evaluation Metrics (2)

- ❑ Need to revisit TRC –new metric or make significant changes to inputs:
 - ❑ Avoided cost calculation – base it on renewable energy plant?
 - ❑ Discounting – use very small discount rates? - to reflect long-term decisions and societal perspective
 - ❑ Carbon adders – use higher carbon values (\$45 instead of \$3)?
 - ❑ Measure lifetime (EUL) – higher or lower values?
 - ❑ Non-energy benefits – include in benefit-cost tests?

Evaluation Practice

- ❑ Evaluation practice depends on how the results will be used:
 - ❑ Demonstrating EE as a reliable resource
 - ❑ Using EE as a means for reducing GHG emissions
 - ❑ Determining shareholder incentives
 - ❑ Improving the quality of programs
- ❑ Critical role for process evaluation
- ❑ More research needed on:
 - ❑ Which consumers participate or do not participate in EE programs and why
 - ❑ Behavior of key stakeholders
 - ❑ Market for EE products and services

National EM&V Protocols (1)

- ❑ Renewed interest in a national EM&V protocol
 - ❑ Common evaluation terms and definitions, evaluation methods, savings values and assumptions, and reporting formats
 - ❑ To produce reliable and transparent savings estimates
 - ❑ To compare savings from one state to another or from one evaluation to another
 - ❑ To reduce evaluation estimation error risks
 - ❑ To reduce evaluation costs to states
 - ❑ To minimize confusion for and reduce barriers for the growing market of EE providers

National EM&V Protocols (2)

- ❑ Concerns in developing a national EM&V protocol
 - ❑ May be challenging in getting a consensus from a broad range of stakeholders
 - ❑ May impede innovation at the state level, or inadvertently exclude evaluation practices that are valid
 - ❑ Best achievable practices in evaluation may differ regionally, due to resource availability
 - ❑ May be viewed as too stringent or too lenient
 - ❑ May be viewed as too general and not specific
 - ❑ May increase transaction costs (state & national requirements)

National EM&V Protocols (3)

- ❑ Must be developed objectively by third parties
- ❑ Must build in room for flexibility and opportunity for updates
- ❑ Must ensure that state reporting goals and reporting needs are being addressed
- ❑ Must encourage an open and transparent process with opportunities for stakeholder input and participation
- ❑ Must provide an array of evaluation categories
 - ❑ Minimum levels of rigor for all programs
 - ❑ Encourage exceeding minimum levels, if desire and budget are available

III. EM&V Infrastructural Issues

- ❑ Developing a professional evaluation community and workforce
- ❑ Training the next generation of evaluators

Developing a Professional Evaluation Community and Workforce

- IEPEC experience: role model
 - Since 1983
 - Referred papers, poster sessions, expert panel discussions, topics, workshops, training, networking

Training the Next Generation of Evaluators

- ❑ Efficiency Valuation Organization
 - ❑ Certification course on M&V and IPMVP
- ❑ American Society of Heating, Refrigerating, and Air-Conditioning Engineers
 - ❑ Training course on M&V
- ❑ Association of Energy Services Professionals
 - ❑ Training course on evaluation
- ❑ IEPEC – evaluation workshops
- ❑ Conferences: IEPEC, American Council for an Energy-Efficient Economy, Consortium for Energy Efficiency
- ❑ Universities and colleges
 - ❑ Directory of energy and energy-related programs (2006) at IEPEC website

IV. Other EM&V Issues Not Discussed

- ❑ Closing the lop between evaluators and implementers
- ❑ Evaluation of persistence
- ❑ Evaluation of rebound (takeback)
- ❑ Evaluation of behavior and behavior change
- ❑ Policy evaluation
- ❑ Evaluation of programs and policies using top-down indicators

Time for Questions

