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EEAC EM&V Briefing

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Organization of Presentation

"EM&V in Massachusetts: Past, Present and Future"

- Past
  - Background
  - Review of MA EM&V Framework
  - Current planning process
  - What EM&V has accomplished since 2010
- Present
  - Status Report
  - Selected recent results
- Future
  - Priorities for the future
  - Changes to planning process

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EM&V Past

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What is EM&V (Evaluation, Measurement and Verification)?

- Impact Evaluation, yes
  - Measurement of Gross Savings
    - Methods: End-use metering, billing analysis, site visits, engineering re-analysis
  - Measurement of Net Savings or Net-to-Gross Ratio (NTGR)
    - Methods: Survey research, sales data analysis, quasi-experimental design, econometric analysis
- But also…
  - Process Evaluation (studying how a program has been implemented and operated)
  - Market Assessment (trying to understand the markets being targeted)
  - Other: measure cost studies, baseline research, analysis of non-energy benefits, analysis of environmental benefits, etc.

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How EM&V is Used in Massachusetts

- Impact evaluation:
  - Refine planning assumptions prospectively, via TRM
  - True-up savings retrospectively, via annual reports
  - Inform program screening and cost-benefit analysis
- Process evaluations
  - Improve program design and delivery
- Market assessment
  - Support program planning and implementation
  - Inform policymaking

MA EM&V Framework

- Under 2009 agreement:
  - All studies are statewide
  - Studies are administered by individual PAs, with responsibility systematically distributed across PAs by research area
  - Studies planned and performed collaboratively with EEAC and its consultants
  - If consensus cannot be reached between PAs and EEAC consultants, consultants have decision-making authority
    - Thus far, 100% of decisions made by consensus
- Three statewide research areas, each with assigned PA evaluators, EEAC consultant reps, and a standing contractor team
- EM&V Management Committee (EMC) provides a forum for statewide evaluation issues, and guidance, planning and direction to each evaluation research area
- 3-year budget cap of $70 million
  - Current pace of spending is well below this cap

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Evaluators and Programmers: The Feedback Loop

- If evaluation is to result in program improvements, communication between evaluators and programmers is critical at every stage
- What coordination mechanisms are in place to enhance the feedback loop?
  - EM&V liaisons to RMC and CIMC
  - Inter-team work groups (recent example: Existing Buildings Working Group)
  - Program staff participation in EM&V planning meetings
  - Informal communication between teams within organizations
  - Some individuals play joint roles (E.G., Jennifer Chiodo, EEAC C&I program and EM&V consultant)
- **We are always looking for improvements**

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EM&V Planning Process To Date

- (Very) high-level EM&V plan and budget cap are submitted as part of each 3-year plan
- Majority of individual studies developed each year in the Spring and fleshed out over the next several months.
  - Supplemented by additional studies developed throughout the year as needs arise.
- Typical study:
  - Enters the implementation stage in July-September
  - Lasts 8-12 months

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Current EM&V Planning Process: Assessment

- Current planning process is:
  - Largely annual, somewhat fragmented and ad hoc
  - Driven in part by need to complete impacts evaluations in time for application to the annual reports
  - Shaped by resource constraints
    - Pressure on EM&V from sharp ramp-up in programs and budgets
    - Shortage of project managers
    - Getting needed studies done has been prioritized over systematizing the planning process
- As discussed further later, we are in the process of overhauling the planning process

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What Value Has EM&V Added Since 2010?

- Substantial increases in the reliability of savings claims
  - Programs and end-uses that showed performance problems at first have largely stabilized
  - Reliable savings claims lead to effective allocation of resources and improved programs
  - **We know the resource is really there!**
- Innovative program approaches have been confirmed as effective, allowing the Commonwealth to increase reliance on them
- Industry-leading research into NEBs has led to more comprehensive accounting of program benefits
  - Has allowed PAs to field wider range of measures
- Impact evaluations have shown differences in the effectiveness of different program models
  - Example: behavioral

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What Program Changes Have Been Made as a Result of EM&V? Residential

- Low NTG results found in 2010 HEHE impact evaluation led to removal of lower efficiency measures and addition of high efficiency ones.
  - New HEHE impact evaluation finds NTGs have increased
- Pilot studies of heat pump water heaters and WiFi thermostats led to the addition of these measures to programs
- Pilot study of solar water heating led to decision not to pursue
- 2010 process evaluation of HES stimulated the pre-WX initiative
- Process evaluations uncovered hurdles to statewide standardization that have now been addressed
  - Implementation procedures, measure definitions, input assumptions, modeling calibration, cost estimates, calculation approaches…
- Residential lighting market assessment activities influenced evolution of program strategy
  - Introduction and positioning of LED incentives

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What Program Changes Have Been Made as a Result of EM&V? Non-Residential

- Many improvements to engineering estimation methods and processes in response to impact findings
  - These have improved the reliability of the resource
- Improvements to gas/electric integration
- Restructuring of account management and customer segmentation

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EM&V Present

(Status Report and Selected Recent Results)

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Status Report: Summary of Studies in Progress

- Some 40 studies have been underway in 2013
- Wide range of studies:
  - Gross savings Impact evaluations
  - Net savings impact evaluations
  - Process evaluations
  - Market assessments
  - Baseline research
- Some 25 of the ongoing studies have recently been finalized, in time for inclusion in the 2012 Annual Reports
- Recently completed studies listed in appendix to presentation
- Remaining studies to be finalized over next 3-4 months
- A new round of studies will start in 2nd half of 2013
- The following selected study results draw on recently completed studies, as well as interim results from those still in-progress
- All studies to be posted on EEAC web-site once finalized

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New Impact Evaluation Results: The View from 30,000 Feet

- At overall portfolio level, effect of new impact results should be to **increase** savings somewhat
- However, much variation across programs, measures, end-uses and PAs
- A few problem areas
  - Demand savings tend to be forecasted less accurately than energy savings
  - New results for HEHE are likely to adversely affect program cost-effectiveness
  - Some individual measure categories continue to be difficult to forecast
  - Some PAs have a tougher row to hoe than others
  - Due to differences in planning assumptions across program years, in a few cases, savings are increased for PY2013, but decreased for PY2012

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Non-Residential Evaluation Results

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Upstream C&I Lighting Program Process and Impact Evaluations

- **So far, this large, innovative new program is holding up well under EM&V scrutiny**
  - LEDs which dominate savings, show a NTG of 82%
  - Interim gross impact evaluation results suggest that gross savings are probably being forecasted accurately
  - Customers and trade allies generally satisfied

Large C&I Electric Impact Results:

Energy Savings Forecasts Accurate Where It Counts Most
But Demand Savings Remain Harder to Forecast

Gross Savings Realization Rates From Several New Studies

	kWh RR	On-Peak Summer kW RR	Relative Magnitude of Forecasted Savings
Prescriptive Lighting Systems	112%	92%	Large
Prescriptive Lighting Controls	72%	24%	Moderate
Prescriptive VSDs	94%	229%	Moderate
Custom Refrigeration	111%	121%	Moderate
Custom Motors	91%	90%	Small
Custom "Other"	61%	63%	Small

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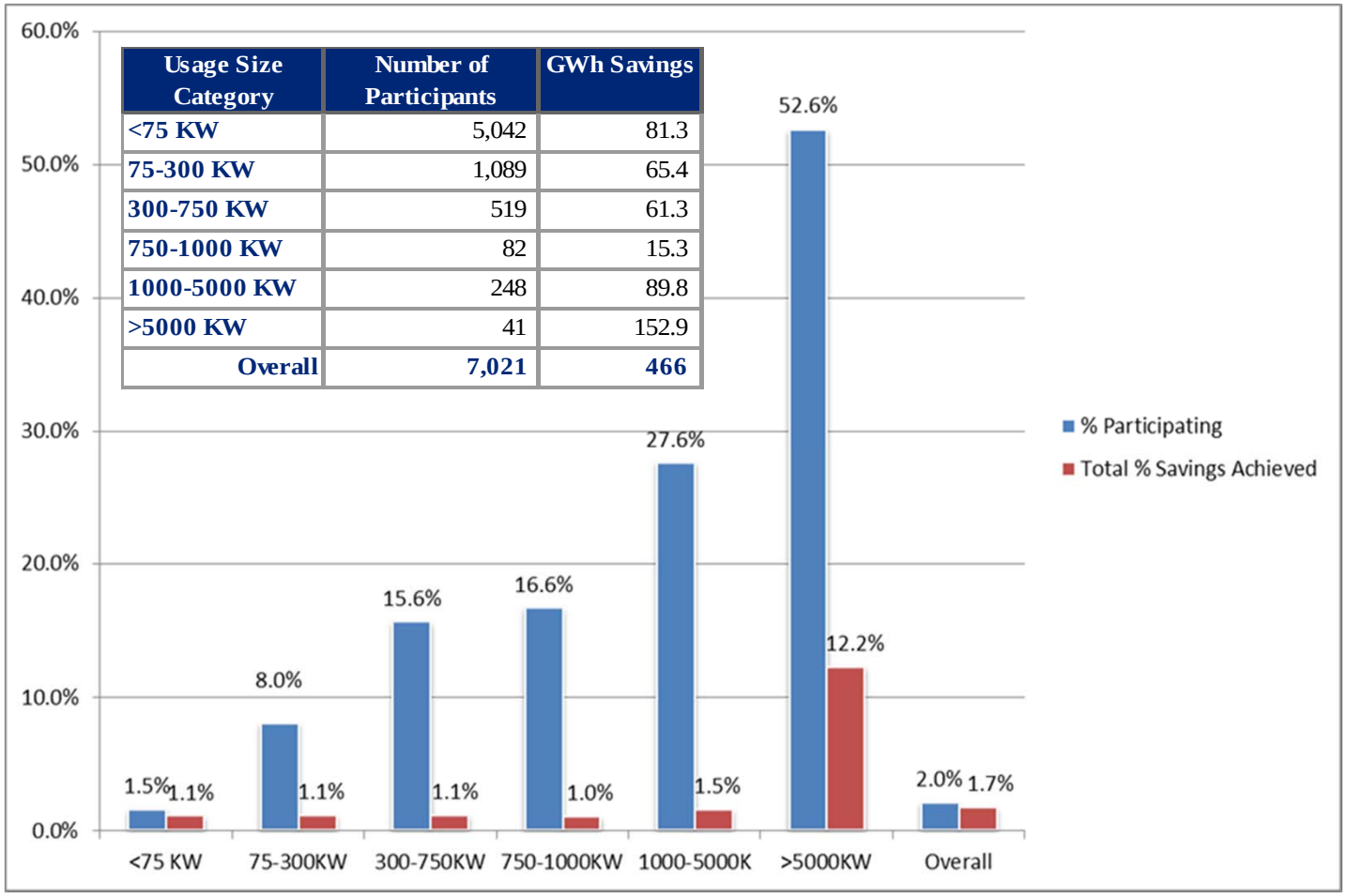
C&I Gas Program Impact Evaluations

- **Studies in 2011 and 2012 found accuracy of C&I gas savings forecasts to be a problem area, but two new studies show results appear to be stabilizing**
- Custom gas measures:
  - Statewide studies done in 2011 and 2012
  - In 2013, new study done only for NSTAR, as desk review found no reason to expect changes for other PAs
  - NSTAR realization rate improved from 68% to 82%
- Prescriptive gas measures:
  - New statewide study
  - Overall, evaluated savings are 102% of forecasted savings
  - But much variation across measures
    - Furnaces: 160%
    - Infrared heating: 20%

C&I Customer Profile Study: Untapped Potential Among Smaller Customers?

Electric Participation Rates and Total % Savings by Account Size

Usage Size Category	Number of Participants	GWh Savings
<75 KW	5,042	81.3
75-300 KW	1,089	65.4
300-750 KW	519	61.3
750-1000 KW	82	15.3
1000-5000 KW	248	89.8
>5000 KW	41	152.9
Overall	**7,021**	**466**



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Mid-Sized C&I Customer Study (Interim Report)

- **Addresses whether there is a need for new services targeted specifically to customers who are:**
  - **Too large to qualify for DI program**
  - **Too small to have an account rep**
- Interim Results
  - Strong relationship between size and participation rate holds when **accounts** are aggregated to **customers**
  - Challenging to come up with consistent statewide criteria for what constitutes a mid-sized customer
    - Many differences across PAs in how C&I customers are segmented, and whether and how account reps are assigned
    - Within PAs, decisions as to whether to assign account rep tend to be complex
    - Even when this complexity taken into account, inconsistencies between reported approaches and analyses of customer databases
  - No consensus among PA and implementer interviewees as to whether mid-sized customers are being optimally served

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Residential Evaluation Results

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HEHE Net-to-Gross/Market Study

- **Results of this NTG/market study raise significant programming and policy issues**
- Study featured:
  - Surveys and interviews with customers, contractors and distributors (participating and non-participating)
  - Collection of sales data where possible
  - Comparisons of overall market conditions in MA and PA
- Reshaped in mid-stream to also help resolve developing uncertainties regarding NEBs from HEHE
- Results:
  - Substantial portion of net program effects consists of program-induced fuel switching from oil to gas
  - NTGs are up somewhat from last study, reflecting updating of qualifying criteria and incentive structure
  - Some categories of NEBs found to have been significantly overstated for HEHE
  - Some qualitative evidence of significant out-of-program market effects

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HEHE Study: Gas Boiler Sales Data "Point" to Net Program Impacts

Sales of Residential Gas Boilers in Massachusetts

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HEHE Study: Implications

- Ultimate effect of findings will be to increase savings modestly, but sharply decrease NEBs
- **Sharp reduction in NEBs, combined with decreases in avoided gas costs, raises uncertainties about continued cost-effectiveness that will need to be explored in coming months**
- Significant role of oil-to-gas fuel switching in net program effects found in the evaluation raises policy issues
  - General directive not to use EE programs to promote fuel switching -- yet fuel switching yields societal benefits

HES Impact Evaluation Follow-On Study

- **Targeted impact evaluation of two Home Energy Services (HES) program measures: insulation and air sealing**
- Follow-up on 2012 impact evaluation was needed to:
  - Accommodate changes in audit tool software
  - Develop PA-specific realization rates to reflect differences in software across contractors
- Larger savings and higher realization rates than found in 2012 study
  - Commonwealth-wide realization rate of 76% as compared to the 61%
  - Average savings per participating home using natural gas for heat rose to 139 therms versus 92 therms
    - Due in part to increased adoption of recommended measures by newer study participants.
- Identified differences in savings from Lead Vendors and Home Performance contractors that need to be further explored

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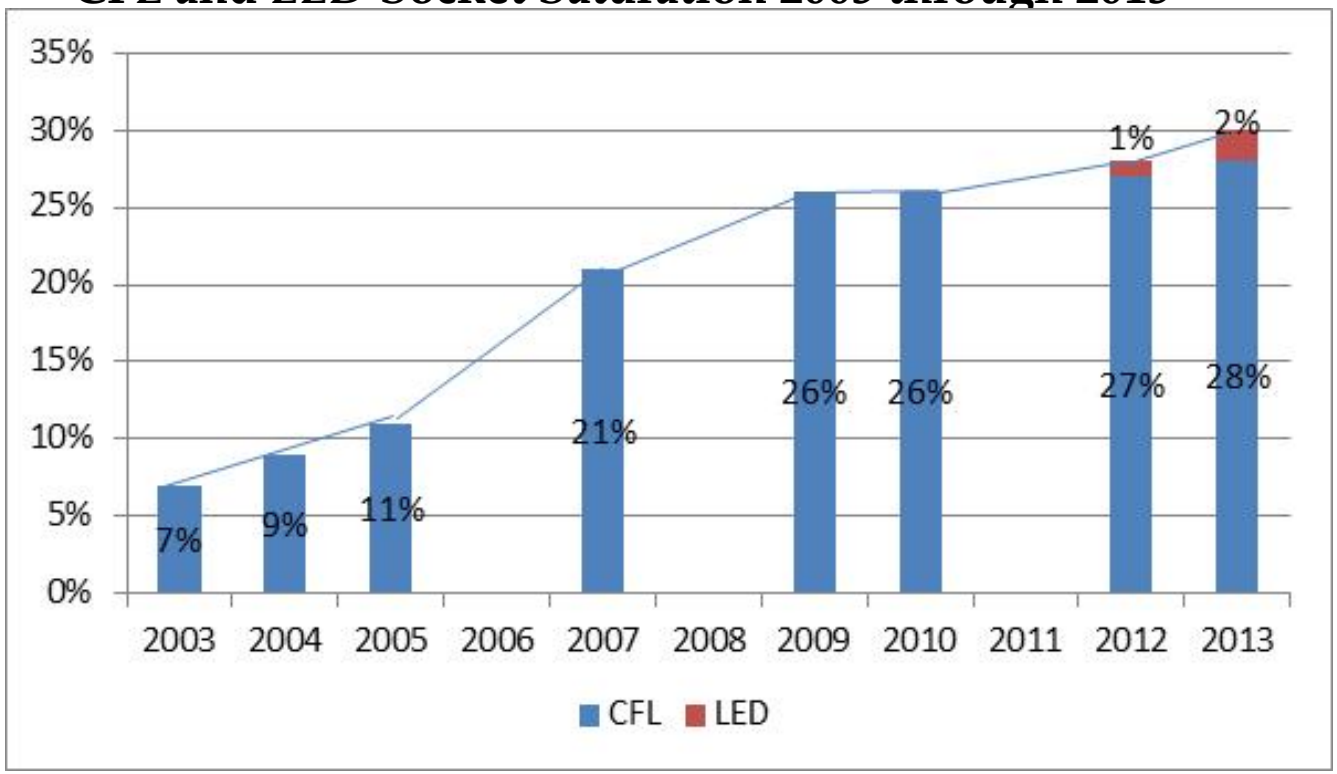
Comprehensive Evaluation of Behavioral Programs

- **OPower programs**
  - Constitute the vast majority of tracked behavioral savings
  - Generally saving energy as forecasted
    - Evaluated savings cluster around 100% of OPower forecasts
  - Savings tend to increase after 1-2 years of messaging
- **CLC SHEMP pilot**
  - Two phases of pilot produced very different results
  - Phase 1: 8-9% savings, even years after initial participation
  - Phase 2: 1.5-2% savings
- **Western Mass Saves**
  - Those receiving home energy reports save 1%
  - Those activating portal save another 1-2% - less than expected
- **Are any approaches other than OPower ready for prime time?**

Residential Lighting:
The Case of the CFL Saturation Plateau

CFL and LED Socket Saturation 2003 through 2013

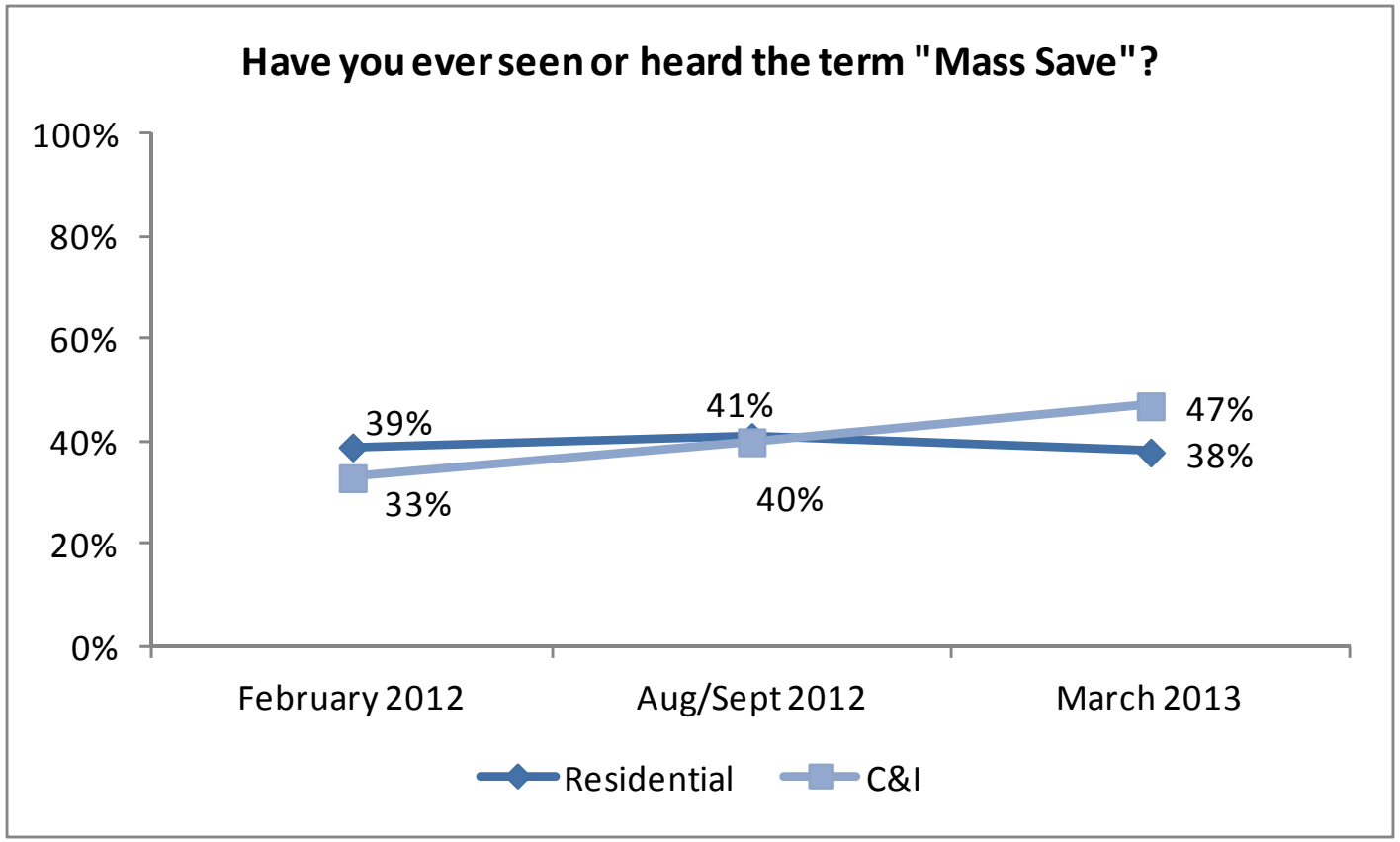


The Case of the CFL Saturation Plateau (Continued)

- **Despite extensive program effort and expenditure, saturation of efficient lighting in homes increased only 4% from 2009 to 2013**
- Does this mean the program is having little if any effect?
  - **NO.** EM&V evidence suggests that:
    - Program continues to cause significant adoption.
    - However, at this point many program-induced bulbs are replacing burnt-out CFLs instead of incandescents
    - In the absence of the program, many of these burnt-out CFLs would have reverted to incandescents
- Nonetheless, saturation plateau suggests that there remains significant untapped savings potential in this market
- Little if any indication that EISA is about to capture this potential
- **New program approaches are needed**

Umbrella Marketing:
More Progress in Non-Res Than Res?

Residential and C&I Unaided Mass Save Awareness Over Time



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EM&V Future

(Priorities for the future;
changes to planning process)

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Priorities for the Future

- Continue to build market assessment component of EM&V program
- Develop top-down NTG research program
  - "Top-down" means econometric analyses aimed at finding evidence of global program effects in the overall consumption patterns of MA end-users.
- Continue moving toward market-based NTG methods where possible
  - "Market-based" means studying the entire market, not just participants
- Strengthen and systematize the collection of sales data

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EM&V Planning Process: In-Progress Changes

- As noted earlier, current planning process needs to be improved
  - Longer-term planning horizon
  - More strategic
  - More integrated
- Established EMC subcommittee for this purpose
- **Key reality is that resource limitations impose tradeoffs between improvements to planning process and continued timeliness of EM&V results**
  - Since 2010, sharp increases in scope and scale of programming have placed EM&V in continual catch-up mode
  - Time spent doing long-term planning is time not spent fielding studies
  - Sharp, sudden transition in planning process is likely to delay needed studies
- Therefore, subcommittee has developed action plan to guide transition

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Refinements to EM&V Planning Process: Components of Action Plan

- Immediate:
  - Improve communication of evaluation plans and results to stakeholders
- July-August: combine results of EM&V planning summit meetings held in February and May into an integrated plan for studies to be done over next 12-18 months
- 2013 Q3:
  - Systematize budgeting criteria
  - Systematize criteria for how often various types of studies are done
  - Codify planning process and communicate to stakeholders
- 2013 Q4: Strategic plan to guide efforts for remainder of 2013-2015 period

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PA Response

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Thanks!

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Appendix: Recently Completed Studies

IMPACT EVALUATIONS

- ***Non-Residential***
  - Upstream Lighting Impact and Process Evaluation
  - Large C&I Prescriptive Lighting Impact Evaluation
  - Large C&I Prescriptive VSD Impact Evaluation
  - Large C&I Custom Refrigeration and Motors Impact Evaluation
  - Large C&I Custom Gas Impact Evaluation
  - Large C&I Prescriptive Gas Impact Evaluation
  - Small Business Direct Install Summary Impact Evaluation
- ***Residential***
  - HEHE/Coolsmart NTG/Market Study
  - HES Impact Evaluation Follow-On Study
- ***Cross-Cutting***
  - Comprehensive Evaluation of Behavioral Programs

NON-IMPACT STUDIES

- ***Residential***
  - Lighting:
    - On-site lighting saturation study
    - Study on early effects of EISA
    - Lighting supplier interview report
    - Lighting Retailer Shelf-Stocking Study
    - Consumer survey report
  - RNC incremental cost study
  - Pre-Weatherization Pilot Evaluation
  - Lighting Controls Pilot Evaluation
- ***Non-Residential***
  - Customer Profile Study
  - Mid-Sized Customer Needs Study (Interim Report)
  - Boiler Baseline Research Interim Report
- ***Cross-Cutting***
  - Marketing Pre-Campaign Snapshot
  - Marketing Campaign Evaluation