

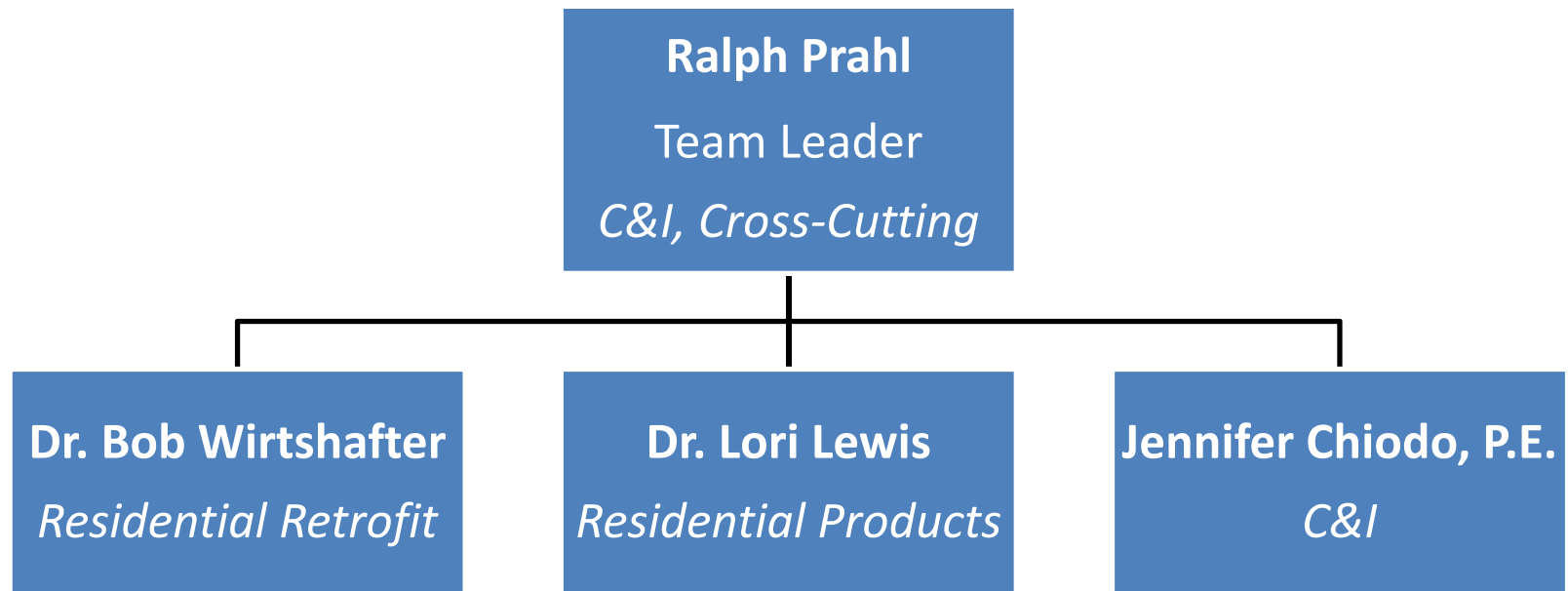
EEAC EM&V BRIEFING:

WHY IT'S GETTING HARDER – AND HOW RECENT EM&V RESULTS CAN HELP

▶ June 21, 2017

www.ma-eeac.org

EEAC CONSULTANTS EM&V TEAM



BRIEF STATUS REPORT



- ▶ **Many studies completed recently in connection with 2016 Plan Year Report filing**
- ▶ **Mid-term update to 2016-2018 Strategic Evaluation Plan recently added 38 new studies**
 - Across planning, implementation, and reporting stages, this leaves us with a record number of studies currently in progress
 - SEP update can be found at <http://ma-eeac.org/wordpress/wp-content/uploads/2016-2018-Strategic-Evaluation-Plan-Update.pdf>
- ▶ **EM&V has also recently assumed responsibility for evaluating all peak demand reduction pilots/demonstrations**
 - 12-15 studies planned, but many pilots are pending DPU approval
 - 3 studies in progress
- ▶ **For the most recent comprehensive status report, go to <http://ma-eeac.org/studies/>**

BRIEF SITUATION ASSESSMENT



- ▶ **EM&V program is turning out a large volume of high-quality research and is responsive to stakeholders**
 - Program continues to grow to satisfy increasing information needs
- ▶ **Timeliness remains a challenge, but making progress**
- ▶ **Collaborative EM&V framework remains effective**

RECENT EM&V RESULTS: THE LAY OF THE LAND



- ▶ **With at least 50 studies completed since last EM&V presentation in June 2016, we have a lot to choose from**
 - Presentation is thus highly selective
- ▶ **We focus on two themes:**
 - Why it's getting harder to sustain current high energy savings levels (the "bad" news)
 - How recent EM&V results may help to make it a little easier (the good news)
 - We draw directly on results from at least 30 different studies
- ▶ **Many of the issues touched upon today may be subject of active discussions in three-year planning process**
- ▶ **In order to enhance timeliness, we present some results that are still in draft form**



THE “BAD” NEWS:

**ACROSS THE BOARD, INCREASES IN BASELINE
EFFICIENCY ARE ERODING SAVINGS**

THE EFFECTS OF INCREASING BASELINE EFFICIENCY ON SAVINGS

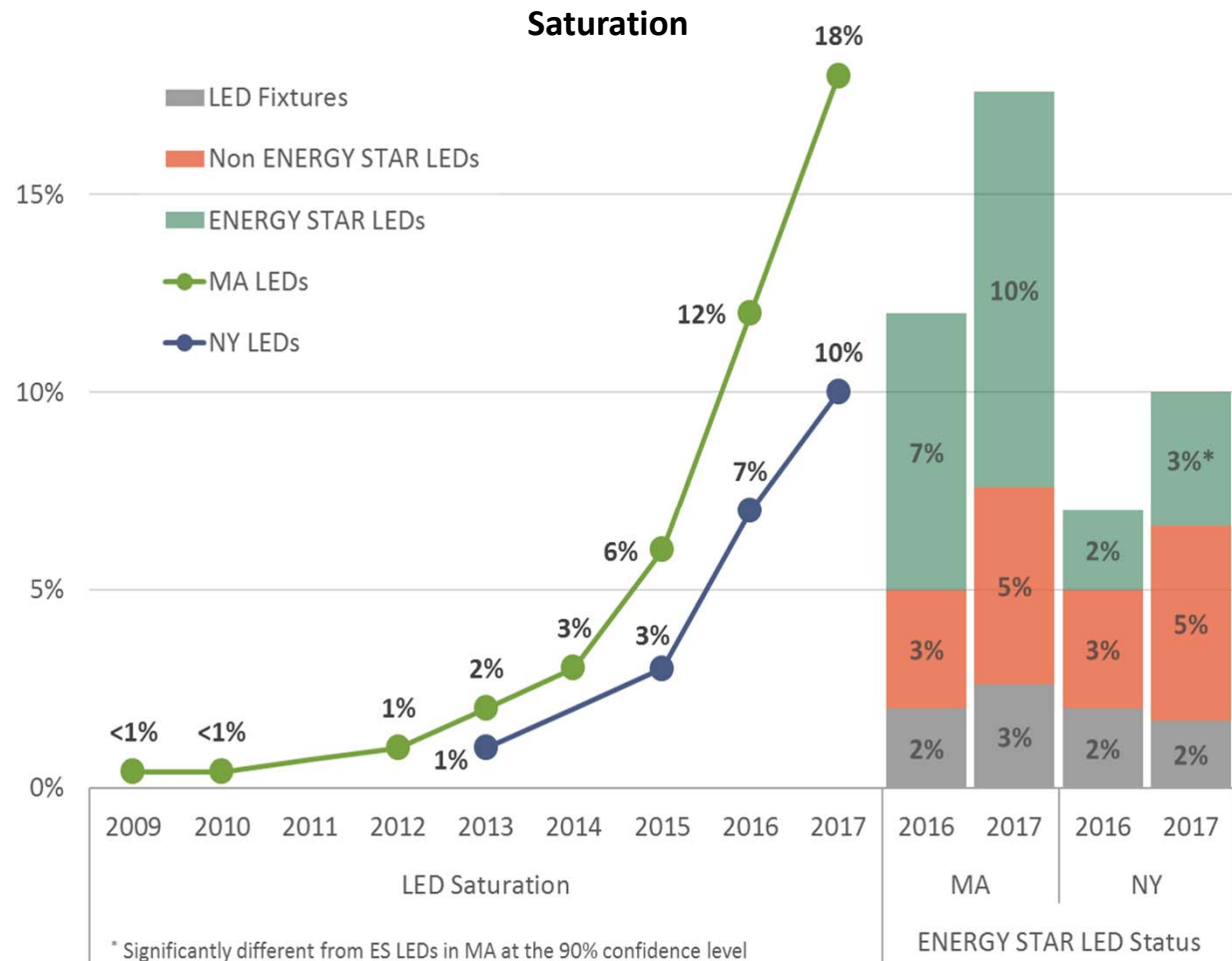
- ▶ **Increasing baseline efficiency decreases gross unit savings, by shrinking the improvement in efficiency**
- ▶ **Increasing baseline efficiency may also be associated with reductions in net-to-gross ratios**
 - Increasingly efficient market practices may make it more likely that participants would have adopted EE measures on their own
- ▶ **This can happen even when there is plenty of technical savings potential left**
 - Baseline efficiency more a matter of current sales patterns than of equipment stock
- ▶ **All of this tends to make it harder to sustain current high savings levels**
 - As discussed in 2nd half of this presentation, “harder” does not necessarily mean “impossible”

WHAT DO INCREASING BASELINES MEAN IN THE BIG PICTURE?

- ▶ **From an overall societal perspective, advancing baselines are desirable!**
 - While program savings are harder to achieve, emissions are still being reduced, and capacity constraints mitigated
- ▶ **In some cases, advancing baselines are the result of national or global market trends**
- ▶ **In other cases, advancing baselines may be the result of program-induced market effects**
 - When this occurs, EM&V tries to capture it and credit the savings
 - However, this is very challenging, and expensive enough that we need to do it selectively

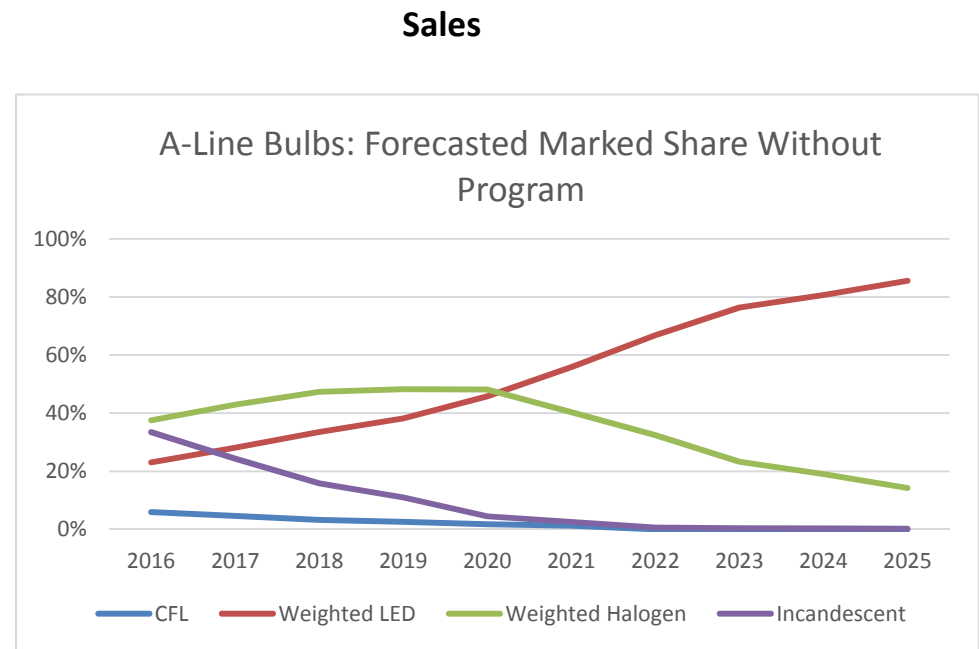
RESIDENTIAL UPSTREAM LIGHTING: STILL WORKING

- ▶ **56% of annual Res savings in 2016**
- ▶ **Long-running MA/NY on-site comparison study shows program is still making a difference for LEDs**
 - MA has:
 - Higher saturation
 - Higher proportion of Energy Star bulbs



RESIDENTIAL UPSTREAM LIGHTING: BUT FOR HOW MUCH LONGER?

- ▶ **EM&V's latest adoption forecast for LEDs has cut effective useful life (EUL) for most LEDs almost in half**
 - LEDs are rapidly commercializing world-wide
 - Program is clearly further accelerating adoption in MA
 - But: most program bulbs installed now would *eventually* have been converted in absence of program
 - We reflect this by forecasting adoption trajectory without program, building result into EUL
 - Most recent analysis shows sharp drop in EUL



RESIDENTIAL LIGHTING: ATTRIBUTION



- ▶ **Next NTG study is scheduled for completion in early 2018, to feed into 3-year plan**
 - Market conditions, and recent study in nearby state, suggest NTGR could be rapidly declining as well
 - **Locking in NTGR prospectively for 3 years, as currently required by MA policy framework, is risky for LEDs**
 - See Summer 2015 EM&V presentation for more detail on this issue

RESIDENTIAL NEW CONSTRUCTION

- ▶ Roughly 2% of 2016 annual residential electric savings
- ▶ Just-completed baseline study shows significantly increased baseline efficiency since previous study
- ▶ This continues a trend seen in four earlier baseline studies completed since 1999
- ▶ Trends for some key parameters:

	2015	2011	2005	2001	1999
Wall insulation R-value	20.8	19.4	16.3	14.1	14.1
Floor insulation R-value	30.7	26.7	18.5	18.6	19.4
Duct leakage (CFM25)	3.9	12.4	21.7		
Air leakage (ACH50)	3.57	4.78	6.36		
Efficient bulbs (%)	48%	20.2%	4.6%	0.1%	

MULTI-FAMILY



- ▶ **Roughly 1% of 2016 statewide annual electric savings**
- ▶ **New Construction: MF High Rise baseline study led to increases in baseline efficiency**
 - High rise is 4 or more floors, 5 or more units
 - Lighting, heating, water heating, various other measures
- ▶ **Retrofit: impact evaluations led to substantial reductions in savings**
 - Reductions on the order of 30-40% for electric
 - Lower-than-expected install rates and operating hours
 - Some quality control issues

C&I LIGHTING: RETROFIT

- ▶ Lighting was roughly 50% of 2015 annual C&I savings (retrofit and new construction combined)
- ▶ C&I on-site study confirmed that the savings potential from converting to linear LEDs is vast
- ▶ **The question is, how quickly will the market do this on its own?**
 - TLEDs are easy to install, and experience with screw-ins suggests potential for rapid naturally occurring adoption
 - Therefore, baselines and attribution may change quickly
 - Some evidence that there were significant TLED sales in MA as early as 2014 – *before programs began promoting them*
 - However, anecdotes of quality issues with out-of-program TLEDs
- ▶ **Future progress of linear LED market is a central unknown and a key focus for EM&V**

C&I LIGHTING: RETROFIT, CONT.



- ▶ **Near-complete impact evaluation of upstream lighting program may be flashing warning signs**
 - Early indications of lower-than-expected install rates
 - Magnitude and cause not fully understood yet
 - Implementers are already working to address the issue

C&I LIGHTING: NEW CONSTRUCTION

- ▶ **LEDs are increasingly common in non-participating buildings, leading to rapid increases in baseline efficiency**
 - Driven by technological advances, not by changes in codes
 - Baseline study found baseline Lighting Power Density (LPD) 25% lower than required by version of code in place at time
 - Now resulting in retrospective downward savings adjustments for projects completed under last code cycle
 - New baseline study now in implementation stage
 - Latest version of code has stiffened LPD requirements, but at same time, LEDs have further commercialized

C&I NON-LIGHTING

- ▶ **Roughly 50% of 2015 annual C&I savings**
- ▶ **C&I custom electric process measures: impact evaluation found 60% realization rate**
 - Realization rate is the percentage of forecasted gross savings that is confirmed by EM&V
 - **Much of the shortfall due to overly inefficient baseline assumptions**
- ▶ **Hydronic boilers: market assessment study led to increase in assumed baseline efficiency from 80% to 85%**

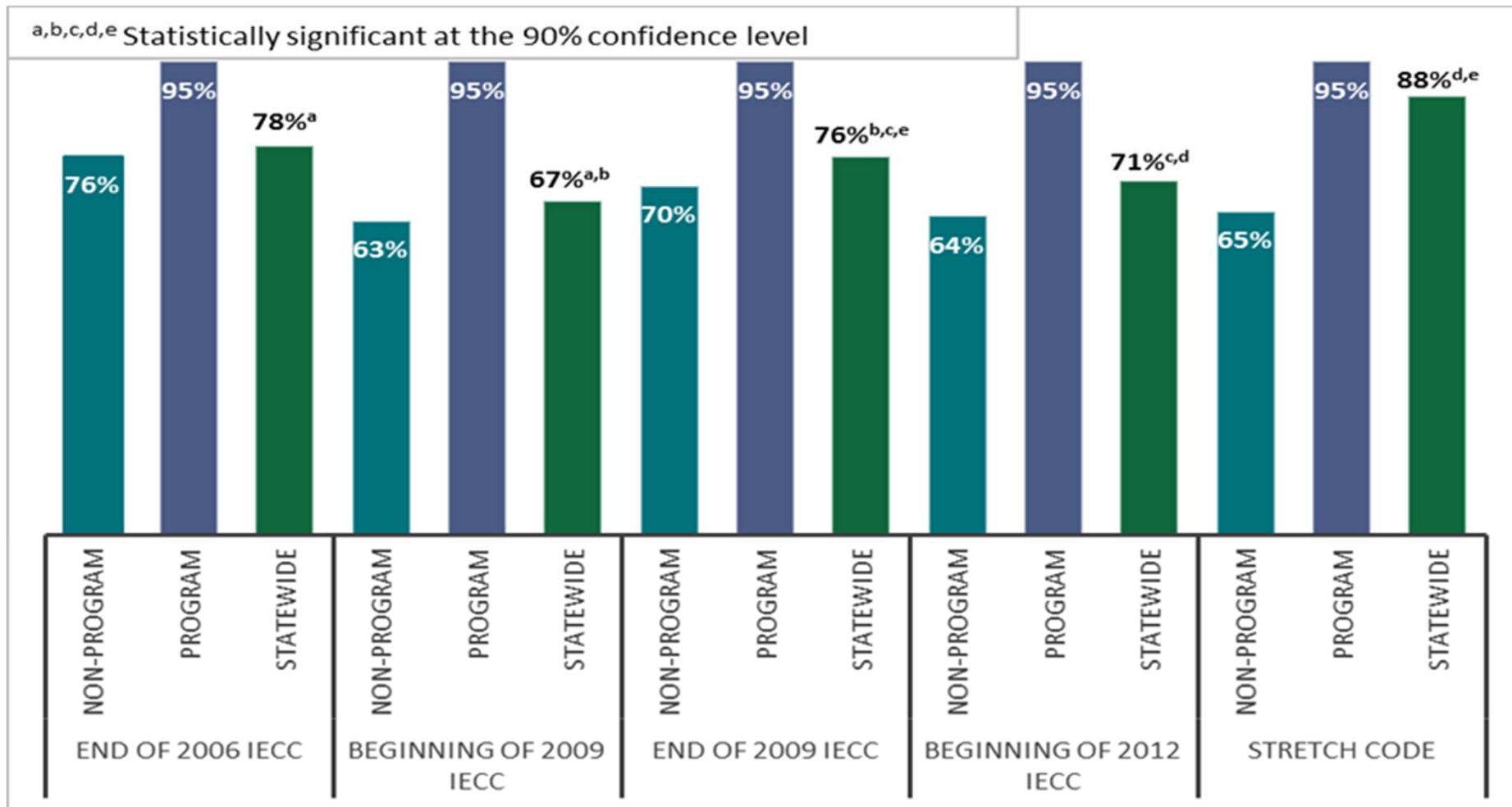
CHANGES IN EM&V C&I BASELINE PRACTICES

- ▶ **Pattern of increasing baseline efficiency is leading EM&V to enhance rigor of baseline estimation**
 - For Replace on Failure measures and New Construction:
 - More focus on Industry Standard Practice (ISP) as opposed to just code
 - More ISP research
 - For Early Replacement measures
 - Clearer evidentiary standards for claiming early replacement
 - More consistent use of dual baseline approach
- ▶ **These changes may lead to further reductions in savings claims**
- ▶ **Changes limited to C&I for now, but likely to be carried over to Residential**

CODES AND STANDARDS SUPPORT INITIATIVE (CSSI)

- ▶ **Latest RNC compliance study found relatively high compliance rates**
 - Suggests that savings potential from continued improvements in compliance is currently moderate
 - Bulk of current compliance opportunities concentrated in three measures in a limited subset of homes:
 - *Air leakage, duct leakage, and lighting in non-program, non-stretch code homes*
 - Latest C&I compliance study is in the field

CSSI, THE NUMBERS: RESIDENTIAL COMPLIANCE RATES OVER TIME





THE GOOD NEWS:

**A VARIETY OF RECENT EM&V
FINDINGS MAY HELP TO SUSTAIN HIGH
SAVINGS**

RESIDENTIAL LIGHTING

- ▶ **Carefully timing withdrawal from the Res lighting market:**
 - Too soon and we will pass up significant savings, too late and we will waste money
 - Even after we have largely withdrawn from the market, there may be niche markets that are still worth pursuing
 - Hard To Reach (HTR) customers
 - Bulb types that lag the overall market
 - Consider a program to get stored incandescents out of circulation
 - **An exit plan as part of three-year planning process will be crucial**

RESIDENTIAL NON-LIGHTING

▶ Opower

- Study of control group size requirements suggests at least 150,000 control group members could be shifted to treatment groups

▶ MF

- Multiple studies suggest programs need to be more comprehensive and quality control improved

▶ Residential Code Compliance Support Initiative:

- Some EM&V findings suggest recent step-up in stretch code requirements may cause decreases in compliance
- Program might thus want to target stretch code communities

▶ Residential Products

- There is no substitute for lighting, but study is currently assessing which new measures are most promising

NON-RESIDENTIAL LIGHTING

- ▶ **Strike an effective balance between promotion of LED fixtures vs TLEDs**
 - TLEDs are a lot easier, but fixtures save more
- ▶ **Closely monitor evolution of the linear lighting market**
 - And promptly incorporate results into program design
- ▶ **Lighting control measures are a relatively untapped resource for optimizing LED systems**
 - Also provides a demand resource

NON-RESIDENTIAL NON-LIGHTING

- ▶ **Latest study of PA differences suggests:**
 - Give program managers flexibility to negotiate HVAC incentives
 - Use dedicated, strategic vendor to serve specific segments
 - Increase focus on HVAC in smaller customers
- ▶ **Latest study of mid-sized customers suggests that, compared to large customers:**
 - Upstream lighting program has significantly improved outcomes, but other end-uses may still be lagging
- ▶ **Upstream HVAC process evaluation suggests:**
 - Expand eligible equipment
 - Reduce incentive processing time in order to appeal to wider range of distributors
 - Step up and systematize program marketing

NON-RESIDENTIAL NON-LIGHTING, CONTINUED



- ▶ **CHP process evaluation suggests:**
 - Try to make the interconnection process easier for developers and end-users
 - Step up educational efforts
- ▶ **Market characterization study suggests:**
 - Significant potential for building automation systems and controls to increase efficiency of HVAC systems

CROSS-SECTOR

- ▶ **Try to use extra headroom provided by ever-increasing NEI estimates to expand offerings within programs**
 - The more we look, the more NEBs we find
 - Meanwhile, increasing baselines are reducing energy savings
 - **Overall effect is that NEBs account for increasing % of total net benefits**
- ▶ **Increase targeting of early replacement**
 - Shown by EM&V studies to generate both higher NTGRs and higher lifetime savings
- ▶ **Make sure EE equipment works the way intended**
 - Condensing boilers actually condense
 - End-users buying minisplits know how to use them

PEAK DEMAND REDUCTION: THE LAST FRONTIER

- ▶ **Pilots and demos are new effort, so few EM&V results thus far**
- ▶ **However, results from completed evaluation of NGRID's WiFi Thermostat pilot encouraging**
 - T-stats generally performed as expected, with variations in outcomes across models
- ▶ **Around 12 evaluations of demonstration projects now in planning or implementation stage**
 - Studies tend to require new methods and pose new kinds of researchable questions
 - Evaluations of pilots focus more on assessing potential of approach than on quantifying outcomes
 - EM&V has always studied demand impacts, but focus must now sharpen
 - Assessment of performance of cutting edge technologies is prominent

CONCLUSIONS



- ▶ **While it's getting harder to sustain high savings levels, that doesn't mean it's impossible**
- ▶ **Innovation will be critical**
- ▶ **EM&V results can help point the way**

Thanks!

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▶ June 29, 2015