



NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS

# Regional EM&V Forum State Evaluation Activities

May 28, 2015 / 10:30AM to 12:00PM and 1:00PM to 2:30PM

Webinar

**\*This webinar recording is available [here](#)**

**\*\*Poll results available on [last slide](#)**

# Agenda (time on recording)



**10:30AM** Review webinar purpose and format

**10:40AM** *Delaware*-Jessica Quinn, Division of Energy & Climate, DNREC (8:18)

**10:55AM** *Vermont*-Barry Murphy & Matthew Walker, Vermont Department of Public Service (19:36)

**11:10AM** *Massachusetts*- Ralph Prah, Consultant to Massachusetts Energy Efficiency Advisory Council; Matthew Nelson, Eversource; Marie Abdou, National Grid (40:34)

**11:25AM** *Rhode Island*- Jeremy Newberger & Courtney Lane, National Grid (1:05:24)

**11:40AM** Question/Answer

**LUNCHTIME BREAK** (1:33:00-2:29:56)

**1:00PM** Welcome back from the break, recap agenda

**1:05PM** *Connecticut*-Lisa Skumatz, Consultant to Connecticut Energy Efficiency Board (2:20:40)

**1:20PM** *New Hampshire*- Tom Belair & Cynthia Trottier, Eversource (2:55:15)

**1:35 PM** *Maryland*-Joe Loper, Itron (3:11:41)

**1:50 PM** Question/Answer

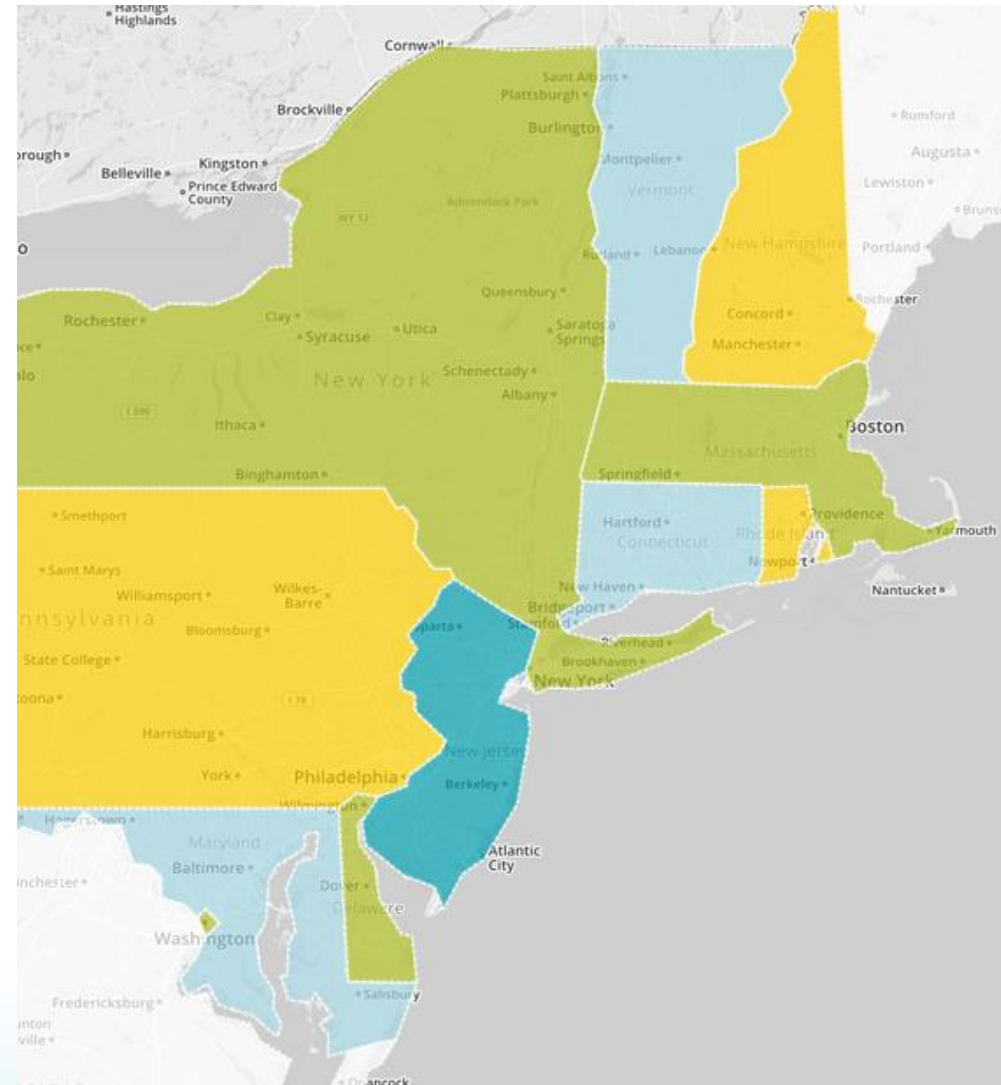
**2:10 PM** Wrap Up and Moving Forward

**2:15 PM** Adjourn

# 2015 State Evaluation Activities Purpose



- Help identify *data sharing* opportunities across states
- Help identify opportunities for *joint state research*
- Help NEEP identify *potential Forum projects*



# Recent Completed and Coming Attractions



## 1) Recently Completed Forum Work:

- Mid-Atlantic TRM V5 now posted and publicly available

[http://www.neep.org/sites/default/files/resources/Mid-Atlantic\\_TRM\\_V5\\_FINAL\\_5-26-2015.pdf](http://www.neep.org/sites/default/files/resources/Mid-Atlantic_TRM_V5_FINAL_5-26-2015.pdf)

- Geotargeting (January 2015)

## 2) Coming Attractions:

- Fri June 5 @10AM** Incremental Cost Study Results Webinar

- June 18 or 19 (TBD)** - Commercial Refrigeration Results Presentation to all Forum members, to subcommittee June 4



# **EM&V Forum State Evaluation Activities Webinar: Delaware Update**



**Jessica C. Quinn  
Division of Energy & Climate  
Delaware Department of Natural Resources and  
Environmental Control  
May 28, 2015**

# Major Delaware Policy Development

- Through the support of a broad group of legislators and stakeholders, Senate Bill 150 with House Amendment 2 passed on July 1, 2014:
  - Enables and directs Delaware electric and gas utilities to provide cost-effective energy efficiency programs
  - Establishes the 13-member Energy Efficiency Advisory Council (EEAC) to assist with the development of energy efficiency programs and financing mechanisms
  - Directs DNREC to establish EM&V Regulations



# EEAC Activities

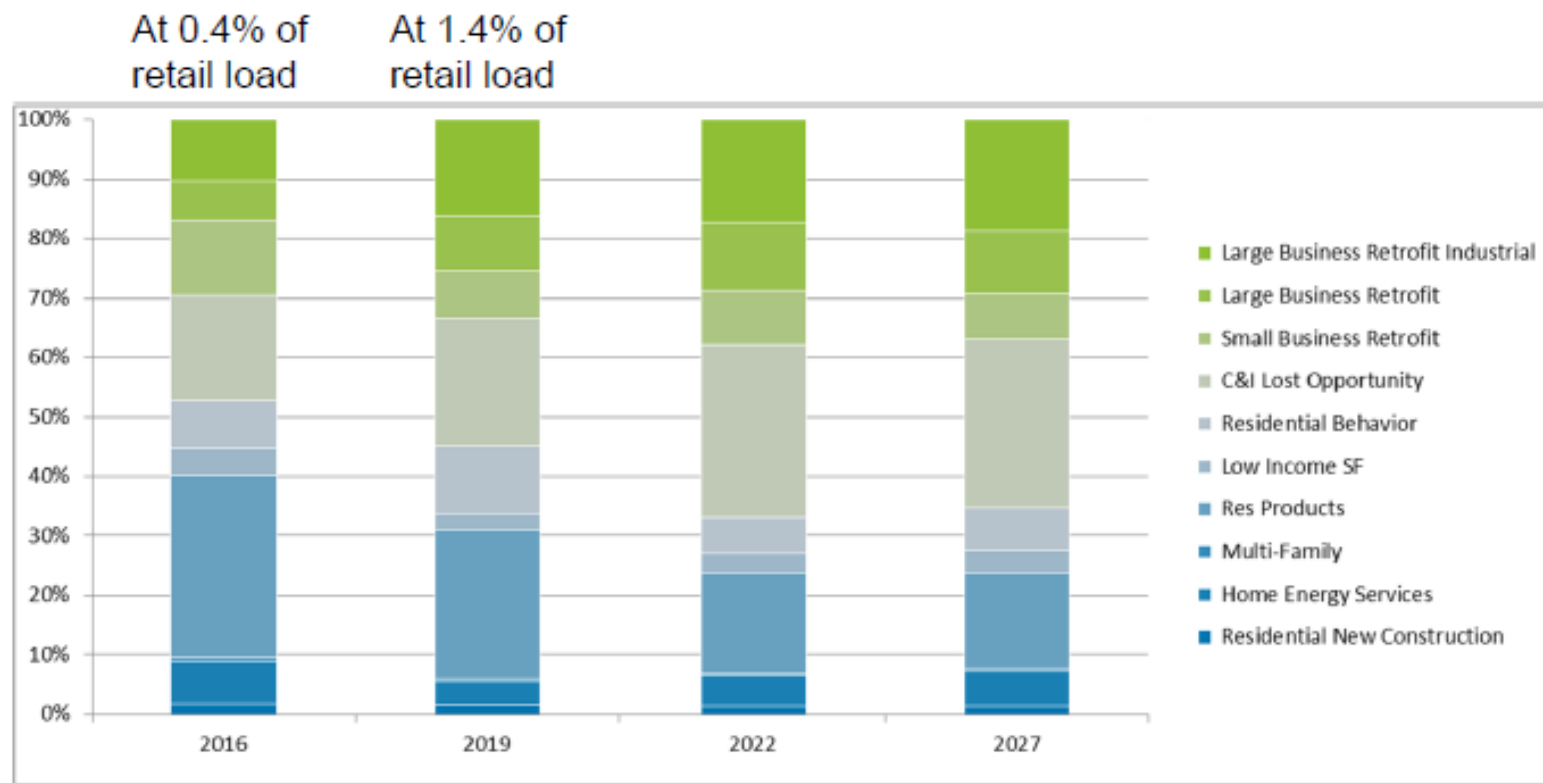
- Began meeting monthly in December 2014
- Currently in the process of setting energy savings goals
- Preliminary program & portfolio development with utilities and SEU
- Next steps:
  - Come to agreement on energy savings goals/targets
  - Finalize selection of initial set of programs and delivery method
  - Develop program budgets to achieve goals with selected programs
- EEAC meeting information and materials posted on EEAC webpage:

<http://www.dnrec.delaware.gov/energy/information/otherinfo/Pages/EEAC/Council.aspx>

# EEAC Energy Savings Goal Setting

- Preliminary target = 0.4% per year

## Evolution of Potential Portfolio Program Mix





# Evaluation in Delaware

- Evaluation activities in Delaware are the responsibility of the Delaware Department of Natural Resources and Environmental Control (DNREC).
- DNREC is currently developing EM&V regulations, to govern statewide evaluation standards, procedures, and protocols.

# EM&V Regulations and Framework

DNREC is developing EM&V Regulations and updating the Delaware EM&V Framework

- Modifying existing EM&V Framework (draft from April 2012)
- Updated Framework Addresses:
  - types of EM&V
  - roles and oversight
  - guidance on methods and timing of studies
  - rules around deeming savings and retroactive vs. prospective use of EM&V
  - Net-to-gross procedures and guidance
  - cost-effectiveness criteria, methods, and assumptions
  - quarterly and annual reporting to EEAC and PSC

# EM&V Framework and Regulations Timeline

- Draft of EM&V Framework will be released in mid-June for public review and discussion by EEAC.

## Draft Timeline for Regulations:

- June: release draft regulations
- June/July: hold public workshops
- October: public hearing
- December: final regulations promulgated

# Questions?

Jessica C. Quinn

Email: [Jessica.Quinn@state.de.us](mailto:Jessica.Quinn@state.de.us)

Tel: 302-735-3485

Division of Energy & Climate

1203 College Park Drive, Suite 101

Dover, DE 19904

# Vermont Evaluation Activities

## NEEP Forum Presentation

May 28, 2015

# Yearly Key Evaluations

## ▶ Savings Verification

- *Engineering review of the Energy Efficiency Utilities (EEUs) current energy savings claim.*
- *Statistical sampling of entire portfolio.*
- *Development of a realization rate which is applied to entire portfolio.*

## ▶ ISO-NE FCM Evaluation

- *Impact evaluation of the EEUs current capacity bid.*
- *Statistical sampling of projects, followed by the deployment of on-site meters and use of AMI data.*



# Additional Evaluations for 2015

## ▶ Residential Behavior

- *Process and Impact evaluation of Opower program*

## ▶ Continuous Energy Improvement (CEI)

- *Process and impact evaluation*

## ▶ Cold Climate Heat Pumps

- *Process and Impact evaluations*
- *Looking at individual ratepayer impact as well as potential grid impacts of wider adoption of ccHP*
- *Onsite metering*

## ▶ Home performance with Energy Star

- Impact evaluation of HPwES new construction program focused on both regulated and unregulated thermal fuels

# Additional Evaluations for 2015

- ▶ **Overall Performance Assessment (OPA)**
  - *Assessing the EEU's past 6 year performance.*
- ▶ **Community Energy & Efficiency Development (CEED)**
  - *Investment of \$21 million over 5 years with the goal of \$46 million of realized societal benefits*
  - *Verification of both the investment and the benefits*
- ▶ **Market Baseline Assessments**
  - *Residential – Existing Building / New Construction*
  - *Commercial – Existing Building / New Construction*

# Market Baseline Assessments

- ▶ Occur every 3 years, last took place for the 2009 – 2011 period
- ▶ Samples the building stock in Vermont looking at both commercial and residential buildings
- ▶ New construction (after October 2011) and existing buildings treated separately.
- ▶ Looks at building type, construction methods, thermal envelope as well as installed equipment (lights, appliances, HVAC ect)

# Market Baseline Assessments

- ▶ 300+ onsites, split between residential and commercial buildings.
- ▶ Verification of building components and assemblies (where possible/practical)
- ▶ Blower door tests for residential properties (if one has not already taken place, HERS compliance path, HPwES program ect.)

# Market Baseline Assessments Results

- ▶ Provides detailed information on new and existing buildings in terms of construction and use.
- ▶ Establishes the code compliance rate with the 2011 VT Residential and Commercial Building Standards (RBES & CBES)
- ▶ Updates the socket saturation numbers for CFL and LEDs.

# Market Baseline Assessments Results

- ▶ Used to modify EEU programs
- ▶ Identifies underserved markets
- ▶ Helps to determine freerider and spillover rates for programs
- ▶ 2011 Market Baseline Assessments can be found at;  
[http://publicservice.vermont.gov/topics/energy\\_efficiency/eeu\\_evaluation#evaluation\\_'09-'11](http://publicservice.vermont.gov/topics/energy_efficiency/eeu_evaluation#evaluation_'09-'11)



# Questions

Barry Murphy  
802-828-3183

[barry.murphy@state.vt.us](mailto:barry.murphy@state.vt.us)



## Massachusetts EM&V Update

Ralph Prah, EEAC Consultants, [ralph.prah@gmail.com](mailto:ralph.prah@gmail.com)  
Matt Nelson, Eversource, [Matthew.Nelson@eversource.com](mailto:Matthew.Nelson@eversource.com)  
Marie Abdou, National Grid, [Marie.Abdou@nationalgrid.com](mailto:Marie.Abdou@nationalgrid.com)

May 27, 2015



# Overview

Ralph Prah

EEAC (Energy Efficiency Advisory Council) Consultants



- 2013-2015 program budget of roughly \$2.2 billion
- Very aggressive annual savings goals
  - Roughly 2.4% for electric, 1% for gas
- Sharply increasing program activity
- First draft of 2016-2018 program plan has recently been filed and is under review by stakeholders
- Under these conditions, expectations for EM&V are high

# MA EM&V Framework

- MA EM&V program is both extensive and complex
  - 2013-2015 Plan calls for three-year EM&V budget cap of nearly \$70 million
- Under the current EM&V framework, all studies are:
  - Statewide
  - Administered by individual PAs, with responsibility systematically distributed across PAs by research area
  - Planned and performed collaboratively with EEAC and its consultants
  - Performed by standing contractor teams under long-term contracts
- EM&V Management Committee (EMC)
  - Provides a forum for statewide evaluation issues, and provides guidance, planning and direction to each evaluation research area
- Under the framework, if consensus cannot be reached, authority for decision-making to reside with EEAC or its designee.
  - But since framework developed in 2009, 100% of issues resolved collaboratively!



# Summary of Current Status

- Roughly 140 studies completed since 2011
- Wide range of topics:
  - Gross savings Impact evaluations
  - Net savings impact evaluations
  - Process evaluations
  - Data-Mining studies
  - Market assessments
  - Baseline research
- Finalized studies are posted on EEAC website
  - <http://ma-eeac.org/studies/>
- Currently nearing completion of implementing 2013-2014 EM&V plan
  - Some 30 studies finalized in recent months
- Simultaneously developing 2016-2018 Strategic Evaluation Plan (SEP) as a component of overall Three-Year Plan





# Where We Are At: A View From 30,000 Feet

- **Gross Savings**
  - Will always remain important, but effort is mature and stable
  - A substantial body of research over many years has established that the resource is there, and realization rates are tending to converge on 100%
- **Net-to-gross**
  - Unprecedented scope and scale of programs have necessitated the development of new methods
  - Substantial ongoing effort on top-down methods and market effects research
- **Challenges in meeting aggressive savings goals have led to a sharp focus on EM&V helping implementers go deeper and broader**
  - Studies intended to draw lessons from variations in outcomes across different PAs, sectors, and regions
  - Carefully targeted market assessment studies
  - Studies in support of new initiatives (e.g., codes and standards compliance enhancement)

# Residential and C&I Highlights

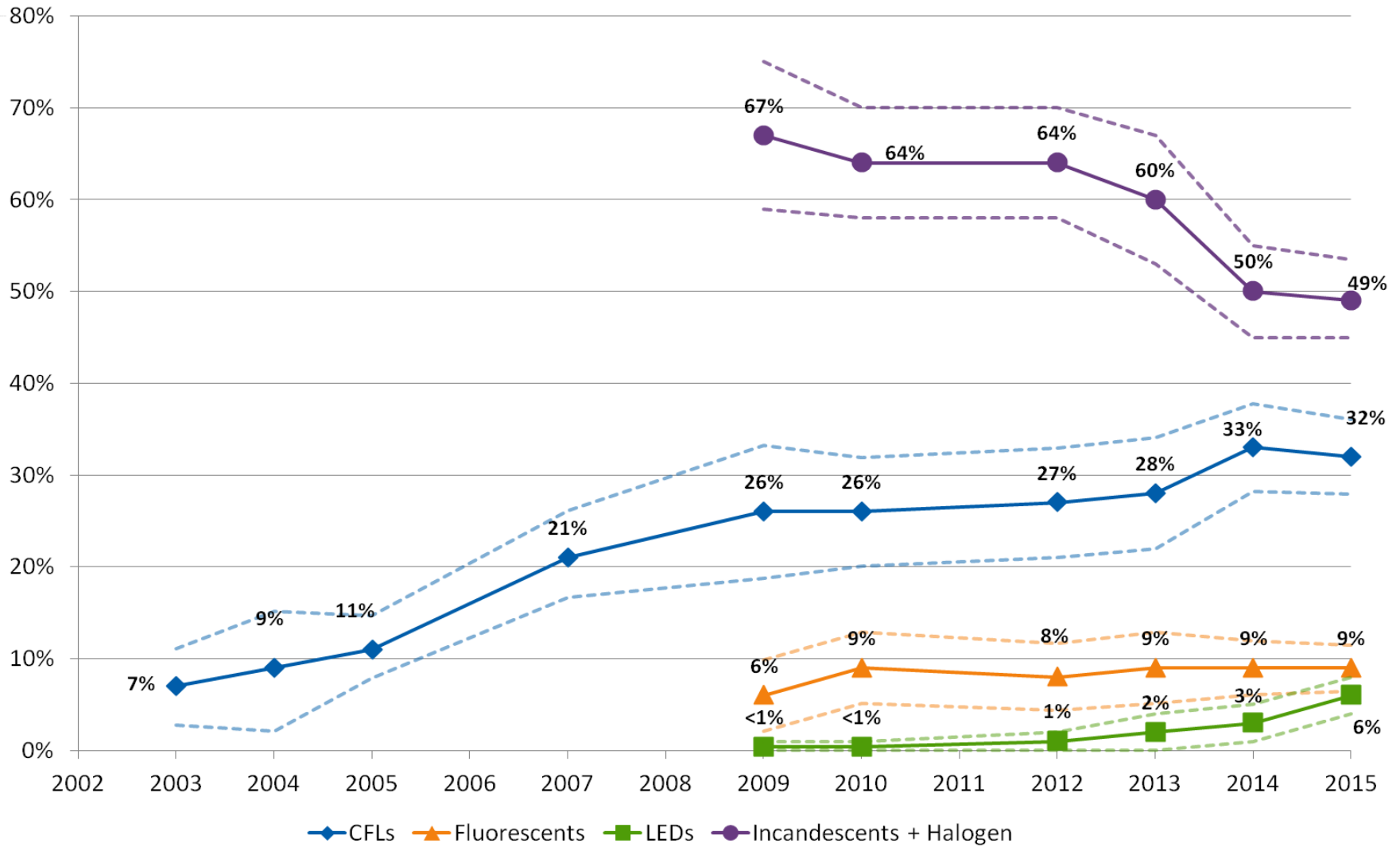
Matthew Nelson, Eversource

Marie Abdou, National Grid





# Massachusetts Saturation



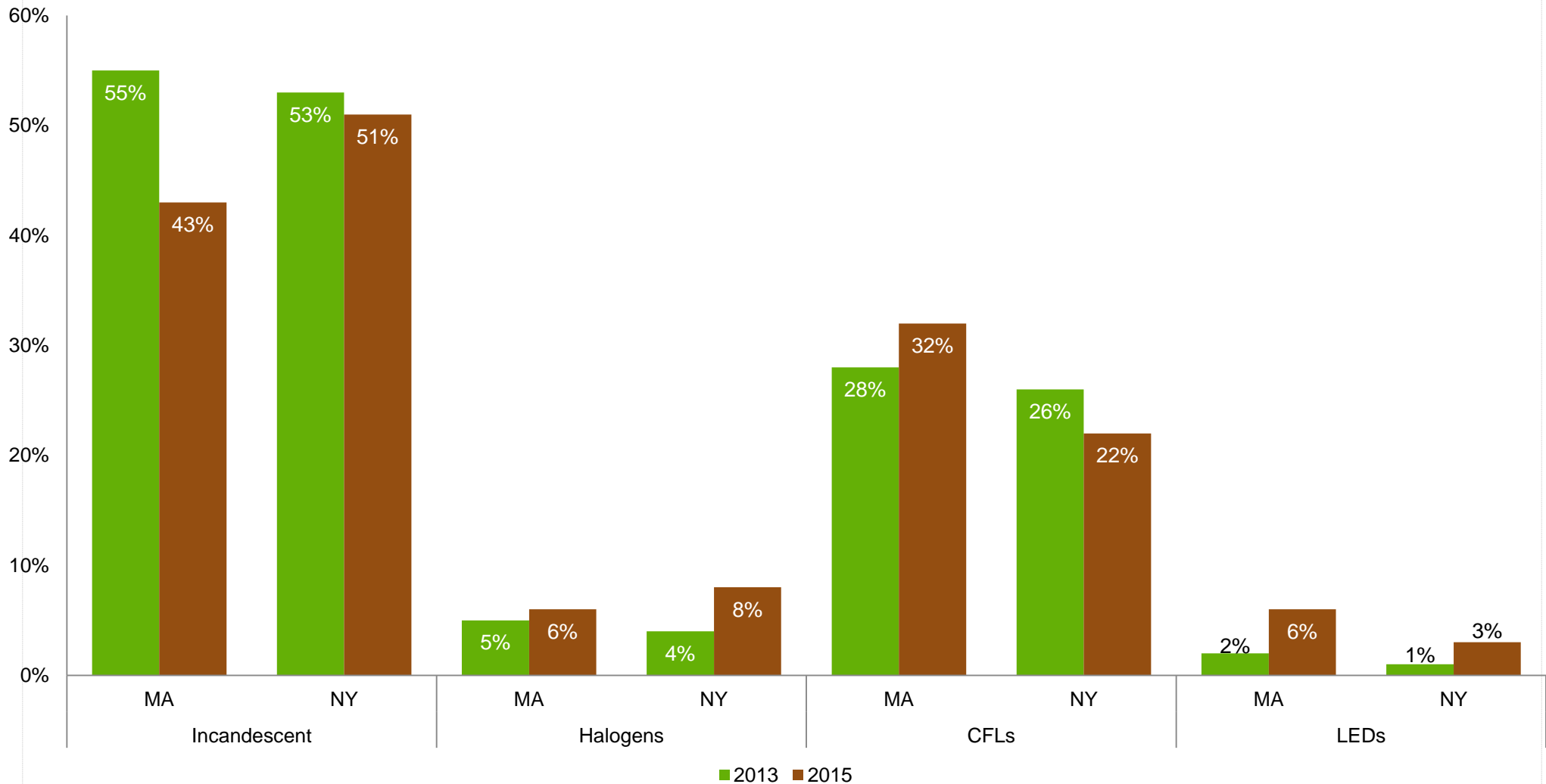
◆ CFLs    ▲ Fluorescents    ■ LEDs    ● Incandescents + Halogen

*Sample Sizes*

2003 - 100	2005 - 232	2009 - 100	2012 - 151	2014 - 261
2004 - 50	2007 - 200	2010 - 150	2013 - 150	2015 - 354

# What Happened in New York?

## Saturation of Residential Light Bulbs



Source: MA Lighting Market Assessment – Site Visit Preliminary Results (NMR Group)

# LED Market Effects Study



## Objectives

- Establish baseline conditions for LEDs in Massachusetts in support of a future market effects study.
- Research key residential and non-residential market indicators:
  - Market Share of LEDs
    - Availability
    - Pricing
  - Customer/Vendor Perceptions and Barriers
- Compare the Massachusetts baseline to a selected comparison area.



## Methods

- Primary Data Collection
  - Customer CATI Surveys
  - Market Actor CATI Surveys and IDIs
- Secondary Research
  - Processing of PA Tracking Data
    - Building Code Review
    - Literature Review
- Coordination with Other MA Studies and CPUC study
  - C&I Customer Survey
  - Lighting Market Assessment
  - Residential Shelf Survey and Pricing Analysis

# C&I LED Market Effects Study Results

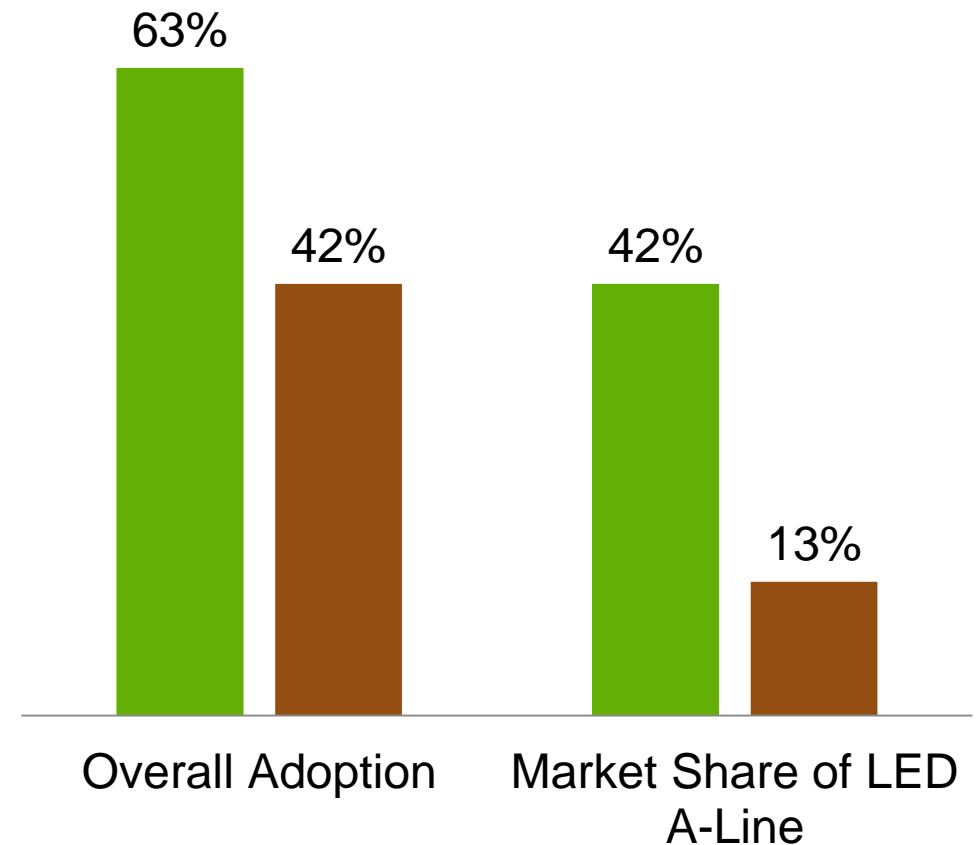


## Results

- Some aspects of the market are similar in both regions
  - Market Share of LEDs in linear applications (16% in MA, 15% Cmp)
- Massachusetts appears to be more advanced in other aspects
  - Overall adoption of LEDs (63% versus 42%)
  - Share of LEDs in screw-in bulbs (42% versus 13%)

## LED Baselines

■ Massachusetts ■ Comparison State





# C&I Customer On-site Assessments

## Principal Goal:

- Build upon the data collected in the C&I customer telephone surveys and gather additional on-site data that will help the energy efficiency programs continue to grow and expand.

## Objectives:

- Provide the data that may be used to:
  - Inform the 2016-2018 Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan;
  - Support updates to energy conservation measure baselines;
  - Assess sales trends and market share for recently purchased equipment;
  - Assess prospective additional energy efficiency opportunities at participant sites; and
  - Validate and expand upon the results C&I Customer Telephone Survey.



# C&I Customer On-site Assessments

On-site data is being collected from a total of 800 sites in two waves:

## Wave I

- 350 site visits  
(completed November 26, 2014)

## Wave II

- 450 additional sites  
(January - September, 2015)

## 13 Building Types

- Campus
- Education
- Food Sales
- Food Service
- Healthcare
- Hospitals
- Lodging
- Manufacturing & Industrial
- Office
- Other
- Public Assembly
- Retail
- Warehouse

## 3 size categories

- < 500 MWh
- 500- 4,500 MWh
- > 4,500 MWh

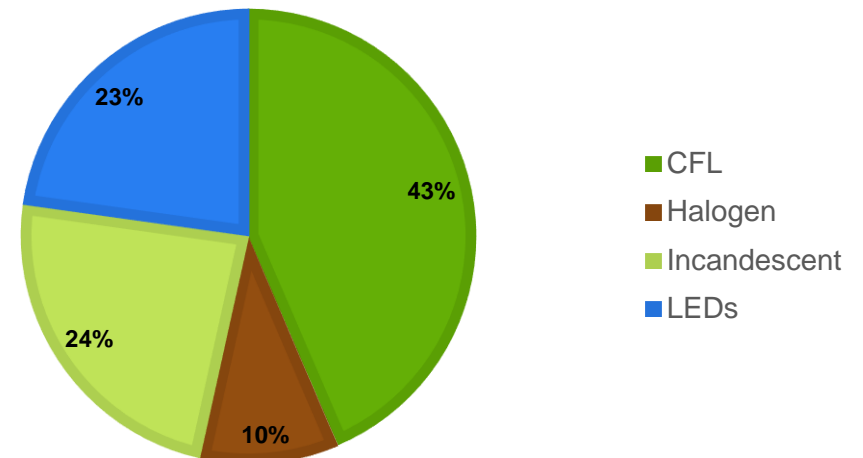
# Upstream Program has captured the market for C&I A-Lamps

Based on 350 recent onsite visits:

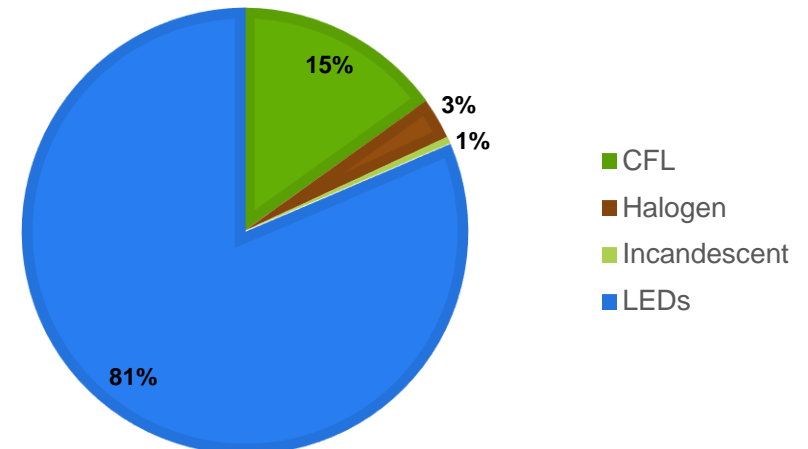
## A Line Bulbs

- 66% of lighting is efficient
- **34% remains (2015-2018)**
- **96%** of bulbs sold are efficient.
  - There is no more room to increase production for A lines

EXISTING STOCK (A-LINE)



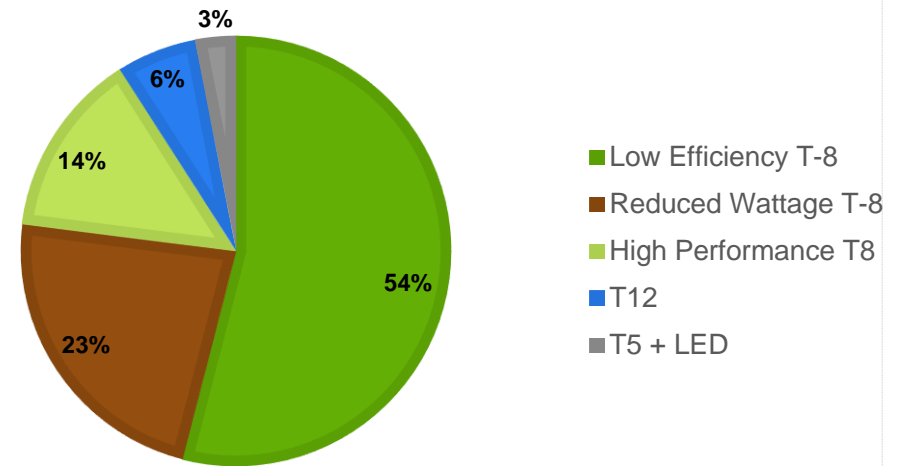
RECENT PURCHASES (A-LINE)



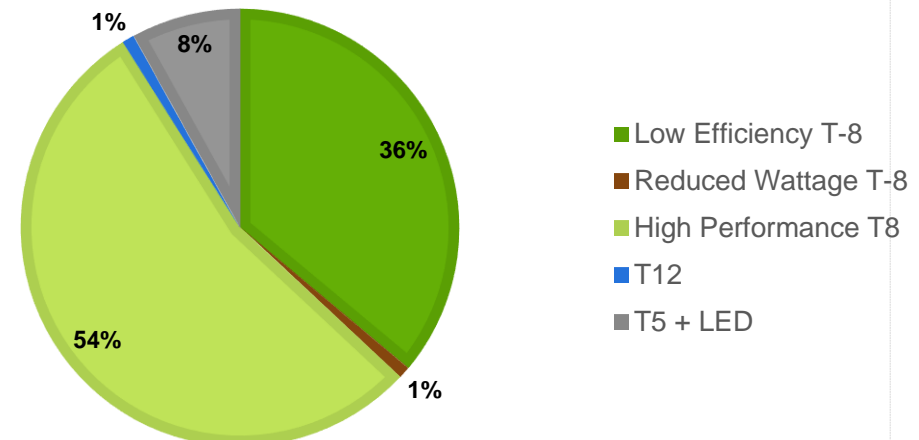
# Opportunity in T-8s and Controls

- Good Opportunity remains in T8 market, but efficient baselines have increased
  - No T-12s or Halogens expected past 2015
- Upstream program having significant impact
  - Baseline will drop T-12s
  - Cost of LEDs and Controls higher
- Research needs to be refined on recent purchase data on LED and reduced wattage T-8s

EXISTING STOCK (LINEAR)

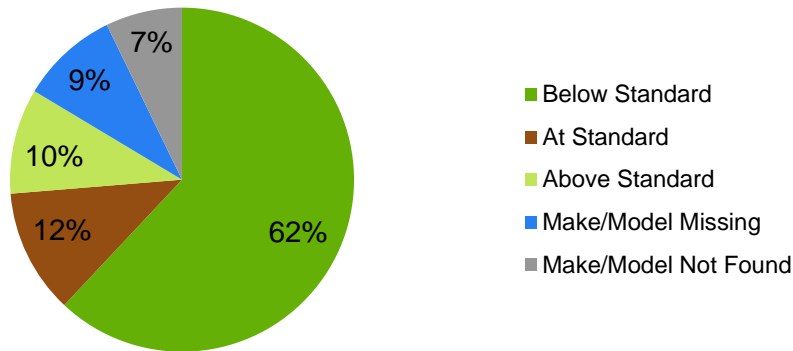


RECENT PURCHASES (LINEAR)

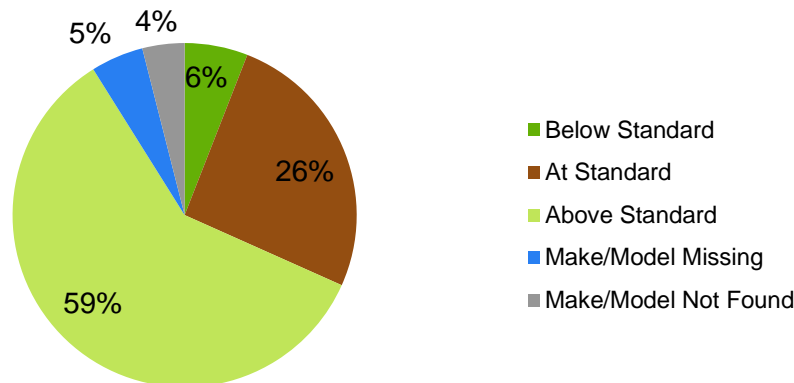


# On-Site Data on HVAC Equipment – Packaged and Split Cooling Systems

## Existing Stock



## Recent Purchases



- Opportunity remains in cooling systems
  - 62% of existing stock of cooling systems are below standard
- Recent purchases trending in right direction
  - 75% of new purchases at or above standard
- Study can be used to help us understand which customers still have these ‘below standard’ systems installed

# Rhode Island Energy Efficiency Evaluation Activities

NEEP Webinar  
May 28, 2015

- Evaluation results applied only prospectively in future program plan
  - RI Technical Reference Manual indicates application of results in program plan
- Leverage MA studies in which National Grid is involved, also NEEP and regional studies
- Studies proposed in Energy Efficiency Program Plan, filed November 1
  - Reviewed by RI EE Collaborative and RI Energy Efficiency and Resource Management Council (EERMC), and its consultants
  - Plan approved by RI Public Utilities Commission
  - Completed studies posted on EERMC website
    - <http://www.rieermc.ri.gov/evaluationstudies/>

# Home Energy Reports Impact and Process Evaluation





# Spotlight: RI Home Energy Reports Program Evaluation

- Program launched in 2013
  - Statewide program, gas and electric.
  - 315,000 participants
  - All customers have access to web portal with personalized messages and interactive audit tool
  - New features such as new mover engagement initiative, redeemable rewards for each unit of energy saved, and programmable controllable thermostat pilot
- Impact evaluation
  - Delta between treatment and control group usage, using pre- treatment and post-treatment data.
  - Matched comparison and randomized encouragement designs for some pilots and initiatives
  - Difference of differences for channeling analysis
- Process Evaluation
  - Interview of program staff and analysis of evaluation results

# Home Energy Reports: Core Results

- Program saved 0.98% savings per household across high usage electric only and dual fuel groups. While electric only savings were greater as a percent of household use, dual fuel realization rate was closer to predicted savings, though reason for this is not clear
- Program saved 0.37% savings per household across the gas only and dual fuel groups. The gas savings for the program underperformed due to a planning error, fewer dual fuel customers, and ramp up effects.
- Across fuels, there were very few channeled savings achieved (savings due to participation in other program) with 3.35% of total electric HER savings and 0.67% of total gas HER savings, generated through other programs.

- Overall, the program has been successful in enhancing customer engagement and satisfaction across the state
- The new-movers initiative had small samples sizes at the time of the evaluation and thus statistically insignificant results. New-movers definitions were too broad to inform a targeted outreach strategy.
- There is clear evidence that the rewards portion of the program is effective in generating savings above the HER treatment, though the results are not statistically significant.
- The best estimate of the incremental savings for the thermostat pilot is 2.31% in gas savings and 0.88% in electric savings per household. These values improve in the heating and cooling season.

- Adjust quantitative savings estimates for evaluation results
- Re-evaluate new movers initiative after a longer treatment period with the program implemented as originally designed.
- Consider having implementer-derived savings forecasts reviewed by a third party in the future.
- Factor gas savings first year “ramp” into program savings calculations and decisions.
- Encourage better documentation of program components, eligible customer definitions, and launch dates.
- Discontinue the use of the Randomized encouragement design (RED) design for the pilot rewards initiatives and using a matched comparison group for evaluation instead.

# National Grid Rhode Island Energy Efficiency Jobs and Economic Impact Studies

Courtney Lane

Senior Analyst

National Grid RI Policy and Evaluation



- In 2014 National Grid conducted two types of studies to quantify the impact of RI EE programs on jobs and the economy.
- Jobs Study
  - Required by General Law 39-2-1.2.
  - Conducted every year since 2012 to quantify direct full-time equivalent (FTE) workers and list companies and agencies involved in programs
- Macroeconomic Impacts of RI EE Investments Study
  - Updated the economic impact multipliers from 2009 Acadia Center (Environment Northeast) report.
    - Multipliers used in planning to quantify the benefits of future EE programs.
  - Determined a multiplier for CHP projects.

- Peregrine Energy Group conducted the 2013 and the 2014 Jobs Study.
- Goal was to quantify the number of direct workers involved in National Grid's 2014 Energy Efficiency programs in RI.
- Methodology
  - National Grid employee counts.
  - Phone survey of lead vendors.
  - Counts of installed energy efficiency measures and average time (in person-hours or person-days) required for each installation.
  - Did not include labor for installations that were not incremental: new construction, HVAC, portion of upstream lighting.
  - Identification of businesses involved in 2014 programs.



- 639.4 full-time equivalent (FTE) workers were employed in 2014 (17% higher than 2013).
- 899 companies and agencies involved in 2014 programs (77% located in RI).
- Observations:
  - FTEs attributable to different programs are not necessarily proportionate to the relative size of program spending.
  - Equipment intensive measures create less FTEs than labor intensive measures.
  - Programmatic cost-effectiveness reduces FTEs.
  - Economies of scale increase cost-effectiveness but reduce FTEs.

- Macroeconomic Impacts of EE
  - Program and participant spending is a direct investment in RI economy.
  - Energy savings to customers has a positive economic impact over the life of installed measures, either through increased spending on goods and services, hiring, or increased cost-competitiveness.
  - Rate increases and customer contributions towards the costs of measures can reduce spending.
- This study utilized the REMI model to evaluate these impacts for the 2014 RI EE Program Plan as well as a typical CHP project.
- The goal was to create updated job year, GDP, income and population multipliers that National Grid uses in its EE Plans.

- Spending
  - Program and participant spending from the 2014 EE Plan was entered into REMI as a production increase in the industries where the money gets spent.
  - There were separate allocations for program and participant spending, residential and C&I programs.
- Savings
  - Used planned lifetime benefits from the 2014 EE Plan, net of the discount rate, divided equally among measure life years, 2014 through 2027, and entered into REMI in 2014 dollars.
  - Includes the value of capacity, energy, fuel savings, other fuel savings, water savings and non energy savings from the 2013 Avoided Cost Study.
- Costs
  - The ratepayer costs consists of SBC, while participant costs consist of customer contributions needed to pay for the EE measures.

## COMPARISON OF RESULTS TO 2009 ENE STUDY

	Job Years / \$ Million			GDP / \$		
	Electric	Gas	Total	Electric	Gas	Total
<b>2014 EE Program Plan Study</b>						
Program Spending / Budget	45.1	23.0	39.7	4.2	1.9	3.6
Pgm and Part Spending / Pgm Cost	36.5	18.5	32.1	3.4	1.6	2.9
<b>2009 ENE Study</b>						
Program Spending / Budget	36.2	38.5	37.4	4.0	4.4	4.2
Pgm and Part Spending / Pgm Cost	27.0	25.5	26.3	3.0	2.9	3.0

- Electric economic impact multipliers are in line with Acadia Center Study for RI (and other New England states).
- Electric spending multipliers are higher because the 2014 electric plan has a higher share of C&I participants in total benefits and a lower share of C&I participants in total costs, implying a larger economic impact for every EE dollar spent.
- Gas multipliers have declined with the drop in natural gas prices since 2009.

- Spending
  - Massachusetts CHP data was used because it has a longer history with more projects than Rhode Island.
  - CHP project spending estimated by entering 60% of the incentive and participant spending amounts. This is the portion spent to install cogeneration equipment.
  - The remaining 40% of spending is assumed to be used to purchase equipment from outside of the region and was not considered in the analysis.
- Benefits
  - Lifetime electricity and heating cost savings, net of increased natural gas and O&M costs needed to run the cogenerating equipment.
- Costs
  - Costs are equal to spending to purchase and install the CHP systems, before federal tax credits and other state incentives.

## Combined Heat and Power Economic Benefits Multipliers on Total Program and Participant Spending

Job Years / \$m	28.0
GDP / \$	2.73
Personal Income / \$	2.0

- Costs (but not spending) reduced tax credit
  - greater Benefit Cost ratio
- Average measure life five years longer than 2014 EE program
  - greater Benefit Cost ratio
- REMI assumption:
  - 40% of customer and incentive spending used for CHP equipment purchased outside of region (no local economic impact)

[Courtney.Lane@nationalgrid.com](mailto:Courtney.Lane@nationalgrid.com)

[Rachel.Henschel@nationalgrid.com](mailto:Rachel.Henschel@nationalgrid.com)

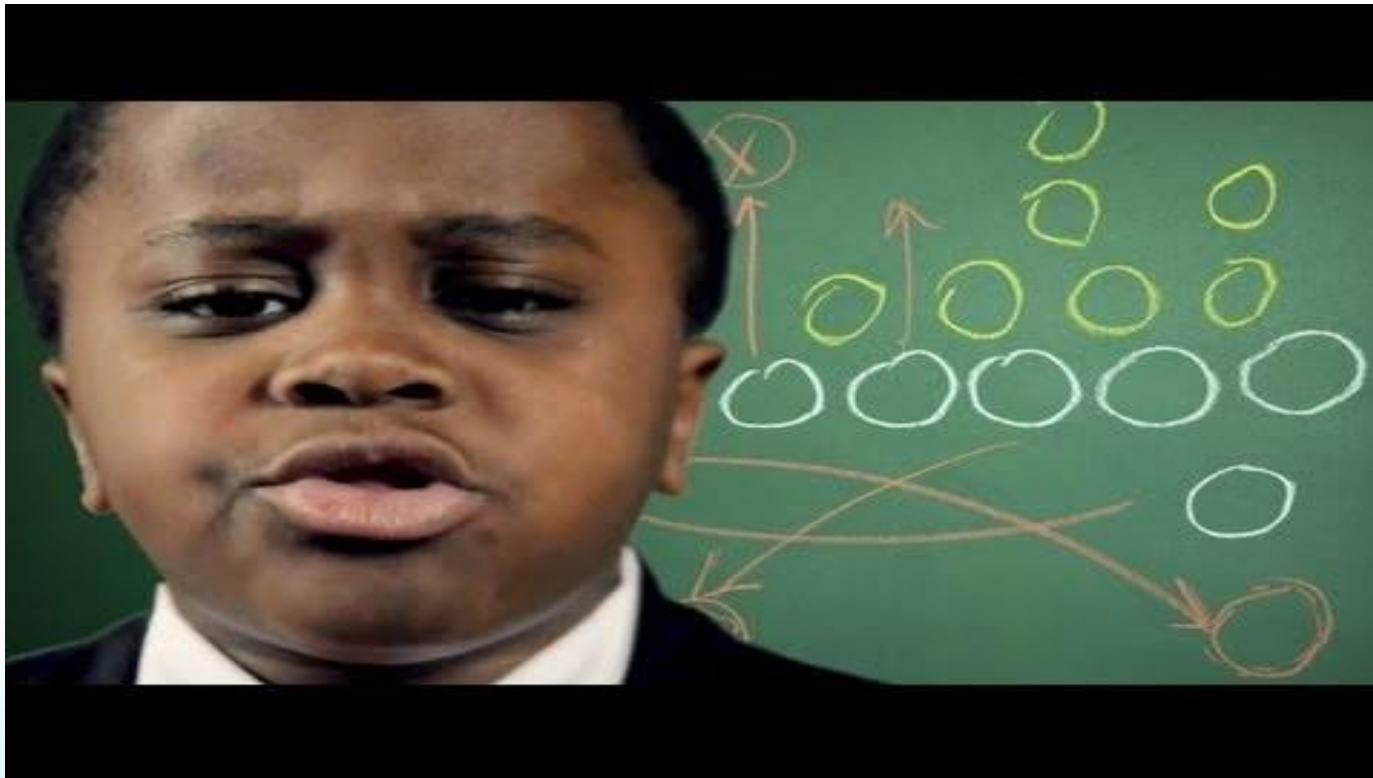
[Jeremy.Newberger@nationalgrid.com](mailto:Jeremy.Newberger@nationalgrid.com)



## Lunch Break 12:00-12:55PM



- 1) Poll question preview
- 2) Lunch reel: pep talk from Kid President + Duke Ellington
- 3) Reconvene at **12:55PM** for PM session, bring your lunch!



# CONNECTICUT EVALUATION & RESEARCH 2015



Connecticut Energy Efficiency Fund  
Energy Efficiency Board  
Evaluation and Research

Presented to NEEP by Lisa A. Skumatz (SERA)  
303/494-1178 [skumatz@serainc.com](mailto:skumatz@serainc.com)  
Evaluation Consultant (Teamed with Apex & AEC)



# Key completed studies since last update

Commercial	Residential	Residential
PROCESS & IMPACT		
<ul style="list-style-type: none"> <li>• Small Business (#9)</li> <li>• Energy Opportunities (14)</li> <li>• ECB Evaluation (20)*</li> <li>• New construction &amp; code baseline (19)*</li> </ul>	<ul style="list-style-type: none"> <li>• Yr 2 HER (2)</li> <li>• SF Potential study (15)</li> <li>• Ground Source Heat Pump (7)</li> <li>• Central A/C (8)</li> </ul>	<ul style="list-style-type: none"> <li>• HES / HES-IE Impact (16)</li> <li>• Lighting Interactive Effects (67)</li> <li>• SF Potential study(15)*</li> <li>• Lighting Mkt Assessm &amp; NTG (86)*</li> </ul>
MARKET RESEARCH & EVAL. ELEMENTS		
<ul style="list-style-type: none"> <li>• Small Biz Data Mining (10)</li> <li>• SBEA low income / limited English (12)</li> <li>• C&amp;I Market Assessment (17)*</li> </ul>	<ul style="list-style-type: none"> <li>• Regional Hours of Use (3)</li> <li>• Weatherization Baseline (5)</li> <li>• HES Add'l Measures &amp; Mkt</li> </ul>	<ul style="list-style-type: none"> <li>• Consumer Electronics Potential (84)*</li> </ul>

\* Completed & published in 2014

# Highlights from a few CT studies

## • Weatherization Baseline:

- ~26% of sampled homes (21-31%) comply with Wx standard as defined (Performance); 5% prescriptive;
- New homes 87%; 7% for those before 1940 – target Pre-1980
- Non-low income homes 29%; low income 15%
- Lowest measures: 15% floors over unconditioned basement, flat ceilings (34%), air leakage (39%)
- 16 of 180 (9%) asbestos or vermiculite; 4% more have mold
- No MF; Compliance measurement challenges to current

Building Element	Prescriptive Requirements and Modeling Inputs for Performance Approach
Above Grade Walls	R-11
Flat Ceilings	R-30
Cathedral Ceilings	R-19
Unconditioned Basements & Crawlspaces	Floor separating basement from conditioned space above is uninsulated to R-13
Conditioned Basements & Crawlspaces	Interior walls fully insulated to R-5
Slab on Grade	R-5 four feet below grade; assume to proper depth if present
Windows	U-0.50 (Double pane or single pane with storm)
Air leakages	9 ACH @ 50 Pascals based on HES program data
Duct Leakage for ducts outside conditioned space	16 CFM @ 25 Pascals per 100 sq. ft. of conditioned space based on HES program data
Duct Insulation: Unconditioned Basements	R-2
Duct Insulation: Unconditioned Attics and Crawlspaces	R-4.2

# Highlights from a few CT studies

## • GSHP

- 40 on-sites, 2 prototype DOE-2 energy models – existing and new construction
- 2 programs –
  - CEFIA (encouraged upgrade to standard GSHP) 79,000-90,000 MBTU – from reduced oil usage
  - CEEF(encouraged upgrade to HE GSHP) – 7,500-12,000 MBTU gross savings annually – from reduced electricity
- CEEF evaluated savings exceeded program tracking estimates
- Air quality improvements
  - Average home yielded emission savings 8,000-11,000 plbs/yr for CEFIA due to reduced carbon from oil heating
  - CEFIA tracking overestimated CO2 emissions (realization rate 0.48 (existing), 0.33 (NC))
  - For NO2, DOE-2 models estimated increase in emissions rather than CEFIA decrease
- NTG modest (average ~.71; higher for federal tax incentives than not and lower for NC)
  - Possibly due to relative incentive amounts, high system costs, and high participant incomes
- System sizing and performance... Systems performing somewhat below rated effic. (85% existing, 91% NC); other conclusions.
- Participation drivers: to get rebate 94%; some want VIP report; energy concerns a motivator. Most concerns regard reliability. Good comfort benefits
- Few program-eligible GSHPs installed outside the program; contractors perceive large opportunity in CT

# Highlights from a few CT studies

- Central A/C:
  - Overall statewide per-unit annual savings is 178.7 kWh/unit; summer seasonal peak demand savings (0.22 kW/unit)
  - Lost opportunity (148.3 / .21), retrofit (390.7 / .34).
  - Realization rate ~98.2% compared to tracking data
  - 11% of inspected systems were oversized (4%) or undersized (7%)
  - Air flow at or below 350 CFM/ton for 49%; caveats
  - Market research findings (\$250 rebates, \$500 rebates incl. early replacement, recommended / not installed):
    - Having a working but inefficient model is significant barrier to replacement / upgrade
    - Rebates not replacement driver (5%), but high efficiency driver (76%)
    - Few used financing, but loan important to most of these
    - Early replacement more aware of rebates before call
    - Of those not replacing, 1/4 still plan to do so within 5 years

# Highlights from a few CT studies

- Behavior Retention, Year 2 (high use, average-ish use)
  - Process:
    - Awareness, readership reported high –  $\frac{3}{4}$  report similar readership to earlier; keeps conservation “top of mind”;
    - Website engagement low (50% aware, 7% have visited)
    - Average use customers hold more positive opinions about program
    - High use customers make home improvements / invest in EE appliances; average use do behaviors
    - Want clearer comparisons
  - Savings 1.82% (0.64 kWh/day; 233 kWh/yr/HH; 4254MWH)
    - Year 2 (high use) → 2.31%; Expansion (average-ish) → 1.17%
    - Lower savings for more average customers
  - Persistence (caveats)
    - High use expansion group: ~2% Yr 1 savings continued during hiatus
    - Savings seem to continue 15 months to 2 years depending on group
  - Ratio of expenditure and savings – better for high use customers (2-3 cents) vs. average use (about 13 cents)



# Highlights from a few CT studies

- Commercial SBEA Data mining:
  - Good job at reach segment; participants, on average, saved about 24% off prior demand usage. Colleges / schools had highest savings
  - 72% of projects were lighting only.
- Limited English and Low Income business owners:
  - Low income: Most common: retail, restaurant & food, construction / contractor, small mfg; 10 or fewer employees; ¼ or fewer own their location
  - Cost, lack of knowledge, time, trust ID'd as primary barriers to program participation
  - Limited English: Spanish most common (Chinese, French, Portuguese, Asian languages)
  - Restaurants, retail, food, salons; 10 or fewer employees; <1/4 own location
  - Language, cost, lack of knowledge, time, trust barriers to participation
  - Organizations interested in helping facilitate program participation (distribute info, provide contact info to utilities, work through process with businesses). 1/3 of organizations said they'd need compensation; ¼ said they wouldn't



# Evaluation Procedures

- Roadmap revisions
  - Steps, interactions
- Planning Process
  - Concepts (July); rankings, voting, approval (October)
  - This year's projects got 2<sup>nd</sup> review – updated Evaluation Plan; prioritized completion for 3 year C&LM plan

# 2015 Evaluation Research Agenda

Sector	ID #	Project name
		<b>RESIDENTIAL IMPACT AND /OR PROCESS EVALUATIONS &amp; ELEMENTS</b>
R	15	Residential SF Potential Study - continuation
R	33	Database Improvement Project - continuation
R	86	Lighting Market Assessment / NTG - continuation
R	4	HES & HES-IE Process Evaluation (incorporating financing, NEIs, NTG, H&S)
R	151	HES Air / Duct sealing insulation practices study
R	152	Process/ Impact evaluation of community-based programs
R	113	Ductless heat pump impact evaluation
R	32	CL&P Behavior Year 2 Persistence study
R	154	Lighting Baseline, Saturation, and Behavior Study (including LEDs)
R	156	Process / Impact of fuel conversions
R	46	Process Evaluation of Energy Efficiency Financing, addressing effects / improvement of financing initiatives
R	157	MF Process evaluation
R	31	Real-time data collection for residential impact/process evaluation work
R	91	Impact Evaluation Disconnects between Engineering and Billing Analysis, and Oil / Propane Treatment in Impact Evaluation (90 and 91 combined);
R	161	EM&V Methods to better understand impacts - Standardized (111d) - NEEP
R	169	NonEnergy impacts; elements of process evaluation - NEEP - (modified version of 110 from last Plan)
R	199	Evaluation of Residential HVAC / Boiler program - (including cost-effectiveness)

# 2015 CT Evaluation Research Agenda

		<b>RESIDENTIAL MARKET AND MEASURE EFFECTS / PERFORMANCE</b>
R	109	REED Database - Regional Energy Efficiency Database (NEEP)
R	108	Studies to be identified
R	84	Consumer Electronic Market and Potential Study
		<b>RESIDENTIAL EVALUATION METHODS AND OTHER SUPPORTING INFORMATION</b>
R	92	NEEP Baseline Costs - CT Contribution
		<b>COMMERCIAL IMPACT AND/OR PROCESS EVALUATIONS &amp; ELEMENTS</b>
C	20	ECB Process & Impact Evaluation (incl. info for program marketing, NEI); 101 in the plan
C	36	Large Projects Evaluation (total over multi-years \$412K)
C	19	New Construction Baseline & Code Compliance; 10 in the plan
C	60	NEEP - Loadshape Research (NEEP);
C	63	NEEP - Incremental Cost Estimation Study (NEEP);
		<b>COMMERCIAL MARKET AND MEASURE EFFECTS / PERFORMANCE</b>
C	17	C&I Financing Market Research; C83 in 2015 plan
C	11	Barriers to program participation (with a focus on finance and cancellations)

# Questions?

- Lisa A. Skumatz, Ph.D.
- 303/494-1178
- [skumatz@serainc.com](mailto:skumatz@serainc.com)

# New Hampshire CORE Energy Efficiency Evaluation

## ❖ New Hampshire Main Team

- NHPUC: Leszek Stachow, (Leszek.Stachow@puc.nh.gov)
- NHPUC: Jim Cunningham (Jim.Cunningham@puc.nh.gov)
- Eversource: Tom Belair (thomas.belair@comcast.net)
- NHEC: Carol Woods (woodsca@nhec.com)
- Liberty: Eric Stanley (eric.stanley@libertyutilities.com)
- Unitil: Mary Downes (downesm@unitil.com)

## ❖ Presenters Today

- NH Landscape, Tom Belair
- Home Energy Reports, Cynthia Trottier

# New Hampshire CORE Energy Efficiency Landscape

## ❖ EERS: New Hampshire Activity

- Sep 2014: NH 10 Year OEP State Energy Strategy (recommended EERS)
- Feb 2015: Commission Staff filed “EERS: A Straw Proposal for NH”
- Mar 2015: Docket IR 15-072 EE Investigation
- May 2015: Docket DE 15-157 Establish an EERS for NH

(Pre-hearing Conference June 3<sup>rd</sup>)

## ❖ NH CORE Energy Efficiency Programs

- Elec: \$28.0M Budget, 0.5% of 2013 Delivery Sales
- Gas: \$ 7.3M Budget, 0.5% of 2013 Delivery Sales

# New Hampshire CORE Energy Efficiency Evaluations

An Official Web Site for New Hampshire Government

New Hampshire



Consumer Regulatory Safety Electric Gas/Steam Telecom Water/Sewer

Sustainable Energy

Enter Search Request  
  
 Go

[Home > Electric](#)

**COMPLETED MONITORING & EVALUATION STUDIES**

[Additional Opportunities for Energy Efficiency in New Hampshire - Final Report](#)

**Evaluation Studies Completed since 2000**

- Hagler Bailly, Inc., 1999 Commercial & Industrial Free Rider Study, June 20, 2000.
- RER, 1999 Energy Initiative Lighting Program Impact Evaluation, June 20, 2000.
- RLW Analytics, Inc., Energy Initiative and Small C&I Programs Indoor Prescriptive Lighting Impact Study, June 19, 2000.
- Michael P. Gallaher , Stephen A. Johnston , Laura J. Bloch , Research Triangle Institute Center for Economics Research, Small Commercial and Industrial Program Evaluation, June 2000.
- RLW Analytics. Sample Design for the 1999 Custom Evaluation Studies Final Report.

125. [Synapse Energy Economics, Inc., Avoided Energy Supply Costs in New England: 2011 Final Report, July 21, 2011, Amended August 11, 2011](#)
126. [NH Home Buyer Survey Final Report NMR Group 2-16-2012](#)
127. [New Hampshire CORE Residential ENERGY STAR® Lighting Program, Impact and Process Final Evaluation Report](#)
128. [New Hampshire Small Business Energy Solutions Program, Impact and Process - Final Report](#)
129. [New Hampshire HVAC Load and Savings Research - Final Report \(4/5/13\)](#)
130. [2013 Synapse Avoided Energy Supply Cost Report \(July 12, 2013\)](#)
131. [DE 12-262 2013-08-21 Wi-Fi Thermostat Pilot Program Evaluation Report \(8/21/13\)](#)
132. [NH Commercial and Industrial New Construction Program Baseline Evaluation, ERS, \(3/4/2014\)](#)
133. [NHPUC - Six-Year Evaluation Plan \(9/15/14\)](#)

# New Hampshire CORE Energy Efficiency Program Evaluations

## ❖ 2015-2016 In Progress Evaluations

1. 2014-2015: Impact Evaluation for NH's Large Business Programs
  - Retrofit Program
  - New Equipment & Construction Program
  - Energy Rewards RFP Program
2. Energy Star Homes Program Impact Evaluation

## ❖ 2015-2016 Planned

1. Municipal EE Process Evaluation
2. Energy Star Products - Market Assessment
3. Energy Star Products - LED Lighting Impact & Adoption Evaluation
4. Small Business Impact Evaluation
  
5. Eversource Home Energy Reports Evaluation (Cynthia Trottier)



# **HOME ENERGY REPORTS PILOT PROGRAM**

## **2014 Preliminary Results and Findings**

NEEP Webinar  
May 28, 2015

50%



50%

## Comparison aka “intrinsic motivation”

Intrinsic motivation =  
Interest in the behavior itself

Normative Home Energy Reports  
Compare customers to similar homes to  
provide energy use context

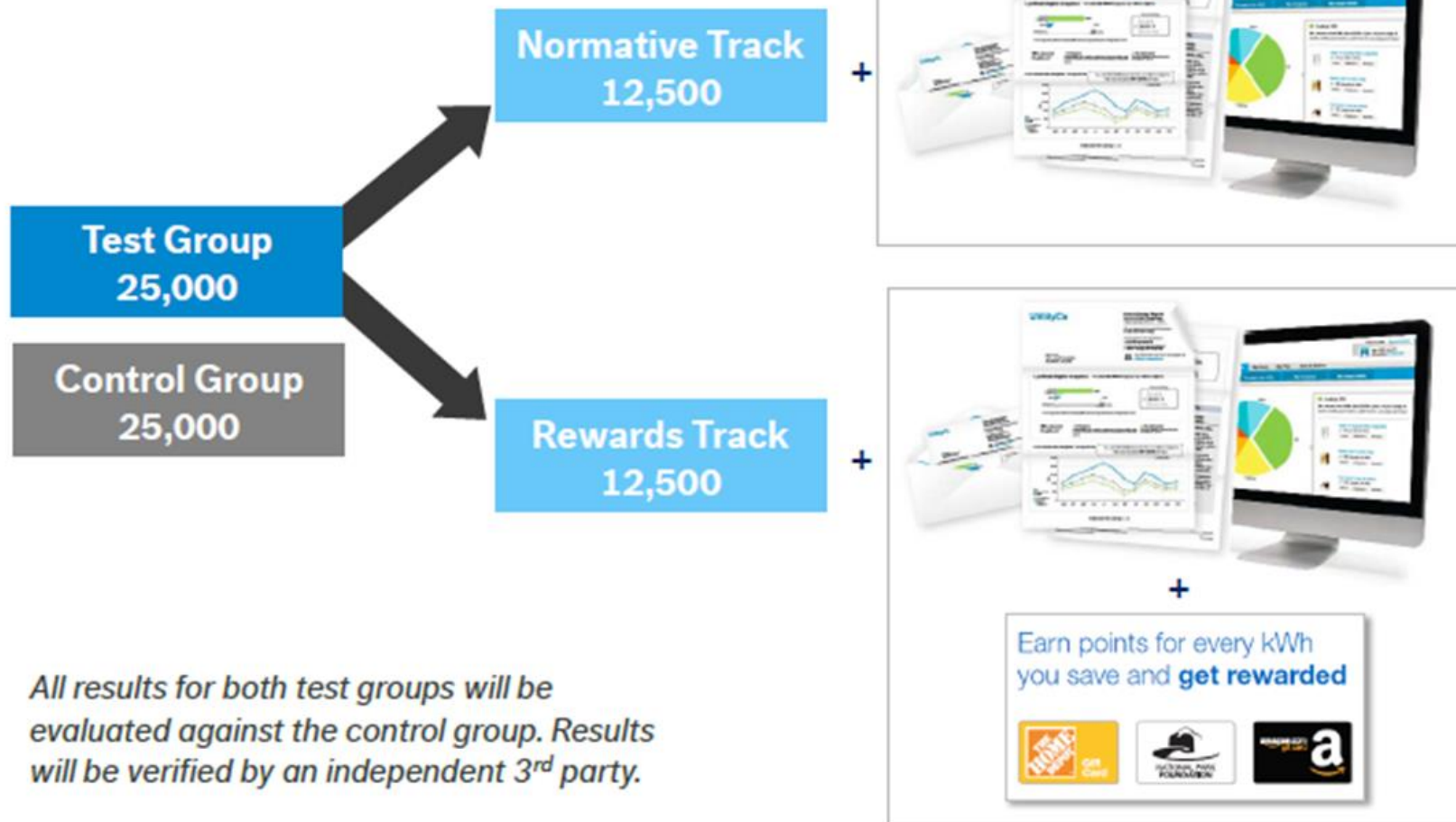
## Rewards aka “extrinsic motivation”

Extrinsic motivation =  
Interest in the behavior does not exist without  
the reward

Rewards Home Energy Reports  
Rewards for saving energy month-on-month  
over the previous year

Customers received *only* rewards to isolate  
effect

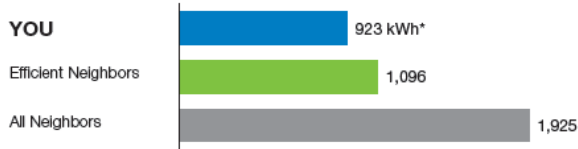
## 25,000 HH pilot, split into a normative track and a rewards track



*All results for both test groups will be evaluated against the control group. Results will be verified by an independent 3<sup>rd</sup> party.*

# Home Energy Reports

## Last 3 Months Neighbor Comparison | You used 16% less electricity than your efficient neighbors.



\* kWh: A 100-Watt bulb burning for 10 hours uses 1 kilowatt-hour.

How you're doing:

**GREAT** 😊😊

Good 😊

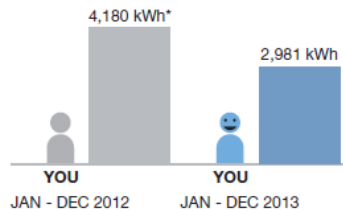
More than average

### Who are your Neighbors?

- All Neighbors:** Approximately 100 occupied, nearby homes that are similar in size to yours (avg 1,963 sq ft)
- Efficient Neighbors:** The most efficient 20 percent from the "All Neighbors" group

## Personal Comparison

How you're doing compared to last year:



\* kWh: A 100-Watt bulb burning for 10 hours uses 1 kilowatt-hour.

In 2013 you used **29% less** electricity than in 2012.

★ You're on pace to use less in 2014.

Looking for ways to save even more this year? Visit [www.psnh.com/savings](http://www.psnh.com/savings)

Public Service of New Hampshire  
Account number: 123456789  
Report period: 08/17/14-11/01/14

Home Energy Report

This report gives you context on your energy use to help you make smart energy saving decisions. For a full list of energy saving products and services for purchase, including rebates from Public Service of New Hampshire, visit: [psnh.com/savings](http://psnh.com/savings)

NAME OF CUSTOMER

How you're doing: **GREAT** 😊😊

Last 3 Months Neighbor Comparison | You used 16% less electricity than your efficient neighbors.

YOU: 923 kWh\*  
Efficient Neighbors: 1,096  
All Neighbors: 1,925

Who are your Neighbors?  
All Neighbors: Approximately 100 occupied, nearby homes that are similar in size to yours (avg 1,963 sq ft)  
Efficient Neighbors: The most efficient 20 percent from the "All Neighbors" group

Schedule your Home Energy Audit  
Let us help you reduce your energy use and save money in three steps:  
1. Visit [psnh.com/hvacs](http://psnh.com/hvacs) to see if your home qualifies.  
2. Get a thorough assessment and personalized report by a qualified contractor for just \$105.  
3. Receive incentives up to \$4,000 toward making the upgrades recommended on your personal report.

Turn over for savings →

Public Service of New Hampshire  
Account number: 123456789  
Report period: 12/25/13-01/23/14

Home Energy Report

This report gives you context on your energy use to help you make smart energy saving decisions. For a full list of energy saving products and services for purchase, including rebates from Public Service of New Hampshire, visit: [psnh.com/savings](http://psnh.com/savings)

NAME OF CUSTOMER

Personal Comparison

How you're doing compared to last year:

YOU (JAN - DEC 2012): 4,180 kWh  
YOU (JAN - DEC 2013): 2,981 kWh

In 2013 you used **29% less** electricity than in 2012.  
★ You're on pace to use less in 2014.

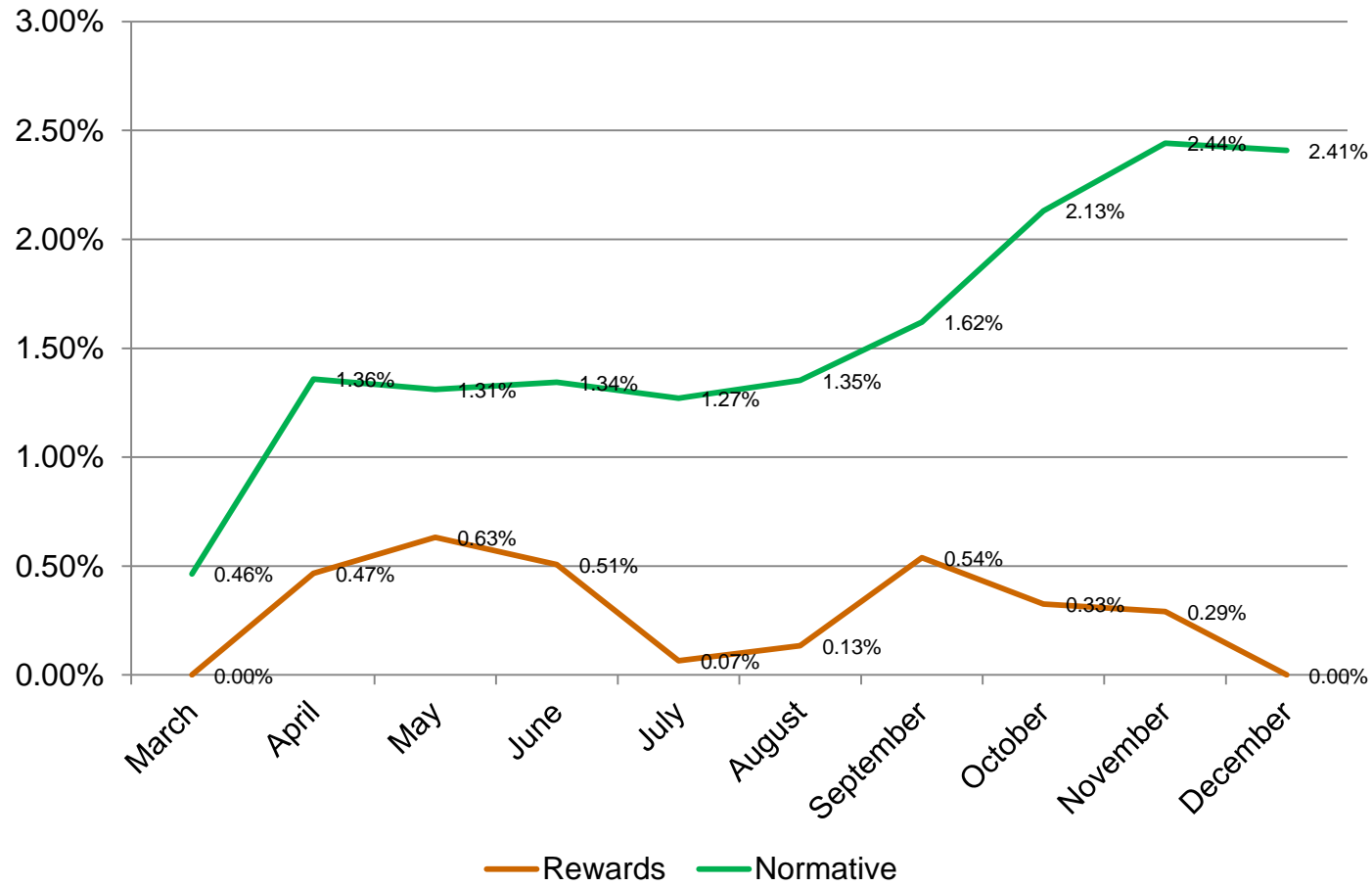
Looking for ways to save even more this year? Visit [www.psnh.com/savings](http://www.psnh.com/savings)

You have 150 rewards points already. Don't lose them!  
Your 150 points will expire if you don't sign up for the Public Service of New Hampshire rewards program.

Don't lose your first 150 points. Redeem them today! Visit [www.psnhenergysavings.com](http://www.psnhenergysavings.com).

Turn over for savings →

# The Results



**Cumulative savings:**  
**Normative: 1.59%**  
**Rewards: 0.28%**  
**Combined: 0.94%**

You have 150 rewards points already. **Don't lose them!**

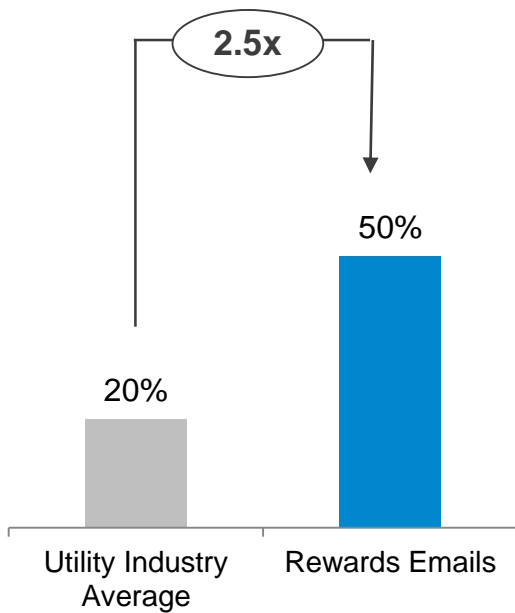
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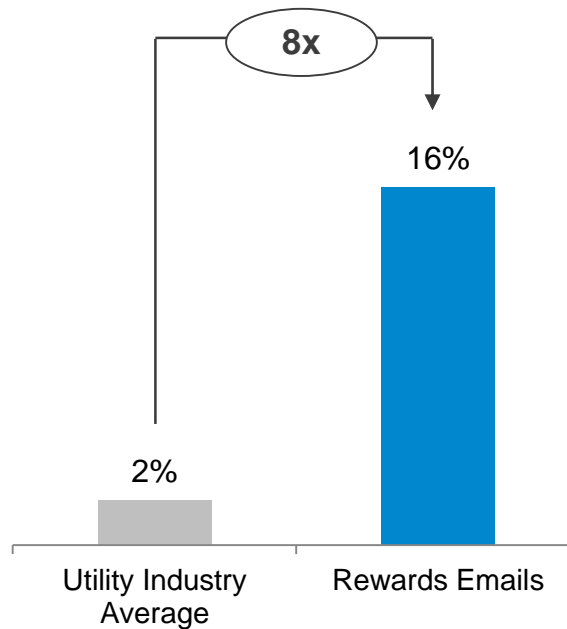
**Don't lose your first 150 points: Redeem them today! Visit [www.psnhenergyreports.com](http://www.psnhenergyreports.com).**

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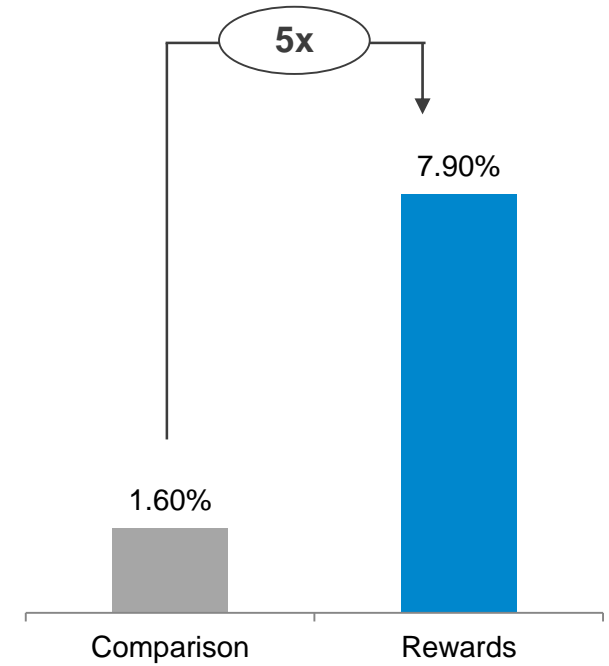
## Email Open Rates



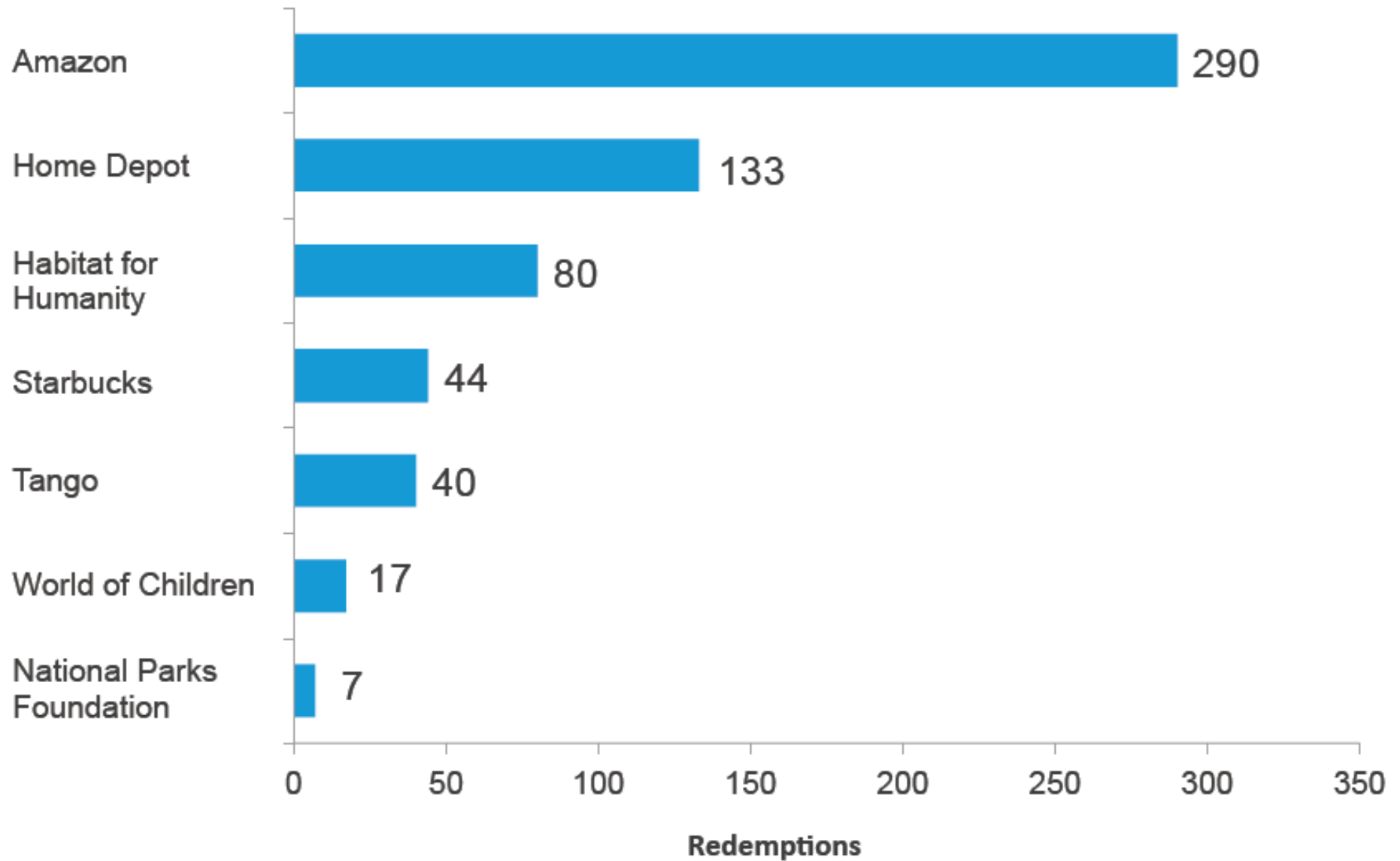
## Email Click Through



## Web Portal Login Rate



# Eversource customers love ...





- In the long run, neighbor comparison is a better motivator to save energy than rewards.
- However, rewards can drive engagement and high-value, one-time actions.



# EmPOWER Maryland Evaluation

NEEP EM&V Forum State Evaluation Activities Webinar

**Joe Loper**

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May 28, 2014

# INTRODUCTION & OVERVIEW

- » EmPOWER Overview
- » Evaluation Process
- » 2014 Evaluation
- » Cost Effectiveness
- » Issues

# EMPOWER OVERVIEW

- » Legislated goals
  - 15% per capita reduction in electric energy and demand by 2015 (from 2007 baseline)
- » 5 utilities responsible for 10% points of goal
  - Gas company programs recently approved
- » MD PSC oversees programs and goal compliance
  - Balancing goal attainment with TRC cost effectiveness
- » Progress toward Goals (thru 2014)
  - Statewide -- 80% of kWh goal, 82% of kW
  - Wide variance among and within utilities
    - 62% to 263% of kWh goal
    - 62% to 428% of kW goal
- » Cost Effectiveness
  - Almost all sector level portfolios are cost effective
  - Lighting carries the load

# EVALUATION PROCESS

- Utility Reported >> Evaluated >> Verified
  - Utility semiannual reports to PSC
  - Evaluated by Navigant/Cadmus reporting to utilities
  - Verified by Itron reporting to PSC staff
  - Stakeholder engagement: MEA, OPC, trades
- Emphasis on first year savings
  - But used for cost effectiveness for cumulative goals
- Alignment with PJM year
  - EY5 = June 1, 2013 thru May 31, 2014
  - EY5 RRs adjust utility reported savings
    - Cast back to June 1, 2013
  - EY5 RRs adjust CY2014 utility reported savings CY evaluation memo

# 2014 EVALUATION

- » Evaluation/verification underway
- » Key resources
  - Mid-Atlantic TRM
  - Primary data and analysis
    - Res lighting -- HOU, CF, penetration and ISR
    - HPwES -- Bill analysis
- » Highlights
  - Res Lighting daily HOU down from 3 to 2.5
  - HPwES, appliance rebates, and HVAC cost effectiveness continue to be challenged
- » Minimal process evaluation
  - Small business best practices, application periods

# 2014 EX POST COST EFFECTIVENESS

## » Current tests and assumptions

- TRC is primary ex post test (PAC and RIM also reported).
- Benefits include avoided electric energy and capacity costs, avoided T&D costs, natural gas and other fuels, water, price mitigation, incandescent replacement costs.
- Discount rate is WACC

## » Under consideration

- Additional non-energy benefits – O&M maintenance (lamp replacement), air emissions damages, comfort, arrearage carrying costs.
- Alternative discount rates: adjusted WACC, societal (e.g., 10-year treasury)
- PAC as primary test?

# ITRON RECOMMENDED NON-ENERGY BENEFITS (NOT APPROVED AS OF 5/27)

Benefit	Programs	Value	Basis	B/C Test
Air Emissions	All	1.1 cents	Multiply by gross kWh saved for the life of each measure times the NTG (incl. spillover)	TRC, SCT
Comfort	HPwES & Low Income	HPwES: \$136 Low Income: \$110	Multiply by the gross number of comprehensive air sealing participants times the measure life times 1 minus the free ridership rate.	PCT, TRC, SCT
O&M	C&I Prescriptive and SBDI	Varies by measure	Multiply by the gross number of measure units times 1 minus the free ridership rate.	PCT, TRC, SCT
Arrearage Carry Costs	Limited Income	2% of kWh savings.	Multiply by the gross kWh saved over the life of the measures times 1 minus the free ridership rate.	PAC, TRC, SCT



# UNDER DISCUSSION

## » New EmPOWER goals?

- PSC decisions/guidance expected soon
- TBD: per capita vs total, goal period, scope, stringency, net vs gross, derating of savings over time.....
- MEA/AEG Potential study underway

## » Prospective vs Retrospective Application of Evaluation Findings

- Evaluation used to adjust reported savings retrospectively
  - E.g., pending evaluation results will be used to adjust reported savings starting June 1, 2013
- Can create angst and confusion
  - E.g., Res Lighting HOU

# UNDER DISCUSSION (CONT'D)

## » Gross Baselines

- Gross evaluations use standards/codes
- Supporting arguments
  - Any baseline shifts will be captured in NTG analyses
  - PJM requires standards/codes as baselines.
  - Quasi exceptions – e.g., lighting standards
- But ....
  - Net to gross studies not conducted every year
  - EmPOWER goals based on gross savings....
  - It makes a big difference – e.g., half of CFL purchases replace CFLs?

## » Other Issues

- Persistence, EULs, dual baselines, winter peak savings

## » New program/activities

- Behavioral, CHP, customer side voltage reduction (proposed)

## » Enhanced program Design

- How to get more out of existing programs?

# THANK YOU



**JOE LOPER**

Silver Spring, MD

410-353-5491

Joe.loper@itron.com

[www.itron.com](http://www.itron.com)

## Next Steps



- 1) Update Regional EM&V Forum Repository (May 2015)
- 2) Post presentation and recording to Forum website
- 3) Connect on future work

# Thank you and questions?



Julie Michals - Director, EM&V Forum: [jmichals@neep.org](mailto:jmichals@neep.org)

Elizabeth Titus - Senior R&E Manager: [etitus@neep.org](mailto:etitus@neep.org)

Pat Wallace- REED Manager: [pwallace@neep.org](mailto:pwallace@neep.org)

Danielle Wilson - Forum Associate: [dwilson@neep.org](mailto:dwilson@neep.org)

Regional EM&V Forum  
Northeast Energy Efficiency Partnerships  
91 Hartwell Ave Lexington, MA 02421  
P: 781.860.9177 [www.neep.org](http://www.neep.org)

# POLL RESULTS

