

RESIDENTIAL SAVINGS FORECAST

November 16, 2016

OVERVIEW

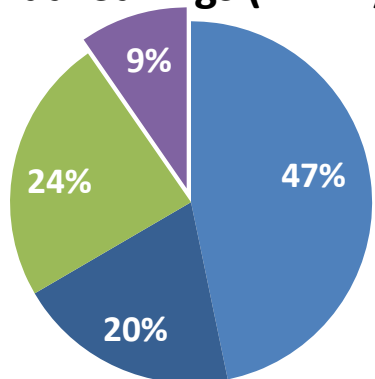


- ▶ **Sources and relative contributions of 2016-2018 Residential Sector savings**
- ▶ **Why are the PAs losing the ability to claim residential lighting savings?**
- ▶ **Expected savings reductions over the next 3-5 years**
- ▶ **Potential solutions to maintaining high level of savings in 2019-2021**
- ▶ **Where are we now, and is it time to consider a change?**

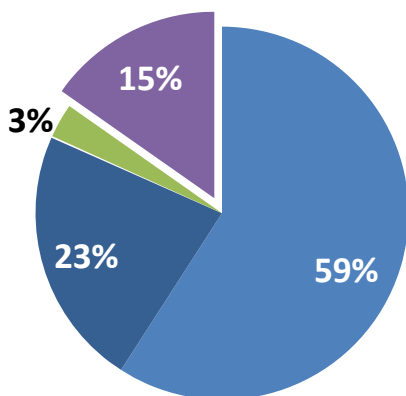
LIGHTING IS THE DOMINANT SOURCE OF RESIDENTIAL ELECTRIC SAVINGS

2013-2015 Report

Annual Savings (MWh)

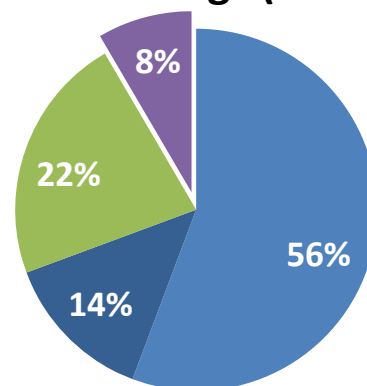


Lifetime Savings (MWh)

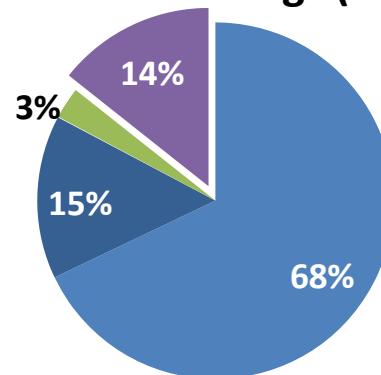


2016-2018 Plan

Annual Savings (MWh)

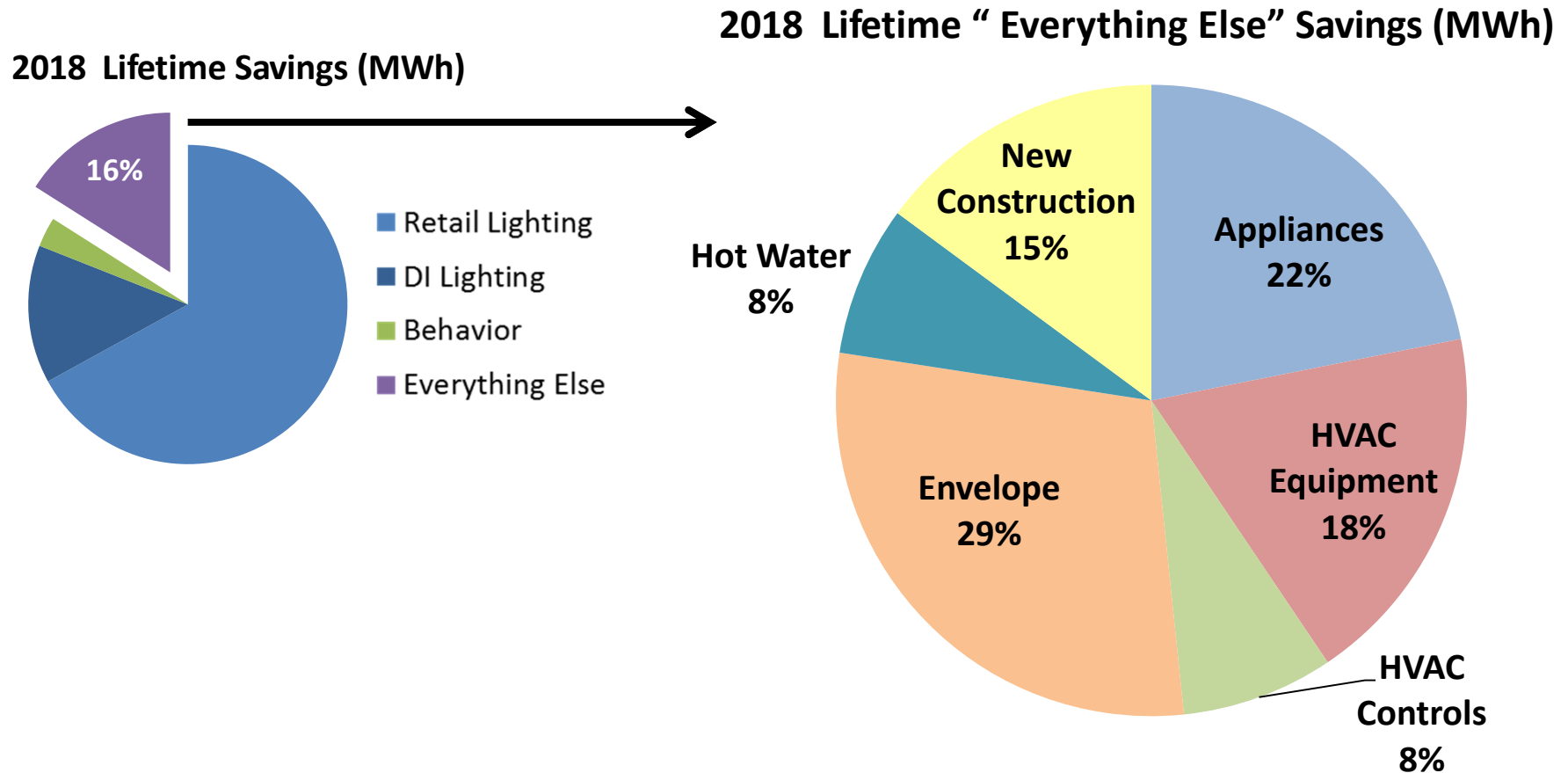


Lifetime Savings (MWh)



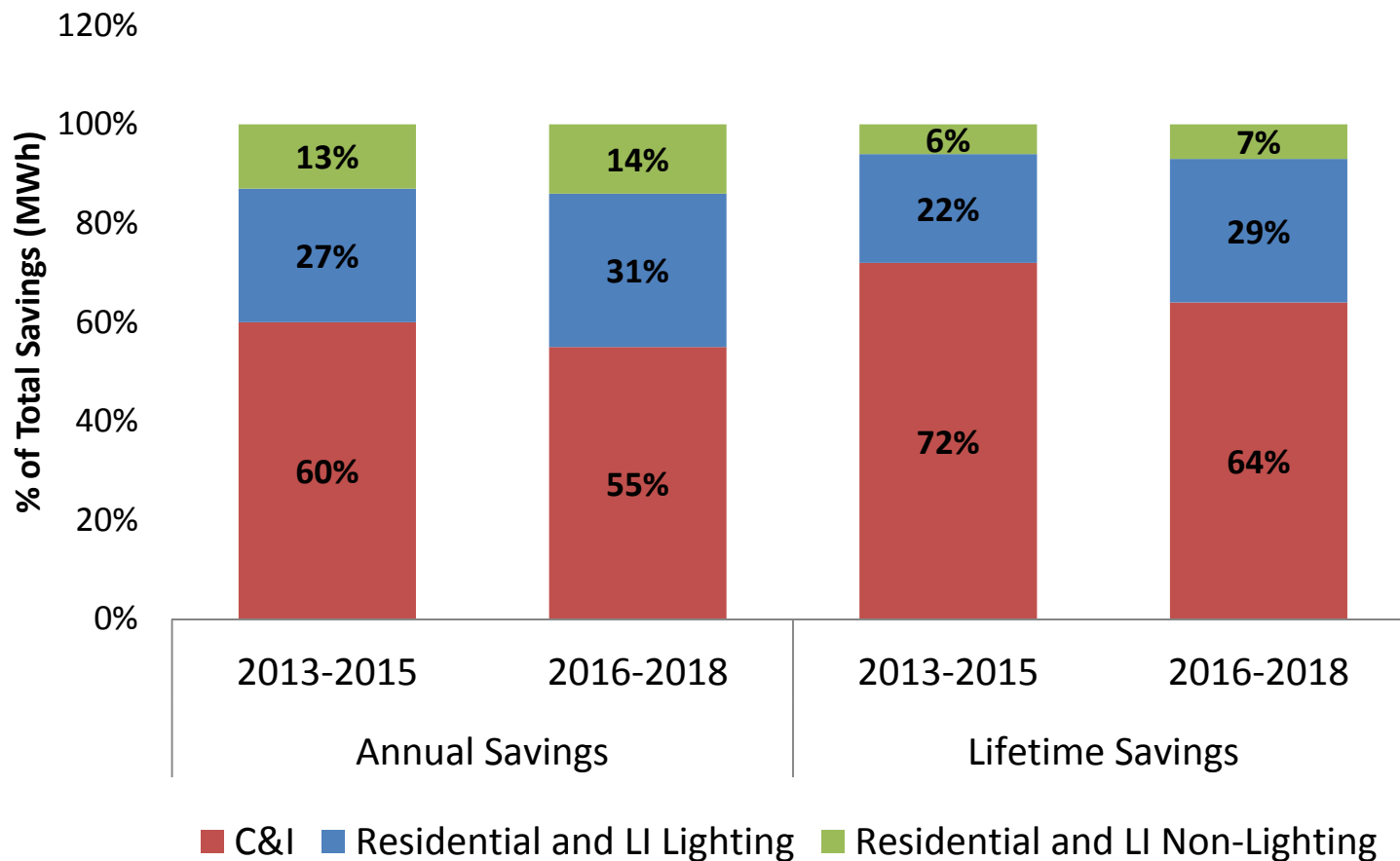
- Retail Lighting
- DI Lighting
- Behavior
- Everything Else

NUMEROUS MEASURES CONTRIBUTE REMAINING LIFETIME ELECTRIC SAVINGS



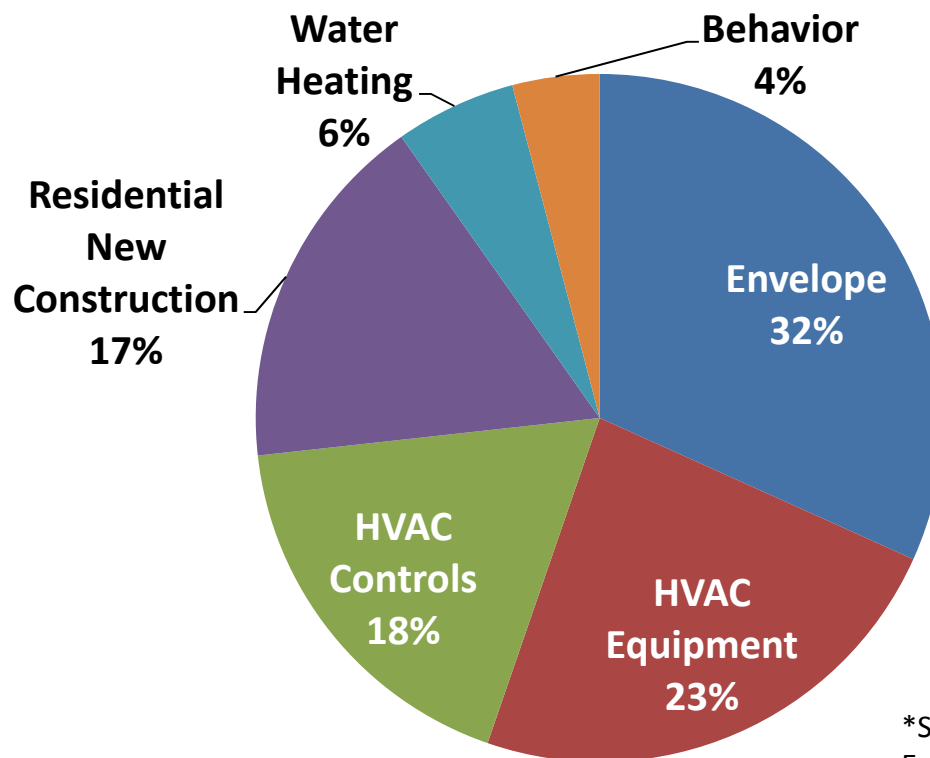
RESIDENTIAL & LOW INCOME LIGHTING IS CRITICAL TO MEETING PA SAVINGS GOALS

Portfolio Savings



GAS SAVINGS ARE DISTRIBUTED WIDELY ACROSS END USES & ACTIVITIES

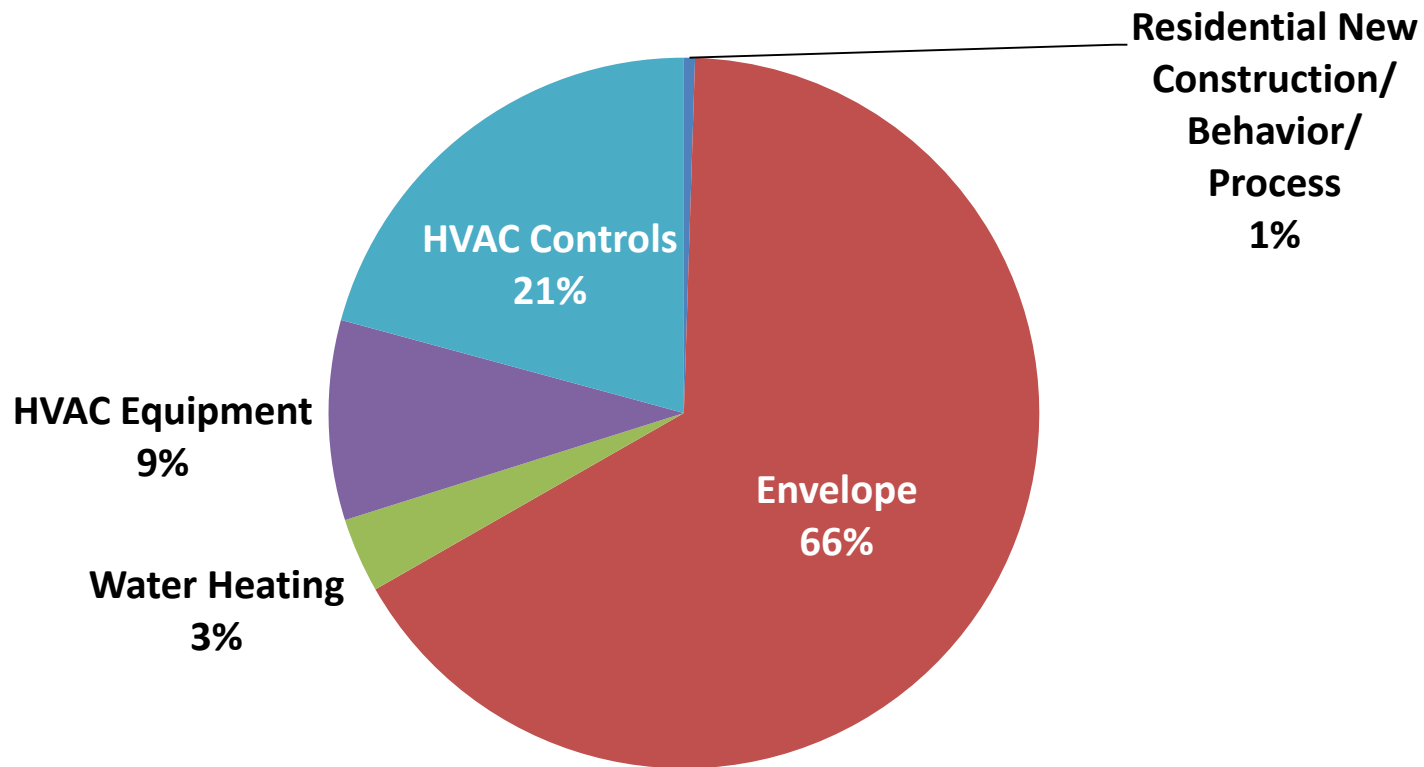
2018 Lifetime Gas Savings*



*Savings from National Grid, and Eversource. Savings do not include retail lighting interactive effects.

MOST RESIDENTIAL LIFETIME OIL SAVINGS ARE FROM ENVELOPE AND HVAC CONTROLS

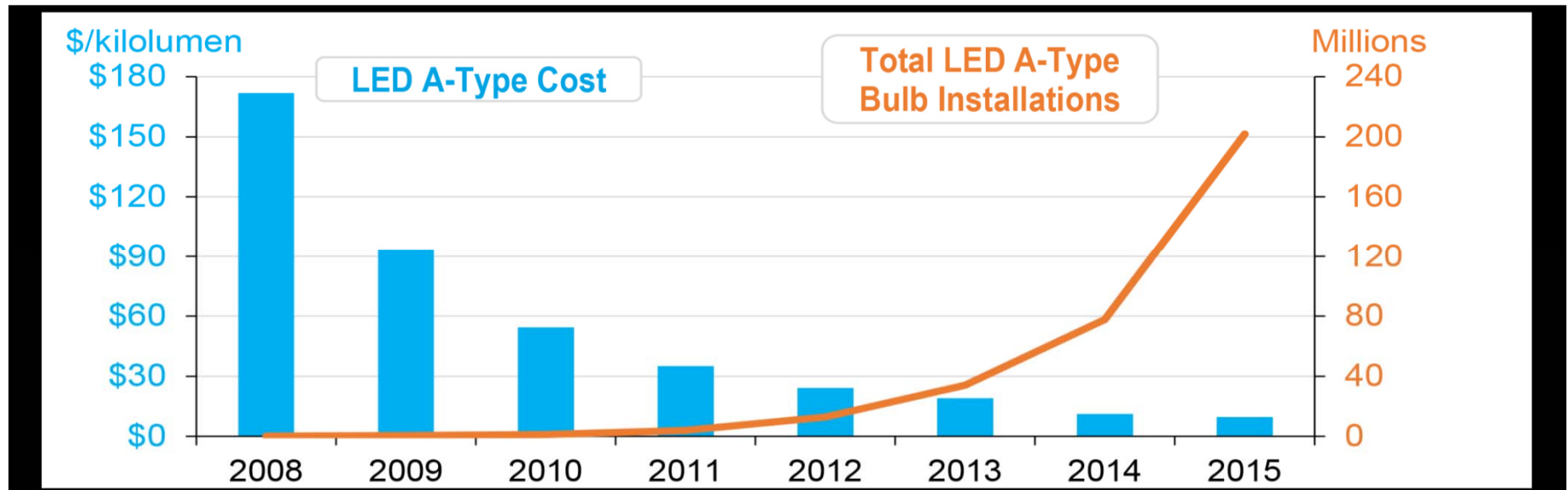
2018 Lifetime Oil Savings*



*Savings from National Grid, Eversource, and CLC. Savings do not include retail lighting interactive effects.

THE PAs' ABILITY TO CLAIM RESIDENTIAL LIGHTING SAVINGS IS GOING AWAY

- ▶ **Most of current in-place residential lighting is already efficient**
 - 51% in 2016
 - 12% LED saturation
- ▶ **Rapid commercialization of LED technology**
 - 94% price decrease from 2008-2015
 - Exponential growth in sales



THE PAs' ABILITY TO CLAIM RESIDENTIAL LIGHTING SAVINGS IS GOING AWAY (CONT.)

Federal standards impacts in 2020

EISA 2009 "Backstop" Standard

- Federal law that set 2012-2014 minimum lamp efficiency standards
- 1/1/2020: Requires CFL or better level of efficiency if DOE does not complete its own rulemaking
- Applies mostly to *general service lamps* (GSL), i.e., screw-in A-lamps
- Sales prohibition

Proposed 2020 Federal CFL and LED Standard

- More stringent than EISA backstop: will likely ban CFLs
- DOE has proposed a greatly expanded definition of GSL
- Standard would cover most common residential applications, e.g., reflector lamps
- Manufacturing and importation ban

EISA COVERED LAMPS



**~40 – 100 Watt
Equivalent (We)**



< 5 inches

51% of Sockets in MA homes

EISA EXEMPT LAMPS OR NOT COVERED BY EISA



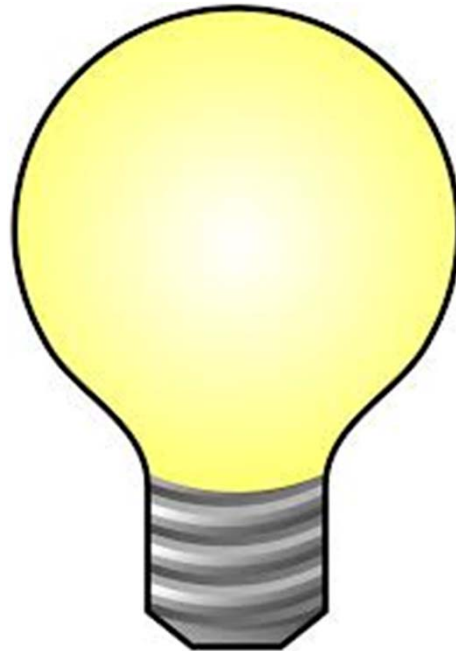
49% of Sockets in MA Homes

- 25% EISA Exempt
- 16% Directional
- 7% Linear fluorescent

THE PRECISE TIMING OF REDUCED RESIDENTIAL LIGHTING SAVINGS ARE SOMEWHAT UNCERTAIN

- ▶ **CFL & LED standard and general service lamp definition must be finalized**

- ▶ **Election adds additional uncertainty**



- ▶ **Order in which EISA backstop and CFL & LED become effective**

- ▶ **Some direct install opportunities may remain**

- ▶ **Retail lighting largely transformed by 2019 or 2020?**

WE EXPECT OTHER SOURCES OF SAVINGS TO DIMINISH OR GO AWAY OVER NEXT 3-5 YEARS AS WELL

Source	Electric	Gas	Oil	Relative Lifetime Savings Impact	Notes
Appliance recycling	x			M	Gross savings will diminish as vintage of removed units becomes newer and more efficient
Wireless thermostats	x	x	x	S-M	Lower NTG will affect per unit savings, though unit numbers are likely to increase significantly. (Net positive impact)
Programmable thermostats	x	x	x	S-M	Unit numbers will likely decrease in favor of wireless thermostats
Federal Standards upgrades	x	x	x	S-M	Clothes washers in 2018. Gas furnaces in 2021 (proposed)
Behavior	x	x		S	Declining savings over time w/ current model from reduced savings per home and participant attrition

ADDITIONAL SAVINGS OPPORTUNITIES

Source	Electric	Gas	Oil	Relative Lifetime Savings Impact	Notes
Wireless thermostats	x	x	x	M-H	Significantly increased market penetration, greater product availability, and ability to control connected appliances
Connected Appliances, Lighting, HVAC and DHW	x	x	x	S-M	Control by wireless thermostats (and possibly HEMS). Possibly significant DR opportunities
Home Energy Management Systems (HEMS)	x	x	x	S-M (?)	Unclear how much incremental savings available beyond those from wireless thermostats. Still some market/technology confusion
Revised Stretch Code	x	x	x	S-M	Impacts new construction savings claims; mostly fossil fuels
Cold Climate Heat Pumps	x	[x]	[x]	S-[M]	Most potential savings opportunities are from fuel switching/displacement
Improved Installation Practices	x	x	x	M	Better boiler installation practices; improved heat pump controls integration

ADDITIONAL SAVINGS OPPORTUNITIES (CONT.)

Source	Electric	Gas	Oil	Relative Lifetime Savings Impact	Notes
Increasing current measure penetrations/Higher efficiency levels	x	x	x	M-H	Duct sealing, HPWH, upstream HVAC, DHW, appliances and electronics, Condensing oil equipment, Tier 2 power strips
Behavior	x	x	[x]	S-[M]	All PAs offer to all appropriate customers; integration w/wireless thermostats and/or HEMS. Larger impact on annual savings
Increased program participation: Moderate income & renter segments	x	x	x	M	Multiple ongoing program activities
Greater depth of savings	x	x	x	M	Pay for performance models; increase conversions
Zero Energy Buildings	x	x	x	S-M	Large per participant savings, though achieving high participation is a challenge. New construction and retrofit

ADDITIONAL SAVINGS OPPORTUNITIES

FUEL SUBSTITUTION

- ▶ **Current regulations and guidelines do not explicitly address fuel substitution**
 - No policy imperative for PAs to pursue
- ▶ **Draft regulations (Residential Conservation Services) may provide opportunities to encourage certain fuel substitution**
 - Approval has been delayed, but expected shortly
- ▶ **If fuel substitution incentives are permitted, what would program activities look like?**
 - Oil to gas vs. oil to electric?
 - Gas to electric?

ADDITIONAL SAVINGS OPPORTUNITIES STRATEGIC ELECTRIFICATION

- ▶ **Consistent with Massachusetts' climate goals**
- ▶ **Pursuing this strategy would include increased promotion of:**
 - Heat pump water heaters
 - Cold climate ducted and ductless heat pumps
 - Net zero energy existing and new home activities
 - Opportunity for renewables (and storage?) integration
- ▶ **How would changes in fuel use be tracked and reported?**
- ▶ **Should multi-fuel PA savings goals be developed?**

SAVINGS FORECAST SUMMARY

Estimated Lifetime Savings in 2021 Relative to 2018

Fuel	Consultants' Estimate of Net Savings Impact	Key Drivers
Electric	-45% to -75%	<ul style="list-style-type: none">- Lighting: Some uncertainty as to details and timing- Other, much smaller impacts from multiple measures/activities+ Potentially wide range of uptake from upstream efforts+ Success in displacing electric heat and hot water with heat pump technologies
Gas	+10% to +25%	<ul style="list-style-type: none">- No single measure or activity expected to have a large impact+ Increased whole house participation and higher conversion rates, greater measure unit quantities
Oil	+5% to +20%	<ul style="list-style-type: none">- Negligible+ Similar to gas, but may be fewer equipment efficiency opportunities

ROLLING IT ALL UP: WHERE ARE WE NOW?

- ▶ **By many metrics, the Res retrofit programs are not only successful, but nation-leading (scale, \$'s invested, years of continuous service – legacy...)**
 - Res 1-4 retrofit programs impact 2.5 million retail transactions and 140,000 in home services annually
 - Current run rates (2013-2015):
 - 85,000 HES participants annually
 - 54,000 HVAC
 - 2.4 million retail lighting
 - 94,000 consumer products
 - And we spend \$213 Million to do it
 - Within the constraints of a Total Resource Cost Test

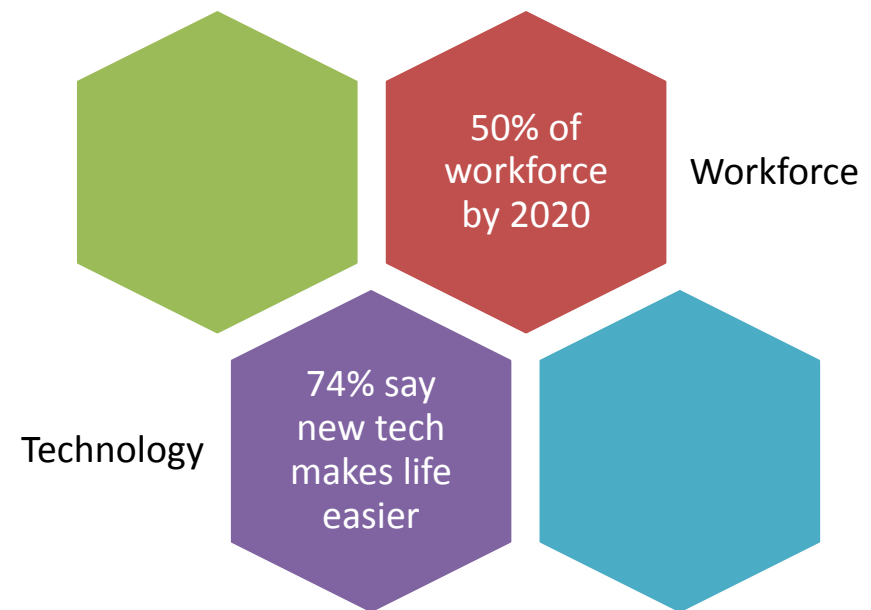
BUT, IS CHANGE REQUIRED TO STAY CLOSE TO HISTORIC SAVINGS LEVELS?

- ▶ **Losing lighting savings, with no silver bullets to replace them**
- ▶ **Legacy of existing res programs is strong, but can be limiting**
 - Our basic program is still heavily influenced by legacy designs dating back to the early 1990's
 - Connections between retrofit initiatives remain tenuous in spite of streamlining the customer experience
 - Difficult for consumers to understand why envelope and HVAC measures are held to different standards
- ▶ **Data collection, tracking, and transfer systems in need of updating**
 - No clear line of sight to # of homes touched or depth of savings
 - Data capture, tracking and reporting systems are grounded in rapidly aging technology

CHALLENGE: CHANGING CONSUMER BASE

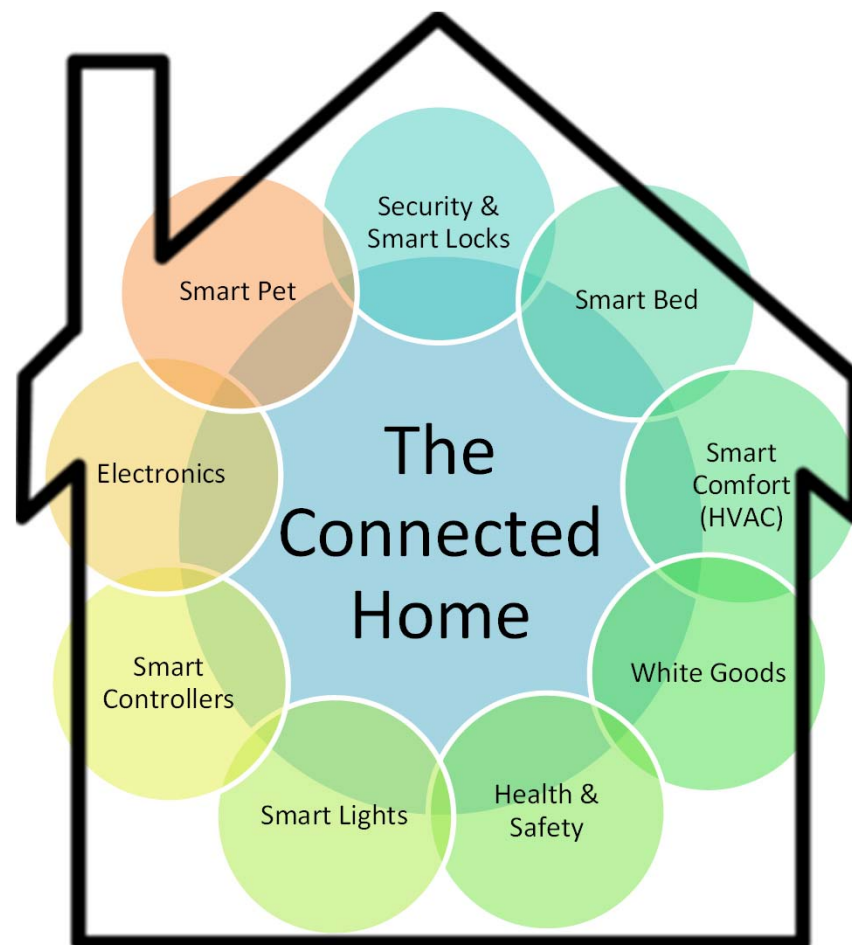
- ▶ **Maintain Massachusetts' position as a leader...**
 - ... in a changing market (are we prepared to serve millennials as homeowners?)
 - ...with a future where energy savings from lighting are diminished
 - ...and we need to maintain volume, generate new savings cost-effectively...
 - ...AND satisfy increasingly aggressive environmental goals

Millennials are changing markets...



CHALLENGE: CHANGING TECHNOLOGY BASE

- ▶ **Keep pace with digital and data technology evolution (or revolution?)**
 - Modern connectivity and data management technologies offer unprecedented access to big and fast-moving data
 - Communicating devices and IoT offer new thinking on how we control our environment via consumer products
 - How do we leverage a consumer base that is “always on” and “overshares”?



NEXT STEPS



- ▶ **Continue to monitor and assess lighting market developments and standards activity**
- ▶ **Consultants and PAs agree that collaboration to discuss and begin assessment of the future of residential programs given the developments noted herein is appropriate and timely**
 - Plans are to commence discussions in next few months, with an update to the Council in the spring

QUESTIONS AND DISCUSSION

