MA ENERGY EFFICIENCY ADVISORY COUNCIL

→ CONSULTANT TEAM

2019-2021 ASSESSMENT OF POTENTIAL (AOP)

▶ March 29, 2018

www.ma-eeac.org

INTRODUCTION

- **First step in planning process**
- **Assessment of Potential (AoP) estimates *potential* savings, which is one important input in goal-setting**
- **Presentation will discuss**
  - AoP key take aways
  - AoP methodology
  - Summary of PA potential studies
  - Electric potential considerations, adjustments and costs
  - Gas potential considerations, adjustments, and costs

KEY TAKE AWAYS

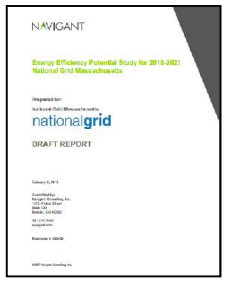
- There is still potential in MA to support electric savings in excess of 3%
- There is still potential in MA to support robust programs
- Residential electric potential is lower than recent achievement due to lighting changes
- C&I electric opportunities remain strong
- No significant changes expected in gas potential for either residential or C&I
- Early expectations are that residential costs may increase somewhat, but PA Plan will provide best source of data for ongoing planning

CONSULTANT AOP APPROACH AND METHODOLOGY

- **In previous planning cycles, Consultants relied on historical achievement as primary basis for AoP**
- **Current AoP uses PA potential studies informed by trends and market knowledge as starting point**
- **For 2019-2021, past not necessarily a strong predictor of the future**
  - Changing lighting standards and market transformation
  - Changing baselines
  - New more varied and integrated opportunities
- **In years past, no potential studies for all PAs**
- **Made adjustments based on additional analysis of key considerations and recent program experience**

PA POTENTIAL STUDIES OVERVIEW

- PAs hired contractors to complete potential studies
- Scopes of work for each study varied by PA
- Not all PA potential studies were completed by the same contractor
- PA contractors used different assumptions
- Most PA studies only included annual savings
- Active demand potential estimate forthcoming (April)
- Contractors will rerun results with new avoided costs
- Consultant analysis required data extrapolation to compare results between studies



PA POTENTIAL STUDIES EXCLUDED SEVERAL SOURCES OF SAVINGS

	NGrid	Ever-source	CLC	Unitil Electric	Unitil Gas	CMA	Berkshire	Liberty
Lead Author	Navigant	Dunsky	ODC/ Dunsky	GDS	GDS	Dunsky	GDS	GDS
Received	2/7	1/15	1/15	3/13	1/31	2/22	2/5	2/5
Includes:								
Fuel Switching								
SEM		x				x		
CHP		Micro	x					
Behavior		x	x	x	x		x	x

TYPES OF POTENTIAL USED IN PA POTENTIAL STUDIES

- **Precise potential definitions varied by study**

Economic

Portion of technically feasible potential that is cost-effective assuming no market barriers

Business as Usual (BAU) Achievable

Level of savings given current programs and incentives

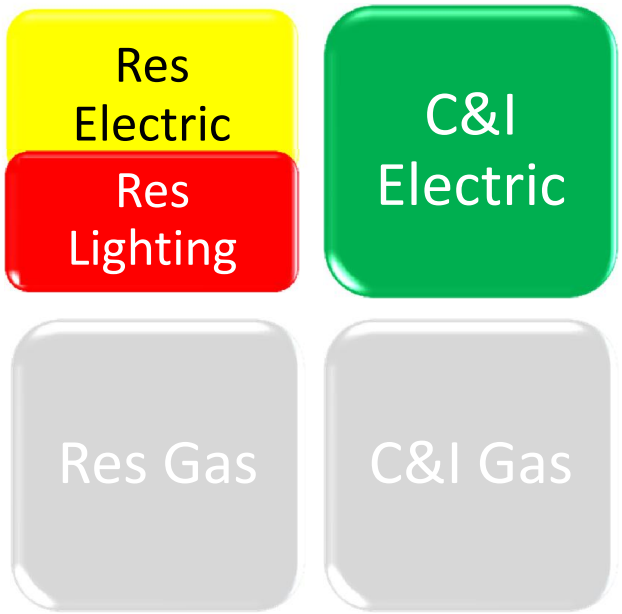
Business as Usual Enhanced (BAU+)

Level of savings given current programs, new technologies, and some different incentive levels

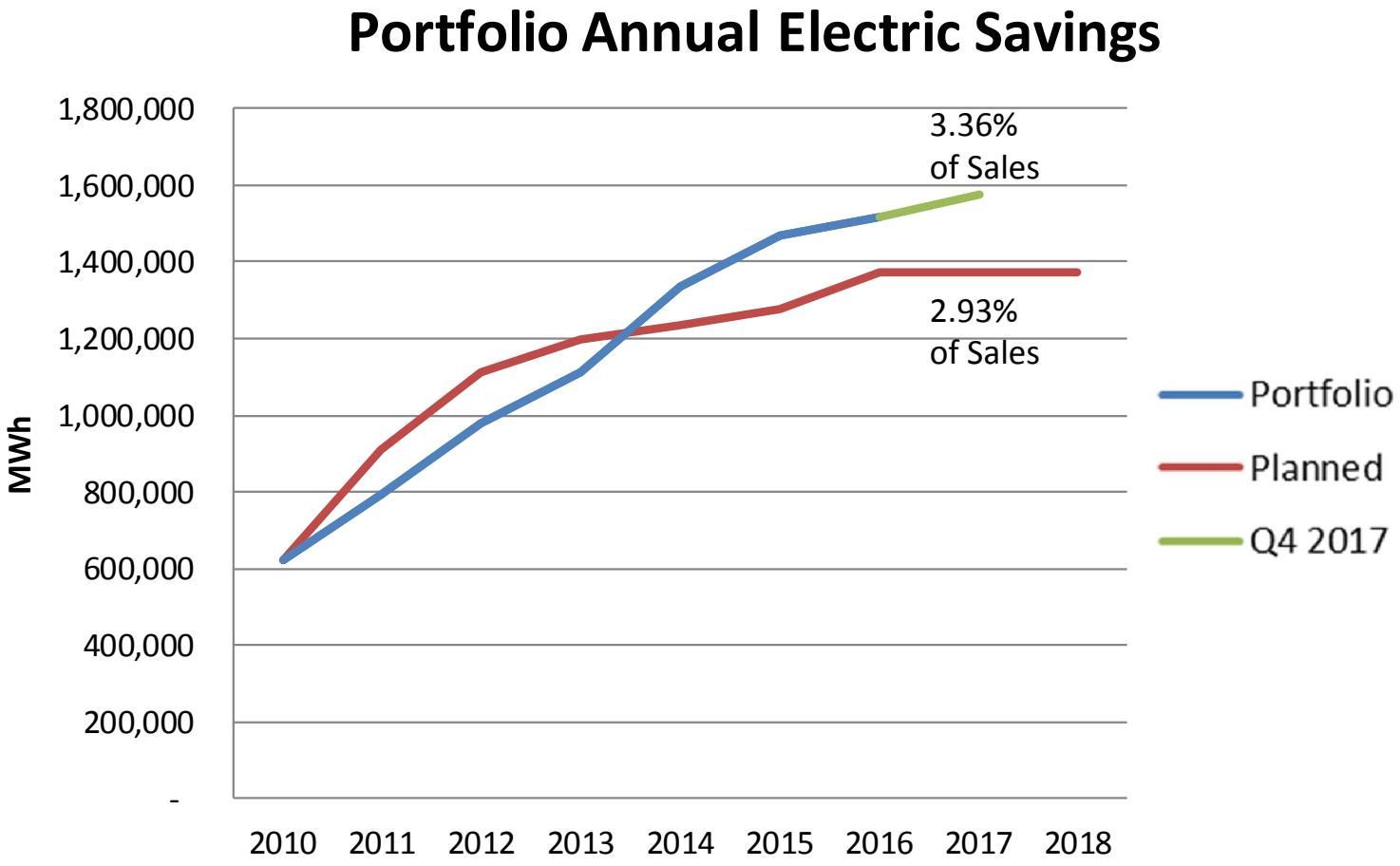
Maximum (MAX) Achievable

Maximum level of cost-effective potential recognizing market barriers

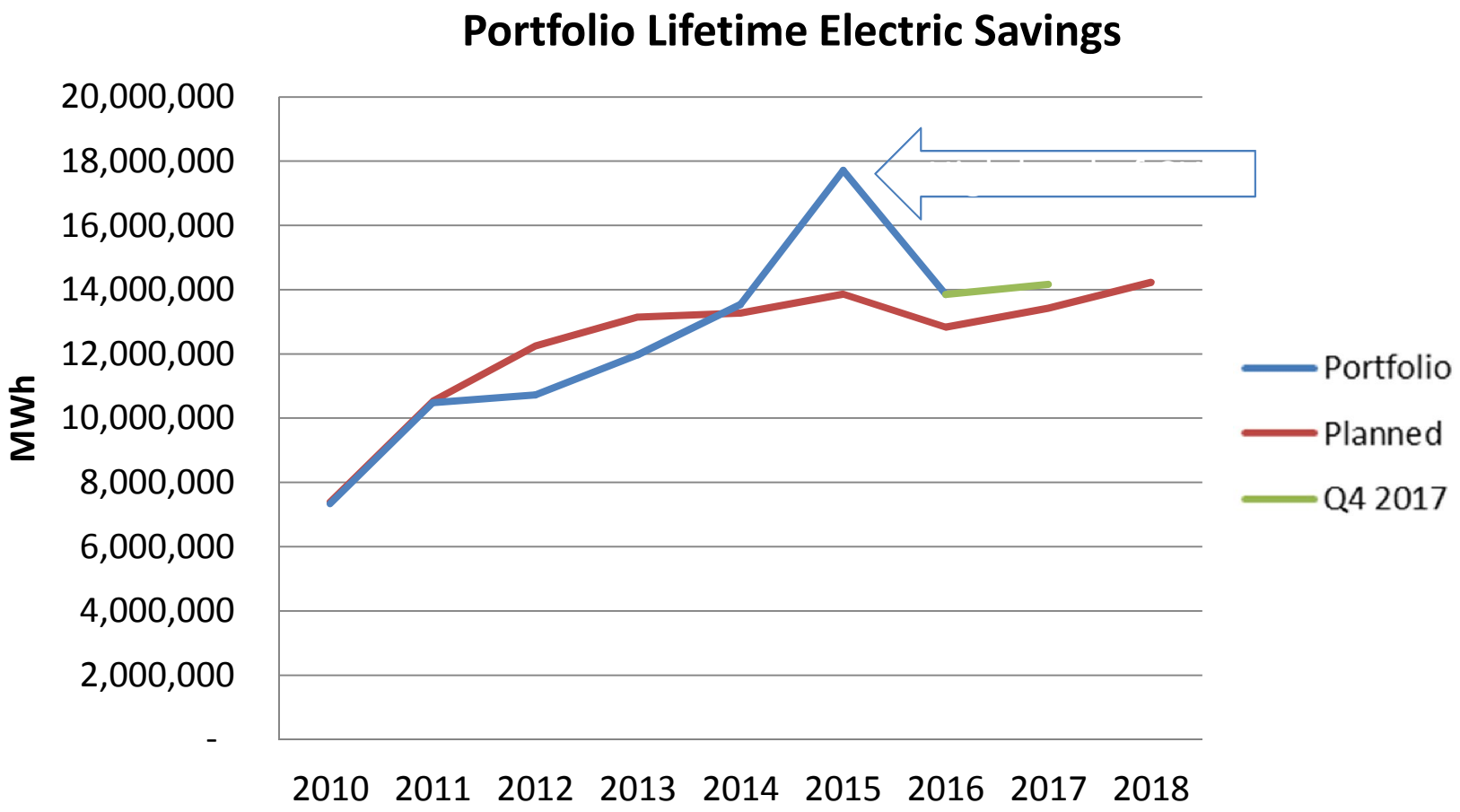
ELECTRIC



2017 PROGRAMS ACHIEVED HIGHEST ANNUAL SAVINGS



PORTFOLIO LIFETIME ELECTRIC SAVINGS OVER TIME



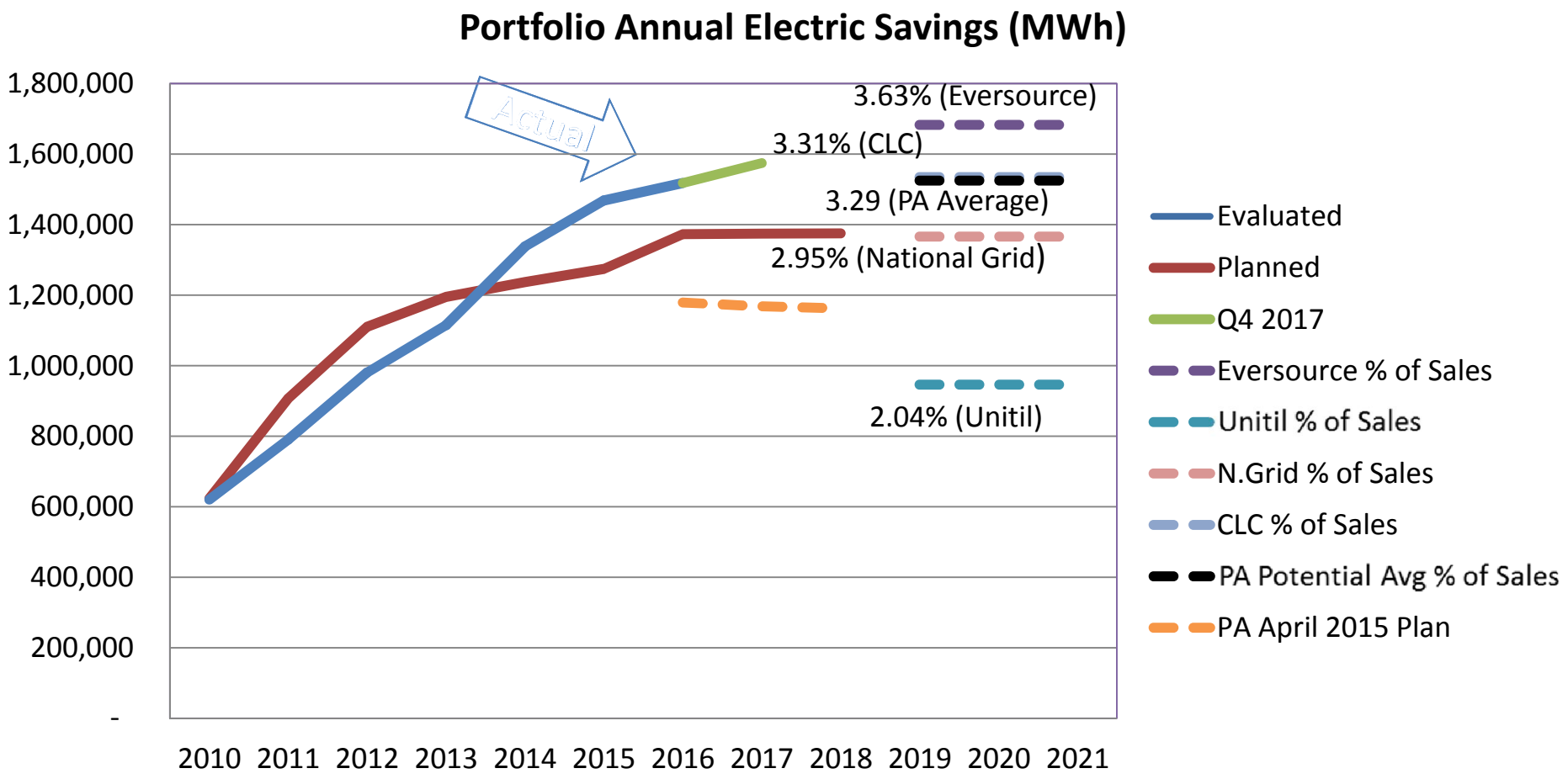
PA POTENTIAL STUDY RESULTS

- **The table below presents 2019-2021 maximum achievable annual electric savings as a % of sales**

	Contractor	Residential	Low Income	C&I	Total Portfolio
Eversource	Dunsky	4.12%	1.93%	3.50%	**3.63%**
CLC*	ODC/Dunsky	3.68%	4.47%	3.50%	**3.31%**
National Grid	Navigant	2.95%	2.32%	3.03%	**2.95%**
Unitil	GDS	2.79%	2.25%	1.70%	**2.04%**
PA Weighted Average		**3.49%**	**2.24%**	**3.28%**	**3.29%**
2017 Q4 Reported		**5.38%**	**2.07%**	**2.38%**	**3.36%**

*CLC potential study did not include Max achievable scenario. Estimated using % change from BAU+ to Max achievable scenario for Eversource study

PA POTENTIAL STUDY ESTIMATES COMPARED TO PAST PLANNING PERIODS



KEY CONSIDERATIONS-POSITIVE OR NEGATIVE IMPACTS

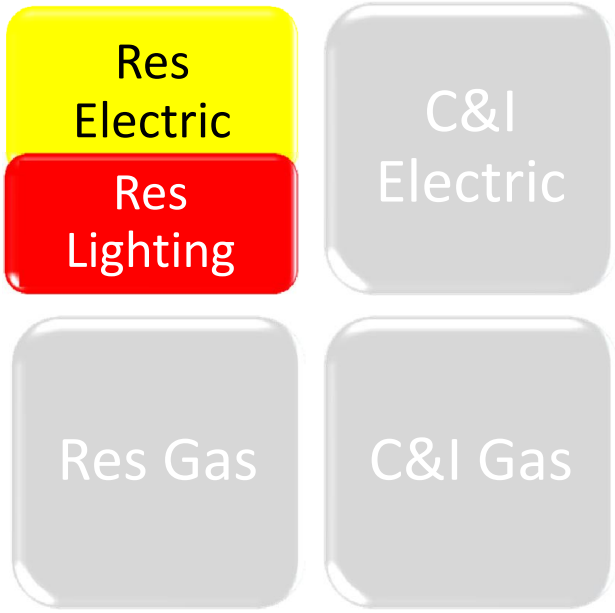
Residential

- Lighting
- Fuel switching
- Program redesign
- Behavior
- Evaluation
- Baseline changes

C&I

- Lighting
- CHP
- SEM
- Upstream changes
- Evaluation
- Baseline changes

RESIDENTIAL



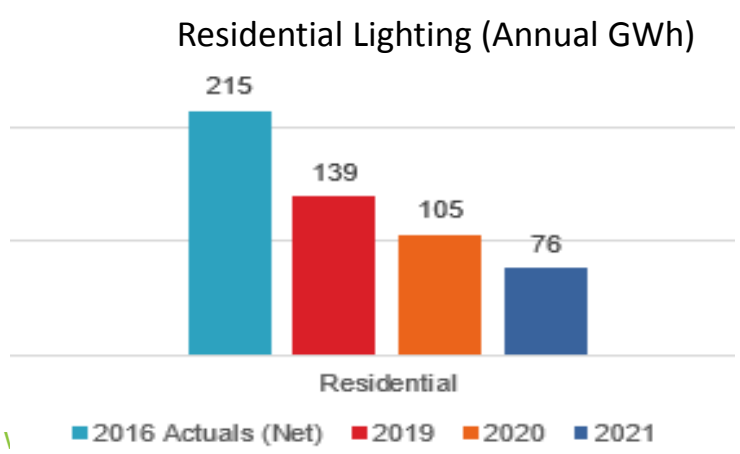
Residential

- Lighting
- Fuel switching
- Program redesign
- Behavior
- Evaluation
- Baseline Changes

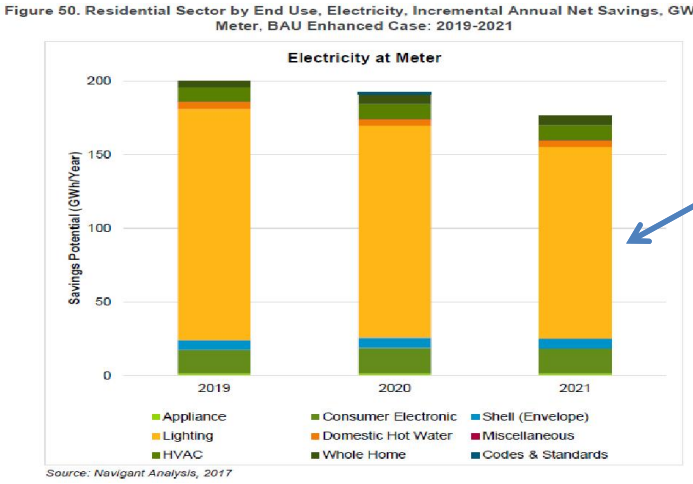
RESIDENTIAL CONSIDERATIONS: LIGHTING

- **2017 Res annual electric savings estimated to be 73% lighting**
- **PA potential studies show varying levels of declining lighting savings and NTG higher than agreed-to values going forward**
- **Eversource report estimates a 65% reduction compared to 2016 and a 45% reduction from 2019 to 2021**
- **Noticeably steeper decline estimate for Eversource than National Grid**

Eversource



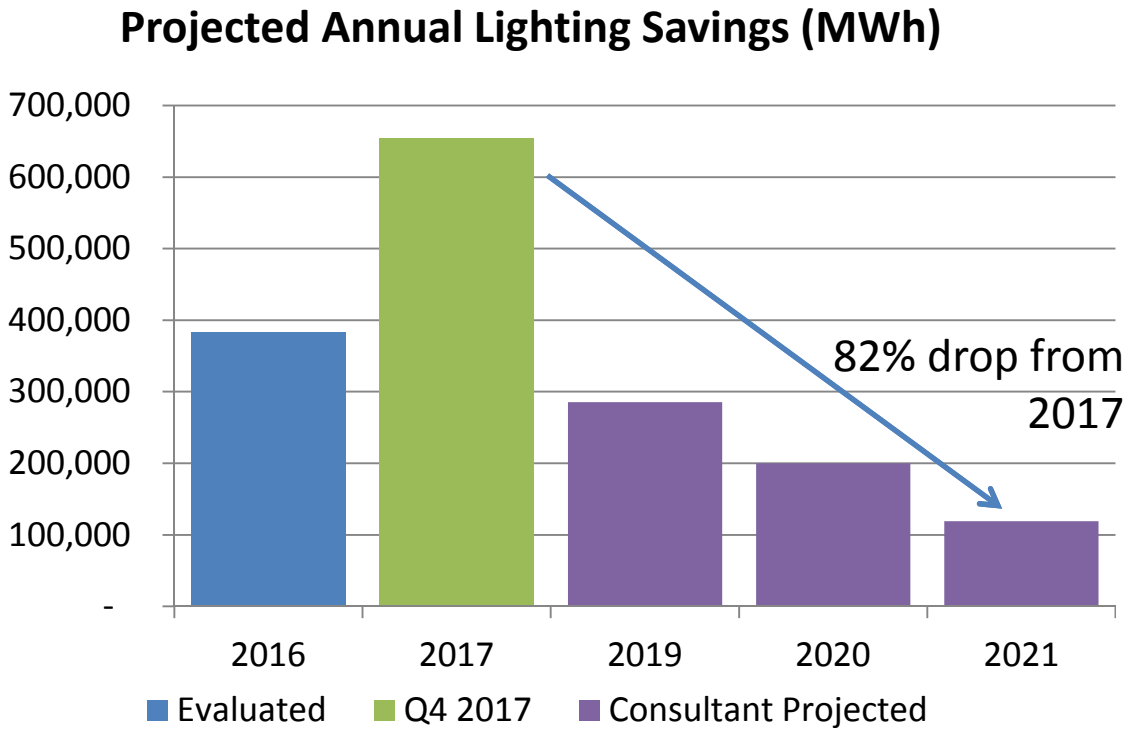
National Grid



Yellow Bar = Lighting

RESIDENTIAL CONSIDERATIONS: LIGHTING

- Consultants estimate steeper lighting savings drop than PA studies
- PA studies did not use most recent evaluation findings
- NTG values are lower (~50% vs 35% and declining) than in PA potential studies
- PA study lighting NTG values vary



RESIDENTIAL OPPORTUNITIES: FUEL SWITCHING

- PA Potential studies did not address fuel switching
- Unregulated fuel (oil and propane) to electric fuel conversions could yield increased electric usage, but modest MMBtu savings

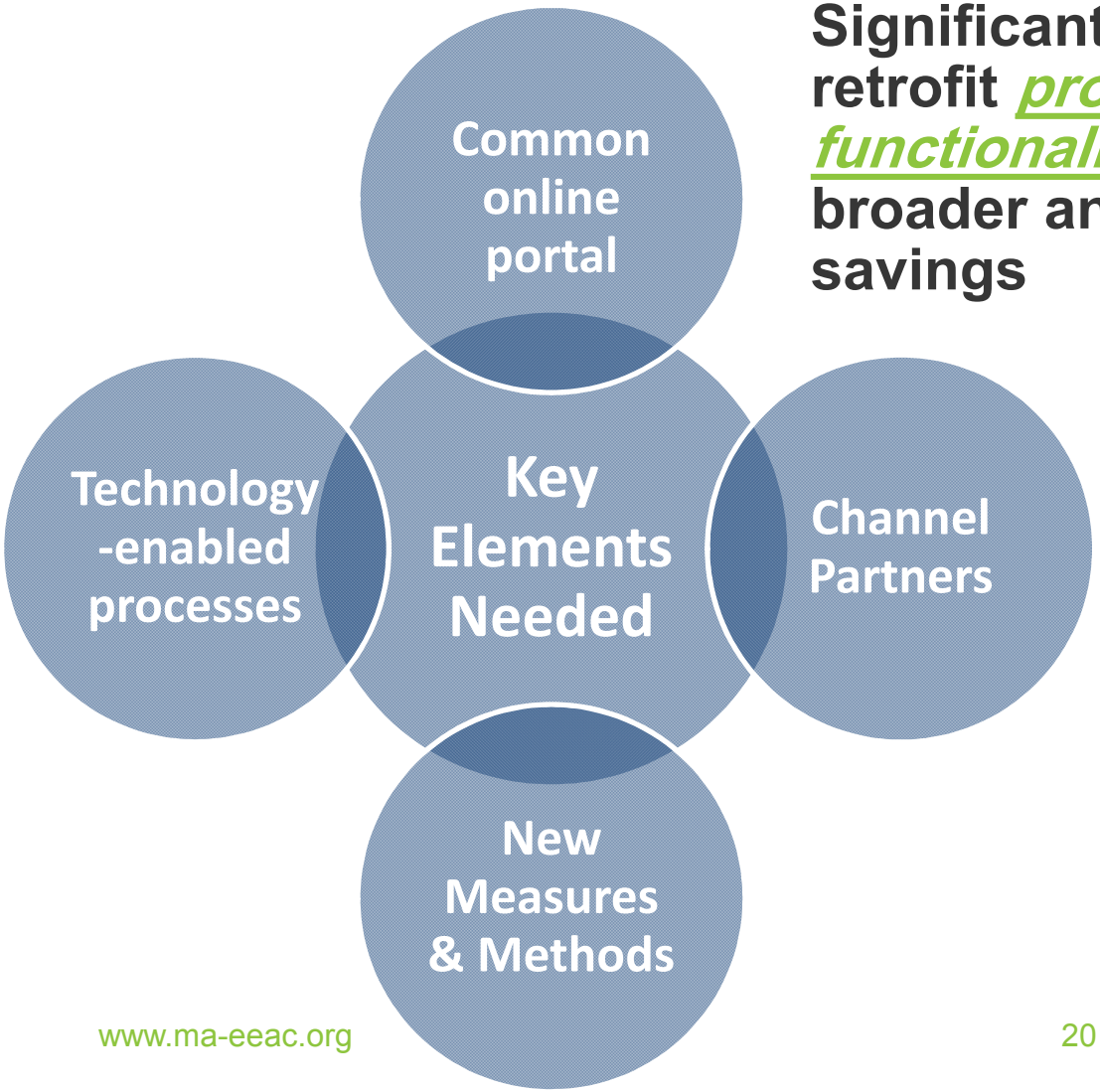
2019-2021 Heat Pump Fuel Switch Estimate*	
Avg. unregulated fuel participation rate	1.5%
Number of units	75,000
MMBtu Fossil Fuel savings (MMBtu)	1.2 Million
Increased Electric usage (MWh)	110,000
Net Annual MMBtu reduction	840,000

*Estimate includes ducted heat pumps, ductless heat pumps, and heat pump water heaters

RESIDENTIAL OPPORTUNITIES: PROGRAM REDESIGN

- **Feb. 28 EEAC resolution supports provision of a new, integrated residential program design**
- **The PAs' potential study scenarios don't involve a significant redesign of the residential program**
  - MAX achievable potential scenarios included generic reductions to market barriers, which translated to higher modeled participation
  - However, specific program changes were not modeled

CONTINUOUS ENGAGEMENT MODEL



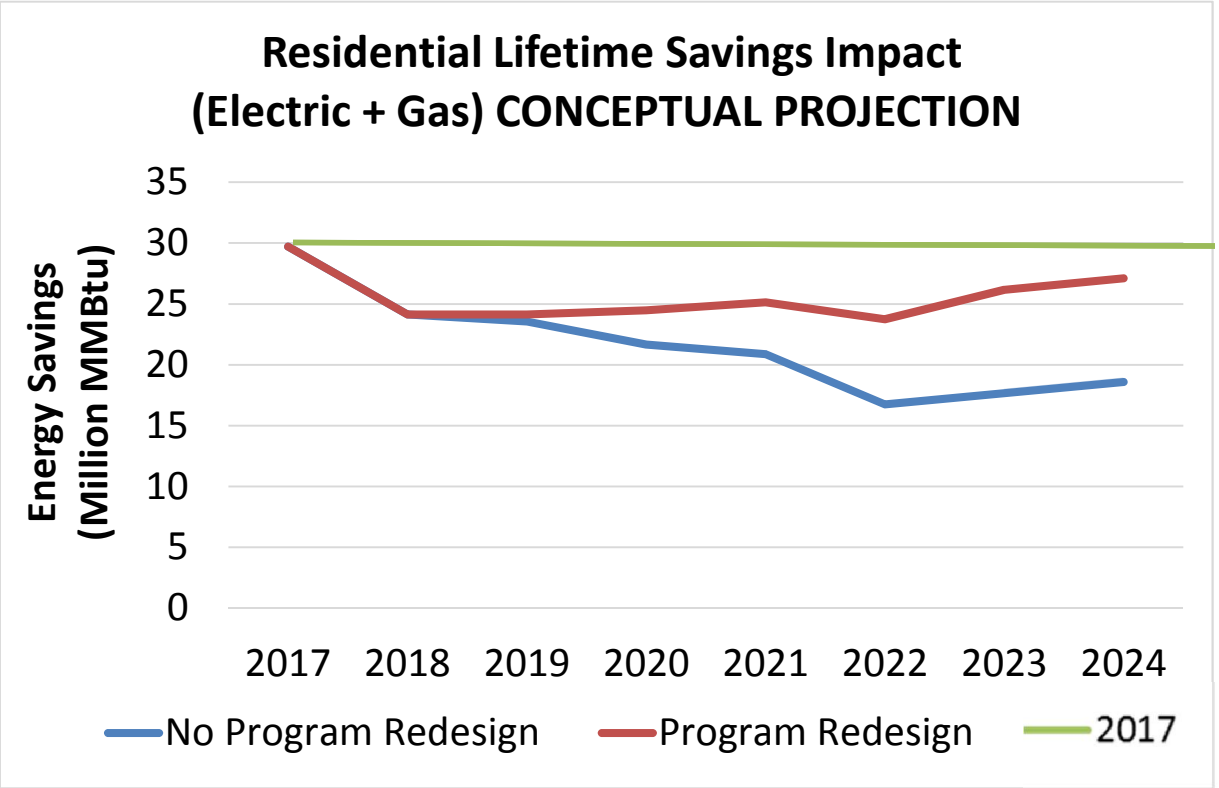
Significant evolution of residential retrofit *program design and IT functionality* needed to achieve broader and deeper cost-efficient savings

REDESIGN SAVINGS POTENTIAL

- **Possible decline in participation and savings during initial rollout**
- **Assumes higher participation and measure uptake and conversions**
  - Changes supported by modernized IT portal
  - Higher HVAC equipment uptake compared to weatherization

2019-21 Possible Additions to Annual Savings Potential

- 50+ GWh
- 9 Million therms
- 250k MMBtu (oil/propane)



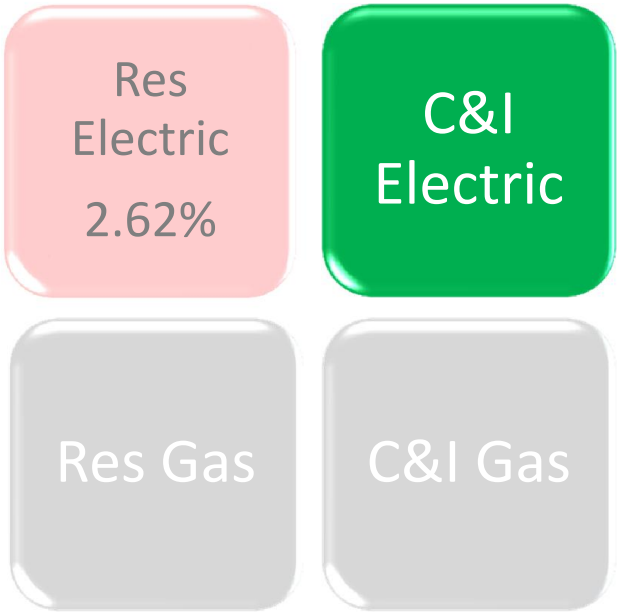
RESIDENTIAL POTENTIAL SUMMARY

- **Will be extremely challenging to make up lost lighting savings in the electric sector in 2019-2021**
- **Several things needed to keep savings impacts as low as possible**
  - Aggressive approaches to boost existing measure production
  - Identifying new measures and approaches
  - Promoting fuel switching
  - Continuing innovations in new construction, and active demand management
- **New continuous engagement program model offers opportunity for broader and deeper savings for all fuels**

RESIDENTIAL ELECTRIC POTENTIAL

Residential Adjustments	Savings as % of Res Sales	Annual GWh (2019-2021)	Annual Other Fuel MMBTU (2019-2021)
Weighted Average PA Potential Study	**3.49%**	**1,550**	
Lighting	- 0.79%	- 350	+TBD
Fuel Switching	- 0.25%	- 115	+ 1.2 Million
Behavior	+ 0.16%	+ 70	
Program Redesign	+ TBD	+ TBD	+ TBD
Net Changes to Potential	**- 0.88%**	**- 395**	**+ 1.2 Million**
Net Potential After Adjustments	**2.62%**	**1,155**	
2017 Q4 Reported Achievement	**5.38%**	**836**	
Annualized Potential After Adjustments	**2.62%**	**385**	

C&I

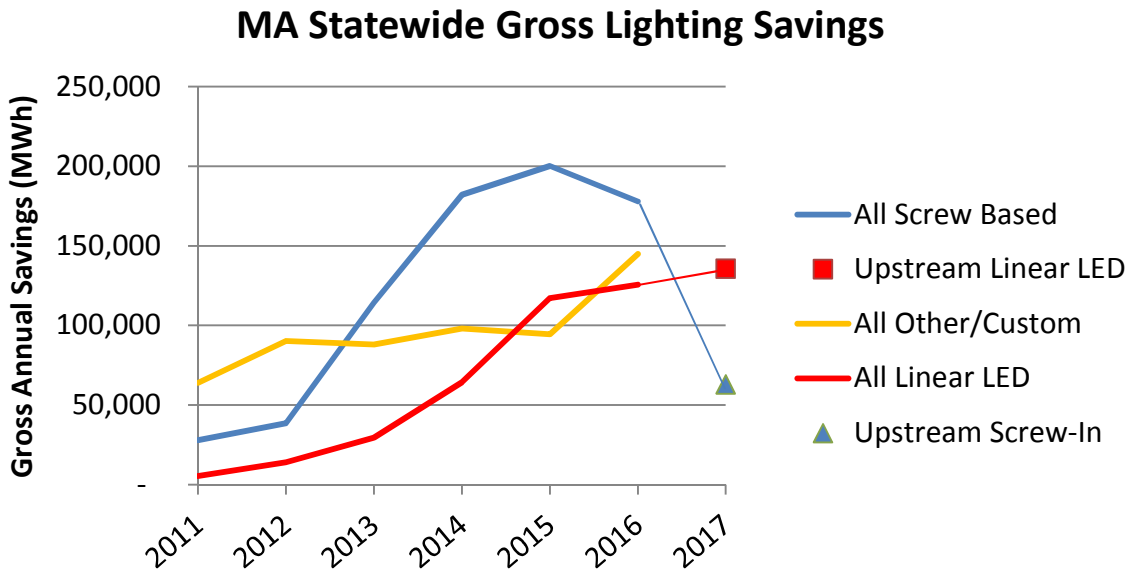


C&I

- Lighting
- CHP
- SEM
- Upstream changes
- Evaluation
- Baseline Changes

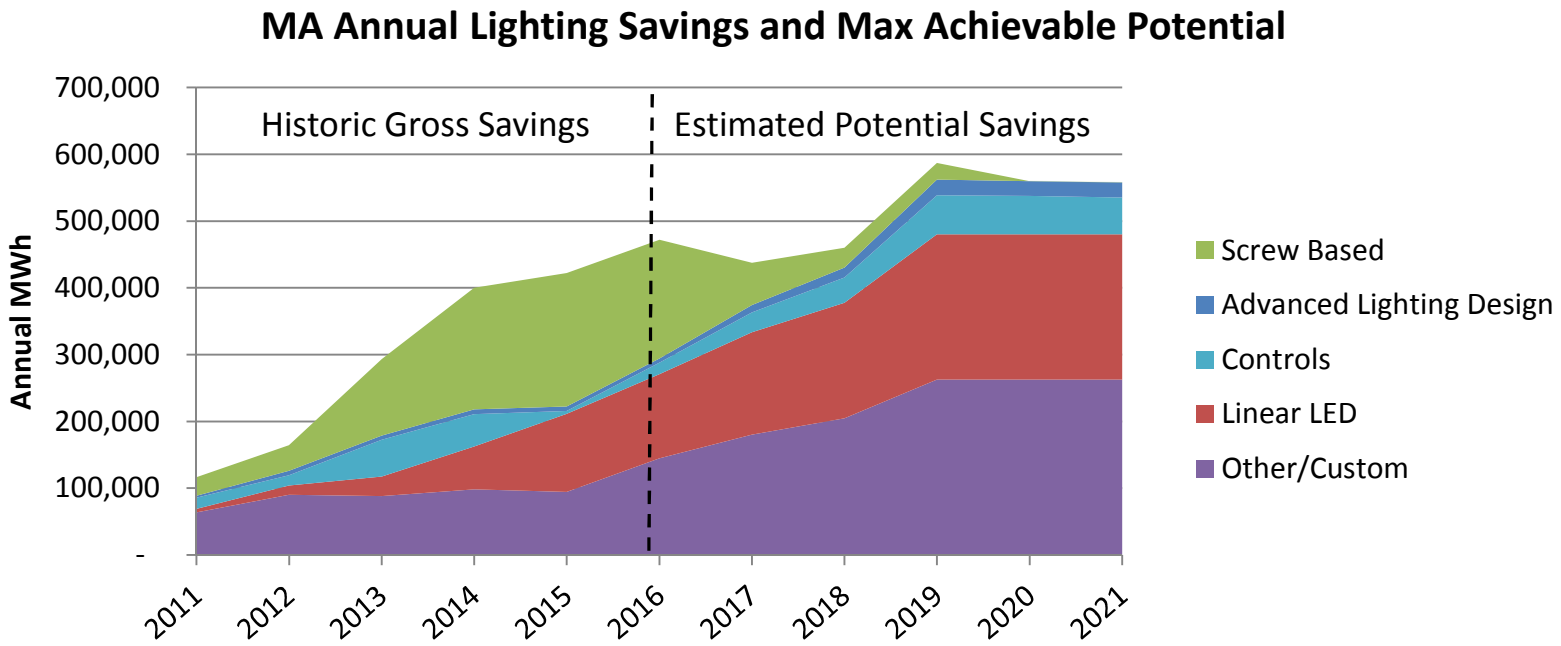
C&I CONSIDERATIONS: LIGHTING

- C&I lighting market transitioning from screw-in to linear and other LED technologies
- This is good from an opportunity and EM&V perspective –favorable evaluations for linear lighting



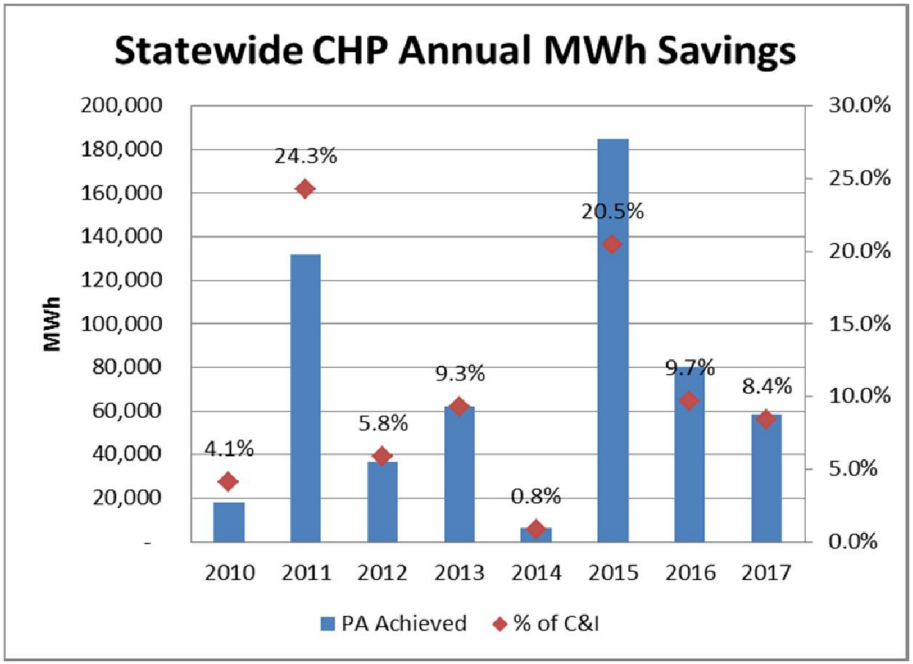
C&I CONSIDERATIONS: LIGHTING

- There is still strong potential in C&I linear lighting (linear lighting not effected by EISA)
- 42% of all C&I economic potential is in networked (controlled) linear lighting



C&I OPPORTUNITIES: CHP

- **CHP was not included in the PA potential studies**
  - CLC found zero potential, Eversource included micro CHP
- **CHP typically increases C&I Savings by 13.5% or 80k MWh annual savings per year (16.4) MW)**
- **DOER has identified a strong pipeline at ~35 MW/yr**



22 MW MIT CHP likely in 2019-2021*

**https://powering.mit.edu/project-faq*

C&I OPPORTUNITIES: STRATEGIC ENERGY MANAGEMENT

- **CMA was the only PA to attribute a value to SEM**
  - Value was applicable to buildings > 25k square ft.
    - Commercial potential assumed to be 6% of gas use
    - Industrial potential assumed to be 2% of all gas use
- **The EEAC has recommended SEM in past resolutions**
- **PAs released a SEM RFP, which could bring in new savings as soon as 2019**
- **Estimate that SEM could increase C&I electric annual savings 2.1% per year and 0.46% for C&I gas savings**

C&I OPPORTUNITIES: UPSTREAM

- **PA potential studies did not consider program modifications such as moving measures upstream**
- **Upstream approach can increase volume and savings**
  - Example: gas water heaters
- **Upstream lighting is the least expensive electric C&I initiative on a $ / lifetime kWh basis**
- **PAs continue to add new measures upstream:**
  - Electric: LED fixtures with controls, LED high/low bay, T5 TLEDs, VRF HP, circulator pumps, food service equip.
  - Gas: Food service, other measures in pipeline

C&I CONSIDERATIONS: EVALUATION AND BASELINE CHANGES

- **Consultant analysis shows the following C&I impacts:**

Electric Evaluations	• **Decrease future electric savings by 1.1%** • Comprehensive Design (CDA), Multiple Upstream, Custom Process, Small Biz Lighting
Gas Evaluations	• **Decrease future gas savings 10.9%** • CDA, Upstream HVAC, Steam traps (Custom and Rx)
Baseline and Industry Standard Practice Changes	• **3% reduction in electric annual savings** • **11% reduction in gas annual savings**

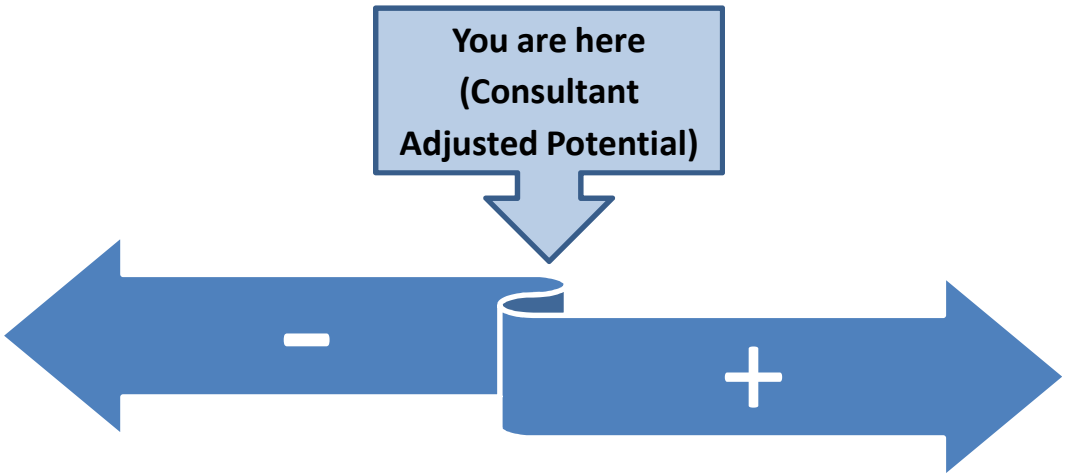
C&I ELECTRIC POTENTIAL

Commercial and Industrial Adjustments	Savings as % of C&I Sales	Annual GWh (2019-2021)
Weighted Average PA Potential Study	**3.28%**	**2,700**
SEM	+ 0.05%	+ 45
CHP	+ 0.29%	+ 240
Evaluation Adjustments	- 0.03%	- 25
Baseline Adjustments	- 0.08%	- 60
Linear Lighting	+ TBD	+ TBD
Net Changes to Potential	+ 0.24%	**+ 200**
Net Potential After Adjustments	**3.52%**	**2,900**
2017 Q4 Reported Achievement	**2.38%**	**694**
Adjusted Annualized Potential	**3.52%**	**965**

TOTAL ELECTRIC POTENTIAL

Portfolio Adjustments	Savings as % of Total Sales	Annual GWh (2019-2021)	Annual Other Fuel MMBTU (2019-2021)
Weighted Average PA Potential Study	**3.29%**	**4,380**	
Residential Net Adjustments	- 0.29%	- 390	+ 1.2 Million
C&I Net Adjustments	+ 0.15%	+ 200	
Net Changes to Potential	- 0.14%	**- 190**	
Net Potential After Adjustments	**3.15%**	**4,190**	
2017 Q4 Reported Achievement	**3.36%**	**1,574**	
Adjusted Annualized Potential	**3.15%**	**1,395**	

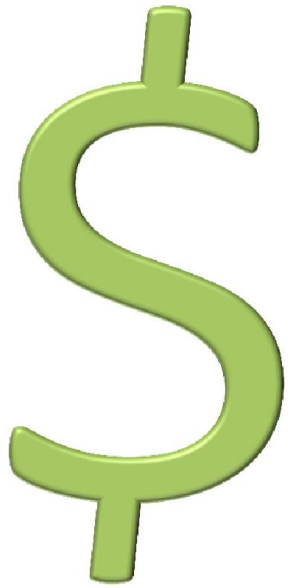
OTHER POTENTIAL IMPACTS



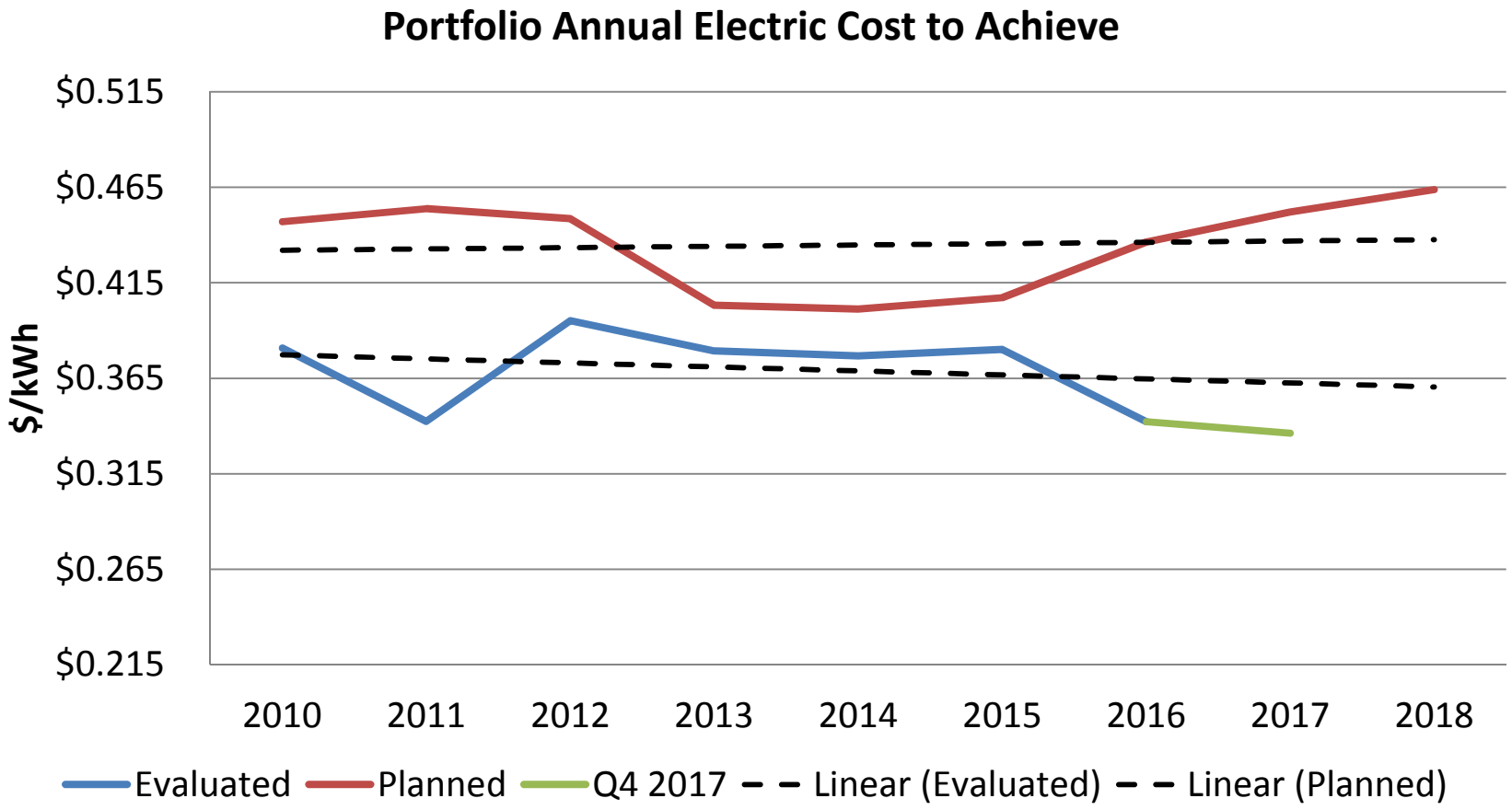
Adjustments that might occur to potential estimate:

- AESC values including carbon & DRIPE
- More residential and LI focus
- EMV changes including NTG
- Baseline changes
- Program mix
  - C&I vs Res and LI
  - Inclusion of fuel switching
- Program redesign
- Emerging markets
- New technologies
- Tech evolution and commercialization
- Active demand synergies
- Timeframe of potential – 2% per year for 10 years is still ~20% potential. It can be achieved faster.

PORTFOLIO ELECTRIC COSTS



PORTFOLIO ELECTRIC COST TO ACHIEVE OVER TIME

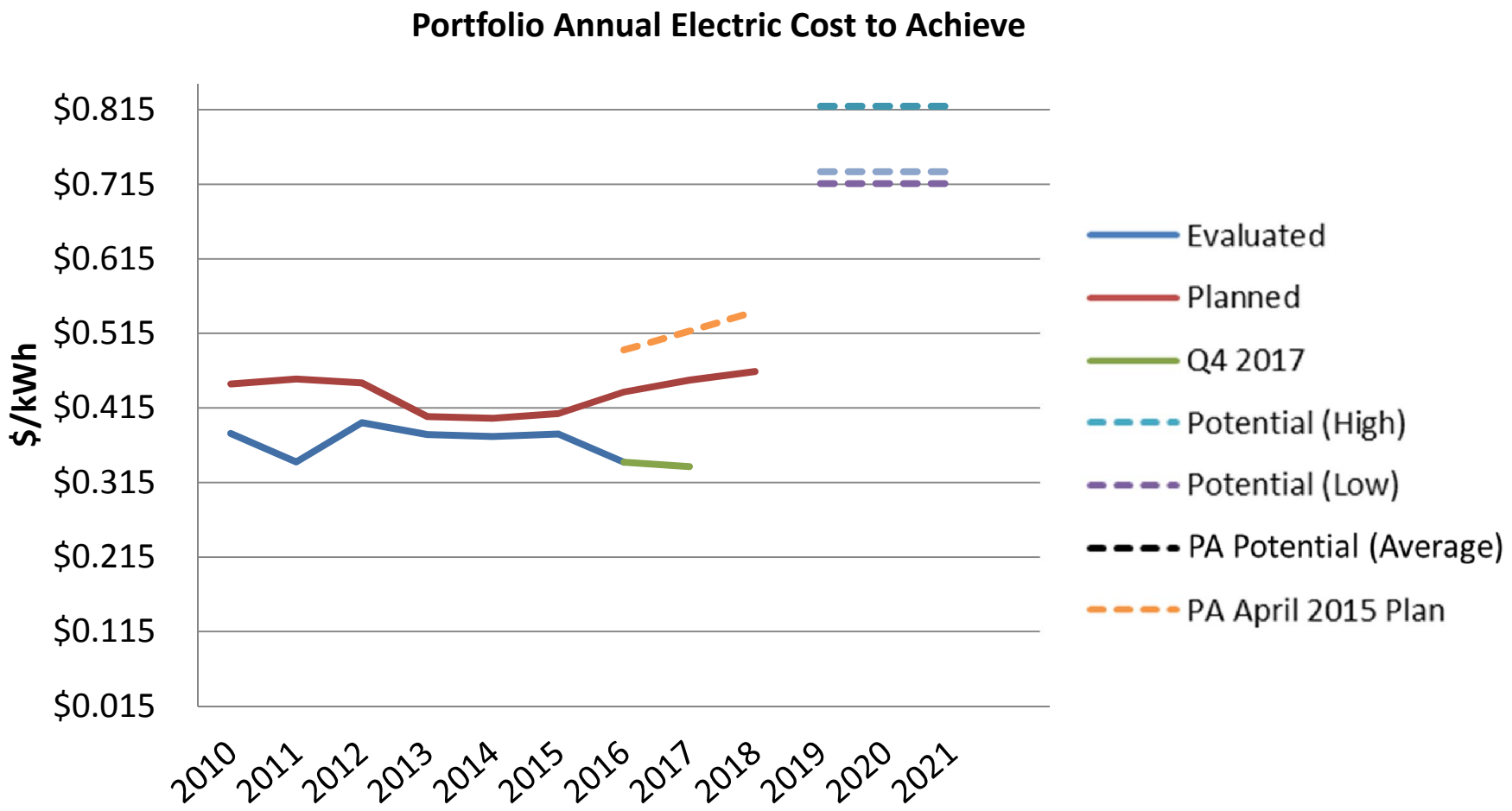


PA POTENTIAL STUDY COSTS TO ACHIEVE

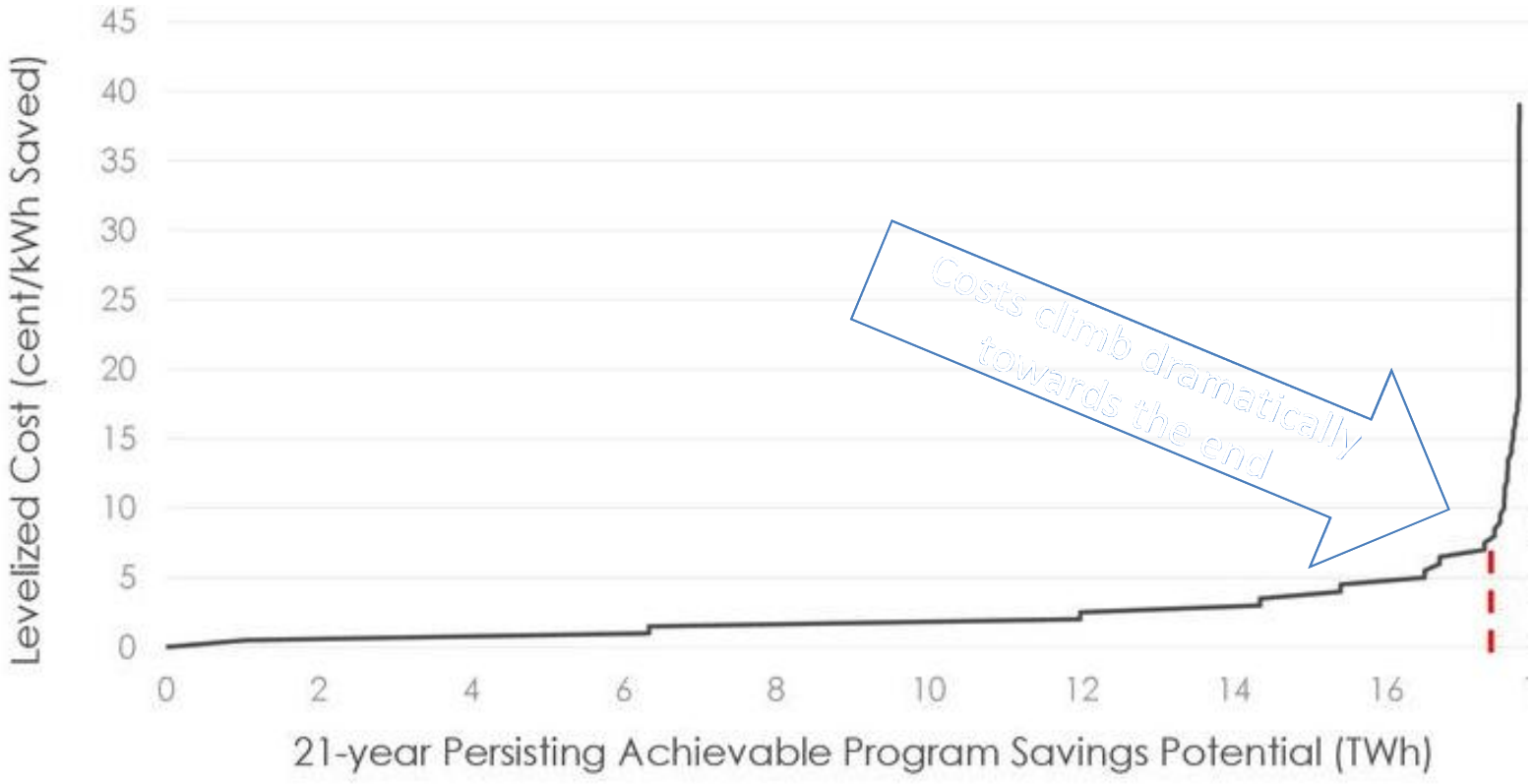
- **Table below presents 2019-2021 Max achievable annual electric costs to achieve ($/kWh)**

	Residential	Low Income	C&I	Total Portfolio
National Grid	$0.90	$1.18	$0.75	**$0.82**
Eversource	N/A	N/A	N/A	**$0.73**
Unitil	$0.95	$0.95	$0.50	**$0.72**
CLC	N/A	N/A	N/A	**N/A**
PA Weighted Average	**$0.90**	**$1.17**	**$0.75**	**$0.73**
2017 Q4 Reported	**$0.27**	**$1.43**	**$0.34**	**$0.34**

PA MAX ACHIEVABLE POTENTIAL COSTS TO ACHIEVE ARE MUCH HIGHER THAN HISTORICAL COSTS TO ACHIEVE

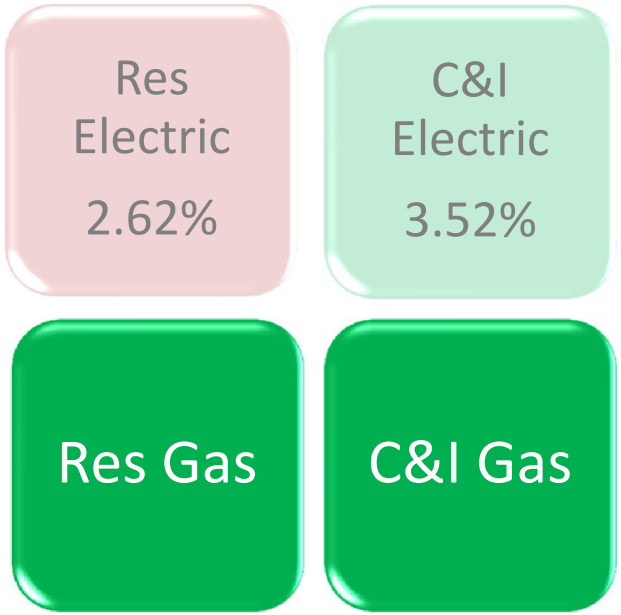


ENERGY EFFICIENCY COST CURVES - ILLUSTRATIVE

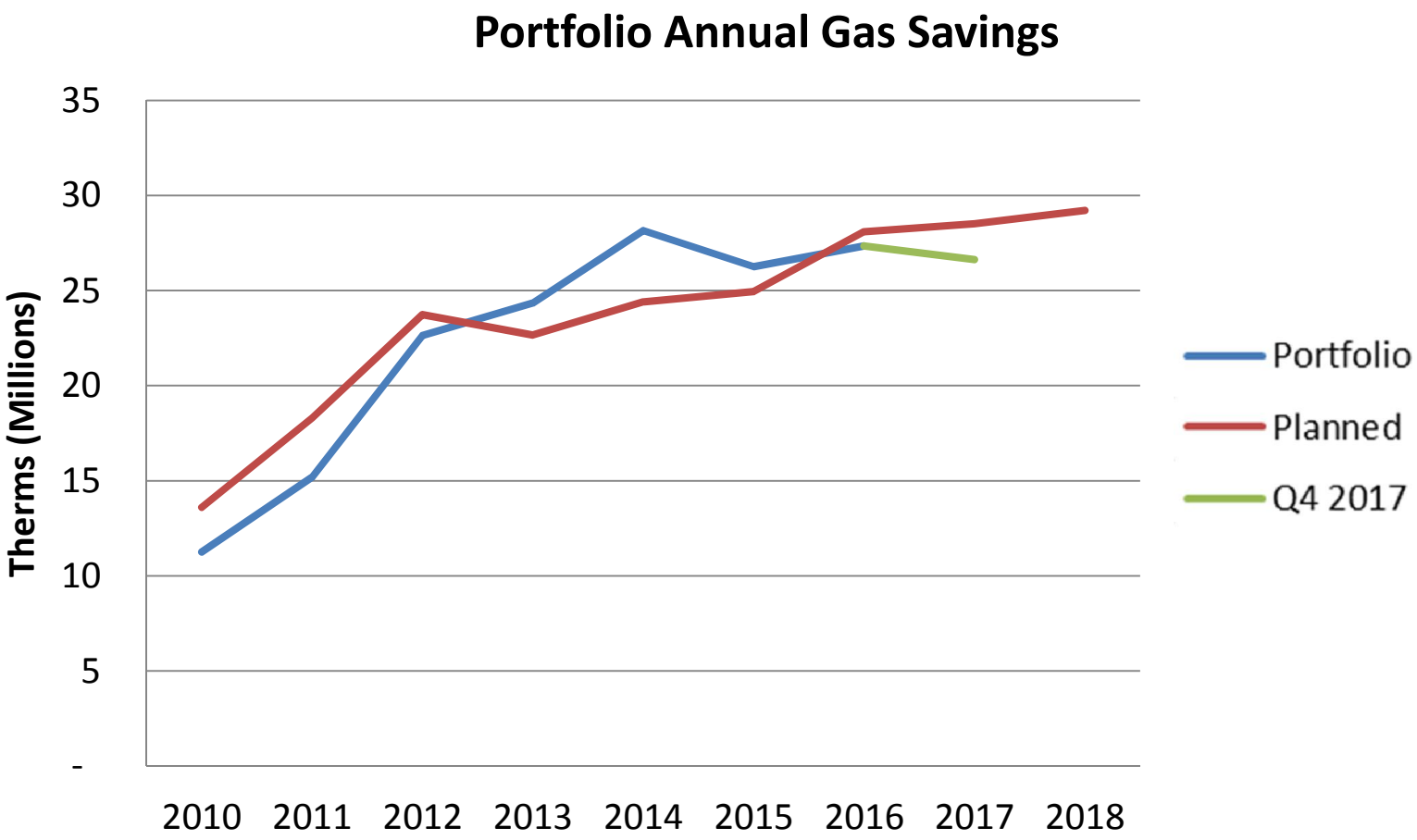


Source: IESO presentation, "Module 3: Conservation and Demand Response Outlook." August 2016

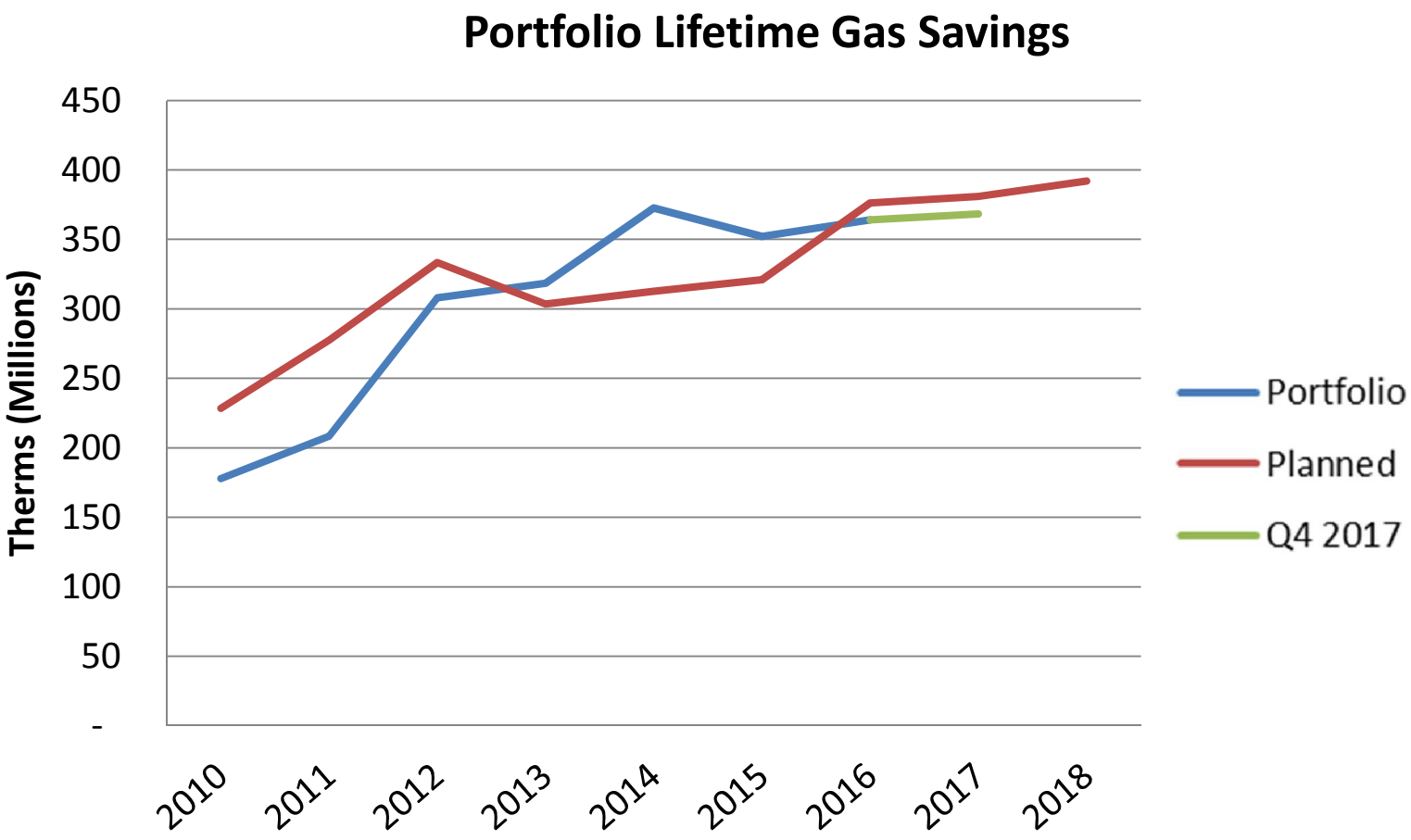
GAS



PORTFOLIO ANNUAL GAS SAVINGS OVER TIME



PORTFOLIO LIFETIME GAS SAVINGS OVER TIME

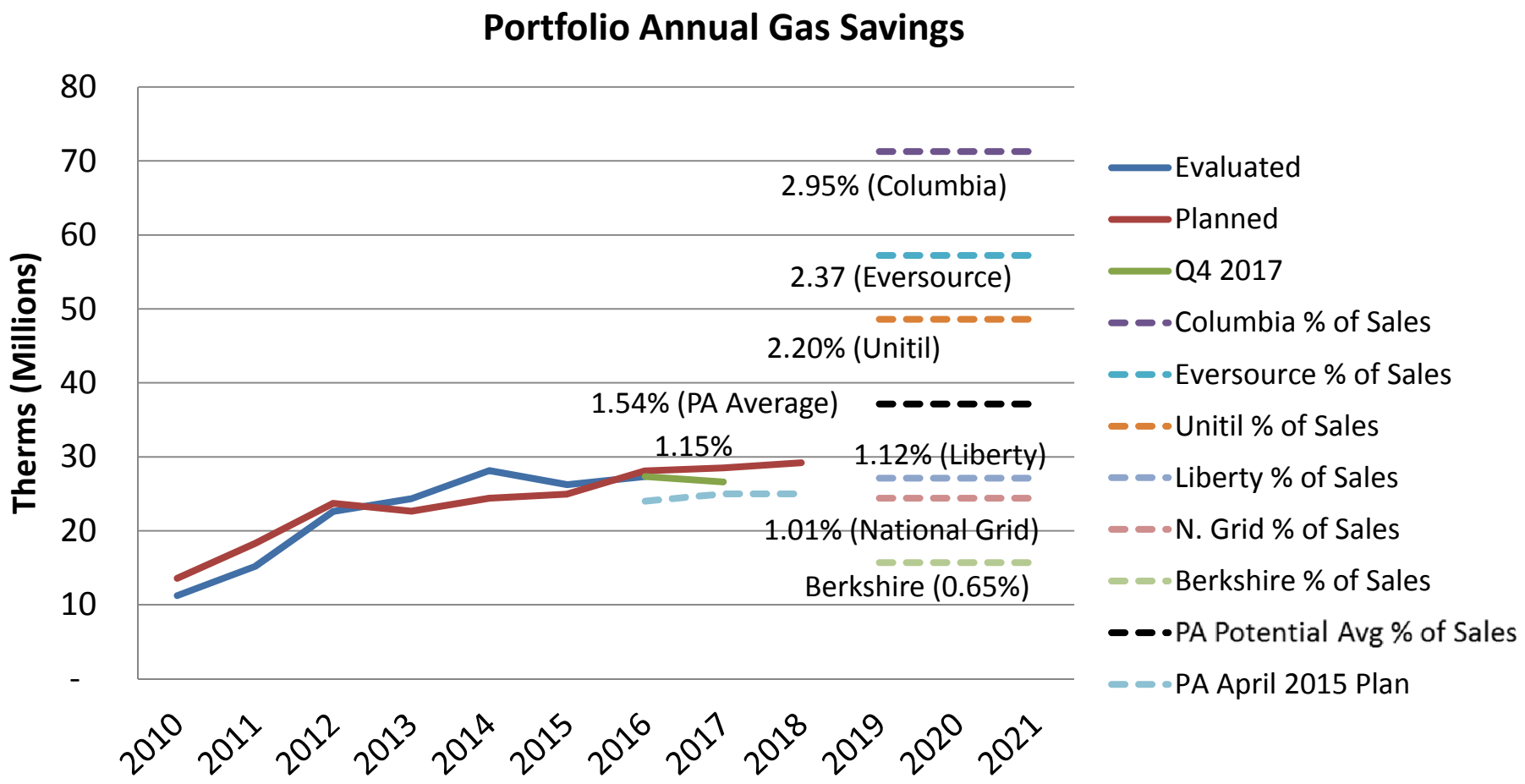


PA POTENTIAL STUDY RESULTS

- **The table below presents 2019-2021 Max achievable annual gas savings as a % of sales**

PA	Contractor	Residential	Low Income	C&I	Portfolio Total
Columbia	Dunsky	3.12%	1.19%	3.21%	**2.95%**
Eversource	Dunsky	3.14%	2.29%	1.84%	**2.37%**
Unitil	GDS	1.04%	1.38%	2.62%	**2.20%**
Liberty	GDS	1.45%	1.33%	0.64%	**1.12%**
National Grid	Navigant	1.07%	2.19%	0.88%	**1.01%**
Berkshire	GDS	0.67%	1.15%	0.58%	**0.65%**
PA Average		**1.81%**	**1.84%**	**1.27%**	**1.54%**
2017 Q4 Reported		**1.22%**	**2.03%**	**0.99%**	**1.15%**

PA POTENTIAL STUDY GAS SAVINGS ESTIMATES COMPARED TO PAST PLANNING PERIODS



CONSULTANT KEY CONSIDERATIONS

Residential

- Behavior
- Program redesign
- Evaluation
- Baseline changes

C&I

- SEM
- Upstream changes
- Evaluation
- Baseline changes

RESIDENTIAL GAS POTENTIAL

Residential Adjustments	Savings as % of Res Sales	Annual therms (2019-2021)
Weighted Average PA Potential Study	**1.81%**	**62 Million**
Behavior	+ 0.40%	+ 13 Million
Program Redesign	+ TBD	+ TBD
Net Changes to Potential	**+ 0.40%**	**+ 13 Million**
Net Potential After Adjustments	**2.20%**	**75 Million**
2017 Q4 Reported Achievement	**1.22%**	**14 Million**
Adjusted Annualized Potential	**2.20%**	**25 Million**

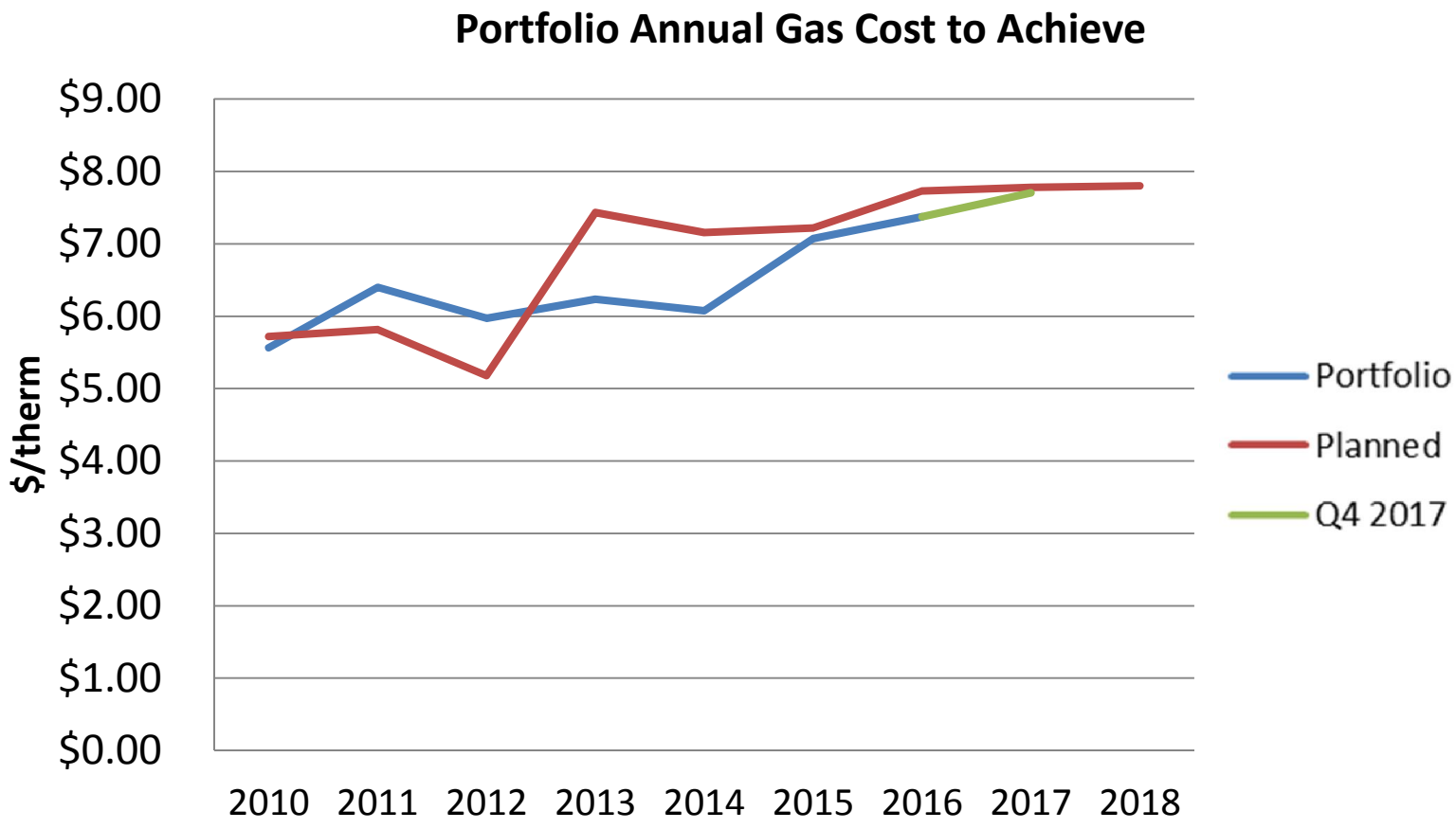
C&I GAS POTENTIAL

Commercial and industrial Adjustments	Savings as % of C&I Sales	Annual therms (2019-2021)
Weighted Average PA Potential Study	**1.27%**	**49 Million**
SEM	+ 0.05%	+ 2 Million
Upstream	+/- TBD	+/- TBD
Evaluation	- 0.09%	- 3.5 Million
Baseline	- 0.09%	- 3.5 Million
Net Changes to Potential	**- 0.13%**	**- 5 Million**
Net Potential After Adjustments	**1.14%**	**44. Million**
2017 Q4 Reported Achievement	**0.99%**	**10.5 Million**
Annualized Potential After Adjustments	**1.14%**	**14.5 Million**

TOTAL GAS POTENTIAL

Portfolio Adjustments	Savings as % of Total Sales	Annual Therms (2019-2021)
Weighted Average PA Potential Study	**1.54%**	**118 Million**
Residential Net Adjustments	+ 0.18%	+ 13 Million
C&I Net Adjustments	- 0.07%	- 5 Million
Net Changes to Potential	**+ 0.11%**	**+ 8 Million**
Net Potential After Adjustments	**1.65%**	**126 Million**
2017 Q4 Reported Achievement	**1.15%**	**27 Million**
Adjusted Annualized Potential	**1.65%**	**42 Million**

PORTFOLIO ANNUAL GAS COST TO ACHIEVE OVER TIME

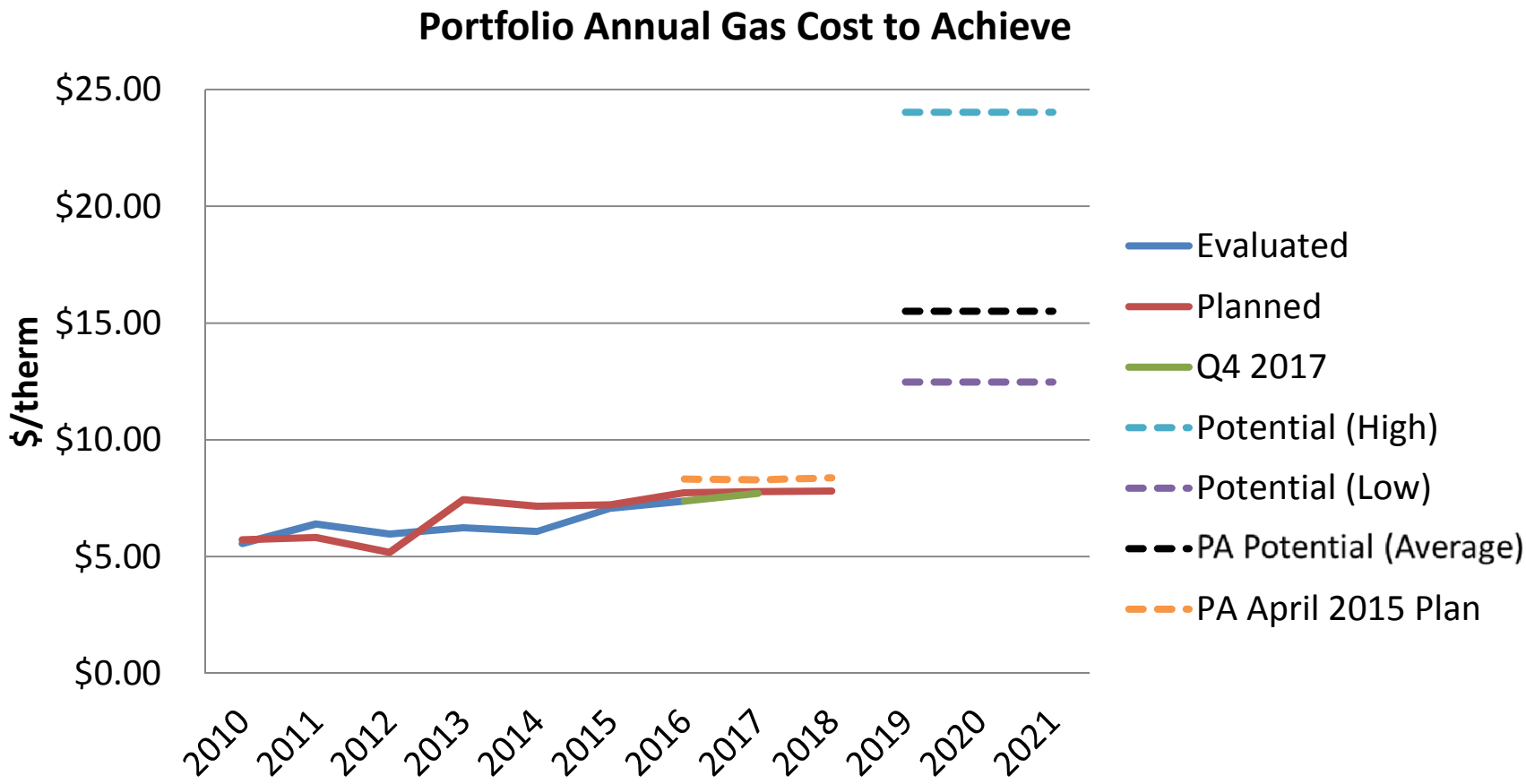


PA POTENTIAL STUDY GAS COSTS TO ACHIEVE

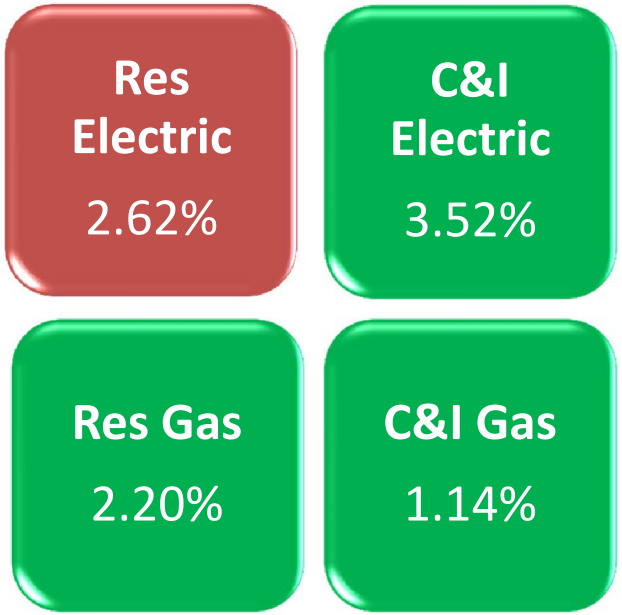
- The table below presents 2019-2021 Max achievable annual gas costs to achieve ($/therm)

PA	Residential	Low Income	C&I	Portfolio Total
Eversource	N/A	N/A	N/A	$24.02
National Grid	$14.36	$30.57	$7.49	$12.60
Columbia	N/A	N/A	N/A	$12.48
Berkshire	N/A	N/A	N/A	N/A
Liberty	N/A	N/A	N/A	N/A
Unitil	N/A	N/A	N/A	N/A
PA Average	N/A	N/A	N/A	$15.51
2017 Q4 Reported	$8.32	$20.12	$4.20	$7.70

PA POTENTIAL STUDY GAS COST TO ACHIEVE ESTIMATES COMPARED TO PAST PLANNING PERIODS



PORTFOLIO



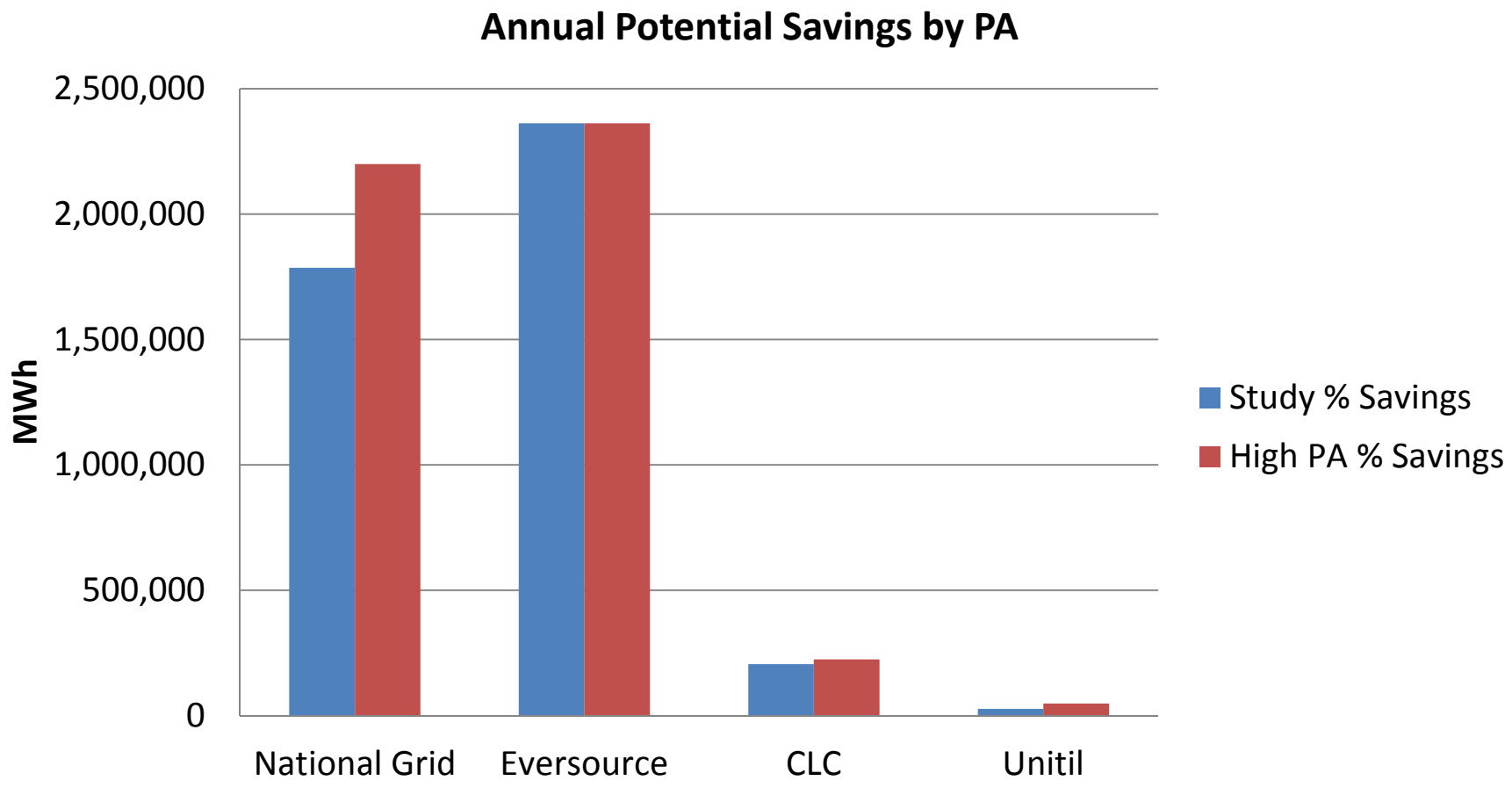
THANK YOU

Questions?

RESIDENTIAL CONSIDERATIONS: LIGHTING

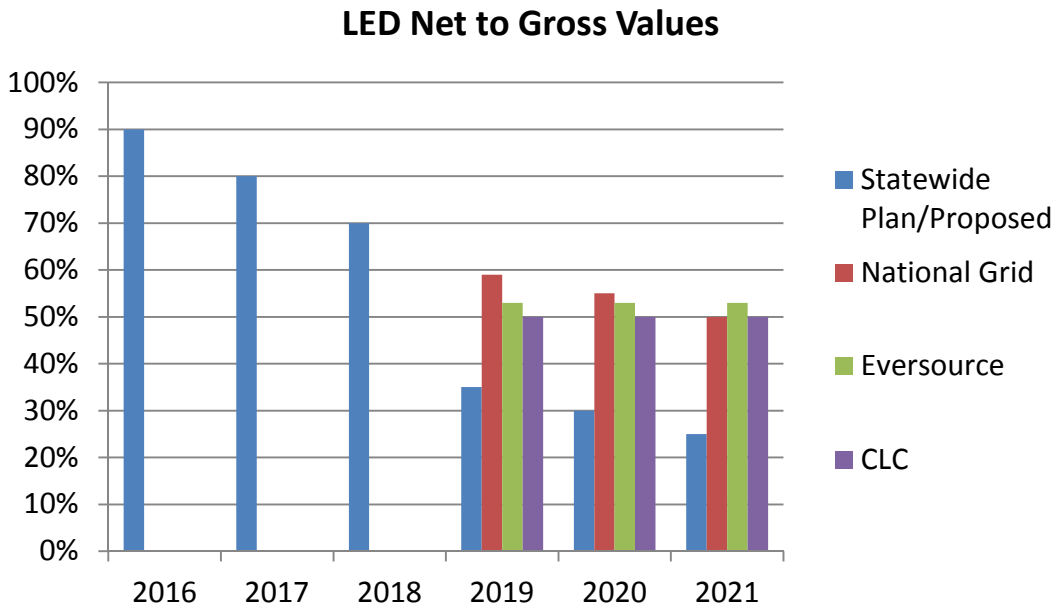
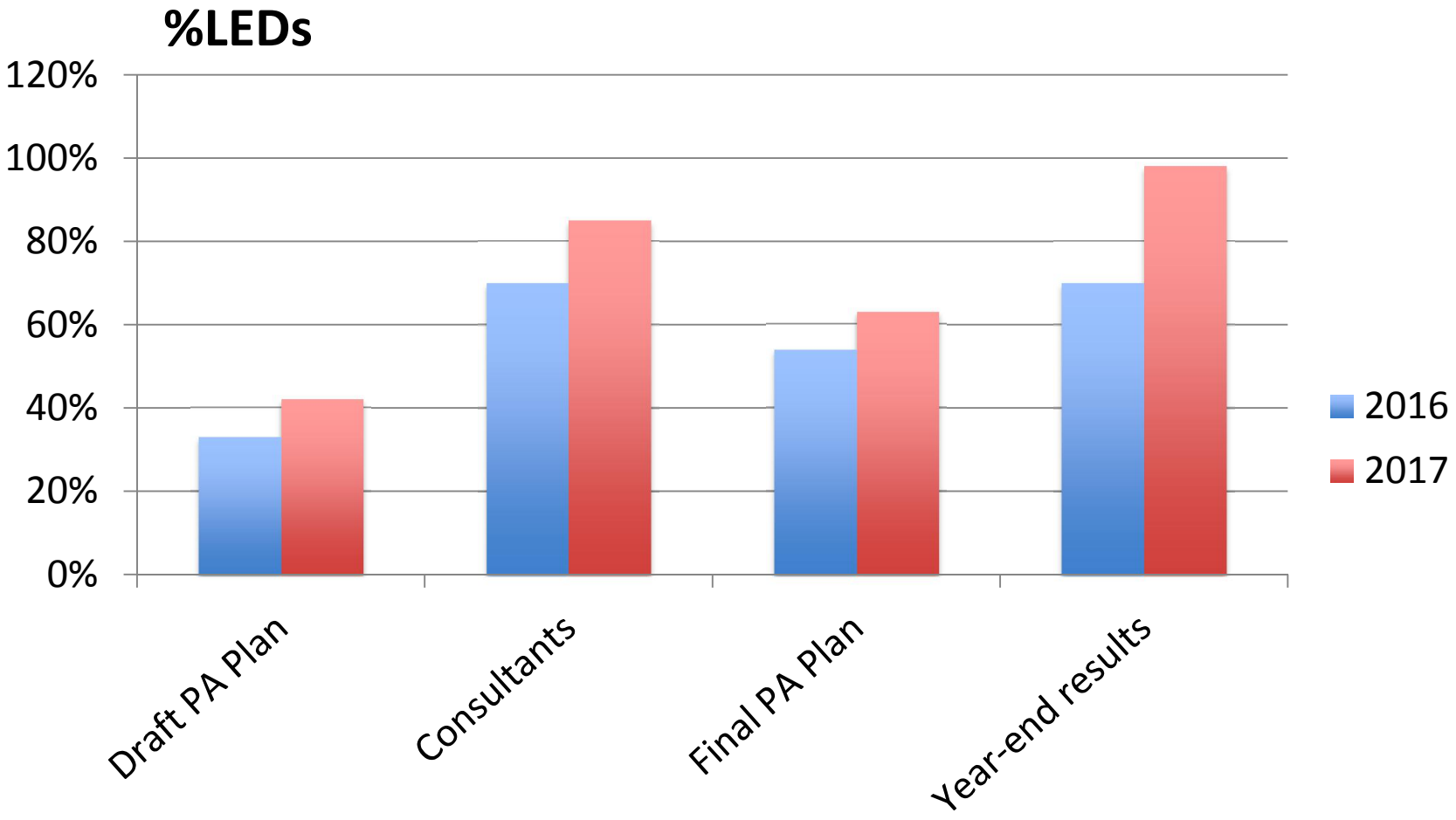
- Consultants estimate even steeper lighting savings drop than Eversource potential study
- By 2021, total annual lighting savings are projected to decline by ~82% compared to 2017
- Would result in a ~64% reduction in total Residential annual electric savings in 2021 compared to 2017
- PA studies did not incorporate most recent evaluation findings into their results
- 2019-21 evaluation agreed-to values are much lower (~50% vs 35% and declining) than assumed in PA potential studies
- Further, PA study lighting NTG values vary

INDIVIDUAL PA POTENTIAL COMPARED TO HIGHEST PA ESTIMATE OF POTENTIAL



RESIDENTIAL CONSIDERATIONS: LIGHTING

- While PA studies anticipated reductions in lighting net to gross, 2019-2021 evaluation agreed-to values are much lower
- Further, PA study lighting NTG values vary



PROGRAMS INSTALLED A GREATER PROPORTION OF LEDS THAN PAS PLANNED