



C&I Evaluation: *Recent Results and New Research Activities and Approaches*

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The C&I sector constitutes about 86% (electric kWh) and 45% (gas therms) of our total net lifetime savings planned for 2019-2021.¹ Given this context, we will cover:

- Improving our C&I programs through evaluation
- Improving and correcting savings estimates
- Capturing additional program benefits

Notes:

(1) Source: *MA Joint Statewide Electric and Gas Three-Year Energy Efficiency Plan 2019-2021*, Exhibit 1, Appendix C – Electric, Savings Summary Table, Statewide Electric, page 31 of 43; and Exhibit 1, Appendix C – Gas, Savings Summary Table, Statewide Gas, page 26 of 36; October 31, 2018.

In terms of annual net savings, 67% (electric) and 42% (gas). In terms of total benefits, including GWSA, 66% (electric, page 25 of 43) and 37% (gas, page 20 of 36).

Improving Our Programs



The PAs have responded to our evaluation results by implementing program improvements that boost savings and increase adoption of high efficiency equipment:

- Evidence of high free-ridership from our Upstream HVAC Net-to-Gross evaluation led the PAs to make their incentives more visible to customers (not just distributors);
- For upstream mini-split heat pumps, the PAs adjusted their incentive structure to favor higher efficiency equipment; and
- For upstream gas water heating equipment, the PAs raised their efficiency requirements.

Water Heater Type	Size	Efficiency Requirement	
		Old	New
Storage	< 75 Mbtuh	0.67 EF	94% TE
	≥75 Mbtuh	90% TE	
Tankless	< 200 Mbtuh	0.82 EF	0.94 EF or 0.91 UEF
	< 200 Mbtuh	0.90 EF	
Volume	≥ 75 Mbtuh	85% TE	94% TE
	≥75 Mbtuh	90% TE	
EF = Energy Factor TE = Thermal Efficiency UEF = Uniform Energy Factor			

Improving and Correcting Savings Estimates



The savings that the PAs had planned for PY2019 will be affected by the results of our recent C&I custom measure impact studies:

- **Gas:** Statewide, evaluated net lifetime savings will be about **3% more** than planned (custom measures represent about 72% of the gas C&I portfolio).

Gas	Columbia	Eversource	National Grid	Berkshire, Liberty, & Unitil
Estimated change in planned net lifetime savings, C&I sector, PY 2019 ¹	+6.4%	-9.0%	+9.1%	-3.8%
	+3.0%			

- **Electric:** Statewide, evaluated net lifetime savings will be about **5% lower** than planned (custom represents about 32% of the electric C&I portfolio).
 - The PAs are anticipating further losses due to faster than forecasted market adoption of linear LEDs

Electric	Eversource	Cape Light	National Grid	Unitil
Estimated change in planned net lifetime savings, C&I sector, PY2019 ¹	-7.0%	-2.1%	-3.3%	-3.8%
	-5.2%			

Notes: (1) Reflects preliminary, draft impact study results. Excludes CHP and comprehensive whole-building design measures. 4

Improving and Correcting Savings Estimates



From these studies, the PAs have learned that:

- Some savings estimates can be readily improved through better verification of pre-existing conditions, refining key operating assumptions (hours of use, equipment loads), and updating statewide calculation tools (steam traps)
 - The PAs are implementing changes now, including possibly instituting an *ex-ante* evaluation review process
- Upon inspection on-site, some measures had been inexplicably removed and a manufacturing facility had ceased operation
 - The PAs are investigating how best to mitigate or account for these instances

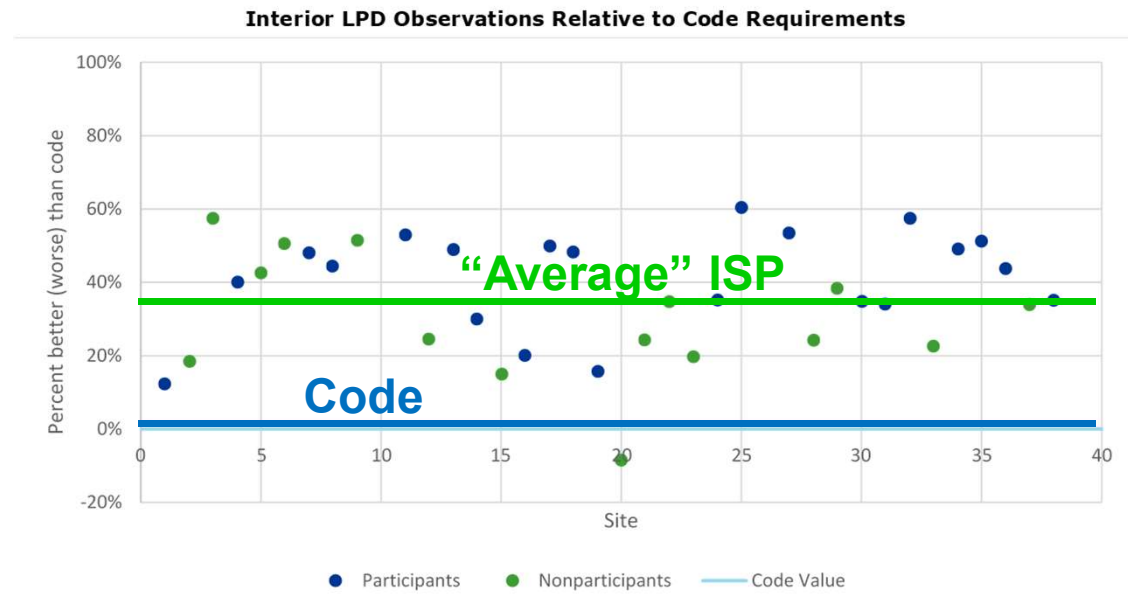
We have also moved to a “**rolling**” impact analysis framework (for custom gas and electric, small business electric, and upstream lighting measures), which will allow for more timely application of results and improvement of savings estimates.

Improving and Correcting Savings Estimates



An evolving source of the savings discrepancy is baseline adjustments, particularly those made to reflect industry standard practice (ISP).

- ISP did not materially affect the results of the recent custom impact studies; yet
- We recognize the need to engage more closely with implementation as research on and application of ISP-based baselines progress more deliberately and comprehensively, affecting program delivery and savings.



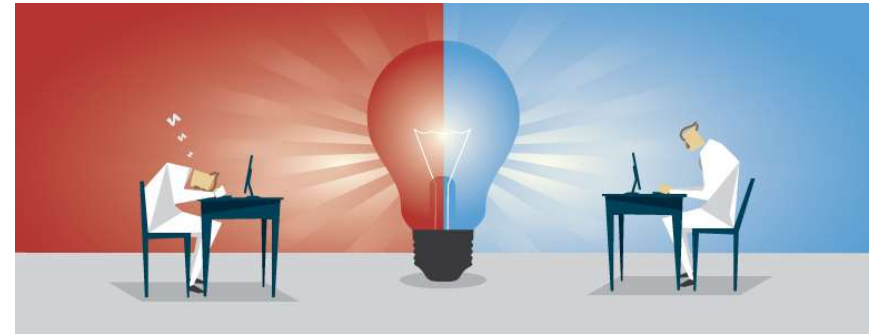
Source: DNV GL (2018), *P70 – MA Commercial Energy Code Compliance and Baseline Assessment for IECC 2012*, March 20.

Capturing Additional Program Benefits



Finally, to better understand and claim a more robust suite of the benefits produced by our C&I programs, we just re-initiated research to:

- Identify and prioritize opportunities to augment or update the non-energy impacts (NEIs) we currently claim and develop research techniques towards quantifying them; and
- Conduct a literature review of possible health, safety, and education-related NEIs such as improved worker and student comfort, safety, and productivity or performance from energy-efficient lighting, HVAC, and weatherization.



Source: University of North Carolina, Kenan-Flagler Business School, "How Lighting Affects the Productivity of Your Workers," September 11, 2017, <https://onlinemba.unc.edu/blog/how-lighting-affects-productivity/>

Thank you



Appendix

Custom Gas Impact Study Results (*Preliminary*)



Net lifetime savings = Gross savings originally estimated x **realization rate (RR)** x measure life x net-to-gross (NTG) ratio

RR = evaluated savings / *ex-ante* or original savings estimate

Realization Rates Custom Gas	Columbia	Eversource	National Grid	Berkshire, Liberty, & Unitil
Current RR	73%	92%	78%	88% ¹
New RR (retrospective, PY2018)	64%	76% ¹	85%	76% ¹
New RR (prospective, PY2019) ²	80%	82% ¹	88%	82% ¹

Notes:

(1) Reflects these PAs' adoption of an aggregate, statewide evaluation result.

(2) Provided further evaluation shows that the PAs have universally adopted the updated estimation tool for steam traps (see slide 5). The final RRs for PY2019 will also be based on the next set of evaluation results from the PAs' new rolling sampling approach.

Custom Gas Impact Study Results (*Preliminary*)



GAS PA RR, Savings and Benefits Changes	Columbia	Eversource	National Grid	Berkshire, Liberty, & Unitil	Statewide
<i>PY2019 estimates, custom gas measures (excluding comprehensive design)</i>					
Current RR New RR ¹	73% 80%	92% 82% ²	78% 88%	88% ² 82% ²	
Affected planned net lifetime savings/total benefits (as a % of C&I)	63.5% 56.7%	83.1% 82.2%	71.1% 61.0%	56.0% 52.8%	72.0% 65.5%
Estimated change in planned C&I sector-wide net lifetime savings/total benefits	+6.4% +5.7%	-9.0% -8.9%	+9.1% +7.8%	-3.8% -3.6%	+3.0% +2.0%
Notes: (1) Provided further evaluation shows that the PAs have universally adopted the updated estimation tool for steam traps (see slide 5). The final RRs for PY2019 will also be based on the next set of evaluation results from the PAs' new rolling sampling approach. (2) Reflects these PAs' adoption of an aggregate, statewide evaluation result.					

Custom Electric Impact Study Results (Preliminary)



ELECTRIC PA RR, Savings and Benefits Changes	Eversource	Cape Light	National Grid	Unitil	Statewide
<i>PY2019 estimates, lighting custom electric measures</i>					
Current RR New RR ¹	102% 88%	98% ² 92% ²	98% 97%	98% ² 92% ²	
Affected planned net lifetime savings/total benefits (as a % of C&I)	18.3% 22.4%	16.3% 11.4%	15.1% 18.3%	9.2% 9.6%	16.7% 20.0%
Estimated change in planned C&I sector-wide net lifetime savings/total benefits	-2.5% -3.1%	-0.9% -0.7%	-0.2% -0.2%	-0.5% -0.5%	-1.4% -1.7%
<i>PY2019 estimates, non-lighting custom electric measures (excluding CHP and comprehensive design)</i>					
Current RR New RR ¹	31% to 134%, depending on end use 64% or 67%, assuming a -25% RR change below:				
Affected planned net lifetime savings/total benefits (as a % of C&I)	18.1% 19.4%	4.5% 2.7%	12.7% 11.9%	12.9% 10.8%	15.3% 15.3%
Estimated change in planned C&I sector-wide net lifetime savings/total benefits	-4.5% -4.9%	-1.1% -0.7%	-3.2% -3.0%	-3.2% -2.7%	-3.8% -3.8%
Notes: (1) Reflects retrospective RRs being applied to PY2018 as prospective RRs for PY2019 are not yet available. (2) Reflects these PAs' adoption of an aggregate, statewide evaluation result.					