Optimal ENERGY Integrated Energy Resources

INTRODUCTION

In his January 2018 *State of the State*, Governor Cuomo announced his intent to present new statewide energy efficiency goals for the building sector by Earth Day (April 22, 2018).[1] These goals are expected to address total energy savings to be achieved by 2025. This document is intended to inform the development and promulgation of these goals to ensure that New York strives to capture all achievable energy efficiency potential from all fuels and restore New York's past role as a leader in energy efficiency. Capturing all cost-effective and achievable efficiency will be critical to support New York in meeting its renewable energy goal of 50% by 2030.[2] Any goal or goals that are established must be clear, objective, and have specific components with sub-goals and clear roles and responsibilities for achieving them. Without these details, no single entity will have responsibility for meeting the goals or clear direction as to what their contributions should be.

The remainder of this document presents guidance on developing the goals to be announced on Earth Day and the achievable potential for different components of any goal. We break out the achievable potential into three main categories, for which we recommend establishing sub-goals with clear roles and responsibilities. These categories are:

- **Electric efficiency programs –** This includes all program and market transformation efforts that could be undertaken by the electric investor-owned utilities, the State authority electric utilities (NYPA and LIPA), NYSERDA, and potentially municipal utilities (most of whom rely on NYPA for power and could be encompassed by NYPA efforts).
- **Gas efficiency programs –** This includes all program and market transformation efforts that could be undertaken by the gas utilities in the State, as well as NYSERDA.
- **Codes and standards –** This includes efficiency savings that can be captured from New York aggressively pursuing the adoption of recommended State efficiency standards for various equipment and prompt adoption of updated national model building energy codes as they are created.

BRIEF HISTORY OF NEW YORK PAST ACHIEVEMENTS AND CURRENT PLANS

New York's current energy efficiency activities resulted from a 2008 order from the New York Public Service Commission (PSC) establishing an Energy Efficiency Portfolio Standard, which included efficiency targets for NYSERDA, the state investor-owned utilities (IOUs), and other

1 *2018 State of the State*, at pg. 301. https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/2018-stateofthestatebook.pdf

2 The greater the level of efficiency savings, the lower the total demand for electricity, and therefore the smaller amount of renewable resources needed to reach the 50% target.

state entities.[3] These targets were established with the goal of achieving a 15% reduction in projected electricity consumption by 2015. The overall goal was allocated to various entities, with large portions of responsibility going to NYSERDA, LIPA/NYPA, and from increased codes and standards. By 2010, utility and NYSERDA programs were filed that set annual utility targets at about 0.5% of electric sales, with NYSERDA savings increasing to about 1.2% of sales in 2012.[4],[5]

However, this situation created some customer confusion and inefficiencies between NYSERDA and the IOU programs, so NYSERDA has since moved away from incentive programs to focus on market transformation and low-income sector activities. In the meantime, utility targets have stayed relatively level and are not expected to significantly rise in the 2018-2021 timeframe. As of 2016, EIA data shows statewide electric savings of 1.0% of sales including NYSERDA, or 0.7% of sales without NYSERDA. This significantly lags surrounding New England states; 2016 net savings were 1.2% in Maine, 1.5% in Connecticut, 2.4% in Vermont, 2.8% in Massachusetts, and 2.8% in Rhode Island.[6]

The situation is very similar for natural gas savings programs and targets. In January 2016, the PSC signed orders essentially keeping NYSERDA and IOU gas savings targets the same as they have been in the past, though as on the electric side, the IOUs are free to apply for expansion programs that would save more than the targets set by the order. Total annual savings comes to about 0.3% of sales, with NYSERDA's contribution making up almost half of the total.[7] As on the electric side, this significantly lags behind the savings of most of New York's New England peers. Here, 2015 net savings were 0.14% in Maine, 0.4% in Connecticut, 0.7% in Vermont, 1.0% in Massachusetts, and 1.0% in Rhode Island.[8] Historically, there has not been much efficiency program activity in New York for unregulated fuels.

SETTING AN OVERALL GOAL AND METRICS/EM&V

The intent of any overall building efficiency goal is that it be fuel-neutral, allowing for efficiency and fuel-switching across all energy sources to minimize overall primary (source) energy consumption. It is generally recognized that to meet ultimate climate and efficiency goals significant fossil fuel building thermal loads will need to be converted to electricity which is then ultimately generated largely by carbon-free renewables. This "beneficial electrification" would draw on a primarily decarbonized electric grid, providing both source energy and carbon savings.

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3 See order on 23 June 2008, http://www3.dps.ny.gov/W/PSCWeb.nsf/All/06F2FEE55575BD8A852576E4006F9AF7?OpenDocument

4 *Aiming Higher: Realizing the Full Potential of Cost-Effective Energy Efficiency in New York*. Prepared for Natural Resources Defense Council by Synapse Energy Economics. 22 April 2016.

5 Unless otherwise specified, all energy savings quantities and percentages in this report are presented in terms of net, rather than gross, savings. Briefly, this means that savings have been adjusted to account for the effects of free-riders, market spillover, and other evaluated effects that result in net-to-gross ratios different from 1.0.

6 *The Regional Energy Efficiency Database (REED)*. Developed by Northeast Energy Efficiency Partnership (NEEP). https://reed.neep.org. Note that in 2014, Rhode Island achieved 3.5% savings.

7 NYSERDA savings from PSC Order Authorizing The Clean Energy Fund Framework, Jan 21, 2016. p. 47. IOU savings from PSC Order Authorizing Utility-Administered Energy Efficiency Portfolio Budgets and Targets For 2016-2018. Jan 22, 2016 p. 9. Total Statewide usage from EPA State Energy Profile. https://www.eia.gov/state/?sid=NY#tabs-1.

8 *REED*.

Therefore, we propose a fuel-neutral goal that would permit utilities and NYSERDA to pursue total energy savings from unregulated as well as regulated fuels, and count all energy savings toward compliance with their overall goal. Below we present goals for electric efficiency reductions in both electric units (MWh) and converted to million British thermal units (MMBtu) based on the New York grid current average generation efficiency.[9]

New York has traditionally established goals in terms of a percentage reduction in electric or natural gas sales from an historic baseline year, as with the "15 by 15" reduction described above. More recently, Governor Cuomo established Executive Order 88 which calls for all New York State Agencies to achieve efficiency improvements (as measured by total energy consumed per square foot of building space) of 20% below 2010 actual energy use.[10]

Given New York's history of goal framework, and that a simple and straightforward percentage savings from some baseline consumption level is likely easy to explain and for the public to understand, we recommend this approach be continued. However, we also recognize some significant challenges with this approach. One challenge is that natural market trends and a growing economy could potentially alter current consumption levels and patterns, which may be difficult to properly adjust for. Given this dynamic, it will be important for the State to thoughtfully include mechanisms to account for such shifting trends as they arise in order to achieve its goals. For example, if a target of a 20% reduction from 2017 historic consumption was established, the State could be successful at capturing the level of efficiency savings that this implies, but at the same time see growing overall energy consumption from growth in electric vehicles, increasing plug loads and building energy intensity, and construction of large new data centers. This would mask any effective capture of efficiency savings.[11]

It is important that any energy efficiency goal meet the following objectives:

- Be clearly communicated and objectively understood by all stakeholders
- Set a clear trajectory of savings that will establish an aggressive and achievable general road map to fully meeting the goal(s)
- Have performance toward the goal be transparent to the public and objectively monitored and verified with reasonable certainty, while minimizing administrative or other burdens
- Fully support and facilitate a fuel-neutral approach to energy use in buildings, including consideration of the primary source energy inputs for electric generation in New York

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[9] We use a constant statewide marginal heat rate of 9,500 Btu/kWh to convert reductions in electric consumption into reductions in primary energy usage within the generation system, based on a review of NYISO data. To the extent that this rate decreases between now and 2025 as a result of increasing penetration of renewable energy sources, our total building energy savings targets may need to be adjusted downward.

[10] *New York State Executive Order No. 88: Directing State Agencies and Authorities to Improve the Energy Efficiency of State Buildings*. 28 December 2012

[11] In fact, this has been and continues to be a significant challenge for NYPA and the State Agencies to determine true progress toward EO88.

- Serve all customer classes, including commercial, industrial, and residential (in particular, low-income customers and residents of affordable multifamily housing)

Given the challenges associated with monitoring and verification (M&V) of savings when significant shifts in forecast energy consumption are likely to occur, we recommend considering a two-tiered approach. The current framework established by the PSC for M&V of utility and NYSERDA program savings—which is also generally consistent with industry practice—is to track and count efficiency savings from programs in a "bottom-up" fashion based on the actual measures and activities occurring in the programs. We expect this will continue, and there are numerous other reasons the PSC, utility, NYSERDA, and the State should be monitoring the effectiveness, impacts and cost-effectiveness of these programs in the future. As a result, while the ultimate goal will be an overall observed reduction in total energy use in buildings by 2025 (as compared to an actual, but adjusted where appropriate, baseline), this utility and NYSERDA program savings data can be both a timely check on the progress of programs in meeting their component of the goal(s), but also significantly inform the overall efficiency achieved and most appropriate way to adjust for exogenous changes in energy consumption.

In addition to establishing an overall goal, with clear subcomponents and roles and responsibilities, we recommend that New York State, in coordination with the PSC and utilities, develop appropriate performance incentive mechanisms for achieving the goals. Currently some utility shareholder performance incentives exist, and this framework can be adapted as appropriate. Any incentives should be sufficient to encourage aggressive pursuit of meeting or exceeding goals, and be scalable in a way that exceeding the goals provides additional "bonus" incentives. Because the programmatic efforts of the utilities and NYSERDA overlap geographically, and to avoid any disincentives for effective joint efforts and cooperation, we recommend that the utilities be rewarded based on total progress toward goals in their territories, including any impacts driven primarily or solely by NYSERDA, code and standards, etc. Integrating the efforts of NYSERDA and the utilities to deliver efficiency savings in the most effective way will be an important factor in reaching the proposed targets, and utility performance incentives should not hinder this integration. Finally, while financial performance incentive awards may not be appropriate for NYPA or LIPA, or the municipal utilities NYPA serves, consideration should be given to how the state will monitor and reward/penalize the authorities based on performance.

ELECTRIC PROGRAMS

New York should ramp up electric efficiency programs from the current level of savings (approximately 1% of consumption per year) to over 3% per year. This tripling of efficiency is achievable, as discussed below. We estimate average annual potential between now and 2025 in New York to be about 3.15% of electric load each year, as shown in Table 1 below.

Table 1 | New York Estimated Average Annual Electric Potential through 2025

Portfolio and Adjustments	Savings as % of Sales
Weighted Average PA Potential Study	3.29%
Residential Net Adjustments	-0.29%
C&I Net Adjustments	0.15%
Net Changes to Potential	-0.14%
Annualized Potential After Adjustments	*3.15%*

This estimate draws from our review of a number of data sources and potential studies. While New York's most recent comprehensive potential study completed in 2013 was considered,[12] the most weight is given to an in-depth analysis of four recently completed electric efficiency potential studies for Massachusetts that assess the remaining opportunities in that state.[13] These reflect the latest assessments of potential based on current and expected equipment baselines and future codes and standards, as well as the significant efficiency already captured. Massachusetts has delivered more aggressive efficiency programs than New York State since at least the late 1990s. Therefore, these levels should be readily achievable in New York, where the current levels of efficiency are lagging behind Massachusetts. Further, the shares of sector-specific (residential, commercial and industrial) electric loads in each state are virtually identical, and the overall building stock and climate are very similar. Therefore, we feel comfortable that the results of these studies are relevant to the potential in New York.

Each of the four Massachusetts studies was assessed to determine what, if any, opportunities were omitted. The analysis then included appropriate adjustments to recognize additional potential from those omissions, as well as other adjustments related to expected market and codes and standards changes in the near future. Further, as shown in Figure 1, Massachusetts has been capturing approximately 3% savings per year in actual savings and underwent a rapid increase from historic levels of about 1.5% per year. New York utilities are currently already assessing increasing efficiency activity through expanded program filings with the PSC; we assume this can be accelerated to an average annual increase of 0.4% of load per year. This would achieve the target savings of 3.15% of consumption by 2025. Table 2 presents the electric savings that would result by 2025 from capturing this level of savings in New York; Figure 2 shows this represented graphically.

12 *Energy Efficiency and Renewable Energy Potential Study of New York State. Final Report*. Prepared for NYSERDA by Optimal Energy, Inc. NYSERDA Report 14-19, April 2014. https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/EERE-Potential-Studies

13 Presentation on results of this analysis available at http://ma-eeac.org/wordpress/wp-content/uploads/2019-2021-AoP-Presentation-032918-Final.pdf.

Figure 1 | Massachusetts Annual Electric Savings

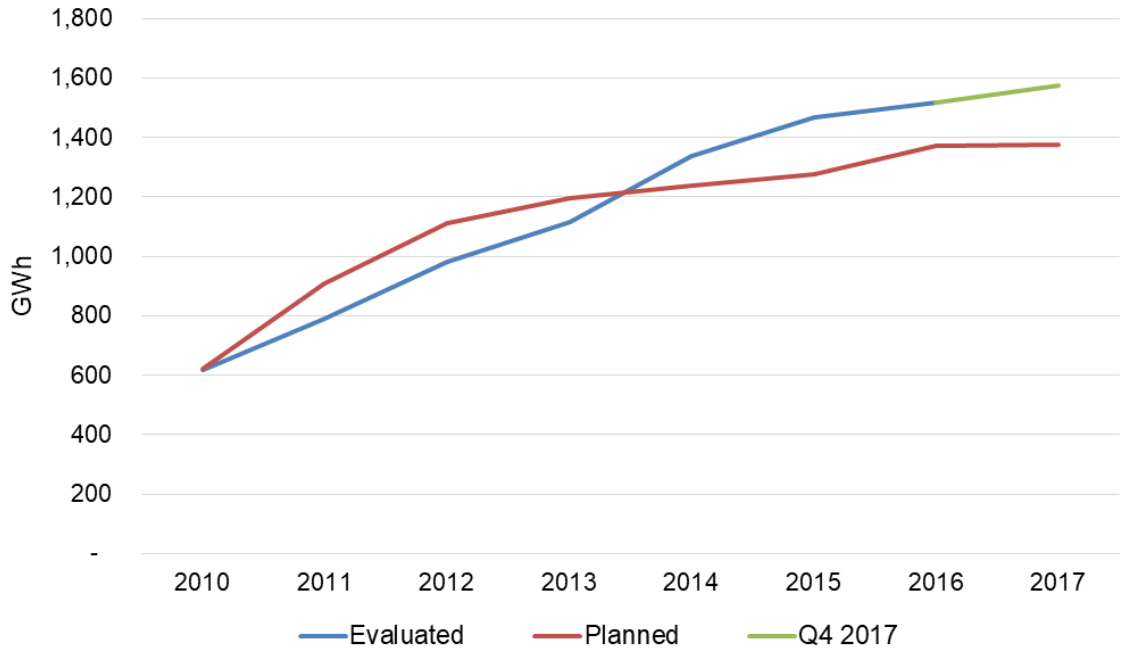
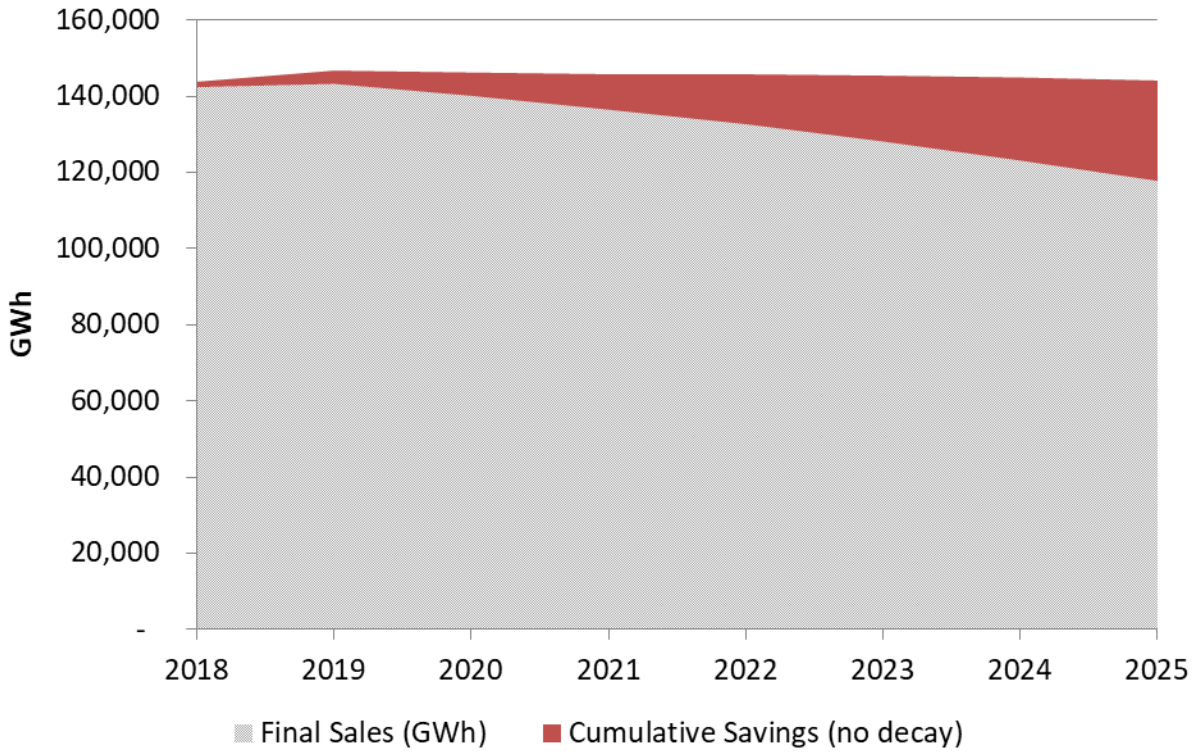


Table 2 I New York Electric Sales and Efficiency Potential

Year	Sales Forecast (GWh)	Savings %	Savings (GWh)
2018	143,820	1.00%	1,438
2019	146,748	1.40%	2,054
2020	146,239	1.80%	2,632
2021	145,805	2.20%	3,208
2022	145,783	2.60%	3,790
2023	145,421	2.87%	4,170
2024	144,942	3.13%	4,539
2025	144,133	3.15%	4,542
		Cumulative Savings	***26,373***

Figure 2 | New York Electric Sales Forecast with Efficiency



We also are proposing a single, overall fuel-neutral efficiency goal, and New York should have a goal of eventually converting its unregulated fossil fuel thermal loads to electricity to save both source energy and carbon (as well as capturing any appropriate efficiency savings from any fossil fuel loads remaining). Furthermore, we think pursuing these unregulated fuel savings is most appropriately incorporated into the overall energy goals of NYSERDA and the electric utilities. We developed achievable savings from unregulated fuels based on the analysis of natural gas savings described below. Table 3 shows the total combined goal appropriate for NYSERDA and the electric utilities, with electric savings converted to source energy equivalent units.[14]

14 Using a constant statewide marginal heat rate of 9,500 Btu/kWh to convert reductions in electric consumption into reductions in primary energy usage within the generation system, based on a review of NYISO data. To the extent that this rate decreases between now and 2025 as a result of increasing penetration of renewable energy sources, our total building energy savings targets may need to be adjusted downward.

Table 3 I New York Electric Sector Efficiency Potential in BBtu

Year	Electric Savings (GWh)	Electric Savings (converted to BBtu)	Delivered Fuel Savings (BBtu)	Total Electric Sector Savings (BBtu)
2018	1,438	13,663	188	13,851
2019	2,054	19,518	443	19,960
2020	2,632	25,007	677	25,684
2021	3,208	30,473	918	31,391
2022	3,790	36,008	1,167	37,176
2023	4,170	39,613	1,397	41,010
2024	4,539	43,118	1,624	44,742
2025	4,542	43,148	1,848	44,997
			Cumulative Savings	***258,810***

GAS PROGRAMS

Typically, the total opportunities for savings of natural gas, on a percentage of load basis, are lower than for electricity. Based on the same analysis described above for the electric sector, we estimate achievable gas program potential to be approximately 1.65% of load per year (Table 4). At the current levels of only 0.27%, Figure 3 and Table 5 show the trajectory if NYSERDA and the gas utilities ramped up to 1.65% in the same time period as the ramp-up in electric program goals. Because the long-term goal is to move away from fossil fuel consumption in New York, we limit the gas program goals to purely efficiency reductions of existing and forecast gas loads, and do not include any Btu savings from other fuels. Achieving this trajectory would result in total reductions in gas loads of 14 million MMBtu in 2025. This savings would of course continue to pay dividends because the vast majority of efficiency measures installed will continue to produce energy and carbon savings into the future.

Table 4 | New York Estimated Average Annual Gas Potential through 2025

Portfolio Adjustments	Savings as % of Sales
Weighted Average PA Potential Study	1.54%
Residential Net Adjustments	0.18%
C&I Net Adjustments	-0.07%
Net Changes to Potential	0.11%
Annualized Potential After Adjustments	*1.65%*

Figure 3 | New York Gas Sales Forecast with Efficiency

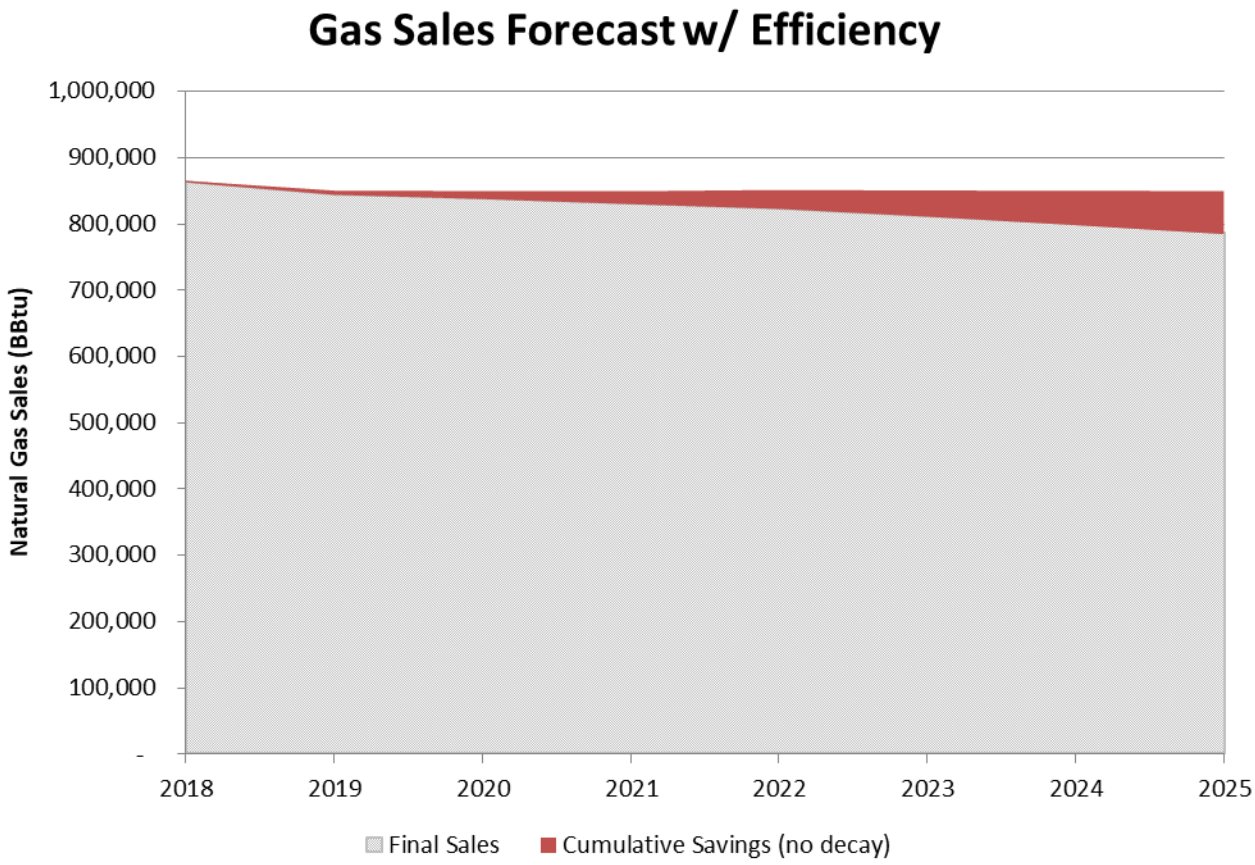


Table 5 I New York Gas Sector Efficiency Potential Potential in BBtu

	Sales Forecast (BBtu)	Savings %	Savings (BBtu)
2018	865,198	0.27%	2,364
2019	850,517	0.47%	4,025
2020	849,772	0.67%	5,721
2021	849,527	0.87%	7,419
2022	851,531	1.07%	9,139
2023	850,590	1.27%	10,830
2024	850,316	1.47%	12,527
2025	849,770	1.65%	14,021
	Cumulative Savings		***66,047***

CODES AND STANDARDS

Impacts from codes and standards are assumed to take effect beginning in January 1, 2020. The sections below describe our analysis of both federal and state appliance standards and the potential for savings from building code enhancements.

Quantifying State Standards

In 2017, the Appliance Standards Awareness Project (ASAP) in collaboration with American Council for an Energy-Efficient Economy (ACEEE) published recommended expanded energy standards and associated potential savings for 21 different appliances.[15] These standards amounted to a cumulative savings of over 10% of New York sales by 2035. In order to assess 2020-2025 impacts and avoid double counting, we compared appliance measures identified in the state standard with the assumptions laid out in the Massachusetts potential studies. For measures included in both, we assumed that the potential studies captured two-thirds of the maximum achievable standards savings estimated by ASAP. All other measures were assumed to represent savings not included in the potential studies at all and were therefore kept in at 100%. Because the report only provided cumulative annual savings in 2025, we assumed a linear ramp up between 2020 and 2025 and calculated savings for each year accordingly.

Quantifying Federal Standards Impacts on Sales Forecasts

To assess federal standard impacts in New York, impacts were extrapolated from a current draft of a potential study being conducted for the state of Minnesota, as follows:

- National residential boilers and commercial warm air furnace impacts were scaled to New York from the Minnesota potential estimate using the ratio of heating degree days in the two states.
- National air conditioner and central air conditioning heat pumps were adapted using ratio of cooling degree days in each state.
- National pool pump impacts were scaled using the ratio of total swimming pools and hot tubs (both residential and commercial) in New York and the total swimming pools and hot tubs in the US using data from the Association of Pool & Spa Professionals. The resulting estimates were further reduced by 50% to account for the fact that New York pools are typically operated for fewer months of the year than the average pool in the US.
- National C&I pumps impacts were scaled to New York based on the ratio of 2015 state industrial sales to total 2015 US industrial sales from the Energy Information Administration.

Lighting

Notably absent from the impacts quantified above are those due to the impending "backstop" provision for general service lamps as presented in the Energy Independence and Security Act of 2007 (EISA).[16] In general, the EISA backstop requires that all general service lamps must meet or exceed the efficacy requirement of 45 lumens per watt if the Department of Energy fails to complete a new rulemaking for general service lamps by a certain schedule. Due to the lighting market's ongoing rapid transformation to LED products, we have not quantified the impact of

15 http://appliance-standards.org/sites/default/files/States%20Go%20First.pdf

16 https://www.gpo.gov/fdsys/pkg/PLAW-110publ140/pdf/PLAW-110publ140.pdf

the EISA backstop provision beyond 2020 as we assume the market changes will have already occurred prior to the compliance date of January 1, 2020.

New York Building Energy Code Impacts

The Pacific Northwest National Laboratory (PNNL) for the United States Department of Energy (DOE) has published a series of reports investigating the energy and energy cost savings impacts of updates to the IECC model building codes.[17] Using these reports, New York code impacts were calculated by comparing average energy use intensity (EUI) from successive iterations of the IECC. EUI data was specific to New York climate zones, 4 and 6.

Because of the significant variability in energy savings between the various versions of IECC, a straight average of the historical improvements may not be indicative of future code updates. Further, diminishing returns can be reasonably expected as energy codes become more stringent, suggesting that the 2012-2015 update may be more representative of future trends. Therefore, we applied a weighting scheme to estimate the average impacts from future code updates.

Assuming that future code improvements will yield the same weighted average percentage improvement from historical versions, we can estimate the impact of the state codes on the sales forecasts (Table 6). First, we assume the same preliminary sales forecasts described above in the context of the standards impacts. Next, we assume that new construction results in average annual load growth of 0.75%.[18] Further, we assume that existing buildings, on average, undergo significant renovations that must meet code requirements once every 25 years. Finally, we assume that same percentage improvement applies to both electric and natural gas sales.

17 https://www.energycodes.gov/sites/default/files/documents/PNNL-22760.pdf, https://www.energycodes.gov/sites/default/files/documents/2015_IECC_Commercial_Analysis.pdf, https://www.energycodes.gov/sites/default/files/documents/2015_IECC_FinalDeterminationAnalysis.pdf, https://www.energycodes.gov/sites/default/files/documents/NationalResidentialEnergyAnalysis.pdf

18 Assumption based on U.S. EIA Annual Energy Outlook forecast. Because overall New York load forecasts are relatively level, the new construction load growth is counteracted by improvements in the efficiency and changing patterns of use in existing buildings.

Table 6 | New York State Codes and Standards Savings

		Sales	Standards Savings	Code Savings
Electric (GWh)	2018	143,820		
	2019	146,748		
	2020	146,239	245	613
	2021	145,805	728	1,218
	2022	145,783	1,442	1,819
	2023	145,421	2,376	2,408
	2024	144,942	3,522	2,987
	2025	144,133	4,859	3,548
Gas (BBtu)	2018	865,198		
	2019	850,517		
	2020	849,772	347	3,565
	2021	849,527	1,042	7,096
	2022	851,531	2,084	10,622
	2023	850,590	3,473	14,085
	2024	850,316	5,210	17,522
	2025	849,770	7,294	20,921

TOTAL ENERGY GOAL AND ROLES

Adopting the above recommended goals for electric and gas programs and codes and standards combined, after adjusting for any double counting, results in ultimate achievement of 18% reduction in 2016 building energy consumption by 2025.[19] This is shown in Figure 5 below, along with the shares of total savings that would come from each segment. While the overall goal is important, it is imperative that the individual segment goals and trajectories of savings also be adopted to provide the appropriate entities with clear roles and responsibilities to collectively achieve New York's objective.

We believe that the electric and gas utilities, along with contributions from NYSERDA, should have responsibility for achieving the electric and gas program goals, and be directed to immediately begin the process of developing plans to succeed. This group would include NYPA and LIPA, and NYPA may appropriately be tasked with providing assistance or direct delivery of programs to municipalities that have public utilities served by NYPA. In addition, we expect that the State government would lead by example, continuing to pursue aggressive reductions in energy intensity from all state agencies, in coordination with NYPA, NYSERDA, and the other utilities, as appropriate.

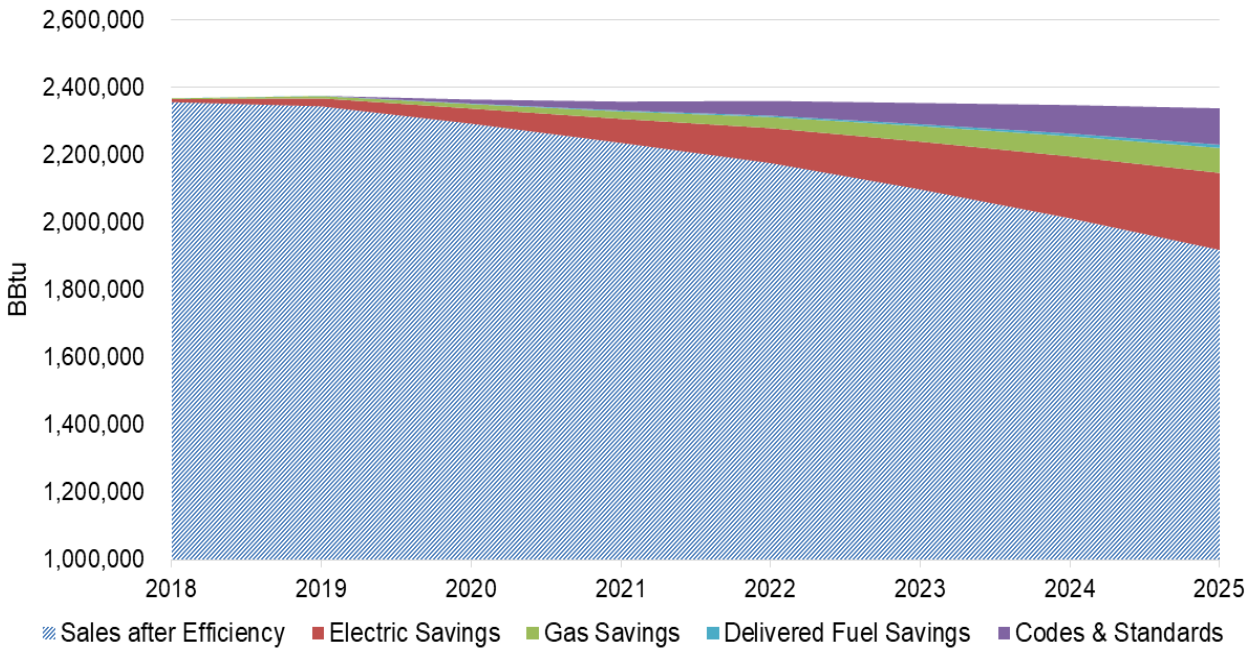
The State, through the REV process, is currently assessing the most appropriate division of activities and efforts between private utilities, LIPA and NYPA, and NYSERDA, which will be critical to achieving these goals. We suggest that, as overall general guidance, it will be most appropriate for individual utilities to take the lead on traditional programs that work directly

19 Ignoring any exogenous changes that otherwise occur to baseline consumption levels outside of these efficiency efforts.

downstream with their customers to incentivize and capture savings. NYSERDA's role may be most appropriate to programs and strategies with a broader statewide focus. This could include, but is not limited to: pursuit of upstream programs that focus on longer term market transformation and engage with supply chains and markets that cross utility boundaries; programs and services that can support and enhance the utility programs; and general market transformation efforts that focus on fundamental shifts in markets and behavior as opposed to immediate short-term resource acquisition.

Finally, the State can aggressively pursue adoption of the most aggressive codes and standards appropriate. NYSERDA and Department of State should play a strong role here in developing proposed codes and standards and working with other parties to facilitate their adoption. This might also include performing analysis to assess the cost-effectiveness of different codes and standards options, and to identify any appropriate state-specific amendments to national model codes.

Figure 4 | New York Building Energy Sales Forecast with Efficiency



CONCLUSIONS AND HIGH LEVEL GOAL

As shown above, New York has captured some significant electric and gas efficiency savings, however, as a percentage of consumption of these fuels, New York has been significantly less aggressive than neighboring New England states. This is made clear by the ACEEE State Scorecard, which ranked New York as 7th place overall, but in 13th place for efficiency programs. In contrast, overall rankings of 1st, 4th, and 6th were achieved Massachusetts, Vermont, and Connecticut, respectively. Further, these three states scored significantly higher than New York

in the efficiency programs category. Compared to New York's score of 10 out of a possible 20, Massachusetts scored 19.5, Vermont earned 18 points, and Connecticut scored 14.5 [20]

It is widely recognized that energy efficiency is the cheapest energy resource, and is readily deployable through proven strategies. Further, New York has a solid foundation on which to build to ramp up efficiency efforts, including the traditional utility and NYSERDA programs, current plans including recent expansions at some utilities, the potential of the Green Bank to scale energy efficiency, and the overall REV framework and direction.

Bringing efficiency program goals up to the levels recommended above, along with an aggressive push to adopt appropriate codes and standards, would result in establishing New York as a national leader in efficiency, while savings its citizens over $7.7 billion in energy bills and avoiding emitting over 15 million tons of carbon dioxide.[21]

20 *The 2017 State Energy Efficiency Scorecard*. Prepared by the American Council for an Energy Efficiency Economy. Report U1710. September 2017.

21 Avoided energy bills calculated assuming $5.39/MMBtu (2018 *Avoided Energy Supply Components Study*, http://www.synapse-energy.com/sites/default/files/AESC-2018-17-080.pdf); avoided emissions calculated using conversion factors from the Energy Information Administration (https://www.eia.gov/tools/faqs/faq.php?id=73&t=11, https://www.eia.gov/electricity/state/newyork/index.php).