NEW YORK STATE OF OPPORTUNITY.

NYSERDA

Department of Public Service

New Efficiency: **New York**

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EXECUTIVE SUMMARY

Energy efficiency is a cornerstone of New York State's national leadership on clean energy and climate. This white paper establishes an ambitious 2025 energy efficiency target for New York State and proposes a comprehensive energy efficiency initiative to meet that target.

2025 statewide energy efficiency target

185 TBtu

site savings

2025 Energy Efficiency Target

The 2025 statewide energy efficiency target established in this paper is 185 trillion British thermal units (TBtu) of cumulative annual site energy savings relative to forecasted energy consumption in 2025—a level of savings equivalent to fueling and powering over 1.8 million New York homes by 2025. These achievements will deliver nearly one-third of the greenhouse gas (GHG) emissions reductions needed to meet New York State's 40 by 30 climate goal.

2025 NYS Energy Efficiency Target Cumulative Annual Site Energy Savings 2015-2025, relative to forecasted site energy consumption in 2025	**185 TBtu Site Energy Savings** ~ fueling and powering 1.8 million New York homes
~ Equivalent Cumulative Annual CO2e Reduction	**22 million metric tons CO2e Reduction** ~ delivering 30% of the GHG emissions reductions needed to meet 40 by 30
Sub-target: Electric Site Savings	30,000 GWh reduction from forecasted electricity sales in 2025
	~ Annual reported electricity savings reach 3% of investor-owned utility sales in 2025 and average savings exceed 2% of IOU sales over 2019–2025
Jobs	NYSERDA will commit an additional $36.5 million to train more than 19,500 New Yorkers for clean energy jobs to support this rapidly growing industry

The new 2025 target is set on an all-fuels basis, addressing energy savings in buildings and the industrial sector across all fuel sources (electricity, natural gas, heating oil, and propane). The target accounts for the energy and GHG savings that can be delivered through sustaining New York's current energy efficiency commitments, and it also demands new actions to increase and accelerate energy efficiency market activity.

Summary of Key Principles and Recommendations

The path to delivering on New York's 2025 energy efficiency target recognizes that a mix of strategies will be necessary, focusing on the approaches best suited for specific markets and their needs and on the mix best suited for long-term cost-effectiveness. The portfolio will include a good measure of innovation, testing those approaches with the best promise, then scaling those that take hold.

This portfolio of actions also reflects a set of principles, aligned with the needs of New York and with Reforming the Energy Vision (REV) more broadly.

- Reduce costs of energy efficiency retrofits to enable greater market adoption
- Unlock value, specifically value to the energy system
- Deploy technology and data
- Pull in from the market sources of innovation and investment that have not yet engaged, by assuring stability and markets at scale
- Engage utilities for greatest impact—harnessing their system knowledge, ability to drive energy efficiency as a system resource, and potential to develop value from the energy efficiency they deliver

Notable proposals and strategies to meet the 2025 target include:

- Accelerating and shifting the portfolio of utility energy efficiency programs, seeking more effective measures and program structures, greater leverage of public funds, and increased market-based energy efficiency. This includes the proposed development of a shared savings approach that provides greater opportunity and reward for utilities to advance energy efficiency as a business and as a resource.
- Considering a fuel-neutral approach to programs to be delivered by utilities, consistent with New York's commitment to reduce emissions from all fuels and across all market segments.
- Advancing energy affordability by developing initiatives focused on energy solutions for low- to moderate-income (LMI) consumers, while dedicating at least 20 percent of any additional levels of public investment in energy efficiency to the LMI sector.
- Strengthening statute on building codes, appliance standards, and finance to result in greater energy efficiency impact.
- Driving deep energy savings in building retrofits and construction, and supporting cost-effective heat pump adoption.
- Lead by example in the State's own facilities and construction activities to directly benefit those owners, bring a market for the best solutions, and prove the level of progress that is possible and valuable.

The next steps coming from this white paper will follow the paths that are appropriate to the actions being advanced.

- Next steps that require Public Service Commission action will ensure stakeholder engagement and deliberation of the white paper, which will be initiated with a technical conference covering all aspects of the paper. While the initial technical conference will be comprehensive, development and implementation of specific elements of the white paper will take place in various decision-making venues.

  Following the initial technical conference, DPS Staff will initiate and define a process and schedule supporting further development of the jurisdictional aspects of the white paper. This is expected to include additional technical conferences, as well as topical working groups and a formal written stakeholder comment process with the goal of developing an adequate record for Commission action, including benefit, cost, and practical implementation information.
- NYSERDA Clean Energy Fund (CEF) activities aligned with the goals and objectives associated with the energy efficiency target will be implemented through additional CEF chapter filings.
- Legislation will be considered, as appropriate, to advance several of the recommendations, including product standards and benchmarking.
- State agency lead-by-example initiatives will be furthered through incorporations into future Executive Order (EO) 166 guidance and through individual agencies' climate action plans and capital planning processes.

1. INTRODUCTION

Energy efficiency is a cornerstone of New York State's national leadership promoting clean energy solutions and addressing climate change. This white paper proposes a comprehensive energy efficiency initiative for New York State coupled with a new 2025 energy efficiency target. The white paper is designed to accelerate progress towards the State's ambitious clean energy goals, including a 40% reduction of GHG emissions by 2030 ("40 by 30") and 80% reduction by 2050 ("80 by 50") from 1990 levels.

Governor Andrew M. Cuomo underscored New York's commitment to energy efficiency in his 2018 State of the State address, while recognizing much work remains to realize the full potential of energy efficiency for New Yorkers. Governor Cuomo directed the Department of Public Service (DPS) and the New York State Energy Research and Development Authority (NYSERDA), in consultation with stakeholders, to propose a far-reaching energy efficiency initiative and a new 2025 energy efficiency target by Earth Day.

In so doing, Governor Cuomo was building on his comprehensive and ambitious REV initiative to build a cleaner, more resilient, and affordable energy system for all New Yorkers. REV seeks to stimulate market innovation and spur private investment to deliver clean energy solutions that customers value, and to achieve New York's energy goals as impactfully and as cost-effectively as possible.

The portfolio approach put forward in this paper builds on the strong foundation of ongoing energy efficiency activities in New York, as summarized in Section 2. Section 3 presents the State's market opportunity, translated into a 2025 target in Section 4. Sections 5-6 recommend specific near-term actions to support energy efficiency markets and spur private investment, while continuously improving utility and NYSERDA energy efficiency programs. Section 7 details the need to drive both deep energy retrofits and the inclusion of heat pumps to achieve the State's ambitious carbon reduction goals. Section 8 offers strategies to support energy affordability for low-income New Yorkers. Recommendations in Section 9 present the vision to harness product and appliance standards and building codes to create broad-based impact. Section 10 describes opportunities for New York to lead by example in State buildings and investments. Next steps to implement the recommendations are outlined in Section 11. Appendix A provides a summary of the input received at the five stakeholder forums, held to discuss and share information relevant to specific topics addressed in this paper. Topics included Innovative Utility Strategies and Emerging Energy Efficiency Business Models, Pay-for-Performance, Accelerating Building Codes, Opportunities and Strategies for Deep Energy Efficiency, and Target Metric and Framing Considerations.

This paper focuses attention on proposals and strategies to realize meaningful increases in energy efficiency savings, notably:

- Proposed acceleration and shift of the portfolio of utility energy efficiency programs (Section 5.2), seeking more effective measures and program structures, greater leverage of public funds, and increased market-based energy efficiency. This includes the proposed development of a shared savings approach to energy efficiency that provides greater opportunity and reward for utilities to advance energy efficiency as a business.
- Proposed consideration of a fuel-neutral approach to programs to be delivered by utilities (also in Section 5.2) to achieve energy savings in buildings and the industrial sector across all fuel sources (electricity, natural gas, heating oil, and propane).
- Proposed advancement of energy affordability by developing initiatives focused on energy solutions for LMI consumers, while dedicating at least 20 percent of any additional levels of public investment in energy efficiency to the LMI sector (Section 8).
- Proposed advancement of deep energy savings in building retrofits and construction (Section 7.1), and support of cost-effective heat pump adoption (Section 7.2).

- Pursuing statutory changes to provide the authority to establish and enforce New York State energy efficiency standards for products and appliances sold in the State (Section 9.1).
- Pursuing statutory changes to advance statewide benchmarking and disclosure of large buildings (Section 6.5).
- Pursuing statutory changes to enable statewide adoption of mandatory stretch building energy codes by 2022 (Section 9.2).
- Proposed development of State agency asset planning and procurement policies to drive deeper energy savings and demonstrate the agencies' contribution to the state's GHG reduction goals, as directed under Executive Order 166 (Section 10).

Through the portfolio of actions described in this white paper, energy efficiency can deliver nearly one-third of the GHG emission reductions needed to meet New York's 40 by 30 goal—leveraging one of the most cost-effective climate solutions. These strategies can save consumers 185 TBtu of site energy in buildings and the industrial sector, across electricity and fuels. This ambitious new target accelerates achievement of the current statewide energy efficiency goal of reducing primary energy consumption by 600 TBtu. In carbon, this corresponds to a reduction of more than 22 million metric tons of carbon dioxide equivalent (CO2e) annually by 2025, which will deliver nearly one-third of the GHG emissions reductions needed to meet New York State's 40 by 30 climate goal.

As discussed in section 4, setting a 2025 site energy savings target on an all-fuels basis, as well as an annual 3% savings of investor-owned utility sales in 2025 as an electricity sub-target, will reinforce New York State's long-term commitment to cost-effectively combat climate change from both the demand side along with the supply side, which New York is addressing through the Clean Energy Standard (CES).

This portfolio of actions also reflects a set of principles, aligned with the needs of New York and with REV more broadly:

- Reduce costs of energy efficiency retrofits to enable greater market adoption
- Unlock value, specifically value to the energy system
- Deploy technology and data
- Pull in from the market sources of innovation and investment that have not yet engaged, by assuring stability and markets at scale
- Engage utilities for greatest impact—harnessing their system knowledge, ability to drive energy efficiency as a system resource, and potential to develop value from the energy efficiency they deliver

This portfolio recognizes that a mix of strategies will be necessary, with focus on the approaches best suited for specific markets and their needs and on the mix best suited for long-term cost-effectiveness. The portfolio will include a good measure of innovation, testing those approaches with the best promise, and then scaling those that take hold.

This is both possible and necessary. Possible, based on the accumulating evidence from similar approaches to energy efficiency in New York State (e.g., Real Time Energy Management), from approaches to energy efficiency elsewhere (e.g., Pacific Gas and Electric Company's innovations in customer targeting), and from approaches to other resources beyond energy efficiency in New York State (e.g., NY-Sun, non-wires alternative "NWAs").

Delivering on this commitment to energy efficiency will produce significant benefits for New Yorkers: saving consumers money by reducing energy bills, providing consumers with additional value such as improved comfort and productivity, empowering customers with additional tools to help manage their energy costs, reducing costs to the utility system to keep rates affordable, preserving public health and protecting the environment by avoiding GHG emissions and other pollutants, and creating jobs in a growing industry.

Importantly, this goal is a call to action to all market participants—from homeowners and renters to businesses, State agencies, and communities—to embrace the cheapest energy available, which is the energy not consumed.

2. NEW YORK'S FOUNDATION FOR ENERGY EFFICIENCY

New York has built a solid foundation of energy efficiency policies and programs. Multiple State agencies are working together with New York's utilities, businesses, and local communities to support market adoption of energy efficiency across all market segments and types of building stock, spanning commercial, residential and institutional properties, affordable housing developments, State- and municipal-owned buildings, farms and greenhouses, and industrial facilities.

2.1 Energy Efficiency as Central to the REV Strategy

New York's ongoing energy efficiency activities are integral to and aligned with REV, Governor Cuomo's comprehensive strategy to build a cleaner, more resilient, and affordable energy system for all New Yorkers.

Energy efficiency, the kilowatt-hour not consumed, will play a critical role in achieving the State's carbon reduction goal of 40 by 30, as it is among the most cost-effective ways to reduce emissions. Experience with efficiency programs in New York and elsewhere has demonstrated substantial savings for customers as energy efficiency is a low-cost resource when compared to supply. Moreover, a large potential for continued efficiency gains remains to be captured.

REV places emphasis on stimulating market innovation and spurring private investment to deliver energy efficiency solutions that customers value, and to achieve New York's energy goals as cost-effectively as possible. Three overarching approaches are central to the energy efficiency policy under REV:

- New York's commitment to drive toward a sustainable, private sector-driven market at scale for energy efficiency solutions.
- Interventions to reduce the costs of energy efficiency retrofits over time, especially to reduce the soft costs of projects to enable greater market adoption.
- Mechanisms to better capture and reward the carbon and grid benefits of energy efficiency.

Delivering on this vision demands meaningful improvement of the energy efficiency programs delivered by utilities and NYSERDA, leading by example in State buildings and investments, and advancing building energy codes and efficiency standards for products and appliances.

As a comprehensive approach, REV encompasses a portfolio of energy efficiency initiatives and actions, many of which are described in The Energy to Lead: 2015 New York State Energy Plan.[1] Published in 2017, the Biennial Report to the 2015 State Energy Plan[2] highlights notable achievements and progress across those initiatives.

As discussed in the State Energy Plan and Biennial Report, the main energy efficiency activities include NYSERDA's CEF; the utilities' energy efficiency portfolios, both at the Long Island Power Authority (LIPA) and at the investor-owned utilities; and the leadership role of the New York Power Authority (NYPA) through operations and programs aimed at improving the energy performance of State-owned buildings. These are briefly described in the next section.

[1] *The Energy to Lead: 2015 New York State Energy Plan, issued June 25, 2015. Available at https://energyplan.ny.gov/Plans/2015.aspx.*

[2] *The Energy to Lead: Biennial Report to the 2015 State Energy Plan, issued December 2017. Available at https://energyplan.ny.gov/Plans/2015-Update.*

2.2 NYSERDA's CEF Investment in Energy Efficiency

Through the CEF, NYSERDA is investing more than $2 billion in funding over the CEF's 10-year life span to support energy efficiency across all fuels, delivering a minimum of 10.6 million megawatt-hours (MWh) in electric savings and 13.4 million MMBtu in non-electric fuel savings over 10 years. In 2018, this level of investment amounts to approximately $200 million.

NYSERDA's approach to energy efficiency focuses on actions to develop a more robust and value-creating market for energy efficiency, with particular attention to:

- Reducing the costs of energy efficiency retrofits and new construction. Specifically, NYSERDA is emphasizing soft-cost reduction, including a focus on cost-drivers such as customer acquisition, project development, and performance verification, which are ripe for cost reduction and addressable by State-level intervention.
- Sustaining industry and market momentum through "bridge incentives" that provide temporary financial support to promising interventions while scaling up these interventions to establish self-sustaining markets and reduce the need over time for financial support.
- Accelerating innovative solutions and driving toward deeper energy retrofits. This encompasses innovation in business models, such as those that seek new models of customer procurement or pay-for-performance models; innovation in deployment of technology, such as real-time energy management; and other strategies to advance the market toward buildings that achieve extremely high energy performance.
- Continuing financial support to specific market sectors where first costs and incremental costs are—and anticipated to remain for some time—the primary barriers to energy efficiency deployment. For instance, NYSERDA provides traditional incentive programs to enable LMI communities to gain greater access to clean energy solutions.[3]

2.3 Utility Investment in Energy Efficiency

2.3.1 Investor-Owned Utilities

In the 2015 REV Framework Order, the Commission established a new framework for the energy efficiency programs of investor-owned utilities, granting increased flexibility and responsibility for administration and design, and provided direction to begin a gradual evolution of those programs to align with REV approaches. Through Energy Efficiency Transition Implementation Plans (ETIPs), utilities provide details regarding their energy efficiency portfolios being implemented to achieve their Commission authorized energy savings targets in support of the State's ambitious clean energy goals.

To date, the ETIP process has ensured stability during the utilities' transition to offering more REV-like programs, including the recent authorization of base-level funding and minimum targets for 2019–2020. Additionally, the Commission approved expanded energy efficiency activities, in the recent Con Edison and Niagara Mohawk rate proceedings. As a result of these actions, approximately $265 million for electric programs and $65 million for gas programs across the investor-owned utilities were approved for 2019, setting the utilities on track to achieve approximately 900,000 MWh of electric and 2.3 million MMBtu of gas savings.

[3] *NYSERDA defines the low-income market segment as households with annual incomes at or below 60% of the State Median Income (SMI), and the moderate-income market segment as households with an annual income between 60% and 80% of the SMI or the Area Median Income, whichever is greater. Together these form the LMI market segment.*

In general, the utilities provide a mix of offerings to their customers to encourage the installation of high-efficiency lighting, heating, ventilation, and air-conditioning (HVAC) equipment, controls, commercial refrigeration and cooking equipment, and in some cases, exterior shell measures. The latest utility initiatives demonstrate the evolution of programs by including additional offerings, such as midstream market strategies, behavioral programs, online marketplaces/customer engagement platforms, coordination of energy efficiency with demand reduction programs and efforts to more closely align and complement NYSERDA's efforts.

Earnings adjustment mechanisms (EAMs) have been developed, and have been put in place to provide a performance-based incentive for utilities measured both on a programmatic basis, as well as testing the concept of outcome-oriented metrics. Energy efficiency will increasingly be treated as a system resource by utilities—accounted for in traditional cost recovery or rate-based approaches and integrated into Distributed System Implementation Plans (DSIPs), which document a utility's integrated approach to planning, investment and operations. The Commission provided guidance for increased integration of energy efficiency into utility business models in the March 2018 *Order Authorizing Utility-Administered Energy Efficiency Portfolio Budgets and Targets for 2019–2020*, directing utilities to evolve their ETIPs into System Energy Efficiency Plans (SEEPs) reflecting all energy efficiency activities undertaken by the utility.

In alignment with New York's broader REV principles, the State also seeks to tap the gains that can be achieved by engaging utilities to promote energy efficiency as a business and as a path to shared savings. Under REV, New York seeks to lower the costs of and speed the achievement of the State's policy goals through accelerating the deployment at scale of solutions that create the most economic value for both consumers and for the State's energy system, drawing on innovation and investment from all sectors. Especially as distributed solutions become more economic and offer greater value, this requires continuous advancement of policies, programs, and regulations that engage and incentivize utilities as well as third parties to routinely make investments and operate to take best advantage of new solutions and value-adding opportunities for customers. New York seeks to realize these objectives and apply the principles across all resource types, including both large-scale and distributed renewable generation, energy efficiency, demand response, electric vehicles (EVs) and associated infrastructure, storage, microgrids, and heat pump and other renewable heating, ventilation, and HVAC solutions.

With respect to energy efficiency, as well as other resources, utilities have untapped potential to deploy knowledge of their system and their customers, and to work with innovative third parties to develop alternative solutions to achieve energy efficiency outcomes at lower ratepayer expense, at a faster rate, or both. These solutions can take the form of technology or deployment alternatives optimal for specific locations or other utility system needs, or business model alternatives that yield additional savings at lower cost or produce additional revenues. In all cases, the resulting benefits could be shared among customers, the innovative provider, and the utility. REV specifically looks to utilities to bring forward shared savings/benefits approaches to compensation as alternatives or complements to traditional cost recovery or rate-based approaches.

2.3.2 Long Island Power Authority/ PSEG Long Island

The Long Island Power Authority (LIPA) Efficiency Long Island portfolio is administered by PSEG Long Island. PSEG Long Island's current energy efficiency initiative invests more than $70 million annually achieving 300,000 MWh (1 TBtu) in annual electric savings in recent years, in five programs that provide residential and low-income incentives for energy-efficient products and services, as well as incentives and services to non-residential customers, including incentives for renovations of existing buildings and new construction projects, rebates for energy saving measures, and technical assistance to offset the cost of engineering and design services. LIPA has programs that are delivering energy efficiency solutions to targeted areas in load pockets to provide maximum grid value.

2.4 BuildSmart NY and Government Leading by Example

NYPA's efforts provide a key example of government leading by example in New York State. NYPA is currently financing energy efficiency projects for State agencies and other municipal and institutional customers at $200 million per year, with a planned increase to a minimum of $300 million per year for energy efficiency and solar. Key NYPA initiatives include the following:

- **BuildSmart NY** – This initiative seeks to accelerate energy efficiency in State buildings, driven by Executive Order 88, which requires 20% improvement in energy efficiency in State buildings by 2020, as measured by source-based energy use intensity (EUI) in energy per square foot of building space. The program is progressing towards meeting the 20% improvement goal. Since the program's initiation, NYPA implemented 95 BuildSmart NY projects that are yielding an annual $49 million in savings for State agencies.
- **New York Energy Manager (NYEM)** – A cornerstone of the BuildSmart NY initiative, the NYEM facility provides analytics for State buildings. The facility is currently tracking the energy usage of 3,500 State buildings with a live connection to 1,200 buildings, allowing for real-time tracking of energy usage and the identification of savings opportunities. NYPA plans to expand the NYEM program to 20,000 buildings over the next five years.
- **Five Cities Energy Program** – This program was established to demonstrate the value of municipal energy planning and create a model process for cities to follow. Energy master plans have been developed in Albany, Buffalo, Rochester, Syracuse, and Yonkers that lay out strategies to reduce energy consumption 20% by 2020, and NYPA will continue to assist the Five Cities with plan execution. Successful implementation of these plans is expected to save as much as $400 million annually.
- **Smart Street Lighting NY** – This initiative seeks to convert 500,000 street lights to LEDs by 2025. As part of this effort, NYPA will track streetlight conversions as well as energy and tax payer savings each year.

State agencies have begun to take account of their emissions reductions opportunities pursuant to Executive Order 166, in order to identify their individual agency's contribution toward achieving the State's GHG reduction goals.

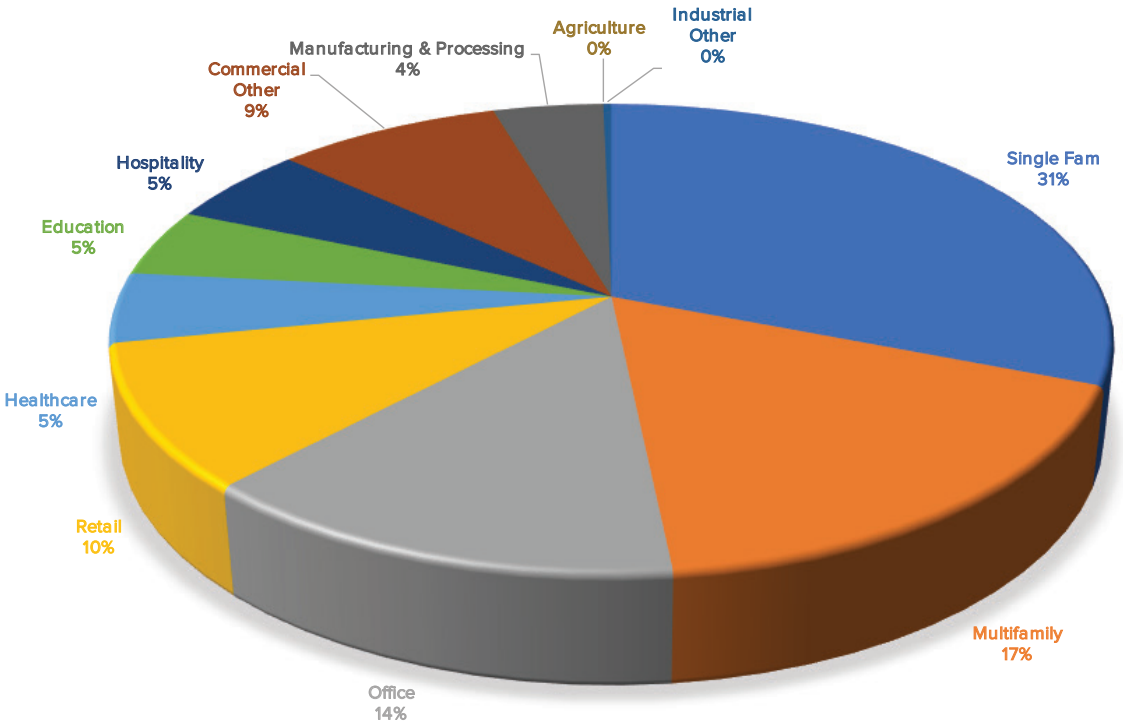
3. MARKET OPPORTUNITY

Energy efficiency is a fundamental resource for achieving New York State's ambitious GHG reduction goals, delivering utility bill savings to customers, and creating local high-quality jobs across the State. Energy efficiency jobs comprise an important and growing part of the State's economy. In 2017, NYSERDA published the Clean Energy Industry Report,[4] which quantifies, characterizes, and analyzes clean energy industry jobs in the State. According to this analysis, there were 146,000 clean energy jobs in 2016. Energy efficiency jobs accounted for 110,000 or 75% of the clean energy economy, a segment that was projected to grow 6% in 2017, a growth rate larger than the rest of the economy

While New York has a strong track record of advancing energy efficiency and a growing workforce to get the job done, there is still considerable potential to be achieved from energy efficiency. According to NYSERDA analysis based on the Energy Efficiency and Renewable Energy Potential Study of New York State completed in 2015, the achievable savings potential attributed to energy efficiency was on the order of 600 trillion BTU of primary energy by 2030.[5] Figure 1 shows energy efficiency savings potential data from this study by building sector, with single-family homes, multifamily buildings, offices, retail, and industrial sub-sectors comprising the majority.

Figure 1. Energy Efficiency Achievable Savings Potential by Market Vertical

Source: NYSERDA analysis based on the Energy Efficiency and Renewable Energy Potential Study of New York State.



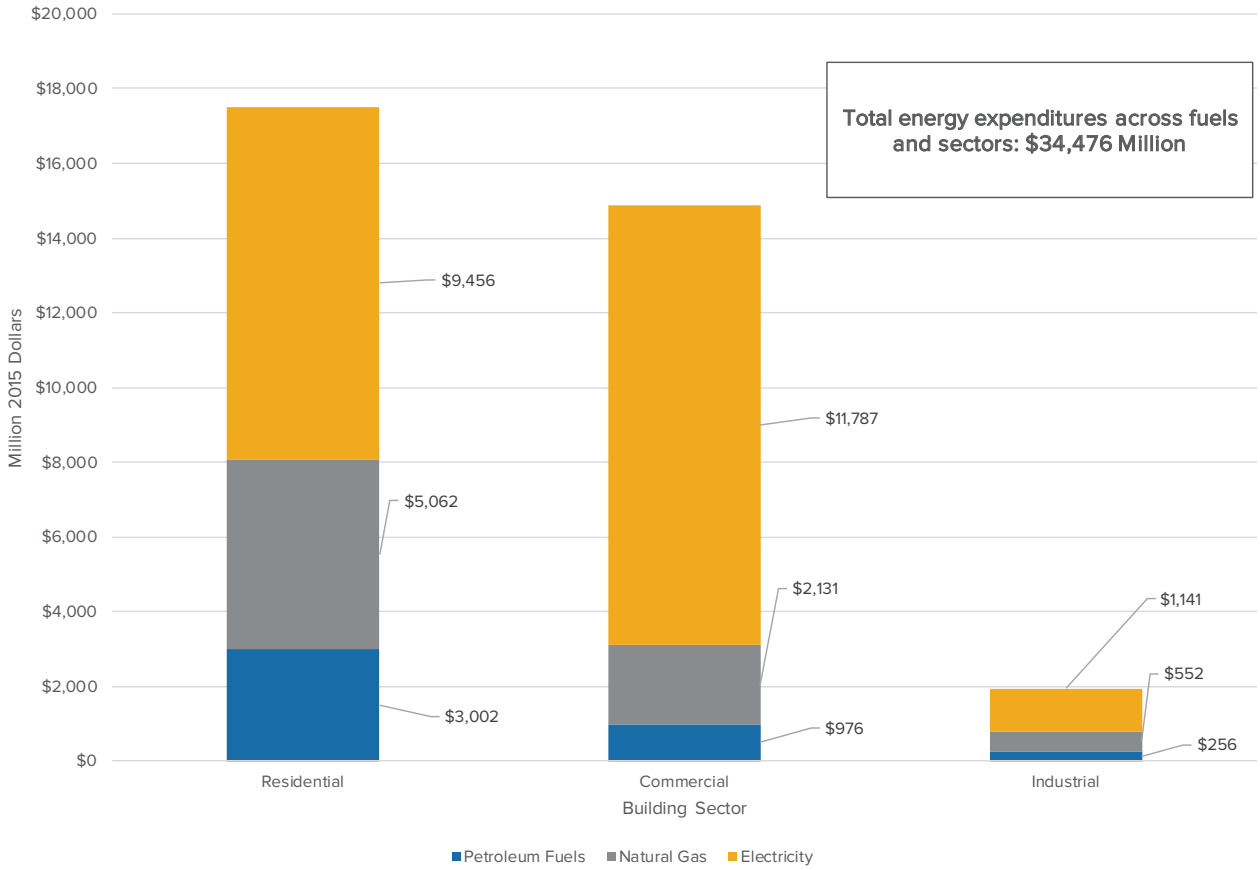
[4] *Clean Energy Industry Report: nyserda.ny.gov/-/media/Files/Publications/Clean-energy-industry/2017-clean-energy-industry-report.pdf*

[5] *NYSERDA's analysis based on Energy Efficiency and Renewable Energy Potential Study of New York State: nyserda.ny.gov/-/media/Files/EDPPP/Energy-Prices/Energy-Statistics/14-19-EE-RE-Potential-Study-Vol2.pdf*

Collectively, residential, commercial, and industrial customers pay nearly $35 billion dollars annually in energy costs across electricity, natural gas, and petroleum fuels as shown in figure 2.[6] The opportunity to deliver customer bill savings is sizable.

Figure 2. New York State Building Energy Expenditures in 2015

Source: Patterns and Trends: New York State Energy Profiles, 2001–2015



Across these sectors, barriers to energy efficiency share some common aspects, including the need for confidence of the customer in the solution and its providers, competition for management attention and capital, as energy is only occasionally a high-priority need, and lack of straightforward and simple solutions, that are easy to say “yes” to.

The differences across sectors relate mainly to the size of potential energy efficiency projects, with implications for the ability of suppliers to develop strong business models, differential capacity of customer decision-makers to have the expertise needed for differential impact of energy improvement on economics of the premise, and or other non-energy values such as comfort.

[6] *Patterns and Trends: New York State Energy Profiles, 2001–2015: nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Patterns-and-Trends.*

Research has shown relatively high levels of agreement on these issues and relative persistence of these issues over time.

In the single-family sector, the most frequently cited barriers relate to:

- Homeowner reluctance to invest in energy efficiency projects that may have longer payback periods
- Lack of awareness and confidence in the energy efficiency solutions, with respect to cost and comfort
- Inertia and lack of attention paid to energy and efficiency decisions, given the low profile of energy costs in household finances
- Lack of capital/financing to cover up-front costs, even if energy efficiency investments are attractive
- Limited availability of the most efficient equipment, as retailers/contractors are reluctant to build inventory with uncertain demand
- Lack of integrated solutions in the market—service providers often have narrow installation capabilities
- Fragmentation of customers and relatively small project sizes, meaning costly for contractors to sell projects

In the multifamily sector, the most frequently cited barriers relate to:

- Reluctance by both owners and tenants to invest in energy efficiency projects that may have longer payback periods, and/or be disruptive
- Inertia and lack of attention paid to energy and efficiency decisions by apartment owners, given the low profile of energy costs
- Split incentives in submetered buildings prevent building owners/managers from counting on pay-off from energy efficiency investments
- Difficult coordination among owners and multiple tenants due to split incentives and differences in investment horizon
- Lack of awareness and confidence in the energy efficiency solutions, as “proof points” are not abundant and as building owners consider capacity of their building staff
- Poor availability of data and technical skills to identify energy efficiency projects that could appeal to business-minded decision-makers
- Lack of capital/financing to cover up-front costs, even if energy efficiency investments are attractive, as owners have multiple, more familiar uses for their capital budgets/financing proceeds

In the commercial sector, the most frequently cited barriers relate to:

- Aesthetics and comfort as much higher priorities than energy savings for building owners and managers who have concerns that energy efficiency projects can have a negative impact on these amenities and hurt their cash flow
- Lack of awareness and confidence in the energy efficiency solutions, as "proof points" are not abundant and as building owners consider capacity of their building staff
- Lack of capital/financing to cover up-front costs, even if energy efficiency investments are attractive, as owners have multiple, more familiar uses for their capital budgets/financing proceeds
- Lack of credibility of technology or solutions, unless in-house staff or trusted engineering advisors are on board
- Poor availability of data and technical skills to identify energy efficiency projects that could appeal to business-minded decision-makers

Specifically, with respect to the retail sector, two further issues relate to:

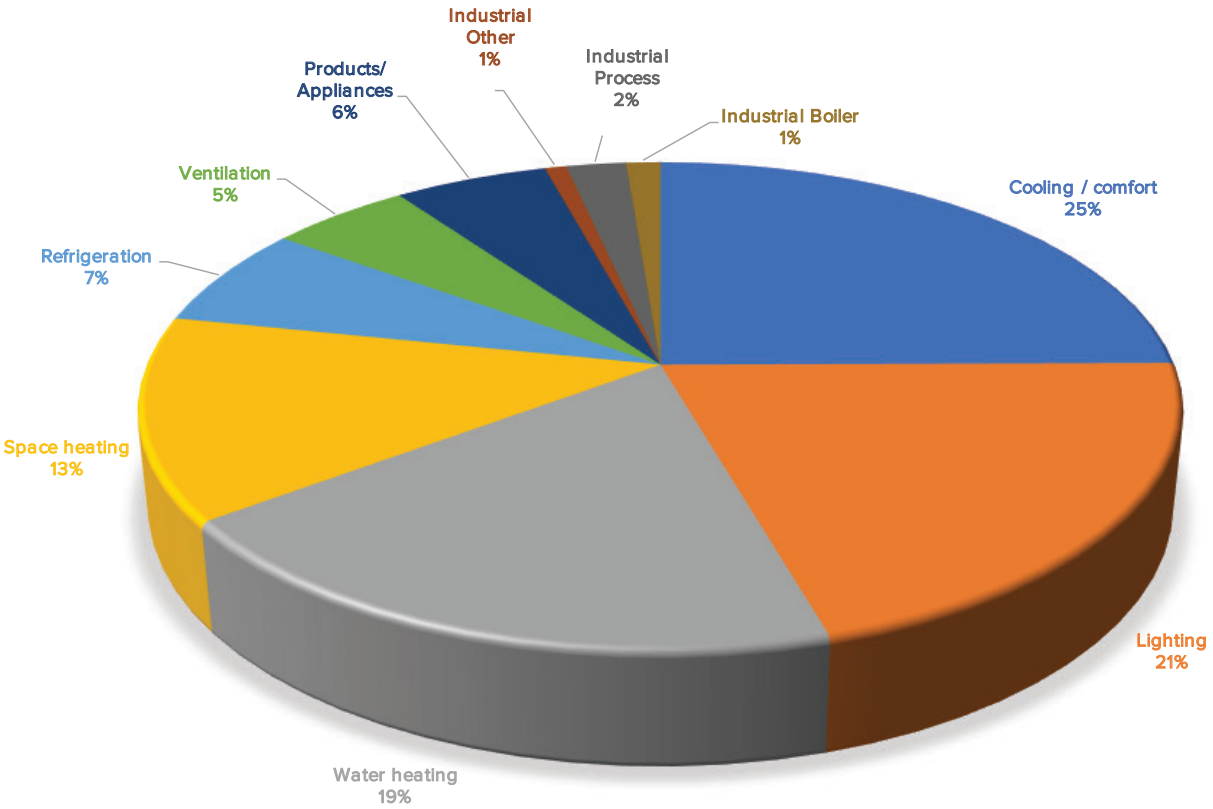
- "Corporate sales" character of proposing energy efficiency projects, since for most large retailers, facility decisions often happen at the national or franchise level, not the store or local level
- Competition with sales as the top priority for retailers; they consider a project that does not have positive impact on revenue generation a low-priority initiative

In the industrial sector, the most frequently cited barriers relate to:

- Energy is frequently a low-priority claim on time and attention of managers, facility, and engineering staff
- Risk aversion of manufacturing decision-makers and excessive risk estimates limit their appetite for assuming risk—especially production risk and financial burden (e.g., upfront costs) as they must cope with intense competition
- Poor availability of data and technical skills to identify energy efficiency projects that could appeal to business-minded decision-makers
- Lack of credibility of technology or solutions, unless in-house staff or trusted engineering advisors are on board

A further important characteristic of energy use and energy efficiency potential is the nature of the end use. Figure 3 shows the same achievable energy efficiency savings potential data segmented by energy end use.

Figure 3. Energy Efficiency Achievable Savings Potential by Energy End Use
Source: NYSERDA analysis based on the Energy Efficiency and Renewable Energy Potential Study of New York State.



Within the highest-potential building sectors of single-family, multifamily, office, and retail, the end-use efficiency potential was concentrated in the areas of cooling/comfort, lighting, water heating, space heating, products, and appliances. For single-family, the greatest potential was found in cooling/comfort, followed by water heating, space heating, and then lighting. For multifamily, the most significant potential fell equally into cooling/comfort and water heating, followed by space heating. For office spaces, lighting, then cooling/comfort, and a modest level of water heating showed the most opportunity. Retail space potential was primarily focused in lighting, with lesser, but still significant, opportunity in cooling/comfort. For industrial and processing, process loads represented the largest opportunity for energy optimization. Collectively, these end uses account for 60% of overall achievable (primary) energy efficiency potential statewide.

These opportunities show significant untapped potential or market penetration, mainly as an outcome of the barriers previously discussed, and the incomplete ability of the energy efficiency administrators and service provides to address those barriers.

The most positive exception to this has been lighting as an end use, where lighting replacement as an energy efficiency solution has been characterized by relatively swift improvements in cost-effectiveness, relatively good pay-backs, and relative ease of customer engagement and adoption.

As of 2015, lighting represented one of the highest end-use opportunities. Since then, utilities' efficiency programs have focused heavily on lighting. At the same time costs of high-efficiency lighting products have come down and natural adoption increased, resulting in a greater portion of the lighting savings potential being achieved

in the years since this study was published as compared to other end uses. However, this data shows several other high-potential, end-use opportunities in addition to lighting—specifically, cooling, and water heating. This highlights a need to broaden the scope of utility programs to address other cost-effective efficiency measures and to encourage approaches that pair lower-cost opportunities like lighting with other efficiency improvements to achieve deeper savings.

In the stakeholder roundtable forums conducted on February 26, 2018 and March 3, 2018, service providers and environmental advocates indicated the market's readiness to achieve accelerated energy efficiency potential once the policy is defined. In order to drive innovation, service providers identified the need for access to data, a better definition of market roles, and a clear valuation of energy efficiency as a grid resource. Stakeholders also emphasized a need for long-term clarity and consistency with respect to program offerings to create the conditions for businesses to build, develop, and sustain innovative models that deliver energy efficiency in ways that better align with building owners' needs.

Market feedback indicates signs of positive changes and early indications of business-model innovation and cost reduction in energy efficiency. A path to scale can be seen through different approaches to aggregating demand for energy efficiency. For example, aggregating a portfolio of multifamily buildings with similar ownership, financing, and tenancy structures is yielding a level of savings at which energy savings agreements become viable. There are also encouraging developments with green lending programs offering better pricing than on conventional, "non-green" loans, as in the case of Fannie Mae's green financing programs.[7] This is early evidence that investments in energy efficiency lower risk, increase net operating income, and reduce exposure, which by extension, have the potential to increase borrowing capacity and property valuation.

Informed by stakeholder feedback and related market research, NYSERDA and DPS identified key opportunity areas where New York State should prioritize its investment and activities. Strategic priorities include the following:

- More useful data to support customers and service providers in their decision-making
- Clearer valuation of energy efficiency as a grid resource to improve the economics of the most valuable projects
- Stability in program scale and design to enable the market to develop with confidence

By sector, those strategic priorities include:

- In commercial buildings, supporting real-time energy management solutions including sensing/automation and energy efficiency as a service; enabling informed, energy-integrated capital planning; making buildings' energy performance visible to building owners and market through benchmarking and disclosure; and supporting financing solutions that better align the customers' investment with realized benefits and useful life of equipment.
- For multifamily buildings, enabling informed energy-integrated and capital planning; supporting deep energy improvements at time of refinancing and underwriting that reflects the full value of energy efficiency savings; and making buildings' energy performance visible to building owners and market through benchmarking and disclosure, aggregating demand for high-performance retrofit solutions with which to entice industry innovation.
- For industrial facilities, demonstrating value propositions of a strategic energy management approach; dedicated energy management personnel; and tools and technical support through energy management platforms that reduce energy costs and increase reliability.
- In single-family homes, creating a negawatt market; demonstrating the value proposition of energy information to inform home buyer renovations; and developing integrated energy-health interventions.

[7] *https://www.fanniemae.com/multifamily/green-initiative-financing*

Table 1. Key Market Opportunities by Sector

	Data and Benchmarking	Business Model Innovation	Smart Energy Systems	Deep Retrofits	New Construction, Codes and Standards
Commercial	• Make energy, asset, and project level more available through benchmarking, streamlining energy usage data sharing with customers and third parties, to reduce costs associated with data gathering, customer targeting, and other soft costs • Build confidence in energy management tools as a means to lower costs and reduce operational risks • Illuminate and enable monetization of non-energy benefits of efficiency (e.g., reduced risk, higher borrowing capability, increased property value)	• Develop "negawatt" models as a flexible delivery vehicle • Fully compensate energy efficiency as a distributed energy resource through targeted "kickers" • Support innovative approaches such as "Efficiency-as-a-Service" to better align customer payment with benefits • Foster integrated design and project delivery approach to developing high-performance retrofit solutions to drive down project soft costs	• Support advanced sensors/control to optimize building operational efficiency, support grid reliability • Support delivery of integrated clean energy solutions (e.g., energy efficiency and renewables/ storage) that optimize energy performance and savings, and minimize customer disruption	• Enable financing solutions that better match investment with realized benefits and align with useful life of capital asset • Integrate deep efficiency upgrades into long-term capital planning and refinancing process to make easy, cost-effective to say "yes" to high-efficiency equipment and systems	• Develop and replicate deep or net zero energy (NZE) solutions and support cost reduction through building competitions • Accelerate energy "stretch" code adoption • Ensure high-efficiency products and appliances sold in the State to reduce consumers' energy bills

Table 1. Key Market Opportunities by Sector *(continued)*

	Data and Benchmarking	Business Model Innovation	Smart Energy Systems	Deep Retrofits	New Construction, Codes and Standards
Multifamily	• Make energy, asset, and project level more available through benchmarking, streamlining energy usage data sharing with customers and third parties, to reduce costs associated with data gathering, customer targeting, and other soft costs • Build confidence in energy management tools as a means to lower costs and reduce operational risks • Illuminate and enable monetization of non-energy benefits of efficiency (e.g., reduced risk, higher borrowing capability, increased property value)	• Develop "negawatt" models as a flexible delivery vehicle • Fully compensate energy efficiency as a distributed energy resource through targeted "kickers" • Support innovative approaches such as "Efficiency-as-a-Service" to better align customer payment with benefits • Foster integrated design and project delivery approach to developing high-performance retrofit solutions to drive down project soft costs	• Support sector-appropriate advanced sensors/ control to optimize building operational efficiency, support grid reliability • Support delivery of integrated clean energy solutions (e.g., energy efficiency and renewables/ storage) that optimize energy performance and savings, and minimize customer disruption	• Aggregate demand for deep retrofit solutions and entice industry innovation to create and scale cost-effective high-performance solutions • Integrate deep efficiency upgrades into long-term capital planning and refinancing process to make easy, cost-effective to say "yes" to high- efficiency equipment and systems	• Develop and replicate deep or NZE solutions and support cost reduction through building competitions • Accelerate energy "stretch" code adoption • Ensure high-efficiency products and appliances sold in the State to reduce consumers' energy bills

Table 1. Key Market Opportunities by Sector *(continued)*

	Data and Benchmarking	Business Model Innovation	Smart Energy Systems	Deep Retrofits	New Construction, Codes and Standards
Single-Family Homes	• Build confidence in realized savings through release of project data and use of advanced measurement and verification (M&V) and other analytics • Demonstrate value of home energy ratings to homebuyers • Quantify and communicate non-energy benefits of energy efficiency (e.g., comfort, health outcomes)	• Develop "negawatt" models as a delivery vehicle • Fully compensate energy efficiency as a distributed energy resource through targeted "kickers" • Support "Efficiency-as-a-Service" approaches • Develop tools to support aggregation and drive down per-project costs	• Support advanced sensors/control to optimize building operational efficiency and support grid reliability • Support delivery of integrated clean energy solutions (e.g., energy efficiency and renewables/storage)	• Support and scale financing solutions that better match investment with realized benefits and useful life of equipment	• Accelerate energy "stretch" code adoption • Build a market for NZE modular homes • Ensure high-efficiency products and appliances sold in the State to reduce consumers' energy bills
Industrial	• Build confidence in energy management tools as a means to lower costs and reduce operational risks	• Support strategic energy management approach for continuous energy improvement, cost reduction and reliability • Demonstrate value of dedicated energy management personnel to identify, implement energy projects and enable energy-integrated capital planning	• Support advanced sensors/control to optimize building operational efficiency, support grid reliability and unlock full value of efficiency as a grid resource	• Provide technical assistance to support robust building and process efficiency improvements and energy cost reduction	

To make good and effective progress requires a high degree of alignment among the programs (including those both at utilities and at NYSERDA) and service providers. The priorities already noted (on access to data, clear and useful valuation of energy efficiency, and stability of outlook for service providers) will serve that purpose. Greater cooperation is encouraged between NYSERDA and the utilities to collectively design their approaches and aim for the best set of services to the market and customers. Transparency is also required between utilities, NYSERDA, and service providers with respect to portfolios, specific plans, and outcomes. To the extent there is value to a central coordinating role in this, DPS and NYSERDA will consider how best to deliver that role. Finally, it is critical to instill approaches among all actors that support effective innovation. In some cases, a pilot or other testing approach may be required to provide proof of concept or market uptake; in these cases, NYSERDA will be prepared to direct such pilots or tests with the objective of arriving at models suitable for transition to utilities and others.

The market opportunities presented here establish the basis for the portfolio of actions described in this white paper.

4. 2025 TARGET AND ANTICIPATED BENEFITS

Establishing and achieving ambitious energy efficiency targets is one of the primary ways that New York State can achieve its climate goal of reducing GHG emissions to 40% below 1990 levels by 2030. This white paper defines a new 2025 statewide energy efficiency target to be achieved through a portfolio of activities that includes utility programs, efforts led by State agencies and local governments, and market-oriented approaches driven by third-party providers, industry, and consumers.

New York's new 2025 statewide energy efficiency target is 185 TBtu of cumulative annual site energy savings relative to forecasted energy consumption in 2025[8]—a level of savings equivalent to fueling and powering 1.8 million New York homes by 2025.

By 2025, meeting this site energy savings target will cut more than 22 million metric tons of CO2e annually, which will deliver nearly one-third of the GHG emissions reductions needed to meet New York State's 40 by 30 climate goal.

The new 2025 target goes beyond the energy and GHG savings that can be delivered through sustaining New York's current energy efficiency commitments. It also demands new actions to increase and accelerate energy efficiency market activity. Over the 2019–2025 period, accelerated near-term actions are expected increase site energy savings by at least 40% above the State's current energy efficiency commitments.

4.1 Current Energy Efficiency Goal and Achievement

The 2015 New York State Energy Plan established a 2030 target of a 600 trillion BTU (TBtu) increase in statewide energy efficiency, expressed as a reduction in total primary energy usage in buildings and the industrial sector when compared to the forecasted use of primary energy in 2030. Meeting this 600 TBtu reduction from the 2,939 TBtu of primary energy use forecasted in the State Energy Plan analysis would require a reduction in the statewide consumption of primary energy in the building and the industrial sectors to 2,339 TBtu in 2030. The State Energy Plan goal is a source-based energy savings goal and is distinct from the site energy-savings goal here; see the "Measuring Energy" box for an explanation of site-based and source-based metrics. Achieving this target level of energy savings will be critical to realizing the State's concurrently set targets of reducing overall GHG emissions by 40% from 1990 levels and supplying 50% of the State's electricity from renewable energy by 2030.

Current State progress toward this goal has been meaningful, and NYSERDA and DPS Staff estimate that New York State will exceed the State Energy Plan 2030 energy efficiency target. The State will accomplish this by (1) carrying forward and building upon its existing energy efficiency commitments across NYSERDA and New York's utilities, (2) investing by NYPA and the public sector in government buildings, (3) supporting energy efficiency in low-income housing, and (4) implementing aggressive building energy codes and appliance standards. Consistent with the REV framework, New York is working to unlock market-based activity to drive even higher levels of energy efficiency savings over the coming decades.

Estimating near-term annual progress toward the 2030 energy efficiency target is complicated by several factors. First, the primary energy methodology, which underpins the 2030 target, is not widely understood among stakeholders, and it will introduce distortions as New York State moves toward its 50 by 30 renewables goal. The concept of "primary energy" accounts for the energy losses incurred when a raw fuel input is converted into secondary energy (e.g., electricity, steam) and delivered to the customer site. It allows different types of energy sources that are used in buildings to be evaluated on a common energy metric. Historically, primary energy

[8] *See Appendix B for the reference forecasts used in this analysis for electricity (based on the CES and the 2015 NYISO Gold Book) and onsite fuel consumption (based on the 2015 EIA AEO).*

accounting has assigned the average heat rate of fossil fuels to non-fossil renewable electricity generation. This approach, however, assumes renewable energy generation has the same energy losses in conversion as fossil generation, with comparable economic losses.[9] As renewable electricity generation grows to comprise half of the electricity consumed in New York State by 2030, an energy efficiency metric based on primary energy savings will become increasingly distorted by fictitious renewable energy "losses" to the energy system.

New York State is shifting to a 2025 energy efficiency target that is based on site energy, which is the amount of heat and electricity consumed by a building as reflected in utility and fuel bills. The new 2025 site energy target will be correlated back to the 2030 primary energy efficiency target, to ensure that New York State is on track to achieve the intention of the latter.

Measuring Energy:
Units, Conversions, and Equivalencies

Energy is measured using a variety of units and at a variety of scales. For example, electricity is typically measured in kilowatt-hours (kWh) at the individual building scale and gigawatt-hours (GWh) at the State level. One GWh is equivalent to 1 million kWh, which is equivalent to the annual electricity required to power approximately 140 homes.

Electric energy use can be measured at different points in the electricity system. Electricity use at the "site" or at the "plug" refers to electricity used at the point of consumption and is what is typically shown on customer utility bills. Some electricity is lost during transmission and distribution from a generating unit to the point of consumption. Electricity can also be measured at the point of generation to account for these line losses, which are estimated in this analysis to be 7.2%. This is a simplifying assumption, as actual line losses vary across space and over time.

Natural gas and petroleum fuel volumes may be measured in cubic feet (cf) or gallons (g). However, in this analysis, British thermal units (Btu) are used as a common unit that measures the energy contained in these fuels. A single Btu represents only a very small amount of energy. To put this in perspective, heating an average New York State household for a year requires approximately 58.7 million Btu. Onsite fossil fuel use is typically measured in million Btu (MMBtu) at the individual building scale and trillion Btu (TBtu) at the State level. One TBtu is equivalent to the annual energy used to heat approximately 17,000 homes.

Electricity can also be measured using Btu when it is convenient to have a common unit of measurement across fuels, as it is in this analysis. Electricity can be converted to Btu directly when calculating site energy, using a conversion factor of 3,412 Btu/kWh, which is based on the energy content of a kWh.

Electricity can also be measured on a source or primary basis, which aims to estimate the fuel (e.g., natural gas or diesel fuel) combusted at a power plant to generate electricity. A lot of the potential energy embedded in the fuel is lost during the conversion to electricity—typically two-thirds of the energy is lost in combusting fossil fuel to make electricity. In this analysis, a conversion factor of 9,505 Btu input fuel (or primary fuel) per kWh of output (or .009501 TBtu/GWh) is assumed based on the estimated average efficiency of New York State's fossil-fueled power plants to calculate primary TBtu from electric GWh at generation. Given these thermodynamics and conversion factors, electric energy savings goals presented on a source basis will be numerically larger than the equivalent goal presented in metrics focused on site-based consumption for exactly the same physical system and environmental outcome.

[9] *Donohoo-Vallett, P. October 2016. Accounting Methodology for Source Energy of Non-Combustible Renewable Electricity Generation. U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy.*

Second, the 2030 efficiency target is expressed as a reduction in primary energy use relative to the 2015 State Energy Plan reference forecast, which was projected based on the 2012 New York Independent System Operator (NYISO) Gold Book baseline forecast for electric sales and the 2012 Energy Information Administration (EIA) Annual Energy Outlook (AEO) for natural gas and petroleum fuels sales. However, forecasts are not static. Both the NYISO and the AEO econometric forecasts have exhibited a significant downward trend in recent years, suggesting lower future energy consumption before any direct adjustment is made for future energy efficiency impacts. For example, a 2030 projection of electric load at generation using the 2015 NYISO econometric forecast (unadjusted for future energy efficiency), as used in the August 2016 CES Order, is 8,765 GWh lower than the 2030 load estimated in the State Energy Plan reference forecast. Some amount of the observed change from the 2012 to the 2015 energy forecasts is attributable to energy efficiency savings that occurred in the interim, and the trend also may reflect incorporation of efficiency practices into standard market activity. In econometric forecasting, historical energy efficiency investments influence the historical sales data, the model parameters, and the resulting sales projections.[10] However, recent energy efficiency achievement is unlikely to explain the full magnitude of the observed change in the forecasts.

As the reference forecast for the 2025 energy efficiency target, NYSERDA and DPS Staff use a 2015 econometric forecast, consistent with the electric load forecast used in the CES Order. Aligning the reference forecast for a 2025 energy efficiency target with the forecast used in the CES Order provides for greater transparency across and alignment of these key policies. The load forecast used to set CES renewable procurement targets netted out incremental electric energy efficiency savings that sum to 35,627 GWh at generation (or 33,234 GWh at site) by 2030, a level of achievement that also is consistent with the energy efficiency goal in the State Energy Plan. The staff white paper on the CES notes the energy efficiency assumption used, "represents the center of a range of possible outcomes and is not itself a target to be achieved in the context of the CES."[11]

Third, under the CEF framework, NYSERDA is transitioning from project-level incentives as its primary market intervention tool toward a range of market-enablement strategies, structured to support the State's long-term clean energy goals. The longer-term market transformation objectives of the CEF portfolio are inconsistent with annual "bottom-up" estimation of energy savings that are attributed to energy efficiency programs in a specific year. To support the achievement of greater impact per dollar spent, NYSERDA's strategies fund pilots and projects intended to maximize indirect savings impacts, which are the market effects expected to accrue over the longer term as a result of NYSERDA investment and subsequent market activity. NYSERDA will quantify and report on indirect savings based on periodic market evaluation studies. Given the objective of market enablement, energy efficiency savings from the CEF portfolio are end-loaded (i.e., more occurs in the later years) rather than achieving a steady level of incremental annual savings each year.

NYSERDA and DPS Staff recognize the value of establishing a 2025 energy efficiency target that is consistent with accelerating progress in the near-term, while prioritizing investments in ways that are positioned to achieve greater leverage of public to private sector investment. To ensure achievement of the 40 by 30 GHG reduction goal, New York will need more of every clean energy resource—including energy efficiency—than is currently projected.

[10] *McMenamin, S. and M. Quan. 2010. Incorporating DSM into the Load Forecast. Itron.*

[11] *This energy efficiency assumption was based on approved ETIP and CEF targets, increased pro rata to include NYPA, LIPA, and direct NYISO customers. See Case 15-E-0302, staff white paper on Clean Energy Standard (January 25, 2016), Appendix B.*

4.2 2025 Target

New York State's comprehensive statewide 2025 energy efficiency target is set on an all-fuels basis, covering buildings and the industrial sector (while excluding the transportation sector). An all-fuels approach aggregates energy efficiency achievement across electricity, natural gas, and delivered fuels (e.g., oil and propane) and tracks the overall reduction of total energy rather than of any individual fuel. This approach is consistent with the main principle of the State Energy Plan 2030 efficiency target to achieve a reduction in the overall quantity of energy use and GHG emissions.

The 2025 target is based on statewide site energy savings (in TBtu) across all fuels. Specifically, it is defined in terms of cumulative first-year annual site energy savings, a common metric that is expected to facilitate more straightforward accounting for, and presentation of progress toward, the target. A site-based energy savings target additionally maintains focus on increasing end-use efficiency in buildings as a key policy lever to reduce GHG emissions. The approximate equivalent cumulative annual CO2e savings is reported in conjunction with the site-based target, based on the projected mix of electric and fuel savings and fixed conversion factors.[12]

The 2025 statewide energy efficiency target is 185 TBtu of cumulative annual site energy savings over 2015–2025, relative to forecasted energy consumption in 2025.[13] This level of savings is equivalent to fueling and powering over 1.8 million New York homes by 2025.

By 2025, meeting this site energy savings target will cut more than 22 million metric tons of CO2e annually, which will deliver nearly one-third of the GHG emissions reductions needed to meet New York State's 40 by 30 climate goal.[14]

Table 2. 2025 Statewide Energy Efficiency Target

2025 NYS Energy Efficiency Target Cumulative Annual Site Energy Savings 2015-2025, relative to forecasted site energy consumption in 2025	**185 TBtu Site Energy Savings** ~ fueling and powering 1.8 million New York homes
~ Equivalent Cumulative Annual CO2e Reduction	**22 million metric tons CO2e Reduction** ~ delivering 30% of the GHG emissions reductions needed to meet 40 by 30
Sub-target: Electric Site Savings	30,000 GWh reduction from forecasted electricity sales in 2025
	~ Annual reported electricity savings reach 3% of investor-owned utility sales in 2025 and average savings exceed 2% of IOU sales over 2019–2025
Jobs	NYSERDA will commit an additional $36.5 million to train more than 19,500 New Yorkers for clean energy jobs to support this rapidly growing industry

A sub-target for statewide electricity savings also is presented for 2025, to communicate the level of commitment necessary to meet the comprehensive all-fuels target. The electricity sub-target is subordinate; the primary basis for tracking progress will be New York's achievement toward its comprehensive, fuel-neutral energy efficiency target.

[12] *This analysis uses an electricity emission reduction factor of 1,160 pounds CO2e/MWh, which is derived using the marginal emission-rate analysis for CO2 from "Appendix: The Benefits and Costs of Net Energy Metering in New York" (filed December 18, 2015 in Case 15-E-0703) and applying a line loss factor of 7.2%. Emission factors for natural gas (117.2 pounds CO2e / MMBtu) and oil (162.9 pounds CO2e / MMBtu) savings are consistent with emission factors used in the updated New York State Greenhouse Gas Inventory (nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Energy-Statistics). These factors are derived from EPA's February 2016 State Inventory Tool release (https://www.epa.gov/statelocalclimate/state-inventory-and-projection-tool).*

[13] *See Appendix B for the reference forecasts used in this analysis for electricity (based on the CES and the 2015 NYISO Gold Book) and onsite fuel consumption (based on the 2015 EIA AEO).*

[14] *Historical and projected GHG Emissions from 1990-2030 referenced can be found in the GHG Inventory and Forecast included as part of the 2015 New York State Energy Plan: https://energyplan.ny.gov/Plans/2015.*

The 2025 statewide sub-target for electric efficiency is a 30,000 GWh reduction from forecasted site electricity consumption in 2025.[15] This level of efficiency will set New York State on a path to achieve annual electric efficiency savings of 3% of investor-owned utility sales in 2025, and average annual savings that exceed 2% of IOU sales over the 2019–2025 period, based on electric savings reported across investor-owned utility and State-supported efficiency activities (e.g., through NYSERDA's CEF). Reported energy efficiency savings may not follow a steady increase in incremental annual savings each year, consistent with the State's objective to enable more market-driven energy efficiency, which will be measured and reported at periodic intervals. Further, increases in beneficial electrification, including heat pumps and electric vehicles, pose the need for separate accounting outside an electricity efficiency sub-target.

Meeting the 2025 energy efficiency target is projected to reduce total site energy consumption in New York State from the forecasted site energy use of 1,649 TBtu to 1,464 TBtu in 2025, accounting for electricity, natural gas, and delivered fuels (oil and propane) consumed by the residential, commercial, and industrial sectors. Achieving the 2025 target also positions New York State to exceed the source-based 2030 energy efficiency goal established in the 2015 State Energy Plan, as addressed in Appendix B.

4.3 Sustained Energy Efficiency Commitments and Key Opportunities for Accelerated Action

To develop a 2025 energy efficiency target that is both ambitious and realistic, DPS and NYSERDA considered recent achievement, published potential studies, and stakeholder input. In particular, the team compiled energy savings projections for a portfolio of activities that span the State's existing energy efficiency commitments and promising new actions.

Tables 3 and 4 and Figure 4 summarize estimates for the major activities over the 2015–2025 period that could deliver to the 2025 target. Site energy savings are estimated for acquired (rather than planned or committed) gross annual energy savings. Savings are assumed to persist through to the 2025 target (with no decay), with the exception of savings from product standards, which take into account the product lifetime.

This analysis estimates that sustaining the substantial portfolio of efficiency activities currently underway in New York will achieve approximately 47 TBtu of cumulative annual site energy savings over 2015–2018 and another 97 TBtu of savings over 2019–2025, after adjusting for some expected overlap in the energy efficiency savings that are enabled by complementary utility programs, NYSERDA initiatives, and lead-by-example efforts in State buildings.

Meeting the 2025 target also demands new actions to increase and accelerate energy efficiency market activity. As described in the sections that follow, this paper proposes a portfolio of accelerated actions to drive an additional 41 TBtu of aggregate efficiency savings statewide by 2025, or a 40% increase above the State's current commitments for the 2019–2025 period.

Notably, the State's investor-owned utilities will be called on to achieve significantly more in both scale and innovation through their energy efficiency activities. Through State lead-by-example initiatives, agencies and authorities likewise will need to increase the pace of their energy efficiency achievement as well as embrace beneficial electrification. The portfolio of new actions also includes legislative changes that would be necessary to accelerate stretch building energy codes, to advance State product and appliance standards, and develop benchmarking and disclosure requirements statewide. With implementation support available through NYSERDA's CEF, these strategies would contribute to meeting the 2025 energy efficiency target, and importantly, position the State for further energy and carbon reductions toward 2030 and beyond.

[15] *The electricity reference forecast used in this analysis is consistent with the CES Order, applying a line loss factor of 7.2% to convert from forecasted electricity consumption at generation to forecasted electricity consumption at site.*

Table 3. Key Activities and Assumptions that Inform the 2025 Target – Sustained Actions over 2015 to 2025

Sustained Actions over 2015-2025: Activities that Sustain New York State's Existing Energy Efficiency Commitments		
New York State Energy Efficiency Activities	**Site TBtu Savings, Cumulative Annual 2015-2025, All Fuels* Cumulative Annual 2015-2025, All Fuels***	**Description of Activity and Assumptions for Energy Savings**
Base Codes and Standards	15	Electric savings from building codes and federal appliance standards are derived from NYISO's methodology as adopted in the 2016 NYISO Gold Book forecast. A comparable assumption is not included for fuels because a base level of efficiency is embedded in the AEO fuels forecast.
EEPS: Utilities and NYSERDA	20	Energy Efficiency Portfolio Standard (EEPS) programs administered by utilities and NYSERDA typically ran through 2015. Certain customer commitments are projected to be installed through 2020.
E088: Lead-by-Example (net of savings from NYPA Southeast NY customers included immediately below)	3	State-led initiative to drive energy efficiency savings across state buildings, consistent with Executive Order 88. Overlap adjustments: Savings shown are net of projected NYPA projects with State customers located in the Southeast NY region. To estimate aggregate statewide savings, a 50% discount factor is applied to the savings shown to account for overlap with utility and NYSERDA programs.
NYPA: Southeast NY Government Buildings	4	NYPA energy efficiency projects with State and municipal government customers located in Southeast NY.
NYPA: LED Streetlights	1	Initiative to convert 500,000 Street Lights to LEDs by 2025. Overlap adjustment: To estimate statewide savings, a 75% discount factor is applied to the savings shown as utility incentives are likely.
HCR: WAP and Affordable Multifamily Housing	3	Estimated savings from sustaining Weatherization Assistance Program (WAP) support for energy saving and health and safety improvements in low-income housing, and through supporting energy efficiency as a component of New York State Homes and Community Renewal (HCR) financing to create and preserve affordable multifamily rental housing.
LIPA	9	Projected savings from LIPA's Efficiency Long Island portfolio for residential and commercial customers.
Utility ETIPs and SEEPs	40	Investor-owned utility energy efficiency achievement is sustained at the level of the ETIP goals approved for 2019, as a base level of achievement to build upon.
Utility Demos, Non-Wires Alternatives, and New EE Programs	6	Projected savings from energy efficiency products and services offered through utility-sponsored e-commerce marketplaces, incremental efficiency included in a non-wires portfolio, and expanded energy efficiency activities over 2017–2019 as approved in the Con Edison and Niagara Mohawk rate proceedings.

NYSERDA CEF: Direct Savings	32	Projected savings from efficiency improvements that receive direct NYSERDA support or NY Green Bank financing. NYSERDA's CEF goals are established and reported on a commitment basis, across direct and indirect savings. On track to reach 10.6 million MWh in electric savings on a commitment basis by 2025, NYSERDA projects that approximately 60% of these committed MWh direct and indirect savings will be acquired (installed or evaluated) by 2025. Acquired direct and indirect fuel savings by 2025 are projected to be over double the minimum CEF goal of 13.4 million MMBtu. Overlap adjustment: To estimate statewide savings, a 30% discount factor is applied to direct electric and gas savings and a 20% discount factor is applied to direct oil savings to account for overlap across complementary NYSERDA and utility activities, as well as savings measured from existing conditions that overlap with codes and standards.
NYSERDA CEF: Indirect Savings (discounted at 50%)	21	Projected savings from the market effects expected to accrue over the longer term as a result of NYSERDA investment and subsequent market activity. Note: Only 50% of the estimated total indirect benefits from market transformation are included in the savings shown to avoid overlap in these values, consistent with the NYSERDA CEF Budget and Benefits Chapter. No further adjustment is made to aggregate savings.

** Note: As noted, discount factors are applied to the TBtu savings shown in order to adjust for overlap when estimating aggregate statewide achievement. Energy savings by activity sum to more than the 185 TBtu target before overlap adjustments are applied.*

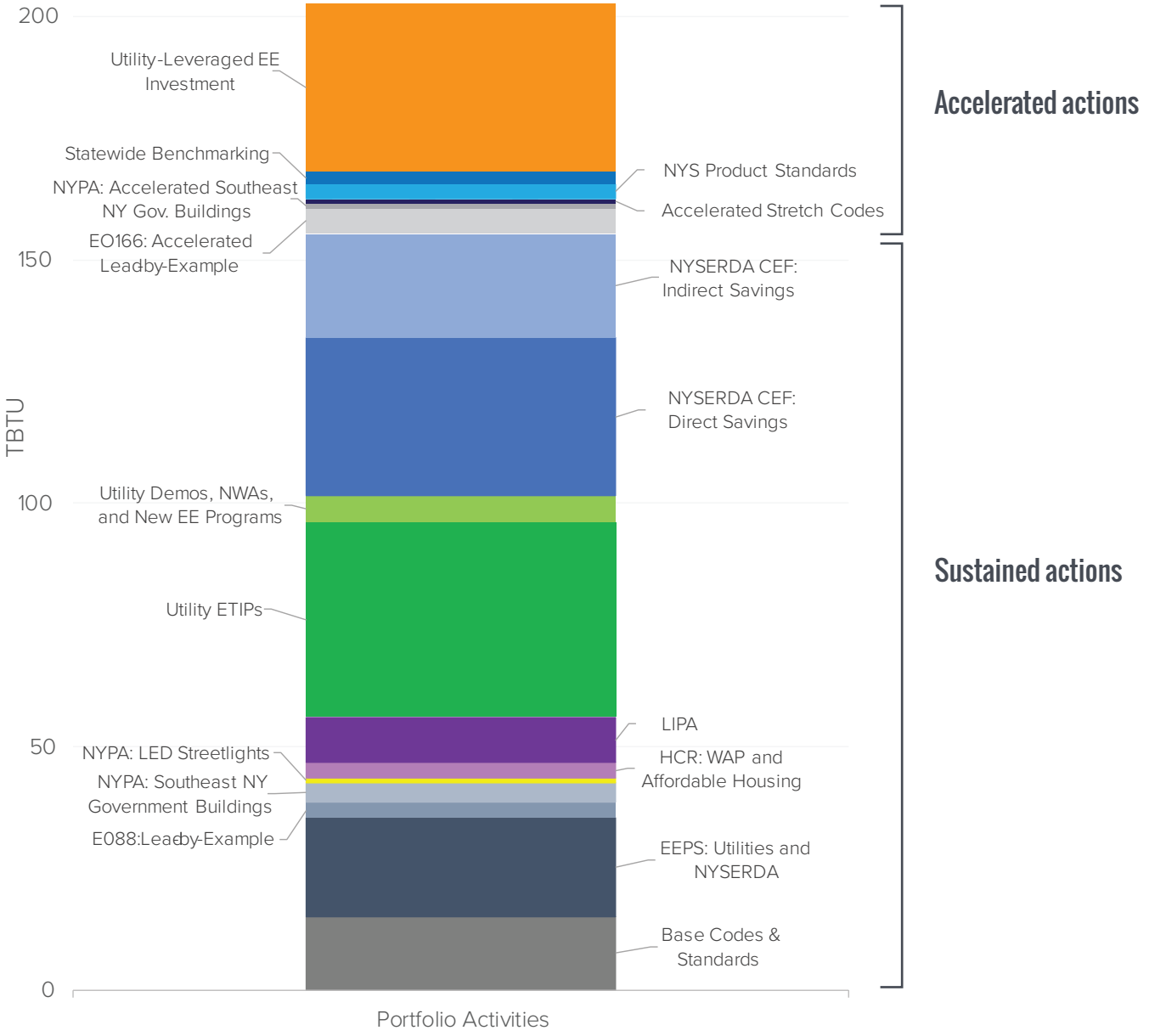
Table 4. Key Activities and Assumptions that Inform the 2025 Target – Accelerated Actions over 2019 to 2025

Accelerated Actions over 2019-2025: Opportunities to Accelerate New York State's Energy Efficiency Achievement		
New York State Energy Efficiency Activities	**Site Tbtu Savings, Cumulative Annual 2019-2025, All Fuels***	**Description of Activity and Assumptions for Energy Savings**
EO166: Accelerated Lead-by-Example (net of savings from NYPA Southeast region customers included immediately below)	5	See Section 10. Driving accelerated energy efficiency is central to the climate plans being developed by state entities to demonstrate their contributions to achieving the State's GHG reduction goals, as identified in Executive Order 166. Overlap adjustments: Savings shown are net of projected NYPA projects with State-building customers located in the Southeast region. A 50% discount factor is then applied to account for overlap with utility and NYSERDA programs
NYPA: Accelerated Southeast NY Government Buildings	1	NYPA will pursue a 25% increase over historic levels of energy efficiency projects with State and municipal government customers located in the Southeast region, which is projected to occur from 2019 onward.
Accelerated Stretch Building Energy Codes (above business as usual code cycles, adjusted for compliance)	1	See section 9.2. This white paper proposes to develop and integrate carbon-focused metrics into future New York State building energy code, and to encourage local adoption of "stretch" codes as a near-term strategy. Projected savings are incremental to a baseline that assumes a regular cycle of code updates that increase efficiency each cycle. Note: Savings shown are adjusted for partial compliance that occurs as new codes are introduced, which reduces savings that accrue by 2025 and shifts benefits to later years. NYSERDA assumes 58% compliance for commercial and 55% compliance for residential buildings, with full compliance to code about two cycles behind code adoption.
State Product Standards (adjusted for natural market adoption and measure life)	3	See section 9.1. This white paper recommends consideration of statutory changes to facilitate setting and enforcing energy efficiency standards for products and appliances sold in the State. Projected savings are informed by modeling specific to the State.
Statewide Benchmarking (discounted at 50%)	3	See section 6.5. Benchmarking building energy use in a standardized manner can help identify energy efficiency opportunity and is correlated with an annual building energy use reduction of roughly 2% across multiple benchmarking efforts. Projected savings are estimated for expanding benchmarking and disclosure requirements to buildings more than 50,000 square feet statewide, which could be advanced through a legislative initiative. Note: Only 50% of the estimated benefits from benchmarking are included in the savings shown to avoid overlap in these values with NYSERDA and utility programs. No further adjustment is made to aggregate savings.
Increase in Utility-Leveraged Energy Efficiency Investment	31	Increased investment through utility programs would be used to catalyze innovation in future energy efficiency markets (see sections 5 and 6), including to support deeper energy savings and heat pump adoption (see section 7). Expanded utility energy efficiency activities also would support energy affordability for low- to moderate-income New Yorkers (see section 8). Expanded activities as approved in Con Edison and Niagara Mohawk rate proceedings are included in this projection from 2020 onward.

** Note: As noted, discount factors are applied to the TBtu savings shown in order to adjust for overlap when estimating aggregate statewide achievement. Energy savings by activity sum to more than the 185 TBtu target before overlap adjustments are applied.*

Figure 4. New York State Energy Efficiency Activities – Total TBtu Savings by 2025 (Cumulative Annual, 2015-2025)

Note: Energy savings in the figure sum to more than the 185 TBtu target because the figure does not incorporate certain discount factors that were applied to adjust for overlap across complementary activities. See Tables 3 and 4 for a description of overlap adjustments.



4.4 Anticipated Benefits of Accelerated Action

Beyond the energy benefits outlined above, the opportunities to accelerate energy efficiency achievement represent significant additional environmental and economic benefits to New York State. Achieving the goal through an increase in lead-by-example activities in government buildings, stretch building energy codes, State product standards, statewide benchmarking, and an increase in utility-leveraged energy efficiency investment will lead to further reduction in GHG emissions, provide energy cost savings to New Yorkers, increase private investment toward energy efficiency, and lead to the creation/retention of clean energy-related jobs in New York. These anticipated environmental and economic benefits are further defined below.

4.4.1 Environmental Benefits

Environmental benefits are characterized by tons of CO2e emissions avoided through energy efficiency activities. The opportunities to accelerate energy efficiency achievement are expected to result in 73 million metric tons of CO2e emission reductions over the lifetime of measures in place by 2025. This level of emission reductions is equivalent to removing an average of more than 1 million cars from the road each year.

4.4.2 Economic Benefits

Economic benefits include energy cost savings, an increase in private investment toward energy efficiency, and energy-related job creation and retention in New York.

In addition to reducing energy costs for New Yorkers, the accelerated investments will stimulate energy efficiency jobs in New York's economy. As part of the initiative, 19,500 New Yorkers will be trained for skills in the rapidly growing clean energy industry, building on the more than 110,000 workers already employed in the energy efficiency field in New York State today.

Table 5. Summary of Benefits from New York State's 2025 Energy Efficiency Target

New York State's 2025 Energy Efficiency Target (2015–2025)
Reduces energy consumption by 185 trillion Btu (British thermal units) below forecasted energy use in 2025—equivalent to fueling and powering 1.8 million New York homes
Will deliver nearly one-third of the GHG reductions needed to meet the State's climate goal of 40% reduction by 2030
Sets New York State on a path to achieve annual electric efficiency savings of 3% of investor-owned utility sales in 2025, and average annual savings that exceed 2% of IOU sales over 2019–2025
A Portfolio of Accelerated Actions to Meet the New 2025 Target (2019–2025)
Proposes accelerated lead-by-example activities in government buildings, stretch building energy codes, NYS product and appliance standards, statewide benchmarking, and increased scale and innovation in utility energy efficiency activities
Includes training for more than 19,500 New Yorkers for clean energy jobs to support this rapidly growing industry
Will deliver approximately 73 million metric tons of CO2e emission reductions over the lifetime of measures in place by 2025—equivalent to removing an average of 1 million cars from the road each year the measures are in place

4.5 Market Effects and Measurement

As REV encourages more market-based energy efficiency interventions, evaluation and measurement practices will need to evolve to assess statewide achievement across direct and indirect savings from program investments, State and local policies, and market-initiated efficiency. Measuring statewide achievement also requires accounting for overlap in savings that are reported for complementary activities. Specifically, this white paper anticipates the need to triangulate across the savings reported for specific energy efficiency programs and measurement of actual changes in the State's overall energy consumption over time.

The traditional framework to measure utility and NYSERDA program savings is to track and sum up efficiency savings from programs in a bottom-up fashion based on the measures installed with program support. NYSERDA's evaluation strategy is expanding to also include sector-level building stock studies and periodic studies to assess indirect savings, allowing a view into market-driven energy efficiency activity that follows on from CEF activities.

The Commission recently required common reporting for ratepayer-funded programs include acquired and committed energy savings data expressed as gross MWh savings, gross MMBtu savings, gross peak megawatt (MW) savings, carbon emission reductions, expenditures, encumbrances, Effective Useful Lives, participant bill savings, and private investment. An online dashboard currently under development at NYSERDA will include data on energy efficiency activities administered by the State's investor-owned utilities, NYSERDA, LIPA, and NYPA, which will provide timely insight into program impacts from traditional "bottom-up" methods, as well as NYSERDA studies assessing indirect market-driven energy efficiency. NYSERDA's periodic measurement of indirect savings from CEF activities is expected to result in some degree of "lumpiness" in terms of reported CEF savings, producing a non-linear trajectory toward the 2025 energy efficiency target of 185 site TBtu.

In conjunction with program-level reporting, New York State should track and regularly report on actual changes in energy consumption in buildings and the industrial sector to assess the aggregate impact of energy efficiency activities in a "top-down" manner. Meeting the State's ambitious climate goals requires a decrease in total site energy consumption over time, which requires energy efficiency to offset economic trends that may otherwise increase energy usage (e.g., growing plug loads, construction of data centers). This white paper, therefore, recommends tracking overall statewide electricity and fuel sales, aggregated into site TBtu consumption, with minimal adjustment for exogenous factors. Adjustments should focus on maintaining a comparable scope of end-use energy consumption over time. This will be achieved by estimating and netting out electricity consumed by EVs (since transportation is beyond the scope of the 2025 energy efficiency target) as well as adding in electricity produced by distributed solar photovoltaic (PV) systems. In addition, measurement of progress toward an electric sub-target should estimate and net out electricity consumed for heating via efficient heat pumps. The net energy impact of heat pumps, however, would be accounted for in the measurement of total statewide site energy consumption across all fuels.

To conduct a rigorous top-down assessment of the impact of energy efficiency on energy consumption trends over time, New York State will need to expand its capabilities for estimating electricity consumption from heat pumps and EVs. Complementary analytic approaches also may include the development of a set of statewide energy intensity indicators that normalize for weather, population, and economic activity, to help to isolate the effect of efficiency versus other drivers of energy use. Both NYSERDA's planned evaluation of indirect savings and the energy-intensity metrics that have been developed for utility EAMs provide approaches to build on.

Recommendations:

- DPS and NYSERDA shall develop improved approaches to regularly and accurately assess the aggregate impact of energy efficiency activities through top-down analysis of energy consumption trends over time, coupled with transparent program-level reporting.
- Integrate comprehensive progress reporting toward the 2025 statewide energy efficiency target into future State Energy Plans and the biennial updates to each State Energy Plan.

5. UTILITY-LEVERAGED ACTION TO DRIVE ENERGY EFFICIENCY

5.1 Build on Successful Energy Efficiency Models

In New York and across the United States, utility programs have been responsible for significant progress in advancing energy efficiency adoption. In 2016, such initiatives were responsible for acquiring more than 1,100 GWh of gross incremental electrical energy efficiency savings, nearly 110 MW of gross incremental capacity savings, and more than 3,400,000 MMBtu of gross incremental thermal fuel saving in New York.

While current utility-supported programs have been successful in generating energy efficiency savings in a cost-effective manner, important challenges are demanding greater innovation in energy efficiency initiatives and utility business practices. These challenges include:

- **Scale** – Traditional programs are too limited in scale to make the necessary progress towards longer-term objectives of reducing customer energy use and energy bills, of reducing carbon, and of delivering clean energy economy job growth for New Yorkers
- **Measure Mix** – The most prevalent utility delivered energy efficiency measure—lighting—is approaching market transformation, such that within three to five years program support will no longer be needed
- **Cost reduction** – With some technology-specific exceptions, such as LED lighting, the costs of energy efficiency have generally seen only modest cost reductions, both with respect to all-in-project costs and to the cost of required public support
- **Innovation** – The old customer-by-customer rebate approaches cannot achieve enough savings at low enough costs
- **Leverage** – Traditional ratepayer funded programs and investments, by themselves, are inadequate to achieve the State's clean energy goals

Recognizing these challenges, REV initiated a transition of New York's ratepayer-supported energy efficiency programs from more traditional resource acquisition programs—where rebates or subsidies are applied on a customer-by-customer basis to acquire savings—to more market-based approaches designed to reduce costs of energy efficiency, animate third-party business models, and increase private sector investment. Since 2015, NYSERDA has transitioned a large portion of its portfolio of initiatives under the CEF to market-based approaches while the utility program mix has remained largely in the form of traditional resource acquisition. During this period, the utilities' programs have played an important role in meeting the State's clean energy goals by maintaining existing market momentum and providing near-term market stability, as the CEF market transformation approaches begin to prove out and to take hold in the market. It will continue to be important to strike the right balance of program approaches to both set the State on a path to meet its longer-term energy and carbon goals and to continue a level of support for cost-effective, but often times less innovative programs, which can provide tangible benefits in the near-term.

The State is committed to transitioning smoothly and does not intend to abandon any sector unless and until new solutions take hold. There are also market segments that may continue their predominant reliance on a resource acquisition approach. LMI New Yorkers as a group, for example, require focused attention to ensure these households also benefit from good energy solutions and improved affordability, recognizing that market-based approaches have not generally found good traction in this sector. Accordingly, such traditional approaches are likely to continue to be necessary. At the same time, the State should commit to promote those kinds of market-based solutions that do have potential in the LMI sector, such as Retrofit-NY.

5.2 Encourage Innovative Utility Approaches and Partnerships

As noted, utility approaches in the future must do proportionally more. This requires portfolios that focus on addressing the challenges described as follows:

- **Value** – Utilities should seek and enable approaches that identify and enhance compensation for energy efficiency that provides heightened value, both locationally (e.g., load pockets) and temporally (e.g. air conditioning is highly correlated to peak)
- **Scale** – Utilities should seek and enable new approaches and new business models that can support the growth of energy efficiency markets and deliver more savings
- **Measure Mix** – Utility programs and business models will need to incorporate and support new, more comprehensive measure mixes to deliver greater levels of savings
- **Cost reduction** – Utilities must create new cost reducing and market-enabling approaches involving leveraging of utility information and data, as well as new partnerships and engagement with service providers and customers, to reduce the costs of achieving savings for their customers
- **Innovation** – New utility business models, new data and information sharing tools, new contracting mechanisms, and new cost sharing and delivery models—all are needed
- **Leverage** – Utilities must employ business and finance models that increasingly leverage public dollars with multiples of private dollars to deliver more savings

Innovative Utility Approaches

The utilities have been exploring a range of new energy efficiency models through REV demonstration projects and pilots,[16] the incorporation of energy efficiency in non-wire alternatives, testing of new models such as Pay-For-Performance (P4P) in partnership with NYSERDA, and the testing of the Self-Direct model with their large customers. In addition, the utilities possess substantial information regarding their customers that could lead to actionable insights and value in helping customers reduce their energy bills while supporting the State's policy goals. All of these approaches and other new additions are worthy of ongoing attention and further refinement and improvement, as the utilities seek to employ additional innovative approaches toward achievement of their energy efficiency goals.

REV Demonstrations and Pilots and Non-Wires Alternatives

Many of the utilities' REV demonstration projects and pilots remain in "proof" stage and have yet to be substantially integrated into broader energy efficiency portfolios at scale. Nonetheless, the portfolio of experiments is interesting in its own right and as an indicator of utility readiness to explore energy efficiency approaches beyond business as usual. Advancement of ideas that boost this exploratory model, including the development of systematic disciplined approaches to establishing clear milestones, timelines, and definitions of success should continue, thereby allowing successful demonstrations and pilots to be deployed at scale and those that are not to be cut off when appropriate.

In addition to innovative approaches like REV demonstration projects and pilots, several utilities included energy efficiency in NWAs and proposed non-pipes alternatives (NPAs), demonstrating both innovation and necessary integration of energy efficiency solutions across traditional solution silos. This points the way to a path of using energy efficiency investments to address load pockets and deliver the associated increase in value, as an opportunity to expand upon baseline energy efficiency investments. (Baseline energy efficiency investments are

[16] *A list of current REV Demo projects is available at: https://rev.ny.gov/rev-demo-projects-1*

broader and more stable, and currently necessary to preserving core markets around which energy efficiency businesses must plan.) The NWA/NPA framework also points to the possible value of implementing NWA-like long-term contracting models as a means of procuring energy efficiency—potentially in a shared savings model—in lieu of conventional capacity and energy.

P4P Pilot Partnership

One innovative model that is in development is a Pay-for-Performance (P4P) pilot that is designed to respond to two key observations.

1. A highly compelling energy efficiency value proposition to customers is some form of comprehensive energy service contract that guarantees lower cost of energy with little or no money down, with the risk of non- or underperformance borne by the service provider.
2. One of the most public-interest-aligned contract structures for ratepayer-funded approaches is a performance-based structure, again where the risk of underperformance is borne by the service provider.

Thus, the core of the P4P model is the design and alignment of the performance-based requirements between the program administrator and the service provider as well as the corresponding services/requirements between the service provider and the customer. The program design and service provider contract need to address key features to best ensure performance, cost-reduction, and meaningfulness of savings. Some of these features are as follows:

- Timing and level of payments aligned as much as possible with delivery of savings
- Mechanics prevent excess attention to low-hanging fruit, such as lighting
- Stability and certainty allow service providers to invest in their business systems and in their project pipelines
- Flexibility allows service providers to adapt approaches and offerings in response to learning and to market evolution
- Streamlined and efficient evaluation approaches that ensure that savings are credible

NYSERDA and two New York utilities are partnering on a P4P pilot to prove out the concept and establish practical approaches to key requirements (such as evaluation), and test the key features previously discussed.

Self-Direct Program

Beginning in 2016, several utilities provided their large customers with the option to participate in a Self-Direct Program through which they could “self-direct” their surcharge allocation toward their own customized energy efficiency project(s). The recent Utility Energy Efficiency Order recognized that the initial self-direct programs resulted in generally minimal participation. The Commission allowed each utility to determine whether they will continue to offer a self-direct program and determine if any modifications to the program structure should be considered in order to enhance the program. In reaching this determination, utilities should consider the level of ambition detailed in this white paper and the basic principle that a self-direct program has the potential to allow for large energy customers to contribute in a meaningful way to the utility’s energy efficiency goals. Further, large energy users should proactively approach the utilities to determine how partnering with the utility can be done in mutually beneficial way in advancement of the State’s policy objectives

Actionable Customer Data

New York's utilities possess a resource of great potential in that they have access to many customer data streams that could be translated into useful information capable of driving down the costs of delivering energy efficiency services. For example, utilities possess data on customer usage and bill payment history, past program participation, and portfolio and project level energy savings performance. Although approaches such as Green Button Connect and the Utility Energy Registry provide some useful information and represent a promising start, they do not yet enable sufficient data analysis and information sharing to significantly lower the customer acquisition costs, which remains a major driver of soft cost, particularly for mass market customers). This topic is further discussed in the Market Enablement section.

In sum, utilities in New York and around the country provide indications of approaches that are promising to explore more fully and resources that can be deployed, from experiments and pilots, to the potential of the NWA framework and the opportunity that data represents.

Recommendations:

- Transform the mix of utility energy efficiency investments to deliver greater leverage and impact to achieve REV goals
  - > Enhance energy efficiency compensation to recognize grid value (e.g., locational and peak).
  - > Advance multi-measure energy efficiency services addressing measures that include, but move beyond, the dominance of lighting in portfolios. Measures that integrate with other distributed energy resources (DERs) will also become important.
  - > Advance shared savings models leveraging third-party capital.[17]
  - > Streamline resource acquisition allowing for market innovation (e.g., Pay-for-Performance).
  - > Leverage data and customer/asset information to reduce soft costs.
- Consistent with the Commission's recent ETIP directive, encourage utility and NYSERDA partnerships in designing innovative approaches so the collective offering is the best solution to move the market. Encourage utilities to continue to include energy efficiency in NWA/NPAs (e.g., deferral to infrastructure) and to reflect energy efficiency as part of DSIPs. Encourage utilities to explore NWA-like long-term contracting models as a means of procuring energy efficiency—potentially in a shared savings model—in lieu of conventional capacity.
- Encourage utilities to build on findings from ongoing energy efficiency "experiments," and develop systems and disciplines to innovate and replicate more effectively.
- Encourage utilities and NYSERDA to launch P4P in 2018 with a focus on providing market stability and certainty to allow service providers to invest in their business systems and projects.

Mechanisms to Encourage Utility Innovation

Earning Adjustment Mechanisms (EAMs) are in their early days in New York and may offer a meaningful and promising means to encourage innovative utility business models. If EAMs demonstrate effectiveness, higher levels of EAM, and thus financial opportunity, could be allowed for utilities in exchange for reductions in the level of ratepayer funding for program support. The need for ratepayer funds would then be reduced at the same time energy efficiency outcomes achieved by the utility are increased. If successful, this can be a more cost effective strategy over the long term and achieve greater levels of market penetration.

[17] *Shared savings models in the context of utility energy efficiency investments include performance contracting, whereby an energy services provider implements an energy efficiency project and the customer pays, in part or in whole, for the project out of the resultant savings. If the utility can provide value-added/cost-reducing service (e.g., better customer targeting, increased customer confidence, integrated billing), it could potentially share in the energy-saving value of a project. Could be connected to a Pay-for-Performance type model. Non-Wires/Pipes Alternatives (NWA/NPA), whereby the net benefits of energy efficiency (implicitly tied to utility avoided cost) are shared with ratepayers and utility shareholders.*

A utility energy efficiency funding framework that ties funding availability to improvement in outcomes would implement a model of flowing investments to what works. The intent would be to drive at the program level innovation of all kinds—from novel approaches that seek and drive new ways into the market, to deployment of new technology, to bread-and-butter improvements in execution. The intent would also be to bring renewed attention at the portfolio level among utilities, DPS, and market actors to prioritization and focus.

Such an approach would clearly require several issues to be addressed, including the establishment of the relevant baseline, the interaction of these mechanics with other financial components (such as other EAMs) and the alignment on valid and useful metrics. Outcome metrics, illustratively, might include the following:

- Percent increase in private capital leverage (as indicator for program impact/scaling potential)
- Percent reduction in ratepayer dollars per lifetime MMBTU saved (as indicator for program economic effectiveness)
- Percent increase in portfolio estimated useful life or percent increase in projects achieving savings greater than 20% (as indicators of investments focused on longer-life/multi-measure projects necessary for deeper decarbonization)
- Percent increase in portfolio focused on demand response/DER integration with energy efficiency (as indicators for potential value creation)
- Percent increase in portfolio activity with market partners leveraging data driven targeting to reduce customer acquisition or percent decrease in customer acquisition costs of market partners (as indicator of cost reduction potential)

Recommendations:

- Improve EAMs as instruments to support new business models at utilities, by allowing higher levels of EAM in constructs that provide net benefits to ratepayers over the long term and achieve greater levels of market penetration.
- Consider a utility energy efficiency funding framework that ties funding availability to improvement in outcome metrics.

Fuel Neutrality

Utility innovation in the delivery of energy efficiency services offers the opportunity to reach more energy consumers at lower costs and provide those consumers with greater options for their energy needs and more opportunities to reduce energy bills. As the customers of utilities often require various fuel inputs to meet their energy needs beyond those provided, such as heating oil and other petroleum products, design and evaluation of utility programs on a fuel neutral basis would allow new interventions that serve all needs holistically and provide cost-effective efficiency benefits. The Commission previously noted the benefits of fuel neutral design across a program portfolio in its adoption of fuel neutrality for the CEF,[18] as well as in providing the opportunity for utilities to create fuel neutral offerings.[19]

A utility-based portfolio of programs that are designed to be innovative, contribute to the scaling of efficiency markets, and accelerate the contributions to statewide greenhouse gas emissions goals can also benefit from fuel neutrality in the portfolio or program design. Designing programs on a whole building, fuel neutral basis offers the opportunity to achieve desired outcomes—particularly carbon reduction—at greater scale and on a more cost-effective basis. For New York's combination gas and electric utilities, design and evaluation of programs on a fuel neutral basis may also provide some administrative efficiency, alleviating the need to coordinate separate electric and gas programs, as well as reduce potential lost opportunities that may result from single-fuel programs. Fuel neutrality will be an essential component of program design for advancing activities that seek deep energy savings and a building stock that approaches and ultimately realizes net zero energy.

[18] *Cases 14-M-0094, et al., Order Authorizing the Clean Energy Fund Framework, issued January 21, 2016, page 61.*

[19] *Case 15-M-0252, In the Matter of Utility Energy Efficiency Programs, Order Authorizing Utility-Administered Energy Efficiency Portfolio Budgets and Targets for 2016–2018, issued January 22, 2016.*

Fuel neutral programs can also help realize system efficiency outcomes that are sought through REV. As the State's emphasis on carbon reduction leads to more of the building stock becoming electrified, mitigation of winter peak load issues will likely become a next generation issue in fuel system operations. Programs that capture all fuel efficiency may alleviate pressures on fuel systems (natural gas and heating oil), which may remain strained during winter when the system transitions to be more dependent on renewables. Furthermore, fuel neutral programs will more readily support fuel switching, including beneficial electrification, thereby providing additional headroom in fuel supplies during periods of constraints for those fuels during winter conditions. It will be important to achieve scale in deep energy retrofits of the State's building stock to alleviate future winter peak demands on the electric grid as more buildings are electrified.

Deep energy retrofits will reach all fuels by encompassing building envelopes and mechanical systems, with both electric and heating fuel (natural gas, oil, propane) conservation measures in conjunction with insulation, air sealing and other envelope improvements. As previously noted, a whole building approach can provide the benefit of reducing overall project first costs, as improving the envelope allows for reduction in size of new mechanical systems, and thereby reduced requirements for both electricity and fuels. Fuel neutrality for deep retrofits will also be necessary to avoid program approaches that incentivize only the shallowest, shortest payback (i.e., most profitable) efficiency projects, which may favor only single-measure/single-fuel projects, at the risk of missing a critical opportunity in the renovation/construction cycle of a building.

Recommendation:

- The Commission should develop criteria and guidelines for the funding of fuel-neutral efficiency programs to be delivered by utilities. Issues to be addressed should include the following:
  - > The potential scale of cost-effective cross-fuel programs
  - > Criteria for determining the cost-effectiveness of cross-fuel programs, including weighting of participant benefits relative to carbon reductions and appropriate use of Benefit Cost Analysis framework
  - > Types of cross-fuel programs and eligibility criteria, including potential weighting toward LMI customers

5.3 Actions for Public Utilities

Achieving the State's ambitious energy and climate objectives and its energy efficiency goals requires accelerated progress from all energy efficiency actors across New York State from Buffalo to Montauk, and looks to the public utilities including the Long Island Power Authority and the New York Power Authority to align with the directions and level of target set out in this white paper

Recommendations:

- While energy efficiency activity on Long Island has been robust, Long Island presents opportunities to realize meaningful increases in energy efficiency savings in the period to 2025 and beyond. During the course of the 2018 year, LIPA should develop its strategy for delivering accelerated energy efficiency services for its customers, consistent with the principles and level of ambition presented in this white paper, including opportunities for innovative approaches to meet customer needs that include implementation of advanced meter infrastructure and value-based efficiency opportunities in areas of increasing constraint.
- NYPA committed to a significant increase in its funding of energy efficiency, increasing the financing program to $300 million, and should continue to create opportunities with its customer base for expanded efficiency contributions as aligned with the goals presented in this white paper. Municipal utilities can also contribute to these broad statewide objectives and goals, possessing unique opportunities to tailor program budgets and efficiency activities that meet the needs of their customers.

6. MARKET-ENABLING ACTIONS

Market-enabling actions help create the environment for more efficient and engaged markets, provide market actors the ability to deliver more economic and compelling solutions to consumers, and facilitate the transition to more market-based mechanisms that can deliver efficiency at greater levels of scale. This section presents a discussion of near-term actions and recommendations directed toward State entities and utilities to enable energy efficiency markets and spur private investment.

6.1 Increase Access to Useful Data and Information

As New York's energy industry evolves through the REV initiative to become more distributed, dynamic, and consumer-focused, a foundational element of progress is the creation of a more information-centered power system. The modernized distribution platform model for the electric system must promote the exchange of information to enable a multi-sided market for DERs. Access to system data and customer data are key components for more efficient and engaged markets. As the Commission stated in its REV Track 2 Order, ready access to information regarding customer energy usage is vital to the success of the DER market.

More robust access to and uses of data hold great promise to support significant growth in the energy efficiency market and achievement of the State's clean energy policy objectives.[20] Data relevant to enabling energy efficiency markets includes energy usage data, building-level/type data, and energy efficiency project data. Customer and third-party access to such data can have a transformative effect on the energy efficiency market by helping to identify target customers to reduce customer acquisition costs, develop better estimates of savings, and increase customer confidence. As AMI begins to be implemented in New York along with other advances in data analytics and supporting tools, the need arises to focus on this area of opportunity and ensure that the State's regulatory, legal, and policy objectives are aligned. Consumer protections and privacy concerns must be addressed in a thoughtful manner as New York considers the evolution of the treatment of and access to energy usage data.

Data useful to the development of energy efficiency market activity at scale includes energy usage data, both at the individual customer and at the aggregated community level; asset data, which captures key energy characteristics of the building or facility; project data, which captures the implemented measures and achieved results of projects, useful for benchmarking and estimating project performance; tariff/rate data, for estimating the bill savings that result from changes in physical energy use and demand; and locational data to identify areas where energy efficiency can provide especially high value.

New York has begun to tap this potential in several areas as evidenced by the actions summarized:

- **Adopting 4/50 Privacy Standard for Aggregated Whole Building Data**[21] – In the April 19, 2018 Order Adopting Whole Building Energy Data Aggregation Standard, the Commission adopted a 4/50 standard for requests by building owners to obtain energy consumption data for their buildings for the limited purpose of benchmarking their building's relative energy efficiency. The 4/50 standard means aggregated customer usage data is considered sufficiently anonymous to share with building owners if the aggregated group contains at least four individual accounts, and no one account represents more than 50% of the total load. This step is noteworthy for two reasons. First, it adopts

[20] *The ability for data analytics to help drive down customer-acquisition costs and improve energy efficiency results holds promise. In fact, a recently published report that looked at two long-standing residential energy efficiency programs offered by Pacific Gas and Electric Company, found that effective targeting can yield significantly enhanced per-capita savings and peak demand reduction, ranging from 50–150%. Data analytics go far beyond merely identifying high-use customers. Utilizing pre-intervention usage patterns can also serve as a means to limit the customers that may not achieve anticipated results, serving as a tool to more effectively target limited program resources for greater impact. (Customer Targeting for Residential Energy Efficiency Programs: Enhancing Electricity Savings at the Meter, Adam M. Scheer, Sam Borgeson, Kali Rosendo, October 2017)*

[21] *In general, a privacy standard for aggregated energy data establishes the minimum configuration and characteristics of energy accounts that, when aggregated over a geographic area or building, are expected to provide a reasonable expectation of customer privacy by not revealing or permitting determination of individual customer-specific energy use.*

a privacy standard for buildings for the first time, which in this case, prevents undue identification of individual customer data from within an aggregated data set. Second, it is a concrete step towards the broader enablement of benchmarking. As discussed in this white paper, a statewide approach to building energy use benchmarking is a foundational step to supporting an energy efficiency market at scale. This policy should require a consistent approach across utilities and jurisdictions and utilize the U.S. Environmental Protection Agency (EPA) ENERGY STAR® Portfolio Manager platform for the housing and presentation of the data.

- **Utility Energy Registry (UER)** – In the April 19, 2018 Order Adopting Utility Energy Registry, the Commission adopted the UER as a vehicle for providing streamlined public access to anonymized aggregated community-level energy usage data, which can help facilitate GHG inventories, community choice aggregation development, and allow communities and service providers to better understand energy patterns. The Commission directed the utilities to upload specified datasets, on a semi-annual basis, beginning in July 2018. The UER datasets compile total load and installed capacity tag data as well as various forms of customer counts by geospatial layers (e.g., zip code), incorporated municipality and county; and rate class groupings of residential, small commercial, and other; the Commission balanced the benefits of making more anonymized, aggregated energy data available through the UER with the need to maintain customer privacy by maintaining the existing 15/15 privacy standard as applied to the residential grouping, while adopting a 6/40 standard for the small commercial and other groupings.
- **Project-Level Energy Efficiency Data** – To support greater data availability and development of alternative market-based energy efficiency business models, the Commission recently took steps to make anonymized project-level information publicly available. NYSERDA published, and is currently in the process of releasing, many additional anonymized historical data sets associated with its programs. Project-level data sets can support third-party business development in many ways. Analysis of patterns in energy efficiency measures and project adoption by different customer types can improve the effectiveness of customer targeting and acquisition by service providers. Availability of project and measure performance information provides evidence that service providers can present to customers to lend confidence and aid in decision making. The Commission directed staff, in consultation with the utilities and NYSERDA, to develop a plan for the utilities' release of anonymized energy efficiency project data through the online dashboard being developed by NYSERDA on a going-forward basis, in recognition of the changes to systems and processes that will require time to implement.[22]

Third-Party Access to Customer Data

The Commission laid important groundwork in the ability for third-party access to customer data in two key areas: the minimum functional requirements established for AMI and Green Button Connect.

A number of the minimum functional requirements established for AMI support third-party access to customer data. Key among these are the requirement for the point where the customer(s) agent interfaces with the AMI system for the data exchange to be in an open, standard, non-proprietary format facilitating the maximization of customer control and further encourages innovation in devices in Home Area Networks (HAN). This allows greater choice in the devices that can interface with the AMI system; the ability to provide customers direct, real-time access to electric meter data in an open non-proprietary format; and the ability to send signals to customer equipment to trigger demand response functions and connect with a HAN to provide direct or customer-activated load control.

[22] *Case 15-M-0255, In the Matter of Utility Energy Efficiency Programs, Order Authorizing Utility-Administered Energy Efficiency Portfolio Budgets and Targets for 2019-2020, issued March 15, 2018.*

The Green Button Connect tool is one way in which customers can share their usage data with third parties in a relatively easy manner. The Commission required all utilities with AMI deployment plans to include in their DSIPs an implementation plan, budget, and timeline for implementing Green Button Connect, or alternate standard that offers similar functionality. Utilities without AMI Deployment Plans were directed to identify other tools that could be used to enable customer and authorized third-party access to customer data, as well as implementation plans, budgets, and timelines.

Recommendation:

- Building upon the foundation that these actions provide, approaches to expedite third-party access—potentially in advance of AMI deployment—should be developed. Utilities, DPS Staff, and stakeholders should assess the benefits and costs associated with accelerated deployment of Green Button Connect, and whether other alternatives exist, given the advancement of technology to achieve these objectives. Additionally, where Green Button Connect is being deployed current requirements being placed on third parties to comply with a robust Data Security Agreement (DSA) should be monitored to ensure they balance access with data security in order to make the investment in Green Button Connect a worthwhile endeavor.

Basic versus Enhanced Data

There is a distinction between the utility-sourced data (mainly usage, locational) that is basic and should be readily available to service providers, customers, and their agents at no cost to these recipients versus utility-sourced data that should be recognized as enhanced and representing extra investment by the utilities, thereby warranting some payment by the recipient. This issue remains unresolved. Clarifying and defining the difference between data that is basic versus data that is enhanced is a priority, recognizing both types are valuable and relevant.

Recommendation:

- The Commission should clearly define basic versus enhanced data for the purposes of clarifying what data should be made readily available to service providers, customers, and their agents at no cost, and what data is appropriate for utilities to charge a fee.

Locational Data

A core principle of REV is broad investments in DERs, and thus in energy efficiency specifically, can provide the most value if they are deployed to provide value to the electric (or gas) system as a whole. A related principle of REV is a willingness to provide extra compensation to those investments that can increase the likelihood and scale of deployment of system-valuable DER investments. Often, this means deploying these resources in a specific location.

At the direction of the Commission, New York's utilities have made progress in identifying specific locations where there are impending or foreseeable infrastructure upgrades needed, such that non-wires alternatives (NWAs) or non-pipes alternatives (NPAs) could be considered and so that DERs could potentially provide delivery infrastructure avoidance value or other reliability or operational benefits.[23]

[23] *Utilities now each maintain a list of active and potential NWA opportunities on their respective websites and maintain a list of all NWA opportunities on the REV Connect website at nyrevconnect.com/non-wires-alternatives.*

The Commission also identified the importance of utilities making accurate, substation-level forecasts available to outside stakeholders, with recognition that more granular data and forecasts will be needed to identify beneficial locations for DERs, including energy efficiency. Notably, Central Hudson's web-based data portal now provides 8,760 historic and forecast data for its system's 10 transmission areas and 54 of the 62 load serving substations, while Con Edison's data portal provides forecasted network-level, 24-hour peak load duration curves as well as at the network level.[24] Yet the accessibility and granularity of load forecast data varies across the utilities.

Continued utility progress toward making locational data available to stakeholders is needed, and this must be coupled with work to align energy efficiency procurement, programs, and value-based payments with locational value. With improved data and analytic capabilities, accounting for locational value may support updates to energy efficiency program designs (including value-based incentives as discussed in Section 6.3) as well as increase benefit-cost ratios of energy efficiency portfolios. Sharing data on higher value locations with stakeholders further invites innovative third parties to work with the utility to develop energy efficiency deployment and customer engagement strategies that are more optimal for system needs, thus creating value that can be shared among customers, third-party, and utility shareholders.

Recommendations:

- Utilities should continue to work toward identifying beneficial locations for DERs and making substation-level load forecasts available to stakeholders.
- Utilities should make it a priority to encourage innovative companies to co-develop energy efficiency deployment strategies that deliver locational value, both through NWA/NPA procurements and by developing other partnership approaches that can be responsive to system needs on an ongoing basis.

Machine Readable Rate Tariffs

Machine readable rate tariffs (i.e., in a format that can be processed by computers) can facilitate DER providers' ability to communicate efficiently and accurately to end users about how proposed load profile changes would change bills based on current and forecast rates. They do so by enabling this rate information to be readily loaded into DER providers' engineering and energy models. New York's utilities do not publish tariffs in a machine-readable format. While the utilities acknowledge that requests by market participants for such information focus on the pricing information included in the various tariffs, the utilities are still working through foundational systems/processes before they could provide data in a machine-readable format. Making data available in this manner is expected to lower the costs to third-party energy service providers, particularly serving the commercial market, as software tools could be utilized to more efficiently scope out project economics.

Recommendation:

- Develop an accelerated and useful approach to enable use of machine-readable tariffs and assess costs and benefits associated with such an approach.

[24] *The Joint Utilities maintain a summary of available system data with links to utility web portals and filings at: http://jointutilitiesofny.org/system-data/*

6.2 Deploy Advanced Measurement and Verification to Build Market Confidence

Advanced measurement and verification (M&V) refers to the use of automated M&V software/analytics to determine normalized metered energy savings.[25] Advanced M&V is attractive to regulators and energy efficiency program administrators due to its potential to provide more real-time performance information—with the explicit objective of decreased costs compared to traditional evaluation, measurement, and verification (EM&V)—and can be used to increase consumer confidence in energy efficiency and support innovative business models.

Historic utility energy efficiency programs were, for the most part, not performance-based, but rather claimed savings based on deemed values or standardized savings algorithms documented in the New York State Technical Resource Manual. As such, the results customers experienced at the meter often differed from the results the program administrator claimed in regulatory reporting. Shifting energy efficiency programs to performance-based in general and utilizing advanced M&V to provide more timely info, starts to align the utilities' interests with that of the customer: real savings at the meter. Growing and sharing advanced M&V data sets is expected to increase customer and lender confidence as savings estimates become more in line with realized savings at the meter, and consumers, contractors and their financing partners will be able to more reliably depend on the energy efficiency being sold.

The Commission and DPS Staff have taken steps in the CEF and REV Track Two Orders, as well as the Evaluation Guidance issued by Staff, to support the use of advanced M&V. NYSERDA and National Grid have undertaken a limited analysis to validate savings using advanced M&V tools, and other utilities (Con Edison, Central Hudson, NYSEG/RG&E) have indicated in their ETIPs that they will begin to deploy advanced M&V. The Commission's recent ETIP Order[26] placed a renewed emphasis on advanced M&V and requires the utilities to specifically describe in their ETIPs how they are integrating advanced M&V into their portfolio of EM&V activities. The ETIP Order also directed staff, in consultation with the utilities, NYSERDA and other interested stakeholders, "to identify the various barriers, approaches, and next steps that could advance the use of this tool in New York." For the interim period, in recognition of the fact that current advanced M&V tools quantify savings using pre-installation existing condition baselines, which is at odds with New York's current baseline policy that primarily uses a minimally compliant federal standard or State code as the applicable baseline, the Commission took the additional step of allowing savings claimed through NYSERDA/utility pay-for-performance pilot(s) to be based on an existing conditions baseline.

These steps have been important and useful, but they have not yet translated into an M&V approach to developing a more active and value-providing energy efficiency marketplace.

Recommendation:

- DPS Staff and the Commission should advance development of such M&V tools in ratepayer-supported energy efficiency programs, specifically:
  - > Develop and make available valid, useful, and desired information to customers and their agents.
  - > Reduce the cost and improve the timeliness and accuracy of EM&V performed by program administrators and regulators.
  - > Enable performance-based approaches to energy efficiency.

[25] *Advanced M&V is sometimes referred to as M&V2.0, Automated M&V, and Energy Efficiency (EE) Meters. Many of the technologies that offer M&V 2.0 capability are not exclusively tools for energy savings estimation, and many tools offer other data analytics capabilities.*

[26] *Case 15-M-0255, In the Matter of Utility Energy Efficiency Programs, Order Authorizing Utility-Administered Energy Efficiency Portfolio Budgets and Targets for 2019-2020, issued March 15, 2018.*

6.3 Align Energy Efficiency Payments with Value to Energy System

Energy efficiency improvements save energy and reduce carbon emissions and pollutants, and additionally may reduce peak demand, which yields system and distribution-level capacity savings. The economic value of energy efficiency savings varies with the season and hours during which the savings occur and with their location, based on the physical and operational characteristics of the individual utility system.

Through customer bill savings, much of the utility system value from energy efficiency flows directly to those customers and facilities that implement efficiency solutions. On average, under existing retail rates, the customer bill reduction that results from an electric efficiency improvement more than compensates the customer for the primary utility system benefits recovered through rates; i.e., the avoided energy generation, system capacity (ICAP), and transmission and distribution (T&D) infrastructure costs. For mass market residential and small commercial customers paying flat volumetric rates, energy efficiency reduces the customer's payment for fixed costs that do not vary with load as well as for usage-related costs, such that the value of the efficiency project to the customer typically exceeds its value to the utility system.[27]

When energy efficiency reduces demand coincident with a utility system's peak load hours, the savings yield above-average utility system value. A Lawrence Berkeley National Laboratory (LBNL) study of the time-varying value of electric efficiency concluded that of five common measures modeled, residential central air conditioning in summer-peaking systems has the most significant added value when the time-varying value is considered.[28] Commercial air conditioning and residential and commercial heat pumps deliver summer energy savings during peak demand periods, suggesting higher system value in New York State. Higher-value energy efficiency upgrades also could combine building or equipment improvements with automated technologies and controls that modify the duty-cycle or hours of operation of end-use consumption.

Both the LBNL study[29] and the avoided distribution costs reported by New York utilities[30] indicate some of largest capacity benefits from energy efficiency are derived from the deferral of T&D system infrastructure upgrades, which also exhibit a wide range in value across locations. This shows the importance of the resource location when evaluating system benefits. Consolidated Edison's Brooklyn Queens Demand Management (BQDM) Program demonstrates the significant distribution-level load relief impacts that energy efficiency can deliver, in the BQDM instance as a component of a non-wires solution project.

A recognized barrier to quantifying the time-varying value of energy efficiency is the fact that publicly available data on end-use load and energy savings shapes are limited in New York and regionally. This white paper recommends addressing the data gap. Concurrently, utilities should continue to work toward making substation-level load forecasts and load shapes available to stakeholders, with the intent to identify beneficial locations for DER as directed by the Commission.[31]

With more granular analysis of system value, utilities could structure a performance-based $/kW "kicker" to increase the incentive available for specific energy efficiency upgrades that are under-compensated for the value they provide to the grid through system-coincident peak demand reductions. As an early opportunity that could precede full availability of such analysis, air-conditioning measures, including potential heat pump solutions, are

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[27] *Modeling conducted by E3 for New York finds that in locations with zero local T&D value, existing mass market rates significantly overcompensate non-dispatchable energy efficiency technologies for the value provided to the grid. See Energy and Environmental Economics, Inc. (E3). April 18, 2016. Full Value Tariff Design and Retail Rate Choices, p. 72. Prepared for: NYSERDA and DPS.*

[28] *Mims, N, T. Eckman, and C. Goldman. June 2017. Time-varying Value of Electric Energy Efficiency. Lawrence Berkeley National Laboratory. The other measures modeled were an exit sign, residential water heating, residential lighting, and commercial lighting, with modeling conducted across the Pacific Northwest, California, Massachusetts, and Georgia.*

[29] *Ibid.*

[30] *Under Case 15-E-0751, Value of Distributed Energy Resources (VDER), each investor-owned utility files a monthly statement with DPS that includes the utility's current (1) Demand Reduction Value rate based on the avoided costs of reducing the distribution grid's peak demand and (2) Locational System Relief Value (LSRV) rate for specific locations that need a stated amount of peak load reduction to defer infrastructure upgrades.*

[31] *Case 14-M-0101: Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting Distributed System Implementation Plan Guidance (Issued April 20, 2016).*

prime candidates for a near-term approach. If such an approach proves to have merit, the list of measures and techniques could be expanded over time to include eligible projects that combine efficient end-use technology and controls to reduce energy and peak demands. Value-based kicker incentives should be considered in the context of existing utility efficiency programs as well as new initiatives such as pay-for-performance.

To support energy efficiency penetration broadly, NYSERDA and utility-administered financial incentives remain an important market intervention to increase uptake and compensate efficiency projects for their societal benefits. Under New York State's Benefit Cost Analysis Framework, the primary societal benefit that is quantified in evaluating utility energy efficiency programs is the social cost of carbon, currently valued at $27.41 per MWh (net of the forecasted RGGI compliance costs included in energy prices). Further analysis of the environmental and public health value of energy efficiency should be pursued in tandem with the value of DER proceeding, under which stakeholders and DPS staff will work to review the DER benefits provided by a reduction in environmental externalities.[32]

Recommendations:

- NYSERDA and DPS shall assess the alignment of energy efficiency payments with utility system and environmental value, engaging stakeholders for input and conducting relevant analysis, with findings expected to inform design of New York State utility incentives for energy efficiency and NYSERDA interventions as appropriate.
- Ensure that load curves developed by utilities for other localized DER resources are suitable in format, granularity, and timeliness for energy efficiency.
- In the interim, New York State utilities are encouraged to provide approximate compensation for energy efficiency where there is found to be locational peak reduction grid value (e.g., through increased incentives for measures such as air conditioning in existing programs or new initiatives such as pay-for-performance). Utilities also should continue to consider and compensate (as viable) energy efficiency savings within their NWA and NPA projects.

6.4 Expand Options for Energy Efficiency Financing

Effective financing solutions are enabling strategies to support the ability for consumers, businesses, and institutions to make clean energy investments. Financing solutions help address first-cost considerations and can allow for investments and repayment obligations to be better matched to the anticipated energy cost savings and useful life of clean energy investments. In turn, this may help customers see the value proposition of such investments more clearly. In general, clean energy financing has proven to be an asset class that compares well with other consumer financing asset classes in terms of delinquency and default, yet there are still impediments in the market hindering the ability (and appetite) of private-sector financial institutions to develop and offer energy efficiency financing products attractive to consumers and capable of achieving real scale. Financing solutions are particularly challenging to address for LMI consumers and renters.

[32] *Case 15-E-0751: Value of Distributed Energy Resources (VDER), VDER Value Stack and Rate Design Working Group Process and 2018 Schedule (filed December 22, 2017).*

NY Green Bank

To date, NY Green Bank committed $50 million in energy efficiency transactions (out of $441 million total NY Green Bank investments). Even where financing solutions are available to be provided to building owners similar to those available for solar PV transactions, intermediaries looking to originate energy efficiency projects have not demonstrated the customer acquisition success exhibited in solar. Financing availability alone is, therefore, not the solution to driving accelerated energy efficiency activity. However, lack of available financing products will certainly impede more rapid development of energy efficiency projects. Often, a primary financing barrier for economically viable business models is lack of precedent, standardization and scale, which are directly within NY Green Bank's mandate and skill set. NY Green Bank could work with market participants to support viable models where replicability and scale is expected and participate alongside other lenders or as a bilateral lender, where leading the structuring precedent and demonstrating scale are the key barriers to follow-on involvement by private market financiers.

Recommendation:

- Capitalize on NY Green Bank's ability to support energy efficiency by addressing barriers of lack of precedent, standardization and scale of economically viable business models through serving as senior capital provider, subordinated capital provider, credit enhancer, or aggregator. In addition, NY Green Bank could play various roles in facilitating some of the financing mechanisms.
- Specifically, NYSERDA and NY Green Bank shall work to launch the following financing products:
    - > Pay-for-Performance Finance. NY Green Bank intends to issue a financing Request for Proposal (RFP) alongside NYSERDA's Pay-for-Performance RFP. NY Green Bank will work with NYSERDA and market participants to provide a loan product to developers/ energy service companies (ESCOs) that take advantage of the pay-for-performance program, enabling them to offer improved value propositions to building hosts. Providing a loan product that finances both future customer payments and pay-for-performance incentives, while utilizing a consistent approach across the market, will result in reduced transaction costs, standardization and scale, which together will result in improved offerings to building owners and ultimately crowd in private sector capital more quickly.
    - > Tenant Improvement Finance. NY Green Bank intends to work with large property owners and management companies to provide financing for their tenants for incorporating energy efficiency measures into the build-out or retrofit of tenant improvements to their premises. NY Green Bank will utilize an approach that maintains the owner-tenant relationship by providing capital on a wholesale basis that is used by building owners/managers to offer financing solutions to their tenants for qualified improvements. The debt service will be structured so ongoing tenant debt service payments will be less than anticipated energy savings, with a payback period shorter than the remaining lease term. By working with multiple major property owners, NY Green Bank seeks to achieve scale and standardization, which will ultimately provide better value propositions to tenants and attract private sector capital providers.

Residential PACE Financing

The General Municipal Law Article 5-L authorizes municipalities to offer Property Assessed Clean Energy (PACE) financing, allowing sustainable energy loans (a/k/a PACE assessments) to be repaid through a charge on the property tax bill. PACE has the potential to solve barriers for longer payback measures, because it offers longer repayment periods than most conventional financing mechanisms, and because the assessment charge is permitted to stay with the property. However, efforts to advance a Residential PACE (R-PACE) program in New York stalled in 2010 when the Federal Housing Finance Agency (FHFA) expressed soundness concerns over the priority lien position of this financing mechanism.

Notwithstanding FHFA's opposition, over the past several years, California municipalities have proceeded to offer residential PACE and seen more than $3 billion in financings accessed by consumers. But the California programs, which were implemented in a decentralized manner, have come under scrutiny due to concerns from consumer advocacy groups that insufficient consumer protections were in place in their programs. These concerns led to state legislation that formalized certain consumer protection policies and implemented state oversight and regulation of the administrators who that offer R-PACE financing to consumers on behalf of California municipalities.

With this in mind, New York should consider calling upon the Department of Financial Services to issue draft consumer protection guidelines and a program for oversight and regulation of residential PACE administrators in New York and call on NYSERDA to develop an approach for assuring that mortgage lenders foreclosing on properties with PACE liens do not incur additional losses attributable to those liens.

Recommendation:

- Promote statewide availability of Residential PACE financing with appropriate necessary consumer protections and regulation of PACE administrators in New York.

Commercial PACE Financing

The Energy Improvement Corporation (EIC), a local development corporation, currently administers Energize NY PACE financing for commercial buildings (C-PACE) in approximately 40 municipalities across the State. But a large number of municipalities still don't offer C-PACE financing, and even for those municipalities where it is offered, C-PACE has been underutilized. NYSERDA and EIC recently worked with the legislature to amend New York's PACE enabling legislation to make the State's C-PACE market more accessible to property owners, third-party capital providers, and clean energy developers, which should help the C-PACE market achieve scale more quickly. In addition, New York City plans to pass legislation instituting a commercial PACE program this year and recently selected New York City Energy Efficiency Corporation (NYCEEC) to be the administrator of its upcoming C-PACE program.

Recommendation:

- Promote C-PACE through collaborations with:
  - > Each of the Regional Economic Development Councils to promote expanding C-PACE to those municipalities that are not yet Municipal Members of the Energize NY Benefit Finance Program and ensure that commercial property owners are aware of the opportunity to utilize C-PACE financing for energy-related commercial projects approved by the REDC in those communities in which it is available.
  - > NYCEEC as it rolls out NYC's C-PACE program, to look for synergies with utilities' and NYSERDA's commercial and multifamily efficiency programs.

On-Bill Recovery

The Power NY Act of 2011 created an On-Bill Recovery financing mechanism through the Green Jobs – Green New York (GJGNY) Program allowing residential homeowners, small businesses and not-for-profits to finance clean energy improvements and repay them through a charge on the utility bill, offering convenience and the ability to match savings and repayment obligations on one bill. The GJGNY program made more than 7,400 On-Bill Recovery (OBR) loans to date exceeding $105 million, and ultimately sources capital through the issuance of bonds to institutional investors supported by repayments from pledged GJGNY loans. In order for each issuance of bonds to achieve an investment grade rating, the GJGNY financing requires funding support. This funding support has been recently provided through limited Regional Greenhouse Gas Initiative (RGGI) proceeds. The GJGNY on-bill program could attract third-party investors to provide capital to finance OBR loans, rather than continuing to use overly-subscribed RGGI funds. Doing so, however, would likely need to address provisions in the original authorizing legislation regarding priority of partial utility payments, utility fees for providing billing and collection services, provisions for transferability of loans, and bill neutrality requirements.

Recommendation:

- Consider statutory changes that would promote On-Bill Recovery with third party capital by addressing priority of partial utility payments, utility fees for providing billing and collection services, provisions for transferability of loans, and bill neutrality requirements.

Green Jobs - Green New York

Green Jobs - Green New York (GJGNY) financing has been refocused to address financing for LMI consumers and other consumers who may have credit characteristics that may preclude them from qualifying for traditional financing. Even with attractive interest rates and flexible loan underwriting standards, the program is somewhat underutilized. NYSERDA is changing underwriting standards and loan origination processes to make the program more appealing for contractors to offer to prospective customers. Regardless, the loan default and performance database that NYSERDA collected through the GJGNY program is reaching a point of statistical significance. NYSERDA is currently working to provide anonymized loan repayment performance information for the GJGNY portfolio on the Open NY platform for use by capital providers, rating agencies, and other interested parties.

Recommendation:

- Expand use of GJGNY financing by streamlining program and pushing loan performance data on OpenNY, or other similar suitable future platforms.
- NYSERDA/NY Green Bank shall explore the possibility of using this database to develop a securitization mechanism to allow the GJGNY platform to expand its ability to provide unsecured loans to market rate customers at lower interest rates, with greater scale.

Underwriting of Project Operational Savings for Deep Energy Retrofits

RetrofitNY is a program offered by NYSERDA aiming to create new solutions to renovate multifamily buildings to achieve or approach net zero energy use and create standardized and scalable processes that will improve residents' comfort and buildings' energy performance. For the RetrofitNY business model to work without continuing state subsidy (i.e., in order for net zero energy retrofits to become cost-effective and scalable), the lenders financing the cost of the retrofits need to be able to rely on the long-term operational (energy, water, maintenance) savings the retrofits will produce. Until there is a much larger database of the performance of deep retrofits, third-party financial providers will likely require some form of support or guarantee in order to underwrite up to 100% of projected performance.

Recommendation:

- Expand underwriting of projected operational savings for deep retrofits by developing a database of multifamily deep retrofit projects, and working with NY Green Bank, NYCEEC, and other parties to develop innovative financing structures that could incorporate contractors' performance guarantees, supplemental bridge financing, insurance products, and/or other financial guarantees.

Low-Income Financing Solutions

While several of the financing vehicles discussed have some applicability to the LMI sector, the following mechanisms would apply primarily to low- to moderate-income consumers.

Opportunity Zone Funds

Low-income opportunity zones are a new community development program established by Congress in the Tax Cuts and Jobs Act of 2017 to encourage long-term investments in low-income urban and rural communities nationwide. This program could create opportunities for bolstering private clean energy investments in certain low-income census tracts designated by the Governor. Once these opportunity zones have been designated, opportunity funds will be able to make various investments in these areas in a tax-advantaged manner for the investors in such funds.

Recommendation:

- NYSERDA/NY Green Bank shall engage with the appropriate State entities to explore forming or managing one or more Opportunity Funds to raise private capital and direct clean energy investments in the designated Opportunity Zones.

Utility Allowances

In regulated multifamily affordable housing properties, each resident's housing expenses—defined as rent plus essential utility expenses (electric, water, gas if applicable)—are capped at a certain level, which varies from program to program, but is most often set at 30% of the resident's actual income. In cases where tenants pay for their utilities (i.e., in direct metered or submetered properties), landlords must provide each tenant with a utility allowance (UA), which is subtracted from the tenant's housing expense cap to arrive at the amount of actual rent that the landlord can receive from the tenant.[33] UAs are set by various mechanisms depending on the regulating entity and the specific program, but are generally intended to approximate the reasonable consumption of utilities by an energy-conservative household of modest circumstances consistent with the requirements of a safe, sanitary and healthful living environment. Outside of California, UAs are usually general approximations and

[33] *The term "Utility Allowances," as discussed in this section, refers to a specific mechanism used in certain regulated affordable housing structures in the determination of the amount of rent that may be collected by landlords. It does not refer to utility bill discounts provided under New York's Utility Affordability Policy.*

are not building specific. Because UAs are difficult, if not impossible, to adjust for specific circumstances, they often overestimate tenants' energy consumption in more energy-efficient buildings, consequently undersizing the amount of rent the landlord would otherwise be allowed to charge as dictated by the housing expense cap. This situation exacerbates the split incentive and can, therefore, serve as a disincentive to landlords to undertake energy efficiency retrofit projects (or to construct higher-performance buildings in the first place).

An alternative method to calculate UAs is through an energy consumption model, which is an engineering-based method to estimate reasonable consumption taking account of specific building and unit characteristics affecting consumption. This methodology generally produces UAs, which more accurately predict tenants' actual energy consumption. California developed the California Utility Allowance.

Calculator designed to calculate project specific utility allowances for low-income housing developments.

Recommendation:

- NYSERDA, in consultation with State and local affordable house agencies, shall explore alternative methods of setting utility allowances, and potentially contract for the development of a New York specific energy consumption modeling tool, in order to provide a mechanism for adjusting UAs following energy efficiency retrofits implemented by affordable housing building owners. Utility allowance adjustments should reflect energy savings in a manner that strikes a balance between fairness to tenants and financial feasibility for owners.

6.5 Advance Benchmarking, Disclosure and Labeling

Measuring and disclosing the energy use and efficiency of buildings in a standardized manner can help bring to light opportunities for improvement and facilitate improvements in energy efficiency. The key value of benchmarking is that it liberates energy usage data, relative energy performance, and other data points (e.g., year built, occupancy, square footage). It is also correlated with energy use reductions ranging 1.3 to 4.3% per year across multiple benchmarking efforts.[34]

New York City, which requires annual benchmarking and disclosure for private buildings over 50,000 square feet and public buildings exceeding 10,000 square feet, has reduced energy consumption by 10% and CO2 emissions by 14% in buildings that have been regularly benchmarked over five years.[35] In 2016, New York City amended its benchmarking requirement to include buildings greater than 25,000 square feet.[36] Yet, outside of New York City, no other community adopted benchmarking ordinances for private buildings. Statewide adoption of building benchmarking regulations is seen as the only foreseeable path to systematic private building benchmarking and energy disclosure.

Energy disclosure at sale/lease is viewed as less burdensome than benchmarking for smaller buildings (under 50,000 square feet) and still has the potential to create demand for energy efficiency and include energy efficiency improvements in financing at closing by providing prospective tenants and buyers with information about the energy cost and use associated with the home/building. While New York's Truth in Heating Law, in effect since 1981, requires disclosure of two years of heating and/or cooling bills to any potential buyer or renter who makes the request, it is widely underused, and therefore, not effective in driving energy efficiency demand.

Building labeling translates benchmarking scores into easily understood "grades," posted in a publicly visible place such as building lobby. The intent of building labeling is to make the energy performance information more visible and more easily understood by a broad audience including tenants, building owners, building operators, and property managers—thereby making it more actionable.

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[34] *Institute for Market Transformation (2018). Putting Data To Work: Impact Assessment - http://www.imt.org/uploads/resources/files/PuttingDatatoWork_ImpactAssessment.pdf*

[35] *New York City's Energy and Water Use 2014 and 2015 Reports (2017) - https://urbangreencouncil.org/sites/default/files/energy_and_water_use_report_spreads.pdf*

[36] *NYC's minimum square footage threshold for mandatory benchmarking started at 50,000 and was lowered 25,000 in 2016.*

To spur the development of the full value proposition for energy efficiency, utilities and NYSERDA could offer—as a requirement or as an opt-in—as a condition of funding or provision of technical support that customers or their agents register commercial buildings in the EPA portfolio manager and generate a EPA ENERGY STAR® score, as well as the Energy Performance and Emissions Performance reports. Initially this could be applied to buildings greater than 25,000 square feet. A similar effort could be supported in the residential sector using either U.S. Department of Energy (DOE) Better Buildings and its Home Energy Score, or a third-party solution such as PEARL certification; NYSERDA is currently supporting pilots with both these ratings systems under the CEF.

Recommendations:

- Consider advancing a legislative proposal for annual benchmarking and disclosure of private buildings energy performance data for buildings greater than 50,000 square feet.
- Commit to annually benchmark and disclose energy performance data for State buildings.
- NYSERDA shall work with appropriate agencies and local partners to develop a statewide building label and assistance for voluntary adoption by leading localities, building on the work underway by NYSERDA to support a NYC building label.
- NYSERDA, potentially with utilities, shall study small building energy disclosure strategies/policies, including disclosure upon sale/lease, and test strategies with localities and/or portfolios.
- The utilities and NYSERDA should pursue opportunities to support benchmarking in large buildings.

6.6 Build a Skilled Workforce

Energy efficiency is a vital and growing segment of the New York State economy. According to the 2017 NY Clean Industry Report, the energy efficiency sector employed more than 110,000 workers as of the end of 2016—equal to 75% of the clean energy economy—and was expected to grow 6.4% in 2017. In addition, energy efficiency jobs were found in every county of the State. These jobs are often related to the buildings industry and construction and cannot be outsourced—creating one of the most localized components of the clean energy economy.

Despite this significant employment opportunity, energy efficiency firms across the State reported experiencing a shortage of qualified candidates to fill entry level and advanced positions. Employers reported six to 12 months and thousands of dollars to recruit, train, and retain workers, leading to reduced profits and lost business opportunities, especially related to new technologies and business model innovation.

Availability of a skilled workforce is critical to accelerating energy efficiency investments and realizing the significant associated economic and environmental benefits. To increase the operational efficiency of buildings, NYSERDA will support employer-driven training partnerships focused on building operations and maintenance (BOM)– an opportunity area that the DOE estimates could save building owners 5-20% on their energy bills annually. In total, NYSERDA expects the BOM training efforts to support roughly 3,000 workers and leverage an additional $22 million in private investment.

Through this effort, NYSERDA is partnering with employers and training providers on initiatives that address skills gaps, foster career advancement, and develop in-house training infrastructure and expertise. For example, NYSERDA is partnering with 32BJ, the realty advisory board on labor relations, the Albanese Organization, MBD Community Housing, and several real estate management companies to provide expanded energy efficiency training to 250 union members across 75 buildings. 32BJ is a joint labor-management partnership that provides training to the 145,000 members of the 32BJ Service Employees International Union and a longstanding partner with NYSERDA in supporting a skilled clean energy workforce.

Recommendation:

- NYSERDA will increase funding for BOM partnerships by $10 million to support needs of an additional 1,500 building operations and maintenance workers

To position New York for continued success, NYSERDA plans to invest additional funding to support business-driven skills training in energy efficiency and clean energy technologies. Investments will focus on the highest need markets and increase the State's training capacity to support energy efficiency firms and workers. NYSERDA will support strategic regional efforts that meet businesses' short-term workforce needs, foster talent pipelines, expand apprenticeship programs, and address the long-term training needs of the growing clean energy industry. Activities will include the following:

- Building clean technology and energy efficiency training capacity including curriculum, trainers, equipment and infrastructure led by employers, enabled by experienced trainer providers, and based on the occupational skills to support business demands. This will include classroom training, innovative training models, on-line training, pre-apprenticeships, and apprenticeships.
- Incentivizing businesses to train new hires through on-the-job training to reduce the time needed to get to full productivity and improve job retention.

Recommendation:

- To address this labor shortage, NYSERDA will invest an additional $26.5 million dollars in business-driven skills training in energy efficiency and clean energy technologies to support more than 18,000 workers.

NYSERDA's investments will continue to place an emphasis on activities that target disadvantaged workers or individuals facing barriers to employment in the clean energy labor market. Disadvantaged workers include, but are not limited to, those residing in low- to moderate-income communities, underrepresented populations including women and people of color, unemployed, under-employed, transitioning, and dislocated or displaced youth or adults. Community-based organizations will continue to play an important role in communicating the opportunities of energy efficiency and clean energy to their constituents, facilitating awareness of clean energy workforce training opportunities available locally and assisting with regional enrollment in those efforts.

NYSERDA will continue to collaborate with and leverage the resources and expertise of State agencies to meet existing and emerging critical workforce needs of New York's clean energy industry. The State University of New York (SUNY), in partnership with clean energy business, is providing funding to SUNY schools to offer additional courses, hire new faculty and purchase or upgrade the advanced machinery and lab equipment necessary to teach students the skills to succeed in the green energy workforce. NYSERDA is partnering with SUNY on its commitment to build a low-carbon, resilient SUNY network to energize the clean energy economy. NYSERDA will continue to partner with New York State Department of Labor (DOL) on clean energy training and job placement activities. The DOL helps coach and train job seekers, connects workers to businesses and partners with businesses to help them compete in today's global economy. Additionally, Empire State Development (ESD) offers a wide range of business training, resources, and assistance programs to help businesses with everything from finding a mentor to taking products and services to a global marketplace. ESD's Employee Training Incentive Program provides refundable tax credits to State employers for procuring skills training that upgrades or improves employee productivity.

Given the highly localized nature of energy efficiency employment, New York State's accelerated investment in energy efficiency will train more than 19,500 workers for high-quality jobs across every region of the State. Through increased investments that will exceed $36.5 million in the coming years, NYSERDA, in partnership with State agencies, unions, training providers and utilities, is poised to ensure New York's clean energy businesses and employers find the talent they need to meet the growing demand for energy efficiency services.

7. DRIVE DEEPER ENERGY AND CARBON SAVINGS

7.1 Design to Advance Deep Energy Savings

Currently, more than 40% of New York's GHG emissions result from heating, cooling, lighting, operating, and occupying State buildings. By all accounts, the large majority of the building stock that will exist in New York in 2030, and even in 2050, is already standing today. If New York is to achieve the 40 by 30 and 80 by 50 climate goals, it will be essential to retrofit the State's existing building stock to dramatically reduce energy consumption, so that most buildings are able to reach Passive House[37] (PH) or net zero energy[38] performance levels. This presents an imperative to develop deep (i.e., 30-40-50% energy savings) and replicable retrofit strategies in the near term that can be applied to various common building typologies, as in the absence of government mandates, which will only reach true scale when market players view them as sound financial investments. NYSERDA has been pursuing the development of net zero energy (or near net zero energy) retrofit prototypes and associated market supports for the affordable housing sector through the RetrofitNY initiative and is evaluating opportunities to expand this approach to other building sectors, including dormitories through collaborations with SUNY.

Cost Reductions

Comprehensive net zero/passive house-level retrofits show promise for rapid and significant cost compression. The experience of Energiesprong[39]—the model for RetrofitNY—showed costs declining by more than 50% over the course of four to five years from their first prototype projects to those being completed today. These cost reductions derive from scale (e.g., when equipment vendors begin making components specifically designed for Energiesprong's NZE retrofit solutions) and learning (e.g., advances in design, and contractors developing more efficient ways to manufacture and install prefabricated, super-insulated exterior building panels).

To keep the incremental costs of net zero/passive house projects to a minimum, it is essential for new construction and deep retrofits to use an integrated project delivery approach, where the construction contractor is involved with the architects and engineers from the outset of the design process. NYSERDA plans to facilitate this cost compression through targeted technology development efforts, as well as demonstrations to accelerate learnings and evidence market viability, including facilitating knowledge transfer from industry experts who are already delivering net zero energy retrofits in the Netherlands through the Energiesprong program. Expansion of the RetrofitNY model to additional building sectors, as well as its potential application to new construction, will help demonstrate the large market potential for these innovative products and components. This market potential should entice manufacturers to work to accelerate the development, production, and cost-compression of the needed products and components, which will improve the cost-effectiveness of deep energy retrofits and net zero energy new construction across all sectors.

Another interesting model is India's "super-ESCO" program, focused on substantially reducing the cost of various high-performance building components through government bulk purchase guarantees. They started with Phillips for LEDs, and are now working with Mitsubishi on heat pumps—asking for a specified level of performance within certain cost bounds, then guaranteeing the market will purchase a threshold number of units meeting those specifications.

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[37] *Passive House (PH) is a rigorous building specification utilizing principles of super-insulation, air sealing, passive solar climate control, low-energy construction methods and active ventilation systems to create buildings which improve resident health and comfort while requiring very little in the way of fuel or electricity inputs to meet heating and cooling needs. Generally speaking, annual energy needs can be reduced by between 60% to 90% as compared to conventional design when utilizing passive house standards. However, these savings largely are achieved in new construction and not retrofit situations.*

[38] *Net Zero Energy (NZE) refers to a building which, calculated on an annual basis, produces as much energy on-site through distributed energy resources as the building (and its occupants) consume.*

[39] *Energiesprong ("Energy Leap" in English) is a Dutch program that has stimulated a large scale private sector industry that has delivered net zero energy retrofits (and new builds) to over 5,000 social housing units in the Netherlands, with an additional 10,000 units already in the pipeline.*

DOE has a similar arrangement with Whirlpool for preferred pricing for ENERGY STAR appliances available to all weatherization contractors operating under the Weatherization Assistance Program. New York could combine this approach with NYSERDA's Innovation Challenges to expedite technical advances to various components and ensure those components are made available to deep retrofit contractors at the lowest possible prices.

Recommendations:

- NYSERDA shall focus research and development on specific products and components that meet appropriate high-performance specifications at specific price points and explore the possibility of bulk purchase agreements for such products and components.
- The State should remove the prohibition from using the design/build project procurement method for deep energy retrofit projects for Public Housing Authorities, SUNY, and K-12 educational facilities to allow for a more integrated process where deeper energy saving measures are more easily considered.
- Establish requirements to drive deeper energy and carbon savings in State-owned facilities (in particular, seizing the current opportunity with SUNY), as outlined in Section 10.
- Consider leveraging New York State bulk purchasing power for cost reduction on high performance equipment (e.g., as NYPA has started to do with LEDs).
- Promote the use of non-monetary incentives, like expedited permitting or zoning bonuses, for deep retrofit projects.

Capital Planning Cycle

Deep retrofits can occur in two ways, one-time comprehensive projects or a series of sequential projects over a longer period. One-time comprehensive projects—the model behind RetrofitNY—are well suited for multifamily affordable housing where tight operating margins mean building owners often defer maintenance over extended periods, followed by a substantial renovation of the building envelope and systems as a comprehensive project. In these cases, it is essential to introduce deep efficiency very early on in the project planning process. In the sequential approach, deep energy efficiency projects are integrated into buildings' long-term capital planning processes whereby building components and capital equipment are replaced over time, as they fail or approach the end of their respective useful lives. In these cases, individual project economics may only make sense from a longer-term lifecycle cost perspective and many building owners (particularly the less sophisticated majority) are not very familiar with long-term modeling and could benefit from technical assistance to aid their decision-making.

Recommendations:

- NYSERDA shall develop a strategy to introduce energy efficiency broadly, and deep energy efficiency specifically as a consideration in the capital planning cycle. Such a strategy could include developing visibility into the capital planning calendar for priority building sectors and portfolios and defining how financiers and owners make capital planning decisions with special attention to the place deep energy efficiency can have in this process.
- NYSERDA shall work with the market to develop tools, models and third-party services useful in enabling effective consideration of deep energy efficiency in the capital planning process, as well as expanding the use of capital asset planning and financing to a broader segment of building owners and facility management firms.
- NYSERDA shall develop and maintain a roster of experts to provide technical support to enhance capital planning by building owners, showing the lifecycle value proposition of net zero/Passive House-level retrofit projects. Technical assistance will be particularly important for the condo/co-op market, which is notoriously difficult to move.

7.2 Support Heat Pump Adoption to Decarbonize Heating and Cooling

Building space and water heating along with space cooling accounts for approximately one-third of New York energy consumption and GHG emissions. Technologies such as heat pumps, which rely on electricity for heating and cooling, provide both greater efficiency than fossil fuel technologies as well as increasing emission reduction benefits over time as electricity generation becomes cleaner. Given the magnitude of New York's GHG emission reductions goals (40% by 2030 and 80% by 2050), the Biennial Report to the 2015 State Energy Plan named electrification of thermal end uses in buildings as a core opportunity for New York State. As a key component of New York's continued climate leadership, the Biennial Report called for the State to "seek to develop electrification policies and opportunities as steps for early action."[40]

Heat pumps produce energy efficiency savings through a reduction in summer electricity use compared to conventional air conditioning and a reduction in onsite energy use for winter heating. While heat pumps generally increase overall electricity consumption—predominantly owing to increased electric consumption during the heating season—this increase in onsite use of electric energy is more than offset by the reduction in onsite fuel use, with substantial net reductions in carbon emissions. Therefore, inclusion of heat pumps as an eligible energy efficiency measure requires a full accounting of energy efficiency on an all-fuels basis, as recommended in section 5.2. Further, increases in beneficial electrification, including heat pumps and electric vehicles, pose the need for separate accounting outside an electricity efficiency sub-target.

As articulated in NYSERDA's Renewable Heating and Cooling Policy Framework (Framework)[41] heat pumps currently have low adoption rates and levels of market penetration in New York State (both around 1%), facing both non-financial barriers (e.g., limited customer awareness, nascent supply chain) and financial barriers. Heat pumps currently can be cost effective from a customer's point of view in oil replacement market applications, but typically require significant up-front investment for a residential system.

Since the publication of the Framework in 2017, there have been significant cost reductions (on the order of 25%), particularly in the residential ground-source heat pump (GSHP) sector, in response to the State's increased engagement. While the level of continuous cost reductions is uncertain, stakeholder feedback, studies, and experience from other technologies consistently confirm that ongoing cost reductions can be realized when long-term deployment policies support market and investor confidence.

Heat pumps provide more efficient air conditioning and can reduce summer electricity peak, thereby providing benefits to all ratepayers. In addition, the increased winter electricity use of heat pumps results in customers paying more for fixed costs currently being recovered through their volumetric kWh delivery rates, resulting in a cost shift. These two factors mean heat pumps provide significant ratepayer/non-participant value. It is expected that cost-effectiveness in the residential sector, in particular, will significantly improve even with only partial provision of the value associated with summer peak reduction and cost shifting. Cost-effectiveness would also improve if the value of avoided GHG emissions was provided to heat pump customers. These values could be provided to heat pump customers through a variety of different mechanisms from incentives, to bill credits, and potentially optional rates such as National Grid is pursuing.

[40] *The Energy to Lead: Biennial Report to the 2015 State Energy Plan. https://energyplan.ny.gov/Plans/2015-Update*

[41] *Renewable Heating and Cooling Policy Framework: Options to Advance Industry Growth and Markets in New York nyserda.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/RHC-Framework.pdf*

Heat pumps could provide a significant contribution to a new utility energy efficiency program. From an all-fuels perspective, which accounts for the value of avoided onsite fuel use and the associated GHG emission reductions, heat pumps could meet approximately one-third of New York's heating and cooling needs while delivering net societal benefits. Within the residential heating oil market segment, heat pumps could provide nearly eight TBtus of onsite energy savings in 2025, at an incentive level comparable to other energy efficiency solutions, while still providing substantial net value to all ratepayers. This type of targeted beneficial electrification offering could potentially deliver low-carbon heating and cooling solutions to more than 100,000 households, while providing substantial benefits to non-participants in excess of program costs.[42]

Recommendations:

- Early action steps, encourage utilities to consider heat pumps:
  - > In energy efficiency portfolios on an all-fuels basis and provide heat pump customers with incentives that stimulate uptake while still delivering net ratepayer savings to non-participants.
  - > Along with other energy efficiency technologies, as eligible strategies in value-sharing models such as Non-Pipe/ Non-Wires Alternatives.
- Within the context of longer-term State Energy Plan considerations toward 40 by 30 GHG goals, develop a multi-year market strategy beyond the NYSERDA temporary incentives, based on the following principles:
  - > Drive long-term cost reduction, program transparency, and steady market growth
  - > Develop a longer term approach to spur the market towards sustainability while maintaining the principle of delivering net ratepayer savings to non-participants.
  - > Consideration of the range of heat pump sectors, including exploration of the needs and opportunities in the non-residential heat pump sector
  - > Continued utility engagement while ensuring a level of statewide long-term consistency that the market needs (see for example NY Sun)
  - > Exploration of a range of mechanisms for utility engagement, including non-pipe and non-wires alternatives
  - > Inclusion heat pumps as a component of deep energy retrofit strategies

[42] *Preliminary market potential estimates suggest that heat pumps could deliver eight TBtu of onsite energy savings in the residential sector by 2025, at an incentive level less than the social cost of carbon, while still providing grid value to non-participants in the form of summer peak reduction and cost shift.*

8. ENERGY AFFORDABILITY FOR LOW- TO MODERATE-INCOME NEW YORKERS

Energy efficiency in the LMI market segment[43] will not only reduce emissions, but deliver sustaining impacts for residents, building owners, and society at large and is an important component of a comprehensive approach for addressing energy affordability for the 3.5 million LMI households in the State. Energy efficiency initiatives can deliver long-term energy affordability impacts, improve health and safety outcomes for residents, advance equity and access considerations as the clean energy economy continues to develop, and reduce reliance on bill payment assistance over time. New York State has a strong foundation of energy efficiency initiatives targeted at the LMI market segment, with annual program budgets exceeding $100 million.

In New York State, a wide range of energy assistance and energy efficiency programs for low- to moderate-income households are currently administered with federal and ratepayer funding.

There are four primary ways in which LMI households are served by energy efficiency programs in New York State:

- **NYSERDA-Administered Programs** – Under the CEF, NYSERDA administers several energy efficiency programs targeted at LMI households and affordable multifamily buildings. The EmPower New York Program (EmPower) delivers energy efficiency and weatherization services and in-home energy education at no cost to low-income households. The majority of investor-owned utilities and several human service organizations refer low-income customers to EmPower for energy efficiency services. The Assisted Home Performance with ENERGY STAR Program serves homeowners with incomes at or below the greater of 80% of State or Area Median Income. The program pays for 50% of the cost of approved energy efficiency upgrades to a maximum of $4,000 for single family homes and $8,000 for two- to four-unit buildings. The Affordable Multifamily Performance Program includes services for multifamily buildings with four or more floors and five or more units where 25% of the units are expected to be occupied by LMI households.
- **Investor-Owned Utility Administered Programs** – National Fuel Gas, Con Edison and KEDLI each operate dedicated low-income energy efficiency programs. National Fuel Gas' Low Income Usage Reduction Program (LIURP) provides energy audits, weatherization measures, as well as customer education to eligible single family and multifamily residents. LIURP is implemented under the EmPower umbrella. Con Edison's Multifamily Program provides its eligible low-income customers packaged measures including energy efficiency products, educational services, as well as both prescriptive and custom rebates. KEDLI operates the EmPower Replacement Program, which provide energy efficiency measures to its gas customers that qualify for KEDLI's Residential Reduce Rate Low-Income Program.
- **Public Utility Programs** – LIPA's Residential Energy Affordability Program (REAP) provides similar energy efficiency services to low-income customers of PSEG-LI.
- **Weatherization Assistance Program (WAP)** – WAP, administered by NYS Homes and Community Renewal (HCR) and funded by appropriations from the federal budget, provides weatherization and energy efficiency services to low-income households. The program serves all types of housing units and both owner-occupied and rental housing. There is no cost to low-income housing units that are owner-occupied. Building owners of low-income rental housing are expected to make a contribution to the cost of energy efficiency upgrades.

[43] *Households with annual incomes of 60% of the State Median Income (SMI), or less, are considered to have low-incomes. There are 2.3 million households in New York that qualify. Households with annual incomes between 60% SMI and 80% Area Median Income are considered to be moderate income, there are approximately 1.2 million households in New York that qualify for this designation.*

However, barriers to adoption such as capital constraints for homeowners and affordable building owners, missed opportunities,[44] and unclear value propositions to third-party capital providers and building owners serve as primary impediments to scale energy efficiency in this important market segment. Over the last 12 years, the primary energy efficiency and weatherization programs targeted at the LMI[45] market segment have reached only 12% of eligible households across building types and ownership status.[46] Additional strategies and interventions are therefore necessary to increase access to energy efficiency and its multiple co-benefits for LMI residents across the State.

NYSERDA will continue to collaborate with DPS to optimize the CEF portfolio of existing LMI energy efficiency programs. Further, NYSERDA will build on the initiatives underway in the CEF by focusing on opportunities to work with stakeholders and other actors in the energy efficiency field to seek opportunities to embed energy efficiency considerations or otherwise increase the likelihood of energy efficiency adoption in relevant markets such as affordable housing, healthcare, and modular construction.

Multifamily Affordable Housing

Multifamily affordable housing is a crucial component of New York's residential landscape, with more than 40% of New York's LMI population living in buildings exceeding five units, and nearly 20% living in buildings with more than 50 units. Energy efficiency improvements in these buildings can reduce operating costs, improve the quality of life for tenants, and contribute to the State's energy and environmental goals. However, the affordable housing market segment faces unique barriers, limiting the investment in and uptake of energy efficiency solutions. Primary barriers to increasing adoption of energy efficiency in the multifamily affordable housing sector include access to capital; a lack of confidence in projected energy savings, which constrains the ability to underwrite to such savings; energy efficiency technical capacity within housing agencies; limited availability of design solutions that can achieve net-zero energy retrofits; tension between unit production and perceived additional cost and effort to include energy efficiency upgrades in work scopes; and long-term refinance cycles. To ensure the long-term viability of affordable housing options for lower-income households, New York State must develop solutions to the barriers to energy efficiency faced by multifamily building owners.

Recommendations:

- NYSERDA shall continue to advance the development of net zero energy retrofit prototypes for affordable housing through the RetrofitNY initiative to substantially reduce the energy consumption and associated operational costs of existing affordable housing.
- NYSERDA shall work with HCR and other key stakeholders (e.g., other housing agencies, building owners, financial institutions, developers, and technical service providers) as well as potentially utilities to provide market supports to address and overcome barriers to scaling energy efficiency in affordable multifamily buildings. Specific activities that NYSERDA will undertake include the following:
    - > Advancing an industry-wide approach to underwriting to potential energy savings by making data and technical support (such as model deals, energy efficiency measure specifications and use cases) available to HCR and other affordable housing lenders
    - > Supporting the adoption of Integrated Physical Needs Assessments (IPNA), which are critical to including energy efficiency at the time of refinancing

[44] *Missed opportunities include structural deficiencies, low audit conversion rates, affordable housing finance cycle/underwriting, and housing replacements.*

[45] *NYSERDA-administered EmPower New York, Assisted Home Performance with ENERGY STAR, Multifamily Performance Program, and the HCR-administered Weatherization Assistance Program.*

[46] *NYSERDA Low- to Moderate-Income Market Characterization Report, Summary Report; APPRISE, p45. https://www.nyserda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/Evaluation-Contractor-Reports/2017-Reports*

> Developing finance models that can support mid-cycle refinance

> Identifying opportunities to align incentive programs with affordable housing financing cycles to enable inclusion of energy efficiency upgrades in work scopes that are financed

> Developing approaches to mitigate the potential for energy efficiency improvements to increase rents in affordable housing, as a way for building owners to recover the upfront costs

- While CPACE is discussed in this white paper, it has the special potential for application in the multifamily affordable housing sector. Specifically, C-PACE should be considered as a financing solution to address finance barriers for some multifamily building owners. NYSERDA will encourage the expansion of C-PACE to municipalities not yet members of the Energize NY Benefit Program and ensure those municipalities, as well as owners and managers of multifamily affordable housing properties, are aware that C-PACE financing can serve as a useful tool to bring the benefits of clean energy improvements to residents of multifamily affordable housing.

Energy Efficiency Improvements Under Medicaid

Although the clean energy industry has long acknowledged the positive impacts that energy efficiency improvements such as air sealing, insulation, and proper ventilation can have on resident health, the value of such impacts has not been sufficiently quantified to enable the investment of non-energy dollars to support the health aspects of this work. To address this gap, NYSERDA will work with the DOH to develop and demonstrate a framework that will allow Managed Care Organizations (MCO)[47] to fund healthy homes interventions as part of value-based purchasing (VBP)[48] arrangements. Healthy homes interventions would include energy efficiency upgrades combined with other prevention measures, such as those aimed at addressing respiratory problems. This development would essentially embed energy efficiency into in-home interventions targeted at improving health outcomes.

Recommendation:

- NYSERDA will facilitate the adoption of energy efficiency improvements under Medicaid, as a component of healthy homes interventions. Activities will include piloting healthy homes interventions to validate the healthcare cost savings and benefits to the residents, developing standardized contracts and specifications to deliver healthy homes improvements under a VBP framework, and fostering a network of contractors to deliver the services.

[47] *The term Managed Care Organization is used to describe a health care provider or a group or organization of medical service providers who offer managed care health insurance plans and coordinates the provision, quality and cost of care for its enrolled members. Managed care plans pay the health care providers directly, so enrollees do not have to pay out-of-pocket for covered services or submit claim forms for care received from the plan's network of doctors.*

[48] *A methodology of arrangements which incentivize value and quality of care, in contrast to the current arrangement of incentivizing quantity of care reform. VBP is a key component of the New York State Delivery System Reform Incentive Payment (DSRIP) Program, which promotes community–level collaborations and aims to reduce avoidable hospital use by 25 percent over five years while financially stabilizing the State´s safety net.*

Zero Energy Modular Homes

Factory built, modular housing has long been a lower-cost and time saving alternative to site-built homes. With the advancement of building techniques and materials that lend to higher performance new construction, modular manufacturers are now reaching net zero performance, increasing the attractiveness of modular homes. Zero Energy Modular (ZEM) homes offer an energy efficient and resilient substitute for traditional mobile homes, with significantly lower operational costs. ZEM homes are also appealing as options for urban infill, where higher construction costs and limited space can render on-site construction costly. While an early market for ZEM is developing in Vermont and Delaware, the ZEM market in New York State does not exist.

Recommendation:

- To advance ZEM as a solution for improving the energy efficiency and resiliency of homes in New York State, NYSERDA will work New York State Homes and Community Renewal, other state agencies, and the modular construction industry to develop a market for ZEM homes in New York State as a replacement for traditional manufactured/mobile homes and as an option for urban infill.

Affordability Policy

New York's landmark Affordability Policy, adopted by the Commission in May 2016 and further authorized in February 2017, created the policy framework to establish an energy burden goal for low-income utility customers of 6% on average and provides direct energy bill cost relief of $260 million to nearly 1.6 million low-income customers on an annual basis. To further low-income affordability and provide opportunities for low-income customers to benefit from DERs, the Commission is considering the efficacy of allowing low-income customers to redirect a portion of their Affordability Program bill discounts to purchase Community Distributed Generation (CDG) subscriptions upon the customers' affirmative decision, and provided this selection delivers at least the bill savings anticipated from the discount under the Affordability program.[49] The Commission should explore the viability of a similar approach related to energy efficiency, thereby producing long-term affordability benefits to low-income customers and reducing the reliance on bill discounts to reduce energy burdens. To ensure the policy objectives of New York's Affordability Policy continue to be met, consideration should be given to a structure that could allow for participation in the energy efficiency component at the discretion of the low-income customer, place appropriate limitations on the eligible portion of the customer's total bill discount, and guarantee the energy efficiency services provided result in energy burden reductions on order with those provided by the bill discount.

Recommendation:

- DPS, utilities, NYSERDA, and interested stakeholders should explore whether utility bill credits authorized under the Affordability Policy could be leveraged in such a way to support energy efficiency while adhering to the principles of the Affordability Policy (importantly, the principles of affirmative decision by customers and of no net loss of energy bill cost relief). If such an approach is found to have merit, a proposal should be put forth for Commission consideration.

[49] *Case 15-E-0751, In the Matter of the Value of Distributed Energy Resources. Staff Report and Low-Income Community Distributed Generation Proposal, filed December 18, 2017.*

Pay As You Save

Pay As You Save (PAYS), also known as "tariff-based" or "inclusive" financing, is a mechanism designed to reduce consumer apprehension with undertaking clean energy investments and provide a higher level of confidence in realized savings by potential participants, thereby leading to higher customer acquisition (adoption) rates. Over the past decade, pilot scale efforts have demonstrated the PAYS model in more than a dozen utility territories nationwide, having financed more than 4,500 projects with a total investment of over $50 million. To date the model has proven particularly effective in reaching lower- to moderate-income customers as eligibility does not require FICO scores, with utility administrators reporting adoption rates generally exceeding 50% of those receiving savings potential assessments.

Under this approach, consumers are provided financing by their utility for making investments in clean energy improvements to their homes, with their repayment obligations being incorporated into a specific voluntary tariff applied to their respective utility meters. The tariff remains on the applicable meter (without regard to transfers in ownership or occupancy of the residence served by the meter) until the initial capital outlay is recovered, including a regulated financing charge (i.e., interest). The PAYS model includes a utility-funded assessment of a home's energy savings opportunities, then sets a participating customer's increased tariff no higher than 80% of the projected energy cost savings identified by the assessment. To date, uncollectable amounts in most of the pilot utility territories have been less than 0.1% – significantly lower than traditional uncollectible revenues for general utility service charges. Strategies are available to further mitigate uncollectible amounts, which would otherwise be recovered by pass-through charges assessed to non-participants, starting with prudent and sound financing and repayment calculations, and further including establishment of reserve funds (which could be funded from fees collected from participants), or third-party guarantees or first-loss reserves which could possibly be provided by NY Green Bank or other sources.

Recommendation

- NYSERDA and DPS shall explore the development of a pilot Pay-As-You-Save tariff-based financing model with one or more utilities, as an instrument that expands the reach and effectiveness of the State's energy efficiency initiatives while remaining consistent with the principles established in this document.

Coordination

The coordination of energy efficiency programs and other social service and housing programs at the State and local levels can reduce administrative overlap, increase the impact of limited public dollars, improve impacts for LMI residents and communities, and preserve affordable housing stock across the State. Leveraging program enrollment processes and eligibility determination systems can help reduce the administrative burden for customers and reduce administrative costs for program administrators. While agencies have made progress identifying options for leveraging program administrative infrastructure at the State level, additional work needs to be done to realize administrative efficiencies and improve the targeting of the limited resources for greatest impact.

Energy and housing considerations in the LMI market segment are inextricably linked. Reductions in operational costs, increased resilience, and improved living conditions are just some of the co-benefits associated with energy efficiency in affordable housing and are essential for the preservation of affordable housing stock in New York State. Some housing initiatives already contribute to the energy efficiency of affordable housing by requiring minimum building performance criteria, such as the Green Building Guidelines that are mandated by HCR. However, additional coordination and collaboration is necessary to address some of the barriers that prevent the incorporation of energy efficiency in affordable new construction and rehabilitation projects.

While agencies have made progress in the coordination of energy and housing programs at the State level, there is untapped potential to leverage housing and community development funds at the local level, which can help to reduce fixed costs for the leveraged programs, allow for more holistic treatments of housing stock (e.g., roof replacement combined with insulation) and may be able to reduce WAP and EmPower deferral rates related to housing unit structural problems.

Recommendation:

- NYSERDA, DPS, and potentially utilities shall work with organizations at the State and local level focused on preserving housing, as well as owners, lenders, and non-profit groups to improve the alignment of policies, programs, and systems to deliver the benefits of energy efficiency to residents of this sector of housing. NYSERDA and DPS will continue to work through the Low-Income Energy Task Force to improve the coordination and leveraging of relevant energy, housing, and social service programs.[50]

Additional Investment in LMI Energy Efficiency and Potential Utility Engagement

As with energy efficiency more broadly, most assessments see clear potential to build on established approaches to delivering energy efficiency for low- to moderate-income New Yorkers. Especially as New York raises its targets and scale of achievement in energy efficiency, now is the time to commit to a dedicated approach to providing these services to these New Yorkers.

Recommendation:

- NYSERDA, DPS, and utilities shall develop, as soon as practicable, a comprehensive and effective approach to energy efficiency for low- to moderate-income New Yorkers. This approach will consider funding and use of funds; specific sectors (such as single- and multifamily, renter and owner) and program approaches suitable for those sectors; roles and responsibilities of NYSERDA, utilities, and others; and appropriate approaches to measurement and accountability.
- Informed by these discussions as well as other data regarding the uptake of energy efficiency in this market segment, it is recommended that at least 20% of any additional levels of investment in energy efficiency be dedicated to services for low- to moderate-income New Yorkers.

[50] *Low-Income Task Force was established in Case 14-M-0565, Proceeding on Motion of the Commission to Examine Programs to Address Energy Affordability for Low-Income Utility Customers, Order Adopting Low-Income Program Modifications and Directing Utility Filings, May 20 2016*

9. BROAD-BASED IMPACT VIA CODES AND STANDARDS

9.1 Advance State Product and Appliance Standards

Continuous advancement of new efficiency standards for products and appliances is a core component of state and national goals to advance energy efficiency and reductions in GHG emissions. Appliance standards are highly efficient, cost effective policy strategies for achieving energy and GHG reductions, and they advance building energy and water efficiency in equipment across all market segments and types of building stock.

Standards also provide broad economic benefits for all consumers and businesses, especially LMI households that tend to spend a greater percentage of their income on utilities and are more vulnerable to impacts of climate change. NYS-specific analysis identified more than two dozen cost-effective appliance standards that have an average simple payback of eight months for each standard, such that customer utility bill savings cover the additional cost of the more-efficient product in less than a year.

As the federal government scales back its role in setting and enforcement of appliance efficiency standards, advancement of standards at the state level is needed. New York's leadership on this front, together with California and other states, especially in the Northeast, would go far in setting de facto national standards given the size of the consumer market of the states advancing new standards.

Recommendation:

- Consider statutory changes to the existing Energy Law Article 16 to provide either the Department of State or NYSERDA with the authority to promulgate regulations for setting New York State energy efficiency standards for products and appliances sold in the State, and for enforcing those standards.

9.2 Accelerate Building Energy Codes

Building energy codes identify the minimum requirements for building energy performance on the day that a certificate of occupancy is issued. The current energy code is applied to both new construction and renovation to an existing building for the building systems that are altered.[51] Building energy codes in new construction can lock in energy performance as well as the carbon footprint of the building for the subsequent 50 years through the energy performance of the building shell and the selection of an HVAC system. Building energy codes in renovation typically apply to lighting, windows and roofing, and HVAC and hot water system components, which are routinely upgraded during a building's life. Driving energy efficiency and carbon reduction through energy code allows New York to leverage existing market activity and the natural cycle of building upgrades into long-term benefits. More aggressive building codes based on energy and carbons savings needs to be built into New York's long-term transition to a low-carbon economy and accelerated action needs to start now.

[51] *NYSERDA estimates that the annual construction activity to which the energy code applies represents 3% of total existing building square footage in New York State, of which 80% is renovation and 20% is new construction.*

Basis of Codes

New York State bases its energy codes on the latest versions of the national model codes, which are updated on a three-year cycle. Based on historical trends, NYSERDA estimates future codes for commercial building energy provisions will increase in efficiency 7% per code cycle and the residential building energy provisions will increase in efficiency 3.5% per code cycle. The national model codes use energy cost as the metric to determine overall code compliance for projects that choose to use a modelled performance compliance path. While the future projected energy savings are meaningful, the underlying structure of the national model codes can hinder the adoption of deeper yet achievable energy efficiency and, more importantly, carbon reduction opportunities, because it tilts the table toward lower unit cost fossil fuel use. For instance, the national model codes favor fossil-fuel-based HVAC systems over all-electric HVAC systems (such as heat pumps) under the current retail pricing of fuels, and it favors onsite generation (such as combined heat and power) systems over more efficient building envelopes, even though it is commonly accepted the 80 by 50 carbon emissions reduction goal will require significant reduction of on-site fossil fuel use for heating. In recognition of this, a few states with aggressive carbon goals, such as California and Washington, have developed their own energy code models or have made significant additions beyond the national model. There is also a shared interest among progressive states in developing carbon-focused metrics for use in energy codes.

Recommendation:

- New York should work collaboratively with other states (through the U.S. Climate Alliance or other appropriate venues) to develop carbon-focused metrics to support deeper carbon savings.

Stretch Codes

Until deeper, carbon-focused metrics can be integrated into future New York State energy code, the use of "stretch" codes can help position the state to achieve the level of energy and GHG emissions reductions that are necessary to meet the state's climate goals. Stretch codes provide readily-adoptable code language that local jurisdictions can voluntarily adopt to overlay the base energy codes to deliver increased energy savings, typically of 10 to 20 percent. NYSERDA is developing its latest energy stretch codes, which would overlay the 2019 base energy codes, and anticipates making it available in Spring 2018. New York City has already mandated the adoption of such stretch codes, starting in 2019.

Recommendation:

- NYSERDA shall continue development of stretch codes for each code cycle and the State should consider making the stretch code mandatory in the 2022 cycle while development of carbon-focused metrics that can be integrated into future state codes is ongoing.

Education and Training

Stricter energy codes are likely to present both technical and economic challenges to developers, designers, and contractors, as the inherent cost of complying and the risk cost of design and construction as new ways of designing and building are incorporated into standard practice. Education and training are therefore critical across the design professions, construction trades, building operators, and the public. NYSERDA can help reduce the hurdles by providing training and assistance to architects and engineers on the design side. Additionally, by incentivizing and promoting the development of replicable low-carbon/net zero new construction and retrofit solutions, the achievability of the proposed codes can be demonstrated from a technical and an economic perspective.

Training will also be important for the code enforcement, as new codes will not have the intended impact if they are not complied with. Localities will need assistance with training and code compliance resources, such as best practice models and tracking methodologies, and may even consider alternative enforcement structures, such as third-party enforcement or shared enforcement resources, as a means to employ solutions that are cost-effective. NYSERDA is well positioned to provide support in these areas in partnership with Department of State.

Recommendations:

- NYSERDA shall use marketing and direct engagement with the new construction market (from design, to construction, through operation) to advance low-energy/carbon practices, increase capacity, and decrease risk through activities such as 1) demonstration of advanced technologies and practices, 2) project measurement and verification, 3) project validation, 4) peer exchange and online tools to support and disseminate practices, 5) support for projects built to stretch codes in early adopter jurisdictions before enactment of statewide mandatory stretch codes, and 6) audience specific training to improve code compliance, targeting the largest savings opportunities, and the optimum training approaches, e.g., online, visual hands-on, classroom, in-field, etc.
- NYSERDA shall work with local communities to test, prove, and disseminate workable and suitable cost-effective code enforcement models, such as uniform online quality assurance and code compliance platforms that streamline enforcement, aggregated county-level enforcement, or use of third-party energy code specialists.

10. STATE AGENCIES AND FACILITIES TO LEAD BY EXAMPLE

State agencies and authorities in New York have been leading by example in clean energy since the 1990s, through a variety of Executive Orders (EOs). These efforts helped grow several new markets (e.g., green building construction, renewable energy), and have driven significant market adoption of new or underutilized technologies (e.g., LED lighting), design techniques (e.g., design charrettes and integrated project delivery), and operations and maintenance practices (e.g., retro-commissioning, intelligent building management).

New York State agencies and authorities own and operate more than 200 million square feet of building space. The portfolio of State facilities affected by lead-by-example Executive Orders in New York have annual utility costs of approximately $400-500 million (including buildings less than the EO88 threshold). In fiscal year 2014/15, EO88 reported an energy load of approximately 30 site TBtu, providing substantial opportunity for cost saving. Combined with other government entities—such as State Courts, other political subdivisions (e.g., Port Authority), local governments, K-12 schools, and community colleges—DPS Staff estimate that public sector entities in the State spend roughly $3-5 billion on energy each year. This comprises a considerable portion of the State's energy consumption and presents a tremendous opportunity to lead by example.

Since the 90s, State lead-by-example initiatives have delivered on average approximately 1.5% EUI improvement per year. To achieve 40 by 30, this pace of achievement will need to accelerate to approximately 3% per year and embrace beneficial electrification and on-site renewable energy production.

Notwithstanding the progress that has been made in New York State agencies and authorities, there remains significant opportunity for cost-effective savings. However, there are four main barriers that have been reported: staffing constraints, procurement, costs, and retention of utility savings. The recommendations below address these barriers and provide examples of how State agencies can embrace energy efficiency as an economically sound strategy, while achieving long-term carbon reductions. The new policy goals and recommendations are a reframing of clean energy policy that bases decision making on economic actions that are replicable in both the public and private sectors.

Energy Master Planning

Managing energy consumption and costs and optimizing facility construction and renovation decisions requires a comprehensive view and understanding of a facility's future program needs to meet its core mission, as well as how those needs align with clean energy goals and objectives. Facility Master Plans and Energy Master Plans will provide a comprehensive road map that enables facility operators, business officials, and executive leadership to make data driven decisions that result in optimal life-cycle cost outcomes, while achieving the programmatic mission of the state agency or authority. Comprehensive Facility Master Planning and Energy Master Planning can help better manage capital outlays and operations and maintenance costs and will enable better decision making about the use of capital budgets, off balance sheet debt structures, and other work. NYPA, the Dormitory Authority of the State of New York (DASNY), and NYSERDA already have services and funding in place that would support this need.

Recommendations:

- By 2021, require that all State facilities that have a utility bill of over $300,000 have either 1) a Comprehensive Facility Master Plan program (updated every five years), which includes a Clean Energy Component that addresses new construction and retrofit needs; or 2) an Energy Master Plan (updated every five years) that addresses new construction and retrofit needs.
- The resulting Master Plan will identify short-term high-impact projects, address smart sequencing of projects, and include a long-term plan to ultimately achieve net zero energy or net zero carbon operation of all facilities.

Lead-by-Example Highlight:
SUNY's Comprehensive Agency-wide Planning and Management

The State University of New York (SUNY) is the largest comprehensive university system in the United States. With more than 430,000 students and 2,400 facilities, SUNY's annual utility bill is nearly $200 million. Committed to reducing energy consumption, SUNY plans to not just meet the U.S. Climate Alliance goals, but to lead the State and the nation by example and deliver a workforce that can develop and operate the clean energy economy of the future.

SUNY engaged in comprehensive facility master planning for years and recently finished an inclusive facility condition index evaluation. To ensure facility modernization takes clean energy into account, SUNY will add a clean energy component to its facility master plans going forward. SUNY also will work with other organizations in the State to ensure that educational facilities provide outstanding learning environments, minimize construction and operational costs, and have a clear plan to a carbon-neutral future.

Committed to becoming a low-carbon and resilient network, all new SUNY buildings will be designed to achieve net zero carbon emissions. Additionally, SUNY will execute decarbonization projects at existing facilities while performing critical maintenance and modernization, ensuring all campuses have a plan for resiliency. SUNY Brockport offers a new advanced energy management and operations and maintenance program. This effort combines next generation digital energy management and constant commissioning services and will soon be expanded to other campuses.

Energy-Efficient New Construction

To meet the State's energy and climate goals, facilities will need to move to Net Zero Energy (NZE) or Net Zero Carbon energy performance. Achieving those outcomes must first start in new construction, where it is the most cost-effective. The policy goal will be to drive new construction to be NZE or net zero carbon by 2030, with interim progress milestones in 2020 and 2025.

Current data shows 5-10% incremental costs for NZE construction in housing, dorms, and office space. Industry experts project this will decrease to approximately 3-4% by 2025 as the market matures. Some projects are already being developed at lower incremental costs, but that is the exception, not the norm. Simple Payback for NZE construction is typically 10 to 20 years in most projects. NYSERDA currently provides incentives for NZE construction projects for customers who pay into the System Benefits Charge (SBC).

The schedule proposes a path where state agencies and authorities would be building to NZE standards approximately five years before NZE construction requirements are adopted under code for similar building types. The proposed milestones will need to be updated on an on-going basis as the market and design capabilities advance.

Recommendations:

- State agencies and authorities should design all new construction to be net zero energy or net zero carbon, when it is technically and economically viable in designated building typologies, pursuant to the schedule set forth.
    - > SUNY recently committed all new construction initiated in 2020 be designed to be net zero energy or net zero carbon, leading the way for State agencies.
    - > New construction at State agencies and authorities for low-rise office buildings (less than four stories) initiated in 2020 or later should be designed to be NZE.

> By 2025, all new construction in dorms, housing, and public assembly buildings (less than 4 stories) should be designed to be NZE.

> By 2030, new construction for all building typologies (limited to buildings less than four stories) should be designed to be NZE, where it is technically and economically viable on a life cycle basis. The State will need to allow for an exception process, where an agency or authority can document that NZE construction is not technically or economically viable. In these cases, buildings will need to be designed to exceed the New York State Energy Conservation Construction Code by a minimum of 20%.

- NYSERDA shall develop design tools and training resources to assist the State's key design and construction divisions (e.g., Office of General Services (OGS) Design and Construction, DASNY, and NYPA), including NZE standard design packages and Integrated Project Delivery and Integrated Design Process training programs.

Lead-by-Example Highlight:
New Construction Projects for Net Zero Energy

SUNY issued a bold goal to have all new construction designed to net zero energy standards by 2020, with gut rehabilitation projects to follow shortly thereafter. SUNY is already underway with advancing this goal at the University of Albany. The Emerging Technology and Entrepreneurship Complex building is a new research and instructional building. The non-lab portions of this building, which account for over 90% of the total square feet, will achieve net zero energy. The high-performance building incorporates a comprehensive set of energy efficiency measures including occupancy-based ventilation, LED lighting, and optimized controls. The space heating, cooling, and domestic hot water for the entire building will be provided by a geothermal heat pump system. Lastly, 100% of the buildings annual energy consumption, excluding lab equipment, will be supplied by an on-site 1.7MW solar photovoltaic system. As net zero energy building designs become more common, construction costs will be less expensive. Since many of the measures last for 20 years or more, the return on investment is considerable. With the State engaging in new construction and gut rehabilitation projects every year, there is significant long-term operational cost savings potential.

Existing Buildings

Renovation of existing facility stock represents the largest potential economic savings opportunity. The policy goal will be to drive existing buildings to be highly efficient and focus gut renovations to achieve deep decarbonization levels of performance or NZE performance. Comprehensively sequencing building shell upgrades will reduce the building's heating and cooling load and allow a smaller HVAC system to be purchased, regardless of what type of HVAC system is selected.

The following recommendations will be updated on an as-needed basis to incorporate market and technological changes.

Recommendations:

- **Statewide Comprehensive Lighting Retro-fit Initiative:** Each agency or authority will commit to all lighting (indoor and outdoor) being retrofitted to LED, or have a scoped, budgeted, and scheduled project for replacing remaining non-LED lighting at all State-owned assets by 2025. All new construction or gut rehab projects will specify 100% LED technologies by 2020.[52]

[52] *A comprehensive lighting retro-fit to LED (tube only replacement at time of relamping) from fluorescent lighting, and the addition of appropriate occupancy and Daylight dimming controls, can reduce office building electric usage by 15-20%, can be self-implemented, and frequently has a two- to four-year simple payback (equal to or greater than a 15% IRR) after including utility and maintenance (relamping) savings. Many utilities provide incentives for this project type. A full fixture replacement project can have payback of 5-8 years.*

- **Acting on Audits:** No later than 2021, all State facilities that have energy audits conducted on existing facilities, energy models generated for the construction of new facilities, or Facility Master Plans/ Clean Energy Master Plans completed will implement all measures that have a 10 year or less simple payback (or a 7% or greater internal rate of return [IRR]) within five years from identification.
- **Smart Sequencing of Building Upgrades:** No later than 2020, all facilities with an annual utility bill greater than $300,000 will conduct and execute building shell upgrades prior to implementing an HVAC replacement project, and will evaluate the cost-effectiveness of an all-electric (heat pump) HVAC system. If the cost difference between a replace in kind (but more efficient than code) system type versus an electric heat-pump HVAC system is a 10-year or less simple payback (or has an IRR greater than 7%), then the building will switch to heat pump-based HVAC.
- **List of 10% Improvement Projects:** Several agencies and authorities have indicated that having a list of projects that could reduce their utility consumption by 10% or more would be helpful. The State, via NYSERDA and NYPA, should publish and keep such a list up-to-date and available for public and private entities to inform planning and project decision making. The provided list is for example purposes.
    - > Lighting retro-fit to LED
    - > Demand control ventilation on larger air handling units
    - > Time-of-use meters, deep sub-metering, and intelligent controls to enable better equipment and building scheduling and shut down management
    - > For larger equipment and buildings, the use of intelligent building management practices and operations
    - > Air sealing and other building shell tune-ups
- **Benchmarking and Public Disclosure of Building Level Energy Performance:** By 2019, each agency or authority that owns and operates a building that is able to receive a score in the U.S. Environmental Protection Agency's Portfolio Manager (PM) benchmarking program, will annually benchmark and disclose the PM score and any prior scores at that facility.
    - > For all buildings 25,000 square feet or greater able to receive a PM score based on the building type, but that are not currently sub-metered for all fuels, submeters shall be installed by 2025. The facility shall comply with the benchmarking and disclosure policy once submeters are installed.
    - > For all facilities master metered on one or multiple fuels (which does not allow for building level benchmarking) and for all facilities that are not a scorable building type for any reason in the PM system, the State shall gather and publish the critical energy performance data of those facilities annually.
    - > The components of this recommendation demonstrate the State's commitment to benchmark its facilities, ahead of and in support of the recommendation in this white paper to introduce legislation for statewide benchmarking of private buildings greater than 50,000 square feet.

Leading-by-Example Highlight:
Deep Decarbonization Projects.

City University of New York (CUNY) recently completed a three-phase upgrade project to modernize the laboratory space in the Marshak Science Building. By phasing the stages of the project, CUNY was able to improve indoor air quality, convert to more efficient technology, and downsize central air-handlers to smaller, more efficient equipment. In total, the project is expected to reduce energy consumption by 50%. By sequencing work, energy projects can result in more efficient, comfortable buildings and reduce construction costs by downsizing HVAC equipment.

Expand State Capabilities to Use Project Financing/Implementation Models that Self-fund Projects

In recognition that capital budgets are not likely to increase substantially in the short-term, the State will need to evaluate and consider project business models that self-fund projects to be able to fund and execute the projects that will result from the recommendations in this framework. Since many of the basic business models were developed in the 1990s, the State should evaluate several updates to existing statutes and authorizing language. Additionally, several of the key financing instruments of the State, such as NYPA and DASNY financing programs, should evaluate their ability to increase the amount of financing per year that they provide to the market.

Recommendations:

- **Consider Energy Law Modifications:** NYSERDA shall work with partner agencies, authorities, and the private sector to evaluate the feasibility of the following recommendations, which would impact not only State agencies and authorities, but also local governments, K-12 schools, and other public entities.
    - > Clarify and expand the list of measures that are listed in law as being specifically eligible to be included in performance contracts. This would enable a broader package of measures to be included in projects and would specifically cover water saving upgrades. The expansion and clarification of the list could expand project scope by 15-30%.
    - > Establish a new eligible project type in Energy Law to complete “Deep Decarbonization Projects.” This new project category would increase the allowable pay-back term to 25 years in instances where 90% or more of the project’s costs have expected useful life of 25 years or greater. This would allow a significant expansion of projects that switch from in-kind heating system replacement to heat pump-based HVAC.
    - > Establish a new eligible project type that would allow very fast payback clean energy projects to also help fund non-energy related upgrades to address deferred maintenance. Under this new “Clean Energy Project to Address Deferred Maintenance Project” category, if the simple payback of the project is 50% or less than the expected life of the measure, the project cost can be increased by 20% to address non-energy related facility improvements. This would encourage agencies to identify and move forward with cost-effective projects that currently sit on the shelves because it would also allow a path to address critical deferred maintenance from non-capital budget funding sources.
    - > Establish authorizing language to allow agencies and authorities to use Design/Build project models and integrated project delivery methods to build or renovate buildings to net zero energy performance. Design/Build is a more effective and cost-efficient way to build and renovate complex and high performing buildings. This recommendation will require the State to establish specific controls and use cases where the Design/Build process could be used and to address public notification of its use.

> Establish a mechanism whereby a State agency or authority can keep a portion of savings that are verified to result in the first year of an efficiency project. At least one other state has established a similar mechanism, which had the effect of driving an increased volume of work.

- **Expand NYPA Financing:** NYPA expects to increase its financing for clean energy projects to approximately $300 million per year. NYPA has the potential to further expand that amount if requests to access its Energy Services Programs continues to increase.
- **Evaluate the Potential Use of the 179D Federal Tax Credit:** The 179D federal tax credit enables Architects and Engineers to capture a tax credit, if signed over by the public entity, when a project meets certain efficiency performance thresholds. This could help pay for part or all of certain design work. If viable, the State should consider modifying standard practice by OGS Design and Construction, DASNY, NYPA, and the State University Construction Fund-for to routinely use the 179D credit in their projects. Clear guidance would need to be provided to the design community and to State entities to implement this more widely.

Leading-by-Example Highlight:
Comprehensive LED Lighting.

The core of any economic plan to improve energy efficiency is to integrate such action into the construction and renovation cycle of the physical asset. With the average age of State-owned buildings exceeding 50 years, it is critical to address facility modernization and deferred maintenance needs. Nearly all facilities undergo minor renovations every 10-15 years, which is the ideal time to implement “10% better” projects, such as lighting. By simply upgrading to LED lighting, most traditional office spaces can realize a 10-15% reduction in their electric consumption, as well as reduce future maintenance costs due to longer life of LEDs. This is a relatively low-cost and non-invasive project that facilities can implement immediately. By identifying three to five “10% better” project types, the State and the private sector can cost-effectively reduce operating costs, improve physical assets, and help drive positive economic and environmental impacts statewide.

Intelligent Building Efficiency

Equipment and systems are rapidly moving from older technologies into digital controls-based systems that are tied to cloud-based diagnostics and two-way communication. As the digital control and remote management capabilities of equipment and buildings continues to expand, the State will need to evaluate cost-effective ways that it can leverage the Internet of Things and digital controls and analysis to optimize building and facility operation. Improved building analytics also may validate the business case for additional clean energy projects. Multiple agencies indicated staff time is a significant constraint and some advanced building systems present challenges for operators as they are so different from previous systems.

New York State has the opportunity to develop a comprehensive intelligent building efficiency program to achieve significant cost savings in the management of its facilities, document operating costs before and after energy upgrades, and train current building operators and the next generation of workforce. New York could structure its State program to allow for opt-in of municipalities and private industry, which may spur expanded public sector collaboration and public-private partnerships

This new recommendation is in part built on a partnership among SUNY, NYPA, and NYSERDA at SUNY Brockport. Several other states and municipalities have successfully developed similar pilot programs, which achieved energy savings ranging from 12-20%, reduced emergency maintenance project costs and equipment downtime, and longer equipment life and fewer emergency repairs.

Recommendations:

- Encourage State facilities to embrace intelligent building solutions, installing submetering and controls in facilities to optimize performance and reduce energy costs.
- Create a new workforce development program (and possibly expand to course curricula) to train facility operators on intelligent building systems, controls, and equipment maintenance and diagnostics. The new program could be developed in collaboration with NYSERDA and NYPA, with consideration of workforce programs that are offered by other State agencies, such as Empire State Development and the Department of Labor.
- Establish a Clean Energy Internship program to provide support for low-cost data analysis and remote energy management. Participants would send recommendations to facilities for scheduling optimization and equipment shut down, preventative maintenance, and similar operational improvements. Interns could possibly also provide ASHRAE Level 1 audits of buildings and support for Clean Energy Master Plan work.

Lead-by-Example Highlight:
Intelligent Building Efficiency

Intelligent controls and sensors in modern buildings generate significant amounts of data. Intelligent building efficiency practices are being adopted by leading public and private organizations, showing significant expansion opportunity in both sectors.

New York needs a workforce prepared to install and manage these systems, as well as energy managers trained to use the real-time system information to drive cost savings. The continuous workforce training program at SUNY Brockport enhances the current training for facility managers to support constant commissioning and advanced building operations.

The New York Energy Manager (NYEM) is a web-based energy data management portal, housed and managed by NYPA, that provides relevant and visually accessible energy and equipment operational data to building operators and energy managers. The NYEM system tools allow staff to rapidly identify equipment scheduling issues and malfunctioning equipment that lead to energy waste. The system also includes a two-way communication capability that can enable minor equipment adjustments to address operational deficiencies. As the system is deployed, each building type can expect to reduce its utility consumption by 5-20% through advanced diagnostics that identifies equipment malfunction, thereby reducing downtime and emergency repair costs.

Meet Lead-by-Example Goals Under Executive Order 88 and Executive Order 166

Executive Order 166 directs State agencies and authorities to develop a plan that demonstrates their contributions to the State's GHG reduction goals and to implement clean energy projects. Meeting EO166 will require State entities to build upon and exceed the already established EO88 goal of 20% improvement in energy efficiency (as measured by EUI) in State buildings by 2020. The new recommendations are stated in the context that all State agencies and authorities meet the goals of EO88.

This white paper identifies several ways for NYPA and NYSERDA to jointly support agency progress toward EO88 and EO166, including through augmenting available guidance documents and expanding reporting capabilities. It also proposes a new site energy-based goal for energy savings in State buildings.

Recommendations:

- NYSERDA and NYPA shall review the potential for the NYEM platform to accommodate EO88 and EO166 facility-related reporting, and shall prepare a recommendation of costs, schedule, and budget for necessary modifications in 2018.
- Consider a new energy efficiency goal for State agency facilities to achieve of 11 TBtu of site energy savings by SFY 2025/26 (Base Year of SFY 2014/15). This equates to slightly greater than a 25% reduction of facility-related energy consumption in SFY 2014/15 as reported in EO88, after taking into account expansion of square footage and natural load growth of converting space to more energy intensive uses. Agencies will be apportioned their share of the 11TBtu savings goal based on their proportion of the total State energy load. NYPA will establish a mechanism to collect project-level energy savings data from State entities (beginning in 2018) to help track savings towards the 11 TBtu goal.
    > If a facility meets an EUI that is determined to be Net Zero Capable, or achieves Net Zero Energy performance, that facility shall be considered exempt from further clean energy work. If a facility receives an EPA Portfolio Manager score of 90 or better, earns the ENERGY STAR Building Label each year, and has electric (heat pump) based HVAC, that facility shall be exempt and the agency's energy reduction target will be reduced accordingly.
- For facilities and utility accounts where the majority of energy use in for process, traction, or other non-regulated loads, the State shall explore establishing an alternative goal, whereby State entities would evaluate these energy loads and seek to achieve a 20% carbon reduction, including energy efficiency.
- The recommendations for NZE construction, existing building retrofits, and intelligent building efficiency also provide relevant guidance to support agency's EO166 goals.

Leveraging State Funding to Drive Economic Energy Efficiency in Private/Municipal Construction

Clean Energy Projects drive significant economic benefit to the State. More companies are embracing clean energy as a sound business strategy—one that their customers and investors are calling for. The outlined recommendations are intended to help achieve mutually beneficial goals of economic development and the advancement of clean energy goals by advancing energy efficiency within the economic development projects supported by the State.

Recommendations

- **Green Design Guidelines and Options for Construction RFPs:** Several State agencies support building construction and development as part of their core missions (e.g., DASNY, ESD). Currently, these agencies and authorities may include reference to various levels of the U.S. Green Building Council LEED rating system; but LEED standards do not necessarily drive energy savings and cost reduction. NYSERDA shall work with partner agencies to develop guidance on energy performance standards that are appropriate to include in construction RFPs, for consideration by State entities that issue RFPs for State-funded construction or private development projects.
- **Economic Development Clean Energy Audits:** NYSERDA shall explore with ESD the opportunity to provide energy audits to recipients of Economic Development grants. The purpose of the audits would be to identify cost-effective capital and operational upgrades that could be implemented by the grant recipients.

- **Pursue Water and Waste Water Best Practices:** New York State has approximately 605 municipal water resource recovery facilities, which in aggregate treat an average design flow of 3.7 billion gallons per day and consume approximately 1.5% of the State's energy. The largest 78 plants (with an average design flow of 5 million gallons per day or greater) consume approximately 80% of the energy associated with the sector. In a partnership across State agencies, NYSERDA, NYPA, New York State Department of Environmental Conservation, and New York State Environmental Facilities Corporation will support initiatives that promote behavioral and operational changes across the State's largest water resource recovery facilities, including integrated capital and energy planning, Strategic Energy Management (a holistic approach to managing energy use that focuses on continuously improving the efficiency of core practices), and an updated Guidebook for Water and Wastewater Best Practices. Through these comprehensive efforts New York State water resource recovery facilities could achieve 60,000 MWh in annual energy savings.
- **Net Zero Energy for Economic Development Program:** NYSERDA, in partnership with ESD, shall launch a new Net Zero Energy for Economic Development program. This new program will leverage the Regional Economic Development Councils (REDCs) to provide a streamlined application and program process, offer payments timed to project status to address cash flow, and support economic development priorities of New York's regions.

11. NEXT STEPS

Stakeholder engagement and deliberation of the white paper will be initiated with a technical conference covering all aspects of the paper. While the initial technical conference will be comprehensive, development and implementation of specific elements of the white paper will take place in various decision-making venues.

- The Public Service Commission has jurisdiction over the investment of ratepayer funds, including utility energy efficiency programs and the CEF. Following the initial technical conference, DPS Staff will initiate and define a process and schedule supporting further development of the jurisdictional aspects of the white paper. This is expected to include additional technical conferences, as well as topical working groups and a formal written stakeholder comment process with the goal of developing an adequate record for Commission action, including benefit, cost, and practical implementation information.
- NYSERDA CEF activities aligned with the goals and objectives associated with the energy efficiency target will be implemented through additional CEF chapter filings.
- Legislation will be considered, as appropriate, to advance several of the recommendations, including product standards and benchmarking.
- State agency lead-by-example initiatives will be furthered through incorporations into future EO166 guidance and through individual agency's climate action plans and capital planning processes.

APPENDIX A. STAKEHOLDER FORUMS

Five stakeholder forums were held, convening stakeholders with relevant expertise to discuss and share information relevant to specific topics addressed in this energy efficiency white paper. Each forum was held as a moderated roundtable discussion, which allowed opportunity for other members of the public to ask clarifying questions based on the discussion. Topics included Innovative Utility Strategies and Emerging Energy Efficiency Building Models, Pay-for-Performance, Accelerating Building Codes, Opportunities and Strategies for Deep Energy Efficiency, and Target Metric and Framing Considerations.

Innovative Utility Strategies and Emerging Energy Efficiency Building Models

Twenty stakeholders, representing advocates, service providers, utilities, and government entities, participated in a stakeholder forum on utility innovations in energy efficiency. All entities noted positive market changes pertaining regulatory flexibility and technology innovation in the traditional program model. Service providers resoundingly commented on the need for long-term solutions and certainty in policy, as well as advocated for new project models, such as project aggregation and using government owned buildings as an example. Utilities highlighted the near-term successes achieved under REV and noted a need for clear targets with financial incentives. Utilities also noted that the market needs flexibility to pursue varied energy efficiency solutions, including testing out difference models. Environmental advocates indicated that markets are ready to achieve targets, once the policy is defined, and argued for standardization of savings calculations in tracking the achievements of goals.

Participants also noted that as new energy efficiency approaches are pursued, there is a need to foster a relationship between utilities and the private market. Service providers noted their current barriers pertaining to data access, market certainty and long onboarding processes as pain points. Service providers stated that access to data, defined market roles and pricing regulation to support smart homes is needed to drive technology innovation and support the private market of energy efficiency providers, and the role regulations can play in building the market. All noted defined market roles would help to achieve targets in a more systematic manor, pointing to Burlington Electric as of example of a program that was successful in providing clarity around role and price to drive success.

There was a clear consensus from participants that the LMI sector should be addressed in a separate forum. All noted that the sector was important, with clear barriers hard to overcome, including financing structures and split incentives. An LMI advocate noted the Clean Energy Advisory Council LMI Roadmap should be revisited as a starting point for LMI programming. Advocates noted the importance of building on existing programming and best practices, including weatherization efforts.

Pay-for-Performance: Next Steps in New York

Sixteen stakeholders took part in a forum focused on a potential pay-for-performance initiative in New York. Participants strongly recommended structuring the program to provide an upfront incentive (e.g. 20% of total incentive), like California's pay-for-performance programs, with shorter program or contract terms. Stakeholders also recommended looking at private sector pay-for-performance models (i.e., ESCOs in the municipality, university, schools, and hospitals Market, MESA etc.) as examples.

Multiple participants also expressed concerned the working program budget presented will not be enough to support deep retrofits in the number of projects NYSERDA is proposing. They recommended reassessing the required number of projects per portfolio, the aggregators, and the allocated budget. Service providers recommended using an open source, transparent measurement methodology or tool for assessing savings is recommended, but also stated that it could potentially be managed by an open, nonprofit entity.

Participants overall stated that advanced M&V won't bring confidence to customers on its own, but it will bring confidence to utilities, investors and other market actors in understanding the grid value of energy efficiency. Customers will, however, care about having their baseline usage broken down in an understandable, transparent way that aligns with how they understand their utility bills. Taking risk off customers and building confidence in customers will be crucial for customer acquisition. However, confidence means different things to different market actors (utilities, end users, investors, etc.) and NYSERDA will have to decide who they are proving savings for.

Participants stated that aggregators benefit from pay-for-performance through reduced acquisition costs, the ability to test and create flexible offerings and partnerships over the course of the pilot, additional data for better customer targeting, and by having the flexibility to take on "losers" in the portfolio (projects that might have negative savings). Customers benefit from a streamlined project approval process, a multi-year relationship with service providers to engage on additional energy efficiency work, and additional outside financing.

Accelerating Building Codes

Fifteen stakeholders participated in a forum discussing the role for advanced building codes in driving energy. Throughout the session, multiple market actors, including government, utilities, and private entities recommended several changes to the energy code, including more nuanced analysis to anticipate future energy costs and technologies (e.g., electrification technologies), outcome or performance-based code, including the need for results monitoring, and carbon-based performance methods. However, private entities had concern with pursuing EUI as a code metric.

Both government and service providers identified a market need for future certainty on the code advancement path to reduce risk, as well as a critical need for education and training across design professionals, construction trades, code enforcement officials, building operators, and the public. Many participants felt that education is key to compliance and enforcement, and multiple market actors identified the need for more code enforcement. There were multiple recommendations for alternative enforcement structures, such as third party and shared enforcement resources among multiple jurisdictions. Participants noted the need to find solutions that are cost-effective and that the market will bear.

Participants also discussed the different barriers and challenges that apply to code implementation and advancement for various building types. Government entities and service providers both identified the need for a prescriptive solution to drive market adoption of low energy and carbon standards for smaller residential and commercial projects, that lays out a path to scale, as energy modeling is difficult for small buildings. The pre-emption issue with federal appliance standards is a key challenge to creating the prescriptive path solution in codes. For the low-income segment, participants identified a need for financing to scale low-energy buildings. The group had two suggestions, to demonstrate the superior performance of the buildings in terms of lower utility costs, thereby raising debt service leading to less public subsidy, and to make improvements in buildings without passing along costs to those who can least afford to pay. The solutions were acknowledged to be outside of codes.

For the high-end, high-rise market, balancing efficiency with exterior aesthetics was identified as an issue, with participants noting that people will not pay competitive market rates for units in buildings with the types of facades and windows generally utilized in high efficiency buildings. There is a need to either change market preferences regarding building facades or find improved technical solutions in terms of economics to drive energy efficiency demand in the types of buildings the market demands.

Opportunities and Strategies for Deep Energy Efficiency

Twenty stakeholders took part in a forum on opportunities and strategies for deep energy efficiency, representing government, the private sector, service providers, utilities, and advocates. Multiple market actors felt that access to financing and bureaucratic processes are soft costs that need to be overcome for deep energy efficiency to proceed. Overwhelming feedback was to use regulation to overcome barriers and test out existing examples of deep energy programs in the State. Examples highlighted include NYC Greener Greater Building plan, and Local Laws 84 and 87, and an Illinois effort that allows utilities to treat rebate investments as virtual regulatory assets that can be rate-based and earn returns.

Private entities specifically noted that debt-based offerings don't appeal to the private sector due to privacy issues and bureaucratic barriers, and that exploring other program structures could drive greater penetration of efficiency. Private entities also argued for addressing codes, as well as driving down soft costs through technical assistance and behavioral programming.

Advocates stated utilities need to deliver cost effective programming to achieve desired levels of energy efficiency, including new technologies that can lead to increased savings. They also highlighted the need for accessible financing, including standardized loan products, as a key need to move energy efficiency projects forward. They specified that LMI customers require direct programming, with additional services to ensure factors that are important to that sector, such as affordability, health, and safety are considered. Advocates also argued that the portfolio should be administered in a fuel neutral approach to drive the highest savings.

Service providers advocated for incentivizing the decarbonization of buildings through smart electrification, using codes and technology to deliver efficient electrification of building stock. They stated that New York needs to look beyond traditional models and understand the financing barriers and structures to overcome cost restrictions to deep energy efficiency. Service providers also noted that utilities can spur deep energy retrofits by creating opportunities through data and customer access, but they need an incentive to act. The advocated for using existing financing processes to unlock capital and supporting implementation through technical assistance. They also noted additional opportunities through ownership models for on-site generation, which could further support smart electrification efforts.

Multiple market actors noted both the barriers and opportunities in addressing the multifamily sector, including the need for access to financing. There was support for an ombudsman to drive increased engagement and participation in energy efficiency from smaller buildings and co-ops through additional assistance.

Utilities stated the energy code can help create market for deep energy retrofits, but the current structure also has consequences as some building owners do not want to pursue updates that will trigger a code review. Utilities argue that as utility programs can currently only support above code improvements, the flexibility to make incremental upgrades, as well as measuring savings around actual performance can help drive deeper efficiency work.

There was overwhelming support to use government and affordable building stock to spur innovation and create market opportunities for deep energy retrofits. A key example highlighted was New York City Department of Citywide Administrative Services (DCAS's) master planning process for City agencies to identify, vet, and fund deep retrofits. Participants argued the DCAS model can serve as an example for other large portfolio managers looking to optimize their portfolio—including incorporating energy into capital improvements, providing technical assistance and hands-on-help.

Participants in the session agreed the markets need access to data and easy alignment with financing cycles to transform the market for energy efficiency. Advocates argued that data and data automation should be used drive down costs and support advanced M&V, proving out energy efficiency technologies. Government entities present stated that it was important to gain an understanding of the total cost of ownership to support energy efficiency projects, including both capital and operating expenses.

Other participants stated that financing cycles can be leveraged for energy efficiency by building tools that can be used earlier in the discussion or require energy efficiency be looked at as part of the financing process. Advocates also argued that using existing financial cycles makes it easier to incorporate energy efficiency into planning activities and programs should look to provide other incentives, such as accelerating permitting or a zoning bonus to drive action. Market engagement should also be timed to align with existing business processes to maximize the impact of the engagement.

Target Metric and Framing Considerations

Seventeen stakeholders participated in a forum on target metric and framing considerations, representing government, advocacy groups, private sector entities, utilities, and service providers.

There was an overwhelming call for a fuel-neutral approach to metrics tracking across stakeholders attending the session. Many also called for a top-down, ground-up approach to target development, balancing both high-level efficiency targets with more granular metrics to track progress. There was also a clear need for clarity and the removal of ambiguity around responsibility for goals. The discussion focused around a shared desire to understand "who's responsible for what" and the need for individual wedges of the portfolio goal. Both advocates and private sector entities argued that the goals and metrics should be assigned to entity types, so the markets are aware of both the joint high level and independent goals, and that metrics for both should work in alignment.

At this session, multiple stakeholders expressed that access to data is a key issue that needs to be addressed in setting and achieving targets, and both advocates and private sector entities stated the importance of access to data throughout the energy supply chain. Advocates also stated that rate design needs to be carefully considered. Attendees argued for making high-level decisions outside of rate cases to provide consistency across all utilities, and to allow for greater analysis. Some advocates noted a desire to revisit the benefit-cost framework, and noted examples, such as Rhode Island's customer benefit costs analysis, for New York to consider.

Utilities noted that increased coordination amongst market participants and flexibility within program design and implementation is needed to create a bigger impact. Participants in the stakeholder forums stated the importance of designing programs and targets holistically, not bound by geographic and technology silos. The utilities also argued that there is a need for a coordination framework, to understand the interactions between programs in the market, and to support flexibility with market priorities and customers to achieve goals.

Service providers stated that achieving targets requires awareness that customers are ultimately making the investment in energy efficiency. Broad customer awareness is needed to drive action and change, and impact customers' energy choices. Several service providers highlighted Illinois legislation as a model to potentially follow, which focuses on long-term persisting savings to drive change.

Advocates argued that when developing the metrics, there needs to be a balance between outcome and innovation and recommended symmetrical metrics and impact metrics to keep both the stick and the carrot. Both advocates and utilities stated that metrics need to be real and have impact on business process and hold entities accountable.

Attendees also stated that in the past, program administrators were competing for customers, which sometimes led to program gaming. Many felt that market mapping goals and clarifying roles would eliminate market confusion. Some pointed to Mass Saves as a model that has overcome market confusion, with multiple program administrators engaging customers statewide. Advocates felt there should be a strategic market focus to program design, rather than a blanket application. Advocates also argued that market confusion has been created in the past when multiple funded strategies targeted the same sector and strategy, eliminating market focus. Private sector entities also argued that near-term goals should not replace long-term market engagement, as short cycle times create perceived market risk.

Advocates stated that long-term goals and allowing for flexibility with new business models should improve energy affordability. Advocates and service providers called out a need for a consistent level of funding in the LMI market, as well as addressing data access issues to bring down soft costs.

APPENDIX B.
FORECASTS USED IN THE ANALYSIS

The analysis to set a 2025 Energy Efficiency Target for New York State used 2015 econometric forecasts for State energy consumption in the building and industrial sectors. This 2015 reference forecast was selected to be consistent with the electric load forecast used in the CES Order.

2015 Econometric Forecasts used in 2025 Energy Efficiency Targets Analysis (1)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity Only (GWH)																
Generation	162,348	164,613	165,800	166,877	168,670	170,558	171,198	171,987	172,745	173,755	174,229	174,704	175,181	175,659	176,138	176,619
Site	151,444	153,557	154,664	155,669	157,341	159,103	159,700	160,436	161,143	162,085	162,527	162,970	163,415	163,861	164,308	164,757
Site Energy (TBtu)																
Elec site	517	524	528	531	537	543	545	547	550	553	555	556	558	559	561	562
Natural Gas + Petroleum Fuels	1,102	1,082	1,105	1,121	1,113	1,105	1,100	1,097	1,096	1,096	1,094	1,092	1,090	1,088	1,086	1,084
Total Site	1,619	1,606	1,633	1,652	1,650	1,648	1,644	1,644	1,646	1,649	1,649	1,648	1,647	1,647	1,646	1,646
Primary Energy (TBtu)																
Total Primary	2,644	2,646	2,681	2,707	2,716	2,725	2,726	2,731	2,738	2,747	2,749	2,751	2,754	2,756	2,759	2,762

(1) Electricity forecast based on CES and 2015 NYISO Gold Book. Onsite fuel consumption forecast based on 2015 EIA AEO.

The 2015 forecasts used for this analysis project lower statewide energy consumption in 2030 as compared to the 2012 baseline forecasts that were used in analysis for the 2015 State Energy Plan.

State Energy Plan Baseline Forecasts (2)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity Only (GWH)																
Generation	166,030	166,915	166,997	168,021	169,409	171,176	172,514	173,569	174,992	176,431	177,884	179,353	180,837	182,337	183,852	185,384
Site	154,879	155,704	155,781	156,736	158,031	159,679	160,927	161,911	163,239	164,581	165,937	167,307	168,691	170,090	171,504	172,933
Site Energy (TBtu)																
Elec site	528	531	532	535	539	545	549	552	557	562	566	571	576	580	585	590
Natural Gas + Petroleum Fuels	1,141	1,144	1,148	1,150	1,153	1,154	1,154	1,155	1,156	1,157	1,159	1,162	1,164	1,169	1,174	1,178
Total Site	1,670	1,676	1,679	1,685	1,692	1,698	1,703	1,707	1,713	1,718	1,725	1,733	1,740	1,749	1,759	1,768
Primary Energy (TBtu)																
Combined Primary	2,718	2,730	2,734	2,747	2,762	2,780	2,793	2,804	2,818	2,833	2,849	2,866	2,882	2,901	2,920	2,939

(2) Electricity forecast based on 2012 NYISO Gold Book. Onsite fuel consumption forecast based on 2012 EIA AEO.

Considering the estimated energy efficiency achievement from the activities described in this white paper and the revised forecasts for statewide energy consumption in 2030, this analysis estimates that New York State is positioned to exceed by 20% the source-based energy efficiency goal established in the 2015 NY State Energy Plan.

Projecting toward the 2030 Statewide Energy Efficiency Target established in the 2015 NY State Energy Plan (SEP)	
SEP Target: Primary Energy Savings by 2030, as a reduction from the SEP reference forecast of primary energy use in 2030	600 TBtu Goal Primary Energy Savings
Projected Reduction from SEP Reference Forecast	
Update the Reference Forecast based on 2015 Econometric Forecasts	178 TBtu Primary Energy Savings
Meet the 2025 Energy Efficiency Target	~ 390 TBtu Primary Energy Savings
Sustain 2026–2030 Energy Efficiency Savings (conservative assumptions)	~ 152 TBtu Primary Energy Savings
Total Estimated Primary Energy Savings by 2030 as a reduction from the SEP reference forecast	~ 720 TBtu Projected Achievement Primary Energy Savings

APPENDIX C. SUMMARY OF RECOMMENDATIONS

ID #	Section #	Recommendation
1	4.5	DPS and NYSERDA shall develop improved approaches to regularly and accurately assess the aggregate impact of energy efficiency activities through "top-down" analysis of energy consumption trends over time, coupled with transparent program-level reporting.
2	4.5	Integrate comprehensive progress reporting toward the 2025 statewide energy efficiency target into future State Energy Plans and the biennial updates to each State Energy Plan.
3	5.2	Transform the mix of utility energy efficiency investments to deliver greater leverage and impact to achieve REV goals • Enhance energy efficiency • Advance multi-measure energy efficiency services addressing measures that include but move beyond the dominance of lighting in portfolios. Measures that integrate with other distributed energy resources (DERs) will also become important. • Advance shared savings models leveraging third-party capital. • Streamline resource acquisition allowing for market innovation (e.g., Pay-for-Performance). • Leverage data and customer/asset information to reduce soft costs.
4	5.2	Consistent with the Commission's recent ETIP directive, encourage utility and NYSERDA partnerships in designing innovative approaches so the collective offering is the best solution to move the market. Encourage utilities to continue to include energy efficiency in NWA/NPAs (e.g., deferral to infrastructure) and to reflect energy efficiency as part of DSIPs. Encourage utilities to explore NWA-like long-term contracting models as a means of procuring energy efficiency—potentially in a shared savings model—in lieu of conventional capacity.
5	5.2	Encourage utilities to build on findings from ongoing energy efficiency "experiments," and develop systems and disciplines to innovate and replicate more effectively.
6	5.2	Encourage utilities and NYSERDA to launch Pay-for-Performance (P4P) in 2018 with a focus on providing market stability and certainty to allow service providers to invest in their business systems and projects.
7	5.2	Improve EAMs as instruments to support new business models at utilities, by allowing higher levels of EAM in constructs that provide net benefits to ratepayers over the long term and achieve greater levels of market penetration.
8	5.2	Consider a utility energy efficiency funding framework that ties funding availability to improvement in outcome metrics.
9	5.2	The Commission should develop criteria and guidelines for the funding of fuel-neutral efficiency programs to be delivered by utilities. Issues to be addressed should include the following: • The potential scale of cost-effective cross-fuel programs • Criteria for determining the cost-effectiveness of cross-fuel programs, including weighting of participant benefits relative to carbon reductions and appropriate use of Benefit Cost Analysis framework • Types of cross-fuel programs and eligibility criteria, including potential weighting toward LMI customers
10	5.3	While energy efficiency activity on Long Island has been robust, Long Island presents opportunities to realize meaningful increases in energy efficiency savings in the period to 2025 and beyond. During the course of the 2018 year, LIPA should develop its strategy for delivering accelerated energy efficiency services for its customers, consistent with the principles and level of ambition presented in this white paper, including opportunities for innovative approaches to meet customer needs that include implementation of advanced meter infrastructure and value-based efficiency opportunities in areas of increasing constraint.

ID #	Section #	Recommendation
11	5.3	NYPA committed to a significant increase in its funding of energy efficiency, increasing the financing program to $300 million, and should continue to create opportunities with its customer base for expanded efficiency contributions as aligned with the goals presented in this white paper. Municipal utilities can also contribute to these broad statewide objectives and goals, possessing unique opportunities to tailor program budgets and efficiency activities that meet the needs of their customers.
12	6.1	Building upon the foundation that these actions provide, approaches to expedite third-party access—potentially in advance of AMI deployment—should be developed. Utilities, DPS Staff and stakeholders should assess the benefits and costs associated with accelerated deployment of Green Button Connect, and whether other alternatives exist given the advancement of technology, to achieve these objectives. Additionally, where Green Button Connect is being deployed current requirements being placed on third parties to comply with a robust Data Security Agreement (DSA) should be monitored to ensure they balance access with data security in order to make the investment in Green Button Connect a worthwhile endeavor.
13	6.1	The Commission should clearly define basic versus enhanced data for the purposes of clarifying what data should be made readily available to service providers, customers, and their agents at no cost, and what data is appropriate for utilities to charge a fee.
14	6.1	Utilities should continue to work toward identifying beneficial locations for DERs and making substation-level load forecasts available to stakeholders.
15	6.1	Utilities should make it a priority to encourage innovative companies to co-develop energy efficiency deployment strategies that deliver locational value, both through NWA/NPA procurements and by developing other partnership approaches that can be responsive to system needs on an ongoing basis.
16	6.1	Develop an accelerated and useful approach to enable use of machine-readable tariffs and assess costs and benefits associated with such an approach.
17	6.2	DPS Staff and the Commission should advance development of such M&V tools in ratepayer-supported energy efficiency programs, specifically: • Develop and make available valid, useful, and desired information to customers and their agents. • Reduce the cost and improve the timeliness and accuracy of EM&V performed by Program Administrators and Regulators. • Enable performance-based approaches to energy efficiency.
18	6.3	NYSERDA and DPS shall assess the alignment energy efficiency payments with utility system and environmental value, engaging stakeholders for input and conducting relevant analysis, with findings expected to inform design of New York State utility incentives for energy efficiency and NYSERDA interventions as appropriate.
19	6.3	Ensure that load curves developed by utilities for other localized DER resources are suitable in format, granularity, and timeliness for energy efficiency.
20	6.3	In the interim, New York State utilities are encouraged to provide approximate compensation for energy efficiency where there is found to be locational peak reduction grid value (e.g., through increased incentives for measures such as air conditioning in existing programs or new initiatives such as pay for performance). Utilities also should continue to consider and compensate (as viable) energy efficiency savings within their NWA and NPA projects.
21	6.4	Capitalize on NY Green Bank's ability to support energy efficiency by addressing barriers of lack of precedent, standardization and scale of economically viable business models through serving as senior capital provider, subordinated capital provider, credit enhancer or aggregator. In addition, NY Green Bank could play various roles in facilitating some of the financing mechanisms.

ID #	Section #	Recommendation
22	6.4	Specifically, NYSERDA and NY Green Bank shall work to launch the following financing products: • Pay-for-Performance finance – NY Green Bank intends to issue a financing Request for Proposal (RFP) alongside NYSERDA's Pay-for-Performance RFP. NY Green Bank will work with NYSERDA and market participants to provide a loan product to developers/energy service companies (ESCOs) that take advantage of the pay-for-performance program, enabling them to offer improved value propositions to building hosts. Providing a loan product that finances both future customer payments and pay-for-performance incentives, while utilizing a consistent approach across the market, will result in reduced transaction costs, standardization and scale, which together will result in improved offerings to building owners and ultimately crowd in private sector capital more quickly. • Tenant Improvement Finance – NY Green Bank intends to work with large property owners and management companies to provide financing for their tenants for incorporating energy efficiency measures into the build-out or retrofit of tenant improvements to their premises. NY Green Bank will utilize an approach that maintains the owner-tenant relationship by providing capital on a wholesale basis that is used by building owners/managers to offer financing solutions to their tenants for qualified improvements. The debt service will be structured so ongoing tenant debt service payments will be less than anticipated energy savings, with a payback period shorter than the remaining lease term. By working with multiple major property owners NY Green Bank seeks to achieve scale and standardization, which will ultimately provide better value propositions to tenants and attract private sector capital providers.
23	6.4	Promote statewide availability of Residential PACE financing with appropriate necessary consumer protections and regulation of PACE administrators in New York.
24	6.4	Promote C-PACE through collaborations with: • Each of the Regional Economic Development Councils to promote expanding C-PACE to those municipalities that are not yet Municipal Members of the Energize NY Benefit Finance Program and to ensure that commercial property owners are aware of the opportunity to utilize C-PACE financing for energy-related commercial projects approved by the REDC in those communities in which it is available. • NYCEEC as it rolls out NYC's C-PACE program, to look for synergies with utilities' and NYSERDA's commercial and multifamily efficiency programs.
25	6.4	Consider statutory changes that would promote On-Bill Recovery with third-party capital by addressing priority of partial utility payments, utility fees for providing billing and collection services, provisions for transferability of loans, and bill neutrality requirements.
26	6.4	Expand use of GJGNY financing by streamlining program and pushing loan performance data on OpenNY, or other similar suitable future platforms.
27	6.4	NYSERDA/NY Green Bank shall explore the possibility of using this database to develop a securitization mechanism to allow the GJGNY platform to expand its ability to provide unsecured loans to market rate customers at lower interest rates, with greater scale.
28	6.4	Expand underwriting of projected operational savings for deep retrofits by developing a database of multifamily deep retrofit projects, and working with NY Green Bank, NYCEEC, and other parties to develop innovative financing structures that could incorporate contractors' performance guarantees, supplemental bridge financing, insurance products and/or other financial guarantees.
29	6.4	NYSERDA/NY Green Bank shall engage with the appropriate State entities to explore forming or managing one or more Opportunity Funds to raise private capital and direct clean energy investments in the designated Opportunity Zones.

ID #	Section #	Recommendation
30	6.4	NYSERDA, in consultation with State and local affordable house agencies, shall explore alternative methods of setting utility allowances, and potentially contract for the development of a New York specific energy consumption modeling tool, in order to provide a mechanism for adjusting UAs following energy efficiency retrofits implemented by affordable housing building owners. Utility allowance adjustments should reflect energy savings in a manner that strikes a balance between fairness to tenants and financial feasibility for owners.
31	6.5	Consider advancing a legislative proposal for annual benchmarking and disclosure of private buildings energy performance data for buildings greater than 50,000 square feet.
32	6.5	Commit to annually benchmark and disclose energy performance data for State buildings .
33	6.5	NYSERDA shall work with appropriate agencies and local partners to develop a statewide building label and assistance for voluntary adoption by leading localities, building on the work underway by NYSERDA to support a NYC building label.
34	6.5	NYSERDA, potentially with utilities, shall study small building energy disclosure strategies/policies, including disclosure upon sale/lease, and test strategies with localities and/or portfolios.
35	6.5	The utilities and NYSERDA should pursue opportunities to support benchmarking in large buildings.
36	6.6	NYSERDA will increase funding for BOM partnerships by $10 million to support needs of an additional 1,500 building operations and maintenance workers.
37	6.6	To address this labor shortage, NYSERDA will invest an additional $26.5 million dollars in business-driven skills training in energy efficiency and clean energy technologies to support more than 18,000 workers .
38	7.1	NYSERDA shall focus research and development on specific products and components that meet appropriate high-performance specifications at specific price points, and explore the possibility of bulk purchase agreements for such products and components.
39	7.1	The State should remove the prohibition from using the design/build project procurement method for deep energy retrofit projects for Public Housing Authorities, SUNY and K-12 educational facilities to allow for a more integrated process where deeper energy saving measures are more easily considered.
40	7.1	Establish requirements to drive deeper energy and carbon savings in State-owned facilities (in particular, seizing the current opportunity with SUNY), as outlined in Section 10.
41	7.1	Consider leveraging New York State bulk purchasing power for cost reduction on high performance equipment (e.g., as NYPA has started to do with LEDs).
42	7.1	Promote the use of non-monetary incentives, like expedited permitting or zoning bonuses, for deep retrofit projects.
43	7.1	NYSERDA shall develop a strategy to introduce energy efficiency broadly, and deep energy efficiency specifically as a consideration in the capital planning cycle. Such a strategy could include developing visibility into the capital planning calendar for priority building sectors and portfolios, and defining how financiers and owners make capital planning decisions with special attention to the place deep energy efficiency can have in this process.
44	7.1	NYSERDA shall work with the market to develop tools, models and third-party services useful in enabling effective consideration of deep energy efficiency in the capital planning process, as well as expanding the use of capital asset planning and financing to a broader segment of building owners and facility management firms.
45	7.1	NYSERDA shall develop and maintain a roster of experts to provide technical support to enhance capital planning by building owners, showing the lifecycle value proposition of net zero/Passive House-level retrofit projects. Technical assistance will be particularly important for the condo/co-op market, which is notoriously difficult to move.

ID #	Section #	Recommendation
46	7.2	As early action steps, encourage utilities to consider heat pumps: • In energy efficiency portfolios on an all-fuels basis, and provide heat pump customers with incentives that can stimulate uptake while still delivering net ratepayer savings to non-participants. • Along with other energy efficiency technologies as eligible strategies in value-sharing models such as Non-Pipe/ Non-Wires Alternatives.
47	7.2	Within the context of longer-term State Energy Plan considerations toward 40 by 30 GHG goals, develop a multi-year market strategy for heat pumps beyond the NYSERDA temporary incentives, based on the following principles: • Drive long-term cost reduction, program transparency, and steady market growth. • Develop a longer term approach to spur the market towards sustainability while maintaining the principle of delivering net ratepayer savings to non-participants. • Consideration of the range of heat pump sectors, including exploration of the needs and opportunities in the non-residential heat pump sector. • Continued utility engagement while ensuring a level of statewide long-term consistency that the market needs (see for example NY Sun). • Exploration of a range of mechanisms for utility engagement, including Non-Pipe and Non-Wires Alternatives. • Inclusion of heat pumps as a component of deep energy retrofit strategies.
48	8	NYSERDA shall continue to advance the development of net zero energy retrofit prototypes for affordable housing through the RetrofitNY initiative to substantially reduce the energy consumption and associated operational costs of existing affordable housing.
49	8	NYSERDA shall work with HCR and other key stakeholders (e.g., other housing agencies, building owners, financial institutions, developers, and technical service providers) as well as potentially utilities to provide market supports to address and overcome barriers to scaling energy efficiency in affordable multifamily buildings. Specific activities that NYSERDA will undertake include: • Advancing an industry-wide approach to underwriting to potential energy savings by making data and technical support (such as model deals, energy efficiency measure specifications and use cases) available to HCR and other affordable housing lenders. • Supporting the adoption of Integrated Physical Needs Assessments (IPNA), which are critical to including energy efficiency at the time of refinancing, more broadly. • Developing finance models that can support mid-cycle refinance. • Identifying opportunities to align incentive programs with affordable housing financing cycles to enable inclusion of energy efficiency upgrades in workscopes that are financed. • Developing approaches to mitigate the potential for energy efficiency improvements to increase rents in affordable housing, as a way for building owners to recover the upfront costs.
50	8	While CPACE is discussed in this whitepaper, it has special potential for application in the multifamily affordable housing sector. Specifically, C-PACE should be considered as a financing solution to address finance barriers for some multifamily building owners. NYSERDA will encourage the expansion of C-PACE to municipalities that are not yet members of the Energize NY Benefit Program and ensure that those municipalities, as well as owners and managers of multifamily affordable housing properties, are aware that C-PACE financing can serve as a useful tool to bring the benefits of clean energy improvements toresidents of multifamily affordable housing.

ID #	Section #	Recommendation
51	8	NYSERDA will facilitate the adoption of energy efficiency improvements under Medicaid, as a component of healthy homes interventions. Activities will include piloting healthy homes interventions to validate the healthcare cost savings and benefits to the residents, developing standardized contracts and specifications to deliver healthy homes improvements under a VBP framework, and fostering a network of contractors to deliver the services.
52	8	To advance ZEM as a solution for improving the energy efficiency and resiliency of homes in New York State, NYSERDA will work New York State Homes and Community Renewal, other state agencies, and the modular construction industry to develop a market for ZEM homes in New York State as a replacement for traditional manufactured/mobile homes and as an option for urban infill.
53	8	DPS, utilities, NYSERDA and interested stakeholders should explore whether utility bill credits authorized under the Affordability Policy could be leveraged in such a way to support energy efficiency while adhering to the principles of the Affordability Policy (importantly, the principles of affirmative decision by customers and of no net loss of energy bill cost relief). If such an approach is found to have merit, a proposal should be put forth for Commission consideration.
54	8	NYSERDA and DPS shall explore the development of a pilot Pay-As-You-Save tariff-based financing model with one or more utilities, as an instrument that expands the reach and effectiveness of the State's energy efficiency initiatives while remaining consistent with the principles established in this document.
55	8	NYSERDA, DPS, and potentially utilities shall work with organizations at the State and local level focused on preserving housing, as well as owners, lenders, and nonprofit groups to improve the alignment of policies, programs, and systems to deliver the benefits of energy efficiency to residents of this sector of housing.
56	8	NYSERDA, DPS and utilities shall develop as soon as practicable a comprehensive and effective approach to energy efficiency for low- to moderate-income New Yorkers. This approach shall consider funding and uses of funds; specific sectors (such as single- and multifamily, renter and owner) and program approaches suitable for those sectors; roles and responsibilities of NYSERDA, utilities, and others; and appropriate approaches to measurement and accountability.
57	8	Informed by these discussions as well as other data regarding the uptake of energy efficiency in this market segment, it is recommended that at least 20% of any additional levels of investment in energy efficiency be dedicated to services for low- to moderate-income New Yorkers.
58	9.1	Consider statutory changes to the existing Energy Law Article 16 to provide either the Department of State or NYSERDA with the authority to promulgate regulations for setting New York State energy efficiency standards for products and appliances sold in the State, and for enforcing those standards.
59	9.2	New York should work collaboratively with other states (through the U.S. Climate Alliance or other appropriate venues) to develop carbon-focused metrics to support deeper carbon savings.
60	9.2	NYSERDA shall continue development of stretch codes for each code cycle and the state should consider making the stretch code mandatory in the 2022 cycle while development of carbon-focused metrics that can be integrated into future state codes is ongoing.
61	9.2	NYSERDA shall use marketing and direct engagement with the new construction market (from design, to construction, through operation) to advance low-energy/carbon practices, increase capacity, and decrease risk, through activities such as 1) demonstration of advanced technologies and practices, 2) project measurement and verification, 3) project validation, 4) peer exchange and online tools to support and disseminate practices, 5) support for projects built to stretch codes in early adopter jurisdictions before enactment of statewide mandatory stretch codes, and 6) audience specific training to improve code compliance, targeting the largest savings opportunities, and the optimum training approaches, e.g., online, visual hands-on, classroom, in-field, etc.

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62	9.2	NYSERDA shall work with local communities to test, prove, and disseminate workable and suitable cost-effective code enforcement models, such as uniform online quality assurance and code compliance platforms that streamline enforcement, aggregated county-level enforcement, or use of third-party energy code specialists.
63	10	By 2021, require that all State facilities that have a utility bill of over $300,000 have either 1) a Comprehensive Facility Master Plan program (updated every five years), which includes a Clean Energy Component that addresses new construction and retrofit needs; or 2) an Energy Master Plan (updated every five years) that addresses new construction and retrofit needs.
64	10	The resulting Master Plan will identify short-term high impact projects, address smart sequencing of projects, and include a long-term plan to ultimately achieve Net Zero Energy or Net Zero Carbon operation of all facilities.
65	10	State agencies and authorities should design all new construction to be Net Zero Energy or Net Zero Carbon, when it is technically and economically viable in designated building typologies, pursuant to the schedule set forth below. • SUNY recently committed all new construction initiated in 2020 be designed to be Net Zero Energy or Net Zero Carbon, leading the way for State agencies. • New construction at state agencies and authorities for low-rise office buildings (less than four stories) that is initiated in 2020 or later should be designed to be NZE. • By 2025, all new construction in dorms, housing, and public assembly buildings (less than four stories) should be designed to be NZE. • By 2030, new construction for all building typologies (limited to buildings less than four stories) should be designed to be NZE, where it is technically and economically viable on a life cycle basis. The State will need to allow for an exception process, where an agency or authority can document that NZE construction is not technically or economically viable. In these cases, buildings will need to be designed to exceed the New York State Energy Conservation Construction Code by a minimum of 20%.
66	10	NYSERDA shall develop design tools and training resources to assist the State's key design and construction divisions (e.g., Office of General Services (OGS) Design and Construction, DASNY, and NYPA), including NZE standard design packages and Integrated Project Delivery and Integrated Design Process training programs.
67	10	State-wide Comprehensive Lighting Retro-fit Initiative: Each agency or authority will commit to all lighting (indoor and outdoor) being retrofitted to LED, or have a scoped, budgeted and scheduled project for replacing remaining non-LED lighting, at all State-owned assets by 2025. All new construction or gut rehab projects will specify 100% LED technologies by 2020.
68	10	Acting on Audits: No later than 2021, all State facilities that have energy audits conducted on existing facilities, energy models generated for the construction of new facilities, or Facility Master Plans/Clean Energy Master Plans completed will implement all measures that have a 10-year or less simple payback (or a 7% or greater internal rate of return [IRR]) within five years from identification.
69	10	Smart Sequencing of Building Upgrades: Not later than 2020, all facilities with an annual utility bill greater than $300,000 will conduct and execute building shell upgrades prior to implementing an HVAC replacement project, and will evaluate the cost-effectiveness of an all-electric (heat pump) HVAC system. If the cost difference between a replace in kind (but more efficient than code) system type versus an electric heat-pump HVAC system is a 10-year or less simple payback (or has an IRR greater than 7%), then the building will switch to heat pump-based HVAC.

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70	10	List of 10% Improvement Projects: Several agencies and authorities have indicated that having a list of projects that could reduce their utility consumption by 10% or more would be helpful. The State, via NYSERDA and NYPA, should publish and keep such a list up-to-date and available for public and private entities to inform planning and project decision making. The provided list is for example purposes. • Lighting retro-fit to LED • Demand control ventilation on larger Air Handling Units • Time of Use meters, deep sub-metering, and intelligent controls to enable better equipment and building scheduling and shut down management • For larger equipment and buildings, the use of intelligent building management practices and operations • Air sealing and other building shell tune-ups
71	10	Benchmarking and Public Disclosure of Building Level Energy Performance: By 2019, each agency or authority that owns and operates a building able to receive a score in the U.S. Environmental Protection Agency's Portfolio Manager (PM) benchmarking program, will annually benchmark and disclose the PM score and any prior scores at that facility. • For all buildings 25,000 square feet or greater able to receive a PM score based on the building type, but that are not currently sub-metered for all fuels, submeters shall be installed by 2025. The facility shall immediately comply with the benchmarking and disclosure policy once submeters are installed. • For all facilities master metered on one or multiple fuels (which does not allow for building level benchmarking) and for all facilities that are not a scorable building type for any reason in the PM system, the State shall gather and publish the critical energy performance data of those facilities annually. • The components of this recommendation demonstrate the State's commitment to benchmark its facilities, ahead of and in support of the recommendation in this white paper to introduce legislation for statewide benchmarking of private buildings greater than 50,000 square feet.

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72	10	Consider Energy Law Modifications: NYSERDA shall work with partner agencies, authorities, and the private sector to evaluate the feasibility of the following recommendations, which would impact not only State agencies and authorities, but also local governments, K-12 schools, and other public entities. • Clarify and expand the list of measures that are listed in law as being specifically eligible to be included in performance contracts. This would enable a broader package of measures to be included in projects and would specifically cover water saving upgrades. The expansion and clarification of the list could expand project scope by 15-30%. • Establish a new eligible project type in Energy Law to complete "Deep Decarbonization Projects." This new project category would increase the allowable pay-back term to 25 years in instances where 90% or more of the project's costs have expected useful life of 25 years or greater. This would allow a significant expansion of projects that switch from in-kind heating system replacement to heat pump-based HVAC. • Establish a new eligible project type that would allow very fast payback clean energy projects to also help fund non-energy related upgrades to address deferred maintenance. Under this new "Clean Energy Project to Address Deferred Maintenance Project" category, if the simple payback of the project is 50% or less than the expected life of the measure, the project cost can be increased by 20% to address non-energy related facility improvements. This would encourage agencies to identify and move forward with cost-effective projects that currently sit on the shelves because it would also allow a path to address critical deferred maintenance from non-capital budget funding sources. • Establish authorizing language to allow agencies and authorities to use Design/Build project models and integrated project delivery methods to build or renovate buildings to Net Zero Energy performance. Design/Build is a more effective and cost-efficient way to build and renovate complex and high performing buildings. This recommendation will require the State to establish specific controls and use cases where the Design/Build process could be used and to address public notification of its use. • Establish a mechanism whereby a State agency or authority can keep a portion of savings that are verified to result in the first year of an efficiency project. At least one other state has established a similar mechanism, which had the effect of driving an increased volume of work.
73	10	Expand NYPA Financing: NYPA expects to increase its financing for clean energy projects to approximately $300 million per year. NYPA has the potential to further expand that amount if requests to access its Energy Services Programs continues to increase.
74	10	Evaluate the Potential Use of the 179D Federal Tax Credit: The 179D federal tax credit enables Architects and Engineers to capture a tax credit, if signed over by the public entity, when a project meets certain efficiency performance thresholds. This could help pay for part or all of certain design work. If viable, the State should consider modifying standard practice by OGS Design and Construction, DASNY, NYPA, and the State University Construction Fund-for to routinely use the 179D credit in their projects. Clear guidance would need to be provided to the design community and to State entities to implement this more widely.
75	10	Encourage State facilities to embrace intelligent building solutions, installing submetering and controls in facilities to optimize performance and reduce energy costs.
76	10	Create a new workforce development program (and possibly expand to course curricula) to train facility operators on intelligent building systems, controls, and equipment maintenance and diagnostics. The new program could be developed in collaboration with NYSERDA and NYPA, with consideration of workforce programs that are offered by other State agencies, such as Empire State Development and the Department of Labor.

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77	10	Establish a Clean Energy Internship program to provide support for low-cost data analysis and remote energy management. Participants would send recommendations to facilities for scheduling optimization and equipment shut down, preventative maintenance, and similar operational improvements. Interns could possibly also provide ASHRAE Level 1 audits of buildings and support for Clean Energy Master Plan work.
78	10	NYSERDA and NYPA shall review the potential for the NYEM platform to accommodate EO88 and EO166 facility-related reporting, and shall prepare a recommendation of costs, schedule, and budget for necessary modifications in 2018.
79	10	Consider a new energy efficiency goal for State agency facilities to achieve of 11 TBtu of site energy savings by SFY 2025/26 (Base Year of SFY 2014/15). This equates to slightly greater than a 25% reduction of facility-related energy consumption in SFY 2014/15 as reported in EO88, after taking into account expansion of square footage and natural load growth of converting space to more energy intensive uses. Agencies will be apportioned their share of the 11TBtu savings goal based on their proportion of the total State energy load. NYPA will establish a mechanism to collect project-level energy savings data from State entities (beginning in 2018) to help track savings towards the 11 TBtu goal. • If a facility meets an EUI that is determined to be Net Zero Capable, or achieves Net Zero Energy performance, that facility shall be considered exempt from further clean energy work. If a facility receives an EPA Portfolio Manager score of 90 or better, earns the ENERGY STAR Building Label each year, and has electric (heat pump) based HVAC, that facility shall be exempt and the agency's energy reduction target will be reduced accordingly.
80	10	For facilities and utility accounts where the majority of energy use in for process, traction, or other non-regulated loads, the State shall explore establishing an alternative goal whereby State entities would evaluate these energy loads and seek to achieve a 20% carbon reduction, including energy efficiency.
81	10	The above recommendations for NZE construction, existing building retrofits, and intelligent building efficiency also provide relevant guidance to support agency's EO166 goals.
82	10	Green Design Guidelines and Options for Construction RFPs: Several State agencies support building construction and development as part of their core missions (e.g., DASNY, ESD). Currently, these agencies and authorities may include reference to various levels of the U.S. Green Building Council LEED rating system; but LEED standards do not necessarily drive energy savings and cost reduction. NYSERDA shall work with partner agencies to develop guidance on energy performance standards that are appropriate to include in construction RFPs, for consideration by State entities that issue RFPs for State-funded construction or private development projects.
83	10	Economic Development Clean Energy Audits: NYSERDA shall explore with ESD the opportunity to provide energy audits to recipients of Economic Development grants. The purpose of the audits would be to identify cost-effective capital and operational upgrades that could be implemented by the grant recipients.
84	10	Pursue Water and Waste Water Best Practices: NYSERDA, NYPA, New York State Department of Environmental Conservation, and New York State Environmental Facilities Corporation will support initiatives that promote behavioral and operational changes across the State's largest water resource recovery facilities, including integrated capital and energy planning, Strategic Energy Management (a holistic approach to managing energy use that focuses on continuously improving the efficiency of core practices), and an updated Guidebook for Water and Wastewater Best Practices.
85	10	Net Zero Energy for Economic Development Program: NYSERDA, in partnership with ESD, shall launch a new Net Zero Energy for Economic Development program. This new program will leverage the Regional Economic Development Councils (REDCs) to provide a streamlined application and program process, offer payments timed to project status to address cash flow, and support economic development priorities of New York's regions.

ACRONYMS

AEO	Annual Energy Outlook
AMI	Advanced metering infrastructure
Btu	British thermal unit
BBtu	billion British thermal unit
CEF	Clean Energy Fund
CES	Clean Energy Standard
CO2e	Carbon dioxide equivalent
C-PACE	Commercial Property Assessed Clean Energy
DASNY	Dormitory Authority of the State of New York
DER	Distributed Energy Resource
DPS	New York State Department of Public Service
EAM	Earnings adjustment mechanism
EO	Executive Order
ESD	New York State Empire State Development
ETIP	Energy Efficiency Transition Implementation Plan
EUI	Energy use intensity
GHG	Greenhouse Gas
GJGNY	Green Jobs – Green New York
GWh	Gigawatt hour
HCR	NYS Homes and Community Renewal
KEDLI	KeySpan Energy Delivery Long Island
kWh	kilowatt hours
LED	Light-emitting diode
LIPA	Long Island Power Authority
LMI	Low- to moderate-income
M&V	Measurement & Verification
MMBtu	million British thermal unit
MW	megawatts
MWh	megawatt hours
NPA	Non-Pipes Alternative
NWA	Non-Wires Alternative

NYEM	New York Energy Manager
NYISO	New York Independent System Operator
NYPA	New York Power Authority
NZE	Net Zero Energy
OBR	On-Bill Recovery
P4P	Pay-for-performance
PACE	Property Assessed Clean Energy
PAYS	Pay As You Save
PSEG	Public Service Enterprise Group
REV	Reforming the Energy Vision
RFP	Request for Proposal
R-PACE	Residential Property Assessed Clean Energy
SEEPs	System Energy Efficiency Plans
TBtu	Trillion Btu
UA	Utility allowance

NYSERDA

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