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Three Empire State Plaza, Albany, NY 12223-1350
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November 3, 2016

Ms. Kathleen Burgess, Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, NY 12223-1350

Re: Matter 16-01006 – In the Matter of the CEAC's Energy Efficiency Procurement & Markets Working Group.
Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision.

Dear Secretary Burgess:

In its May 19, 2016 Order,[1] the Commission directed the Clean Energy Advisory Council (CEAC) to develop and propose metrics and targets for energy efficiency beyond existing Energy Efficiency Transition Implementation Plan and Clean Energy Fund targets to be filed by October 1, 2016. On August 31, 2016, the Secretary, at the request of the CEAC Steering Committee, granted an extension for the proposed metrics and targets until November 4, 2016.

In compliance with this requirement, the CEAC directed the Energy Efficiency Procurement & Markets Working Group of the CEAC to develop a report on energy efficiency metrics and targets. On behalf of the Energy Efficiency Procurement & Markets Working Group, please find the Energy Efficiency Metrics and Targets Options Report dated November 3, 2016, attached for filing.

Sincerely,

/s/

Marco L. Padula
Acting Deputy Director, Market Structure
Office of Markets & Innovation

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1 Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting a Ratemaking and Utility Revenue Model Policy Framework (issued May 19, 2016).

# *Energy Efficiency Metrics and Targets Options Report*

*November 3, 2016*

*This report was developed by the Energy Efficiency Procurement & Markets Working Group of the Clean Energy Advisory Council*

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## Executive Summary

The Energy Efficiency Procurement & Markets Working Group was tasked with developing recommendations on: (1) energy efficiency targets that go beyond the State's existing Energy Efficiency Transition Implementation Plan and Clean Energy Fund targets; and (2) outcome-oriented energy efficiency metrics to support utility performance incentives. It was further directed to analyze the potential impacts of energy efficiency measures on peak load reduction and load factor metrics. These initial tasks are elements of the Working Group's overall work to develop strategies to create vibrant markets for energy efficiency as an attractive business opportunity, resulting in greater market-wide levels of energy efficiency with less need for direct ratepayer support.

The objectives above reflect the Commission's desire to implement new approaches that create a more lasting market structure to catalyze investment in energy efficiency and clean energy. Because of the uniqueness of these goals, an overarching finding of this Working Group report is that significantly more analytical work is needed in order to determine the most appropriate energy efficiency metrics and targets to support an outcome-oriented, performance-based incentive for each utility. In multiple instances, this report therefore presents options for initial implementation of such targets and metrics, preliminary recommendations from stakeholders (some as Working Group recommendations, others from defined group of stakeholders), or topics for consideration to inform additional analysis. Since the REV Track 2 Order specified that utility performance incentives be implemented in utility rate filings, the options presented herein are expected to be useful inputs to those proceedings. The recently concluded collaborative in the Consolidated Edison rate proceeding cited the work of this group as a key input to their successful creation of an outcome-oriented incentive mechanism.

The Working Group was guided by a number of recent Commission orders, which direct the Clean Energy Advisory Council to develop outcome-oriented metrics and targets that facilitate the cost-effective achievement of the State's energy policy goals and policies, including the Clean Energy Standard. Recent Commission orders reflect a policy preference to transition to an increasing use of market transformation strategies where possible so as to leverage customer investment and outside capital to accomplish greater energy savings. The Commission has indicated a preference for increasing energy efficiency investments beyond existing programs so as to achieve the State's energy policy goals in a cost effective manner. The Commission also has articulated its concerns regarding the fulfillment of State energy policy objectives using primarily surcharge-funded energy efficiency "resource acquisition" programs and the extant shareholder incentives framework, and has underscored the limitations of tying shareholder incentives narrowly to activity directly administered by the utility. The Commission makes clear that achievement under an outcome-oriented metric should be measured by system-wide energy savings that can be brought about by a combination of utility programs, third party initiated efforts, improvements in codes and standards, and market transformation.

The Working Group defines an outcome-oriented metric to be a metric that measures net changes in normalized electricity consumption across the utility service territory over time, or net changes in normalized electric usage intensity across a sector over time, that is caused by aggregate energy efficiency activities across that territory or sector, spanning programmatic and policy interventions and market-initiated activity that operates without direct utility or government incentives. Outcome-oriented metrics generally fall into two categories: energy consumption metrics and energy intensity metrics. Consumption metrics measure the change in overall energy use over time, such as wholesale or retail electricity sales. Intensity metrics measure the energy use on a per unit level, such as usage per capita or per square feet of building floor area.

In both cases, the measurement of energy usage would be normalized (or adjusted) for weather and certain other factors that drive load. The Working Group is unable to recommend a precise method for normalization and underscores the need for further analysis by specialists. The Working Group recommends that mechanisms to account and adjust for fuel-switching be developed and phased in incrementally, with initial focus on "good load" from electric vehicles and heat pumps. The recently concluded Consolidated Edison rate case collaborative, which a number of Working Group members actively participated in, has provided a basis for further analysis and refinement.

The Working Group identifies that one practical means to implement an outcome-oriented approach may be to further define a consumption metric that measures the reduction in normalized MWh sales for the service territory as a whole, so as to provide the utility with flexibility in achieving the corresponding target. The Working Group also finds that sector-specific intensity metrics could be tracked: electricity usage per capita in the residential sector and electricity usage per employee in the commercial sector appear most promising. For the industrial sector, more study is required on the availability of sufficiently granular data to construct an electric usage intensity metric.

The Working Group also notes that a possible approach would be the use of a "hybrid" policy that combines both an outcome-based approach and a program-based approach. This approach recognizes the solid framework of utility incentives and funding tied directly to energy efficiency program-based achievements in New York and other states, and combines it with the potential for greater savings using an outcome-oriented approach that is still under development. This transitional approach will provide some means of assuring greater efficiency achievements in the near term without jeopardizing existing levels of savings and potentially a feasible, near-term ramp up in energy efficiency investment to facilitate the State's energy policy goals. The Joint Proposal in the Consolidated Edison rate case is an example of the hybrid approach, where both programmatic and outcome-oriented incentives are contemplated.

With respect to setting electric efficiency targets, the Working Group found it premature to propose utility-specific performance incentive targets in this report since additional work is required to specify the outcome-based metric or metrics which would be used to measure progress toward the target level of performance. This report describes options for target setting rather than a consensus recommendation. One approach considered would develop minimum statewide energy efficiency achievement levels that cumulatively sum to the total electric efficiency assumed in the Clean Energy Standard Order by 2030, while allowing for a non-linear trajectory over the 2016-2030 period with greater savings in the later years. A second approach would "ramp up" near-term 100% targets such that annual incremental electric efficiency savings as a percentage of sales increases by 0.4% per year. Under this strategy, long-term targets to 2030 would be set based on a new energy efficiency potential study that would be divided by utility service territory.

The Working Group conducted a “stack up” comparison between (1) compiled estimates of energy efficiency savings from currently funded activities across program administrators and expected savings from codes and standards and (2) illustrative electric efficiency targets. Analysis of this data varied among Working Group members. The majority of Working Group members concluded that in the near-term, the Commission should provide for cost recovery mechanisms that allow for ambitious and cost-effective utility investments in energy efficiency; this includes resources for established utility programs and, to the extent feasible, new REV market mechanisms. DPS, NYPA, and NYSERDA staff emphasized the expectation that energy efficiency investments will increase, but also the need to take into account the cost-effectiveness of alternative approaches to achieving the State’s energy efficiency goals.

The Working group analyzed the potential impacts of energy efficiency measures on peak load reduction and load factor. Our report discusses the complexity of this task, and finds that to accurately measure how energy efficiency installations affect “system efficiency” metrics it is necessary to (i) develop representative hourly load impact profiles for an energy efficiency measure being installed for a specific end use in a specific customer segment (for example, a LED light bulb installation in the living room of an apartment in northeastern Brooklyn) on a peak day, and (ii) develop an ability to aggregate such representative curves of all energy efficiency measures in a given area in order to accurately predict the overall impact of all those measures collectively at various levels of the electrical system on a peak day.

# 1. Introduction

The Clean Energy Fund (CEF) Order, issued by the New York State Public Service Commission (Commission) on January 21, 2016,[1] established the Clean Energy Advisory Council (CEAC or Council) in pursuit of consistent, effective, and transparent New York State Energy Research and Development Authority (NYSERDA) and utility clean energy programs. The CEAC functions in conjunction with and in support of New York's Reforming the Energy Vision (REV)[2] and Clean Energy Standard (CES)[3] proceedings. The Council was chartered to support innovation through effective transition from current program offerings in order to "enable an effective and coordinated portfolio of programs and initiatives in pursuit of New York State energy objectives, with a focus on energy efficiency, other distributed energy resources (DER)[4], and non-wire alternatives."[5]

The Council is structured to establish a venue for embracing input from market participants and as a transparent means to create vibrant clean energy programs, consistent with REV initiatives. The Council consists of a steering committee and six working groups, with the steering committee co-chaired by the Department of Public Service (DPS) and NYSERDA. Other members include all New York utilities, including the Long Island Power Authority (LIPA) and the New York Power Authority (NYPA). The Council furthermore consists of six working groups that report directly to the steering committee. The working groups include representatives from technology providers, environmental groups, the business community, and customer and low income advocates, as well as members from the organizations represented on the steering committee.

The Energy Efficiency Procurement & Markets Working Group (hereafter, the Working Group) was initially tasked with developing recommendations on: (1) energy efficiency targets that go beyond the State's existing Energy Efficiency Transition Implementation Plan (ETIP) and CEF targets; and (2) outcome-oriented energy efficiency metrics to support utility performance incentives. These initial tasks, which are responsive to the Commission's direction in the REV Track 2 Order,[6] are elements of the Working Group's overall work[7] to develop strategies to create vibrant markets for energy efficiency as an

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[1] Case 14-M-0094, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework (CEF Order) (Issued and Effective January 21, 2016).

[2] Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision.

[3] Case 15-E-0302, Proceeding on Motion of the Clean Energy Standard (CES Order) (Issued and Effective August 1, 2016).

[4] In the REV proceedings, "DER" is used to describe a wide variety of distributed energy resources, including end-use energy efficiency, demand response, distributed storage, and distributed generation.

[5] Matter 16-00561, In the Matter of the Clean Energy Advisory Council, CEAC Charter (Issued and Effective April 27, 2016).

[6] Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting a Ratemaking and Utility Revenue Model Policy Framework (REV Track 2 Order) (Issued And Effective May 19, 2016), at p.70.

[7] In ongoing work that will be synthesized in a subsequent report, the Working Group is also evaluating energy efficiency procurement concepts that maximize opportunities for new business models, including to integrate energy efficiency into utilities' basic business operations, and that enable newly monetized value streams for both third parties and utilities to promote an animated market and to lessen reliance on standard programs funded by the SBC charge. In this work, the Working Group is investigating the different streams of energy efficiency value, with attention to

attractive business opportunity, resulting in greater market-wide levels of energy efficiency with less need for direct ratepayer support.[8] This report discusses the Working Group's research and analysis to date on energy efficiency targets and metrics, with the ultimate goal of constructing an outcome-oriented, performance-based incentive for utilities. In multiple areas, the Working Group finds that significant additional work is needed prior to making definitive recommendations.

Section 2 of this report discusses the existing policy and regulatory framework that informed this Working Group's efforts, including the REV proceedings, the CEF Order, ETIPs, and the CES.

Section 3 discusses options for transitioning from a traditional utility program-oriented metric to an outcome-oriented metric (i.e., electric usage intensity) by which energy efficiency achievement will be measured. The metrics considered by the Working Group are "outcome-oriented" in the sense that they measure energy efficiency activities and energy savings across a utility service territory, regardless of the source of those savings. In this manner, the metrics count progress achieved through policy and market interventions in addition to that achieved through utility and NYSERDA programs. Section 3 explores opportunities and the potential benefits and risks of different types of outcome-oriented metrics.

Section 4 of the report discusses normalization mechanisms and methodologies (i.e., weather adjustments and econometric modeling) in order to account for the largest sources of exogenous effects on outcome-orientated metrics. Section 5 explores a performance incentive that "links increasing performance to increasing reward"[9] so as to provide a financially meaningful incentive for enterprise-wide attention by the utility.

The Working Group further analyzed options and methodologies for developing a trajectory of statewide electric efficiency targets that would ramp up energy efficiency (corresponding to increasing energy efficiency over time) to achieve the long-term savings goals outlined in the New York State Energy Plan and the CES. Section 6 describes options for setting a trajectory of electric energy efficiency targets through 2030, including both near- and long-term approaches, while recognizing that the path to realize these goals is not straightforward and requires mechanisms to support achievement.

In Section 7, the report discusses a framework for analyzing the potential impacts of electric energy efficiency measures on peak demand reduction and load factor metrics, as outlined in the Commission's REV Track 2 Order.[10]

Section 8 concludes the report, summarizing the Working Group's findings to date and identifying areas in which additional analysis is needed.

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better understanding the distribution impacts of energy efficiency in cases where there is not a clear near-term NWA opportunity.

[8] Matter 16-00561, In the Matter of the Clean Energy Advisory Council, CEAC Energy Efficiency Procurement and Markets Working Group Scope (Issued and Effective September 2, 2016).

[9] REV Track 2 Order, at p.70.

[10] Id., at p.74.

# 2. Policy Goals and Direction under the REV Initiative

The Working Group supports the priority the Commission has placed on establishing energy efficiency performance incentives for New York utilities that are consistent with the State's REV initiative and energy policy goals, including the achievement of a 40% reduction in greenhouse gas emissions from 1990 levels by 2030,[11] and the cost-effective achievement of a 50% renewables goal by 2030.[12]

## 2.1 Policy Background

In the REV Track 2 Order, the Commission used the term Earnings Adjustment Mechanism (EAM) to describe a specific performance-based incentive that uses financial rewards or penalties to align the financial interests of a utility's shareholders with desirable system-wide outcomes, as conveyed through specific performance targets.[13] The Commission stated that "…creating new earning adjustment opportunities are both a fair and a necessary means of promoting change."[14] The Commission instructed the CEAC to develop recommendations regarding metrics and targets to inform an EAM for energy efficiency, specifying that these energy savings targets should go beyond those included in the existing utility ETIPs and CEF programs.[15] The Commission further directed the CEAC to generically analyze the potential impacts of energy efficiency measures on peak reduction and load factor.

In developing these options and recommendations, the Working Group is guided and informed by a number of recent Commission orders, including those in the REV proceeding, authorizing the ETIPs, the CEF Order, and the assumed contributions of energy efficiency in the CES. Past Commission experience with energy efficiency shareholder incentives is also instructive. Commission orders in these proceedings reflect the Commission's clear policy preference to use market transformation strategies where possible so as to leverage customer investment and outside capital to accomplish greater energy savings than is currently feasible under existing programs.

The Commission also has indicated a preference for increasing energy efficiency investments beyond existing programs so as to achieve the State's energy policy goals in a more cost-effective manner. In the REV Track 2 Order, the Commission explains that the CEAC "will recommend a target or set of targets" designed to "reduc[e] the cost of achieving" the State Energy Plan and CES goals.[16] Moreover, the CES Order states that "[e]nergy efficiency is a crucial and cost effective means to achieve clean energy objectives. Study after study has shown that when deployed well, energy efficiency is the cheapest and most effective manner to reduce carbon emissions in the energy sector."[17] The CES Order sets clean energy procurement targets using a methodology that, according to the Commission, assumes current energy efficiency targets will be extended. But in setting those clean energy procurement targets, the Commission

[11] New York State Energy Planning Board (2015), The Energy to Lead: 2015 New York State Energy Plan, retrieved from: https://energyplan.ny.gov/Plans/2015.aspx.
[12] Id. and CES Order.
[13] REV Track 2 Order, at p.59.
[14] Id.
[15] Id., at p.82.
[16] Id., at pp. 81-82.
[17] CES Order, at pp.81-82.

indicated that it anticipates the CEAC to recommend more ambitious levels of energy efficiency in accordance with its cost effectiveness:

> The achievement of higher levels than the current energy efficiency targets can clearly benefit individual consumers and create system-wide value through the cost effective achievement of the [CES renewable goals] and carbon reduction goals. Higher levels of energy efficiency and its timing will positively impact both the total [clean energy procurement] target and the trajectory proposed to achieve it. However, for the purpose of the initial calculation of the 2030 target, it is premature for the Commission to presume any level more than the current objectives. Rather, this determination will be revisited after the work of the Clean Energy Advisory Council is concluded.[18]

The Commission has had a number of opportunities in recent years to articulate its concerns regarding the fulfillment of State energy policy objectives using primarily surcharge-funded energy efficiency "resource acquisition" programs and the extant shareholder incentives framework. These existing programs are generally oriented toward using rebates and other incentives to overcome market barriers in order to procure energy efficiency savings in a cost-effective manner. Utility shareholder incentives were based on such efforts. The Commission has contrasted this approach to efficiency with a "market transformation" approach in which wide-scale penetration and market acceptance of efficiency measures is encouraged.

In the 2015 REV Framework Order (the "Track 1 Order"), the Commission noted that while existing surcharge-funded programs have been successful in achieving considerable kilowatt-hour (kWh) reductions, "achieving the carbon reduction goals proposed in the Draft State Energy Plan through existing [surcharge] approaches would require large increases in the surcharge which already represents a substantial portion of some customers' bills."[19] It noted the large potential for further efficiency gains that are not being effectively captured by current approaches and the risk that subsidy programs can displace market development, and it recommended implementing new approaches that create a more lasting market structure to catalyze investment in clean energy and energy efficiency. The Commission also emphasized the imperative that "the regulatory system must begin to properly value the attributes that the [System Benefit Charge] has been used to promote." It further explained that "[a]chieving greater efficiency gains will require more private capital, not only in the form of sharing contributions under efficiency programs, but in the form of unsubsidized market activity."[20]

In the ETIPs Order, the Commission restated its direction of capping and gradually decreasing surcharge-based program funding while at the same time increasing energy efficiency deployment:

> [w]hile the Commission appreciates commenters support for increased deployment of energy efficiency, it notes that the budgets and targets established here are but one component of the energy efficiency efforts the Commission expects the utilities to pursue moving forward. The Commission

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[18] Id., at p.82.
[19] Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting Regulatory Policy Framework and Implementation Plan (REV Framework Order) (Issued and Effective February 26, 2015).
[20] Id. at p.77.

> was deliberate in the inclusion of energy efficiency in its definition of Distributed Energy Resources (DERs) in the REV Proceeding, and to that end expects utility REV Demo Projects and DSIPs to include energy efficiency efforts beyond those funded by the budgets authorized here. As the utilities prepare their DSIPs and advance their plans to function as the Distributed System Platform Provider (DSP)… the Commission expects significant utility investment in energy efficiency in a manner that best supports the local needs of their systems and advances energy efficiency as an operational resource rather than a regulatory mandate. Consistent with its previously stated desire to cap and gradually decrease the System Benefit Charge (SBC) of which the EE tracker is a component, the Commission finds that energy efficiency efforts funded through a surcharge should remain capped, and therefore maintains the 2016 budgets for 2017 and 2018.[21]

The Commission provided further guidance in the REV Track 2 Order, noting that energy efficiency will remain a priority area in which utilities may earn performance-based incentives for energy efficiency, and reaffirming the principle set forth in the ETIPs Order[22] that previously established electric and gas efficiency targets and budgets will serve as a baseline for future efforts. New targets to which EAMs will be tied, the Commission explained in the REV Track 2 Order, should exceed those existing targets. The Commission emphasizes the critical role that energy efficiency must play in achieving the CES and other state energy policy goals.[23]

The Commission also underscored the limitations of tying shareholder incentives narrowly to energy efficiency program activity that is directly administered by the utility, or specified in plans directed by regulators: "Outcome-based incentives will allow utilities to determine the most effective strategy to achieve policy objectives," including cooperation with DER providers and development of new business concepts that would not be considered under narrow, program-based incentives.[24] It also noted that these incentives may be oriented toward outcomes that utilities can influence but not necessarily directly control.

The Commission has also had the opportunity to opine on the weaknesses it considers in the current approach, where complicated verification processes and debatable baseline assumptions cause controversy. The Commission further elaborated these concerns in the REV Track 2 Order, noting that incentives that depend on proving of a counterfactual can lead to contentious *ex post* review processes and burdensome administrative efforts. Instead, the Commission recommended that metrics should, where appropriate, establish fixed performance targets on a predetermined basis that avoid *ex ante* and/or *ex post* analytic exercises that rely on contestable calculations and input assumptions.[25]

In its discussion of energy efficiency EAMs, the Commission in the REV Track 2 Order makes clear that achievement under an outcome-oriented metric should be measured by system-wide energy

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[21] 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 (ETIPs Order), (Issued and Effective January 22, 2016), at pp. 27.
[22] 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 (ETIPs Order) (January 22, 2016).
[23] REV Track 2 Order, at 79.
[24] Id., at p.62.
[25] REV Track 2 Order at p.65

savings that can be brought about by a combination of utility programs, third party initiated efforts, improvements in codes and standards, and market transformation. It also specifies: “one of the metrics for earning opportunity should be electric usage intensity across the utility’s territory…A number of energy intensity metrics can be considered, including kWh per capita, kWh per customer, and kWh per GDP.”[26]

The Commission provided insight into the methodology to be used for the metric, requiring that in implementing such a target, “[n]ormalization for weather, economic development, increases in electric vehicles and heat pumps, and possibly other factors will also be required,” with “[a] precise method to be recommended by the CEAC process.”[27] The Commission Order also allowed for utility proposals of additional energy efficiency earning opportunities based on program-specific savings, in instances where the utility exceeds minimum program targets, adopts new approaches to save ratepayer costs, or supports low-income affordability goals.[28]

[26] Id., at p. 82.
[27] REV Track 2 Order, at p.82, fn.96.
[28] REV Track 2 Order, at 82-83.

## 3. Outcome-Oriented Metrics for Energy Efficiency

Utility performance incentives tied to energy efficiency are common nationwide and have been in use in New York State since 2008.[29] They are intended to encourage utility management support for energy efficiency initiatives that result in lower overall energy sales than would occur under a business as usual scenario. They encourage the delivery of effective programs and help align utility incentives with state policy goals by ensuring the utility is rewarded for greater amounts of energy efficiency.[30]

There are four central components of developing any EAM, including one for energy efficiency:[31]

1. *Policy goals* that specify performance areas of interest and desired outcomes;
2. *Metrics* that provide a standard of measurement for assessing how well a utility is performing in the specified areas of interest;
3. T*argets* that define the level of performance that a utility is expected to achieve during a particular time period, as measured by the metrics; and
4. *Financial incentives* that are based on the utility's performance relative to the target.

In this report, the Working Group focuses specifically upon options for an outcome-oriented metric or metrics which are structured to encourage utility performance toward increasing system-wide energy efficiency, consistent with State policy goals. We adopt this focus in recognition of the Commission's direction that under REV, utility earning opportunities for energy efficiency will "continue this direction away from utility-specific resource acquisition and toward more outcome-oriented metrics that encourage market participation and collaboration across efforts, and which support the State's efficiency and carbon reduction goals." The Working Group further appreciates that this anticipated shift in the basis for assessing and rewarding utility support for energy efficiency is both significant and unfamiliar. This report, while providing the Working Group's synthesis of research related to outcome-oriented metrics and interim recommendations for the Commission's consideration, acknowledges that additional analytical study is necessary to determine adoption of an appropriate and specific outcome-oriented metric applicable to utilities. Pending further analytical investigation, the Working Group sees potential for an outcome-oriented metric to strengthen the link between utility motivation and efficiency policy objectives.

As noted in Section 2, the Commission has acknowledged that there will be a phasing down of programmatic approaches to energy efficiency over time, as market transformation efforts take hold. Although the Working Group is focused on outcome-orientated metrics in this report, we understand that these outcomes will be produced by programmatic, policy, and market activities with programs continuing as long as necessary to achieve statewide efficiency targets and to address any market segments that are not adequately served by other mechanisms. As a result, a broad outcome-oriented EAM may need to be

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[29] In 2008, the Commission adopted shareholder incentives in the EEPS proceeding, geared toward approved energy efficiency targets. Case 07-M-0548, Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard, Order Concerning Utility Financial Incentives (Issued and Effective August 22, 2008).

[30] Lowry, M., Woolf., T. (January 2016), Performance-Based Regulation in a High Distributed Energy Resources Future, Future Electric Utility Regulation, retrieved from: https://emp.lbl.gov/sites/all/files/lbnl-1004130_0.pdf, page 23.

[31] Whited, M., Woolf, T. (March 9, 2015), Utility Performance Incentive Mechanisms, A Handbook for Regulators, Western Interstate Energy Board, Synapse, retrieved from: http://www.synapse-energy.com/sites/default/files/Utility%20Performance%20Incentive%20Mechanisms%2014-098_0.pdf.

supplemented by more program-specific EAMs that are directed to achievement of complementary goals. This report further includes the recommendation from multiple Working Group members that successful energy efficiency investments, such as those made by utilities that enable energy efficiency providers to facilitate customer adoption of energy efficiency, should be increased and adequate funding should be made available (or cost recovery rules for efficiency investments structured in a manner) to put that State on a trajectory to meet its 2030 energy policy goals.

This report does not extend to utility earning opportunities that may be built into a specific non-wires-alternative project (i.e., following the incentive model of Con Edison's Brooklyn-Queens Demand Management program), or that may evolve to reflect broad system value creation through energy efficiency. The Working Group is at the initial stages of investigating how to identify and monetize the total value in a unit of energy efficiency, and in a subsequent report we anticipate addressing "shared savings" approaches which allow the utility to share some portion of the net benefits associated with energy efficiency.

## 3.1 Overview of Outcome-Oriented Metrics for Energy Efficiency

In the context of this report, the Working Group defines an "outcome-oriented" metric for electric energy efficiency to be **a metric that measures net changes in normalized electricity consumption across the utility service territory over time, or net changes in normalized electric usage intensity across a sector over time, that is caused by aggregate energy efficiency activities[32] across that territory or sector, spanning programmatic and policy interventions and market-initiated activity that operates without direct utility or government incentives.** In contrast, the traditional program-oriented approach, as used under the State's Energy Efficiency Portfolio Standard (EEPS) framework, measures energy efficiency achievement by estimating and summing up the measure-by-measure savings that are "acquired" through energy efficiency programs directly administered by the utility or another program administrator.

If an outcome-oriented metric and performance target are adopted to define an energy efficiency EAM, the utility's performance with respect to that EAM is assessed based on a broad measurement of all energy savings achievement in the utility service territory, rather than on a narrower "attribution" determination of what proportion of energy savings are due to the utility's direct incentive programs. This broader outcome for which performance will be assessed may be measured by an electricity consumption metric that is normalized to the extent necessary for exogenous factors such as weather, for relevant fuel switching (including increases in "good load" such as that from electric vehicles) and for certain economic and/or demographic factors that also impact energy usage. Outcome-oriented targets should be set in a manner that takes into account economic and demographic factors and their impact on broader energy use patterns, as historic energy use appears to be distinctly impacted by such factors during different historical periods. An outcome-oriented metric can be expected to capture savings not measured by traditional

[32] This definition is consistent with the specific direction from the Commission in the Track 2 Order to establish an energy efficiency outcome-oriented metric, although the Working Group acknowledges that there may be merit in considering outcome-oriented metrics that do not attempt to disaggregate energy efficiency from other load modifiers such as distributed generation.

program-oriented evaluation approaches, including savings driven by market transformation, from more aggressive codes and standards, and other interventions that have cumulative effects on efficiency.

### 3.1.1 Opportunities to Align Utility Incentives with Policy Goals

A thoughtful shift toward outcome-oriented metrics for an energy efficiency EAM has the potential to align utility incentives with central policy goals under REV, as the Commission has emphasized. Notably:

- An outcome-oriented metric which measures energy efficiency achievement over the utility service territory can be more directly tied to state policy goals such as greenhouse gas emissions reductions or cost-effective implementation of the CES.
- Under REV, utilities are called upon to enable markets and to pursue innovation to drive outcomes. The Commission underscores that: "Outcome-based incentives will allow utilities to determine the most effective strategy to achieve policy objectives," including cooperation with DER providers and development of new business concepts that may not have been considered under narrow, program-based incentives.
- Rewarding territory-wide saving is intended to encourage utilities to collaborate with NYSERDA, the NYPA, local governments, and Community Choice Aggregation (CCA) localities toward achieving mutual local and statewide objectives, while reducing competition among program administrators to "lay claim" to energy savings.
- At present, a barrier to increased investment in market transformation is that efficiency program administrators are rarely given credit for such efforts; indeed, once an efficiency program accelerates the adoption of an efficient technology to become the new market standard, it is no longer able to claim credit for the resulting savings. An outcome-oriented metric will capture and give credit for longer-term market transformation savings.
- Relatedly, an outcome-oriented metric will encourage and reward improvements in building energy codes that translate to real energy reductions, such as those that will have an impact on existing buildings during retrofits and renovations at the end of capital cycles. These are often the most cost-effective improvements that can be made. Utilities will have an additional incentive to support code development and enforcement,[33] where the energy savings are significant and should count.
- Administrative burden may be reduced by relying on an outcome-oriented metric rather than requiring detailed measure-by-measure analysis to determine utility performance. The Working Group recognizes, however, that utilities and other entities undertaking energy efficiency will continue to track and report a variety of metrics to support effective program delivery, planning, and oversight.

[33] Stellberg, Sarah (2012), Role for Utilities in Enhancing Building Energy Code Compliance, ACEEE 2012 Summer Study, retrieved from: http://aceee.org/files/proceedings/2012/data/papers/0193-000174.pdf.
Utilities and Building Energy Codes: Air Quality and Energy Savings Opportunities, The Institute for Electric Efficiency http://www.imt.org/uploads/resources/files/IEE-IMT-UtilitiesAndBuildingEnergyCodes_FactSheet.pdf

### 3.1.2 Methodological Complexities and Implementation Risks Require a Thoughtful Approach

The Working Group recognizes that the shift to an outcome-oriented metric for energy efficiency as described in this report also brings significant challenges and risks, requiring a thoughtful approach to development and implementation. These include:

- Methodological and empirical issues related to the measurement of energy efficiency achievement are complex, whether a conventional "measure-by-measure" approach or an "outcome-oriented" metric is adopted.
- In contrast to metered electricity generation or consumption, energy efficiency cannot be directly measured. The observed change in energy consumption must be compared to a counterfactual of what would have occurred in the absence of energy efficiency resources. The Working Group anticipates that significant work will be required to reach agreement upfront on an analytic approach to disentangle the change in energy use over time that is attributed to energy efficiency from other "structural" factors that also impact energy usage, such as weather and changing aspects of demographics and the economy. Sections 3.2 and 4 discuss potential options.
- With shareholder incentives at stake, the analytic approach and assumptions used are likely to be contested by parties. The choice of the energy consumption and/or energy intensity metric adopted, the baseline year or model adopted, and the normalization approach used to adjust actual results will directly impact the measured energy efficiency performance. The lack of a robust analysis on these matters and informed decisions about assumptions used upfront may signal a larger risk for an ex-post dispute.
- In contrast to the goal of encouraging cooperation, there is a risk of acrimony and finger-pointing if utilities identify that NYSERDA or NYPA are not delivering upon energy efficiency commitments, or are not allocating their resources equitably across utility service territories, and are thus hindering a utility in meeting its EAM targets. This risk is exacerbated when substantial energy efficiency contributions are expected from still unproven and evolving efforts such as market animation and market transformation activities undertaken by NYSERDA and expectations from improved codes and standards without an agreed upon analytical basis to determine those expectations.
- If a utility perceives that it has limited control over whether or not an outcome-oriented EAM target is met or exceeded, it may have limited motivation to focus attention on energy efficiency (beyond meeting regulatory requirements). In general, higher levels of uncertainty with regard to achievement of an EAM will lower the expected value of the available shareholder incentive to the utility and potentially "dull" the incentive mechanism with consequent reduction in utility motivation. Furthermore, if the EAM is based on targets that are largely out of utility control and includes a penalty for poor performance, investor perception of market correlated risk may increase, resulting in potentially higher costs of equity for the utility, and ultimately customers. Many of these concerns can be mitigated by the approaches explored throughout this report.
- In the Working Group's experience thus far, stakeholders hold markedly different views around what level of territory-wide energy efficiency savings constitutes a "realistically achievable" EAM target for an outcome-oriented metric. Particularly in the near-term, we recognize the risk of setting

targets that are either (1) higher than the utility believes can be achieved with reasonable certainty, thus dampening utility motivation or (2) lower than what can be expected to be achieved by energy efficiency efforts undertaken by various entities as well as through improved codes and standards, and market transformation activities, which further could allow the utility to earn shareholder incentives for providing average energy efficiency programs and unintentional "free riding" on activities initiated by other market actors. A robust study of achievable efficiency potential in New York could help address this concern.

- These concerns suggest a transitional period, including potentially a period with a hybrid approach as described in Section 3.2.3 below, would be beneficial to allow adequate time for analyses to determine appropriate outcome-oriented metrics and targets.

### 3.1.3 Lack of Comparable Implementation Experience in U.S. States

The Working Group is not aware of any U.S. states that currently tie utility performance incentives to an "outcome-oriented" energy efficiency metric that is intended to capture savings from aggregate program and policy interventions and market-initiated activity. [34] We do note prior experience adopting an electricity usage intensity metric in Maryland, as well as pilot studies in California and Massachusetts that utilized "top-down" econometric models to measure the impact of energy efficiency efforts on overall electricity and natural gas consumption.[35]

Under the 2008 EmPOWER Maryland Energy Efficiency Act, utilities were responsible for a 10% reduction in per capita energy consumption (with the Maryland Energy Administration expected to provide additional savings) and 15% per capita peak demand reductions by 2015, based on a 2007 use per capita baseline. Since the Act did not permit electricity sales to be weather normalized or otherwise adjusted for economic variables, Maryland's Public Service Commission observed a disconnect between EmPOWER program achievement and the EmPOWER per capita goal achievement.[36] This experience underscores the importance of incorporating appropriate normalization adjustments for weather and other structural factors into an outcome-oriented energy consumption or intensity metric.

[34] Robbie Orvis and colleagues have published several policy briefs promoting outcome-oriented metrics for assessing and compensating utility performance on energy efficiency. Mr. Orvis indicated that he was not aware of any U.S. states that have adopted such metrics. See Orvis, Aggarwal & O'Boyle (April 2016), Metrics for Energy Efficiency: Options for Adjustment Mechanisms, America's Power Plan, retrieved from: http://americaspowerplan.com/wp-content/uploads/2016/04/EEMetricDesign-white-paper.pdf. Orvis (April 2016), Avoiding Counterfactuals in Performance Incentive Mechanisms: California as a Case Study, America's Power Plan, retrieved from: http://americaspowerplan.com/wp-content/uploads/2016/04/AvoidingCounterfactuals-white-paper.pdf.

[35] The pilot studies conducted in California and Massachusetts are discussed in Section 4.

[36] Public Service Commission of Maryland (March 2014), The EmPOWER Maryland Energy Efficiency Act Standard Report of 2014.

## 3.2 Options for Outcome-Oriented Metrics

In the assessment of the Working Group at this time, significant additional work is needed prior to making a definitive recommendation for an outcome-oriented metric and normalization method for an electric energy efficiency EAM. We therefore present a synthesis of our research and analysis to date, including a variety of options to capture the opportunities and address the challenges associated with adopting an outcome-oriented metric for an EAM. Given time and capacity constraints, the Working Group decided to limit its initial investigation to metrics for electric efficiency, although we stress and acknowledge the importance of increasing efficiency savings across all fuels.

As discussed in this report, outcome-oriented metrics generally fall into two categories: energy consumption metrics and energy intensity metrics. Consumption metrics measure the change in overall energy use over time, for example, wholesale or retail electricity sales. Intensity metrics measure the energy use on a per unit level, for example, usage per capita or per square feet of building floor area. In both cases, the measurement of energy usage would be normalized (or adjusted) for weather and certain other factors that drive load.

While at first glance energy intensity metrics and energy consumption metrics appear to be conceptually distinct from one another, through normalization the line between these two types of techniques blurs, because the same factors that act as the denominator in various intensity metrics could be included in an econometric model used for normalization. Accordingly, normalization can address the same types of variables that are measured through intensity metrics, but give them more or (more likely) less weight than an intensity metric would entail. Thus, using a consumption metric while normalizing for the factors to be captured in proposed intensity metrics may provide for the greatest degree of flexibility, while incenting the desired outcomes.

### 3.2.1 Electric Energy Consumption Metrics

In the case of an outcome-oriented consumption metric, a utility would report the reduction in normalized megawatt-hours (MWh) electricity sales below a Commission-projected baseline level[37] or target level throughout its service territory. Following the definition introduced previously, this metric would measure net changes in normalized electricity consumption across the utility service territory over a specific time period that is attributable to aggregate energy efficiency activities, spanning programmatic and policy interventions and market-initiated activity. (Methodological approaches to construct a baseline and to normalize load are discussed in section 4 below.) This consumption metric and corresponding target could be established either for the service territory as a whole or separately for each major customer (or end-use) sector: residential, commercial, and industrial. The Working Group evaluated this design feature.

The Working Group proposes that a consumption metric that measures the reduction in normalized MWh sales for the service territory as a whole is an appropriate starting point for an outcome-oriented EAM, given the newness of this approach and in order to provide the utility with flexibility in achieving

[37] Such a Commission-projected baseline would be developed based on utility data and other inputs, as described further below.

the corresponding target. Depending upon the methodology used to construct the metric, in practice sector-specific econometric models may be developed to set baselines. Further, the methodology may vary by utility territory given the significant diversity in the types and relative significance of customer sectors across different utility territories in New York. Even so, the utility's performance could be assessed relative to an aggregate MWh consumption target across all customers in its service territory.

The Working Group recognizes the risk that a consumption metric established for the overall service territory risks "leaving behind" some customers as efficiency efforts advance in New York. If the EAM metric does not track savings by customer segment, it may not effectively incentivize the utilities to facilitate efficiency that targets all significant customer segments. For instance, a utility could try to satisfy the majority of its energy efficiency target by focusing mainly on enabling energy efficiency services for commercial and industrial (C&I) customers.[38] In order to address this parity issue, the Working Group suggests that utilities could report normalized MWh reductions or intensity metrics by customer segment as part of a scorecard that tracks energy efficiency progress but is not tied to EAM incentives. Based on utility sales data, it appears possible to do this kind of reporting for the residential, commercial, and possibly industrial segments. Accurate reporting on a more granular level of customer segmentation, such as for multifamily buildings or low-income customers, might not be possible with currently available data. Bringing transparency to savings levels by customer type might help inform and improve the efficiency planning decisions of the utilities, as well as related regulatory decisions.

An outcome-oriented consumption metric could measure performance with respect to either (1) the change in <u>retail</u> electricity sales at the customer meter or the (2) change in <u>wholesale</u> electricity sales at the point of generation or power purchase. The Working Group devoted limited attention to this distinction. Section 6 of this report discusses options for state-level energy efficiency targets in terms of wholesale load reductions, which provides consistency with the NYISO statewide electric energy econometric forecast, the energy efficiency assumptions included in the CES Order, and the energy efficiency potential findings of the 2014 Energy Efficiency and Renewable Energy Potential Study of New York State.[39] A metric based on changes in wholesale electricity sales also would encompass savings from reduced distribution-level electric line losses that can be can be achieved with utility deployment of Volt-Var Optimization (VVO) technologies.

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[38] To some extent, this issue of customer parity in efficiency services is a fundamental challenge for all energy efficiency procurement approaches. It reflects the basic economic realities and characteristics of the different customer segments. Some customer segments, particularly commercial and industrial customers, offer more cost-efficient procurement opportunities than other customer segments, especially residential and low-income customers. A single C&I project, for example, will produce a significant absolute quantity of energy savings while only requiring the transaction and customer acquisition costs of one project. Yet it may take acquiring many residential customers to achieve the same quantity of savings, but with the disadvantage of higher overall transaction and customer acquisition costs.

[39] Energy Efficiency and Renewable Energy Potential Study of New York State (April 2014), Prepared by Mosenthal, Bower, Trombley, Hill, and Lange for the New York Energy Research and Development Authority (NYSERDA). Retrieved from: https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/EERE-Potential-Studies.

### 3.2.2 Electric Usage Intensity Metrics

In the assessment of the Working Group, energy-intensity metrics and targets would need to be developed separately for the residential sector, the commercial sector, and the industrial sector to provide for forward-looking targets and meaningful interpretation. The U.S. Department of Energy (DOE) observes that: "declines in energy intensity are a proxy for efficiency improvements, provided a) energy intensity is represented at an appropriate level of disaggregation to provide meaningful interpretation, and b) other explanatory and behavioral factors are isolated and accounted for."[40]

The DOE Office of Energy Efficiency and Renewable Energy has developed a system of energy intensity indicators for major end-use sectors of the U.S. economy (residential, commercial, industrial, and transportation), which are ultimately aggregated to an overall energy intensity index for the economy as a whole.[41] DOE uses the Log Mean Division index (LMDI) method to decompose aggregate energy intensity into energy-intensity indexes and "structural" indexes that adjust for weather, electrification, electrical generation efficiency, and compositional shifts across industrial subsectors; these indicators do not adjust for economic growth or income trends. The Working Group notes the DOE system of indicators and adjustment method as useful reference points, which may be applicable if New York State elects to develop and publish state-level indicators to track trends over time. However, we do not view the DOE's multi-step methodology to develop energy intensity indexes as feasible for the purpose of setting an electric usage intensity EAM metric and prospective targets in the near term.

Rather, the Working Group expects that the "numerator" (MWh/kWh) of any electric usage EAM would be normalized for weather and other factors, comparable to the methodology that would need to be developed for a consumption metric. The interpretation of energy intensity metrics as indicators of changes in energy efficiency further depends upon the choice of the activity measure "denominator."

Figure 1 below provides a resource for the potential future work needed to develop sector-specific energy intensity metrics that are amenable to both interpretation and target setting. It summarizes potential electric usage intensity metrics, provides an assessment of the availability of relevant data at the level of NYS utility service territories, and highlights notable strengths or concerns for each metric. Further detail on data sources by metric is provided as Appendix A.

The Working Group's discussion and analysis of electric usage intensity metrics highlighted several salient, cross-cutting themes. With respect to the choice of activity measure (i.e., the denominator) for the metric:

- Analysis prepared for the DOE recommends that in setting energy intensity metrics, physical-based measures of activity are generally preferred, such as floor area in buildings (which is directly related to

[40] http://www.energy.gov/eere/analysis/energy-intensity-indicators-efficiency-vs-intensity
[41] The DOE system of energy intensity indicators is available at: http://www.energy.gov/eere/analysis/energy-intensity-indicators. Also see: Belzer, DB. (August 2014), A Comprehensive System of Energy Intensity Indicators for the U.S.: Methods, Data, and Key Trends, U.S. Department of Energy, retrieved from: http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22267.pdf.

space conditioning and lighting).[42] Unfortunately, there are no publicly available annual time series estimates of either residential building floor area or commercial building floor space in the U.S., although data for certain jurisdictions may be available from local tax assessors' offices, such as the NYC PLUTO database. Across the state's utilities, is unlikely that floor space data is currently available or accurate enough to enable reliable calculation of intensity metrics based on floor area.

- The Working Group noted concerns about adopting a kWh/customer meter metric, which might otherwise be attractive given the ready availability of data. This is because a single meter may not accurately represent the customer premises being served; i.e., a meter can serve an individual building, part of a building, or a whole campus, making the metric less meaningful in heterogeneous sectors. A kWh/customer meter metric is likely best suited for the residential sector, but for that sector population data also is readily available and is likely to be preferred. The Working Group hypothesized that the number of utility meters serving buildings in the commercial, institutional, and multifamily sectors could increase to a meaningful extent with new market opportunities anticipated under REV (e.g., a shift from "master meters" to direct meters to enable customer participation in new rate structures, or meters for electric vehicle charging stations), or potentially due to utility "gaming" of the metric. In this event, a kWh/customer meter metric could decrease based on increasing the number of meters serving a given amount of space rather than due to decreasing the associated kWh consumption.
- Different views exist in the literature with regard to the appropriateness of adopting an energy-to-Gross Domestic Product (GDP) intensity metric outside of the industrial sector, or for the economy as a whole. Work prepared for the DOE emphasizes the limitations of the energy-GDP approach, including the fact that GDP is influenced by a variety of structural factors that affect energy consumption independent of underlying changes in energy efficiency.[43] At present, data limitations also exist with respect to historic data and forecasts of GDP at the state or service-territory level.

The Working Group recommends that further consideration and analysis of energy intensity metrics that measure total energy intensity, across electricity and fuel use, be conducted. Two commonly used definitions of total energy are: 1) *delivered*, the sum of fuels and electricity use, and 2) *primary or source*, where electricity losses from electricity generation and transmission are assigned to the end user and added to delivered energy. Tracking a total energy usage intensity metric, and potentially developing a corresponding EAM, could be a means of recognizing and incenting utilities to facilitate actions that decrease energy usage across all fuels or accelerate environmentally beneficial fuel switching (see Section 4.4.2). Moreover, national energy intensity indicators reported in the United States and in Europe generally measure total energy usage. The Working Group emphasizes that it has not had the opportunity to conduct any substantial analysis of the potential for a utility EAM based on a total energy intensity metric.

[42] Id.
[43] Id., at pp. 51-53.

**Figure 1: Analysis of Potential Electric Usage Intensity Metrics by Customer Sector**

| Metric | Description | Data Availability (Denominator) | Notable Strengths / Concerns |
|---|---|---|---|
| **Residential Sector** | | | |
| kWh per customer meter | *Weather-normalized residential sales divided by a count of residential meters in a utility's territory* | Counts of customer meters are readily available. | -Likely not applicable for commercial, industrial, and sub-metered facilities.<br>-While more meaningful for the residential sector than for the C&I sectors, population data is likely preferred. |
| kWh per capita | *Weather-normalized residential sales divided by estimates of a utility territory's population.* | Population estimates at the county level are available annually from the U.S. Census Bureau. Population forecasts available.<br><br>Straightforward to aggregate to utility service territory. | + Intuitive to interpret for residential sector.<br>+ Data is readily available and easy to map to utility territories.<br>+ Simple to create benchmark with other State performances.<br>- Challenges when handling multifamily sub-metered energy sales. |
| kWh per household | *Weather-normalized residential sales divided by an estimate of the number of households in the utility territory.* | The American Community Survey (ACS) publishes the number of occupied housing units at the county level annually. | + Intuitive to interpret for residential sector.<br>+ Data is readily available and easy to map to utility territories.<br>+ Simple to create benchmark with other State performances.<br>- Challenges when handling multifamily energy sales. |
| kWh per square feet of occupied housing units | *Weather-normalized residential sales divided by an estimate of the floor area of occupied housing in the utility territory.* | No publicly available time series data on residential floor space. Very limited data available only in limited metropolitan areas. | - Serious data limitations.<br>* Home sizes and use don't change often. |

| | | | |
|---|---|---|---|
| **Commercial and Institutional** | | | |
| kWh per customer meter | *Weather-normalized commercial sales divided by a count of commercial meters in a utility's territory.* | Counts of customer meters are readily available. | - Less meaningful in heterogeneous C&I sectors: the meter can serve a building, partial building, or campus.<br>- Potential that the number of meters serving a constant amount of space could increase significantly. |
| kWh per square feet of commercial building space | *Weather-normalized commercial sales divided by an estimate of the floor area of commercial buildings in the utility territory.* | No publically available time series estimates of commercial floor space. CBECs data is insufficiently granular and infrequent. Private companies provide data, but their update frequency is unclear. | - Serious data limitations; unlikely to be accurate enough to be reliable.<br>- Direct data collection may be an unreasonable burden.<br>-Only useful if data is available and Commercial vs. Industrial sales data could be accurately separated. |
| kWh per employee | *Weather-normalized commercial sales divided by an estimate of the number of employees in the commercial/services sectors in the utility service territory.* | Monthly employment data by industry is available from the NYS Department of Labor. Data is reported statewide, by metropolitan area, and by minor county. | + Electric usage highly correlated with the number of employees.<br>? May be difficult to map jobs data to utility territories.<br>* Commercial and Industrial jobs will need to be separated based on industry codes. |
| kWh per Gross State Product (GSP) | *Weather-normalized commercial sales divided by an estimate of the commercial-sector GSP in the utility service territory.* | Bureau of Economic Analysis (BEA) publishes gross domestic product (GDP) statistics for the nation, states (GSP), and metropolitan areas, but does not currently publish GDP by county. GSP is published quarterly, metropolitan data is published annually. No forecasts of GSP. | - Mapping GSP data to utility territory is a challenge.<br>- Isolating the load and GSP for the commercial sector could be problematic.<br>- Major structural changes to the NY economy over time could result in misleading data.<br>* DOE does not recommend commercial kWh/GDP given wide variability of commercial activity, however European nations use this metric for the services sector. |
| **Industrial** | | | |
| kWh per GSP | *Weather-normalized industrial sales divided by an estimate of industrial-sector GSP (manufacturing and non-manufacturing) in the utility service territory* | More research is necessary to identify potential data sources. | + Useful measurement…<br>-…if it can be granularly broken down and separated from the commercial sector, which at this time may be difficult/impracticable.<br><br>* Structural changes to industrial sector over time should be adjusted for in metric construction. |
| **Commercial and Industrial (C&I), if impractical to disaggregate data** | | | |
| kWh per GSP | *Weather-normalized commercial and industrial sales divided by an estimate* | Bureau of Economic Analysis (BEA) publishes gross domestic product | +Useful for broader statewide metric, but… |

| | | | |
|---|---|---|---|
| | *of the GSP in the utility service territory* | (GDP) statistics for the nation, states (GSP), and metropolitan areas, but does not currently publish GDP by county. GSP is published quarterly, metropolitan data is published annually. No forecasts of GSP. | - GSP will be difficult to calculate accurately when divided by utility service territory.<br><br>-Less informative of actual energy performance when Commercial and Industrial cannot be parsed out. |

### 3.2.3 A Proposed Implementation Strategy

The Working Group acknowledges that additional analytical study is necessary to determine adoption of an appropriate and specific outcome-oriented metric applicable to utilities. In preparing this report, the Working Group focused upon advancing understanding of the outcome-oriented electricity consumption and electric usage intensity metrics described above. Based on our initial assessment, we suggest that a practical means to implement this outcome-oriented approach may be to utilize a consumption metric that measures reduction in normalized MWh sales for the service territory as a whole, with corresponding targets for each utility. The exact approach to calculate this metric requires further analysis and development, as discussed Section 4. Sector-specific intensity metrics could be tracked to understand program effectiveness and inform program performance: electricity usage per capita in the residential sector and electricity usage per employee in the commercial sector appear most promising. For the industrial sector, more study is required on the availability of sufficiently granular data to construct a metric such as electricity usage per industrial-sector GSP, or alternatively a metric tracking program penetration (e.g. the number of customers that participated in a specific program over a given time period).

The Working Group also notes that a possible approach would be the use of a “hybrid” policy that combines both an outcome-based approach and a program-based approach, at least in the short term, in order to effectively incentivize the utility to both collaborate with market participants, government, and communities, and to achieve or exceed its program goals. This approach recognizes the solid framework of utility incentives and funding tied directly to energy efficiency program-based achievements – including programs developed to meet utility business needs as well as state policy objectives – in New York and other states, and combines it with the potential for greater savings using an outcome-oriented approach that is still under development. This transitional approach will provide some means of assuring greater efficiency achievements in the near term without jeopardizing existing levels of savings and potentially a feasible, near-term ramp up in energy efficiency investments that are a core part of utility business operations and that facilitate the State’s energy policy goals. The Joint Proposal in the Consolidated Edison rate case is an example of the hybrid approach, where both programmatic and outcome-oriented incentives are contemplated.[44]

[44] CASE 16-E-0060 – Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service (Consolidated Edison Rate Case). Joint Proposal (September 19, 2016)

# 4. Normalization Methods for Outcome-Oriented Energy Efficiency Metrics

In the Track 2 Order, the Commission recognized that an outcome-oriented metric for energy efficiency will require normalization of electricity sales for weather, economic development, increases in electric vehicles and heat pumps, and possibly other factors, and it instructed the CEAC to recommend a precise method in this regard. The Working Group underscores the need for further analysis prior to recommending a specific normalization method and outcome-oriented metric. In the section that follows, we propose a potential approach to normalize for weather, discuss possible econometric approaches to address economic and other factors that impact electricity consumption, and support the need to develop adjustments for fuel switching in a gradual manner.

## 4.1 Normalization Concepts in Traditional Utility Practice

The concept of "normalization" is commonly used in utility planning and ratemaking as a means to take variations in weather patterns out of the equation, which allows delivery volume and revenue forecasting for normal weather conditions. Because a major factor in determining load is weather, which is difficult to predict, utilities estimate the peak load under design weather conditions first and then determine a potential range of unusual volumes around that peak load. The process of estimating the design load is generally termed "weather adjusting." In addition, a process called "weather normalization" adjusts energy usage so it can be compared to "normal" energy usage in other years. These comparisons allow for more accurate load and revenue forecasts for utility planning purposes.[45]

Load volume and revenue forecasts also are used in utility rate cases for purposes of determining customer volumetric charges and utility revenue requirements. Since a portion of the utility's revenue requirement will typically be collected from customers through volumetric charges on a per kWh or per kW basis, the delivery volume is forecasted using econometric models that include weather normalized data and economic variables such as personal income, employment, and the cost of energy. These forecasted delivery volumes are further used for revenue decoupling purposes, where a utility's expected normalized revenue is compared to actual revenue received, and any over or under recovery is recovered through a distribution-based surcharge. By separating – or "decoupling" – rate revenue from usage, utility revenues are less dependent on selling energy, thereby enabling the utility's incentives to be better aligned with supporting energy efficiency efforts. In rate cases, both the utility and DPS file testimony propounding their respective forecasted delivery volume. Absent a settlement, an administrative law judge will determine what forecast should be utilized and make recommendations to the Commission for final dispensation.

In deriving its delivery volume forecast, the utilities and DPS use annual, quarterly, or monthly data to develop an econometric (regression) model that consists of a structural component and a time series component. The structural component of the model relates a dependent variable to a group of independent

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[45] Separately, a different type of weather adjustment is used for peak demand forecasting. Electric utilities conduct comprehensive planning processes to ensure the reliability of the grid. In order to ensure the reliability of their systems, utilities forecast peak demand for a peak-day design weather condition.

variables. The dependent variable can be the number of customers or electricity delivery volumes. The independent variables typically are weather and economic variables such as personal income and employment. Generally, weather variables are heating degree days (HDD) and cooling degree days (CDD). HDD measure how much (in degrees), and for how long (in days), the outside temperature was below a base temperature (generally 65°F). CDD provide a measure of how much, and for how long, the outside temperature was above that base temperature.

The weather normalization process uses the estimated relevant relationships (or parameters) and the departure of actual degree days from the normal degree days to remove the above- or below- normal impact on energy usage. For example, if the outside temperature was 4 degrees above the base temperature for 4 days, there would be a total of 16 cooling degree days over that period (4 degrees * 4 days = 16 degree days). Normally, National Weather Service provided CDD and HDD information is used in this computation. However, because the National Weather Service does not provide a humidity modifier to CDD data, the CDD measure must be adjusted to reflect humidity conditions.

In addition to weather, demand for electric energy is directly related to demographics and economic activity. As population increases or the economy expands, demand for goods and services grow, and the businesses that provide goods and services increase, resulting in increases in energy use. In general, economic growth by itself not only leads to customer additions, but also results in increases in energy use by existing customers. When the economy grows, household income increases, resulting in home ownership and appliance purchases increases. These factors all lead to an increase in energy usage. Counteracting some of the drivers of increased energy usage is the total cost of electricity itself. Higher total energy costs in general place downward pressure on energy usage, and vice versa.

## 4.2 Applicability to Outcome-Oriented Metrics

Correcting for weather-related effects is usually the only form of normalization used in rate cases. With additional appropriate normalization methods, the econometric models that utilities and DPS use to estimate delivery volumes may be extended to formulate outcome-oriented metrics for energy efficiency. As explained above, an outcome-oriented energy efficiency metric may focus on total energy usage (kWh) or energy intensity (e.g., kWh per customer), thus incenting utilities to facilitate actions that generally decrease electricity usage or its intensity.

Normalizing an outcome-oriented metric in order to control for exogenous factors entirely outside a utility's control (e.g., weather, economic activity, changes in the number of customers) is intended to ensure that the observed change in the metric is due to the true causal effects of the utilities' efforts to increase adoption of energy efficiency. Because disagreements between adversarial parties can occur with normalization and other forms of adjustment, transparent methodologies and data sources should be agreed upon upfront, at the time the metric is created.[46] Similarly, metrics should strive to minimize the need for

[46] One means of guarding against disagreements with regard to normalization methodology would be to form an independent commission to evaluate these measures, similar to the Regional Technical Forum (in the Pacific NW) or the California Technical Forum. While these commissions are designed to evaluate inputs to the bottom-up efficiency modeling done in those regions, a similar structure could be adopted in the outcome-oriented context.

ex-post adjustments to the maximum extent possible; however, ex-post adjustments may be necessary to account for certain factors such as observed fuel switching, as discussed in Section 4.4.

Approaches to evaluate and isolate exogenous effects include: (1) use of an econometric model that includes independent exogenous variables in order to determine the contribution of those variables to changes in energy use, distinct from the effects of energy efficiency measures on energy use and (2) use of an intensity metric that accounts for the effect of a single exogenous variable that is included as the "denominator" in the metric itself, albeit with an implied assumption of unitary elasticity for that variable.

In the case of an intensity metric, such as kWh per customer or kWh per unit of GDP, unitary elasticity implies that a 1% change in the denominator results in a 1% change in the numerator. In other words, a kWh per square foot metric indicates that a 1% change in square footage is expected to result in a 1% change in kWh. Preliminary analysis by Con Edison suggests that this assumption does not hold true for any of the various variables it has analyzed. This suggests that a consumption metric normalized for the same factors sought to be measured through an intensity metric may better account for those factors.

By contrast, using an econometric model allows the model to predict how a unit change in each independent variable impacts energy use. For economic and other normalizations, the difference between forecasted and actual values of a variable could be applied to the relevant parameters to remove the economic forecasting errors on actual energy use. Section 4.3.2 discusses econometric modeling approaches considered by the Working Group to date, none of which are considered ready to implement for the purposes of an outcome-oriented metric as discussed in this report.

Under either general approach, electricity consumption should be normalized for weather variation by using a methodology agreed upon in advance and National Weather Service data. Although the Working Group expects weather normalization to be relatively straightforward, we note that there is variation in the precise weather normalization procedures adopted by NYS utilities in sales forecasts for rates cases; for example, the base temperature for calculating degree days varies. We propose for consideration that an objective weather normalization procedure could be to develop a regression model using daily sendout[47] data and weather data over a short period of time, likely seven days to one month. Within this time interval, electricity consumption and weather would be cleanly matched and the impact of changes in structural factors like the economy would be minimal. The weather normalized sendout data could then be aggregated for the year, and subsequently used either to construct an intensity metric or to develop an econometric model that adjusts for economic variables.

Normalizing for factors other than weather is likely to be more challenging where data is not readily available. In turn, adversarial disagreements may arise if data estimates are pieced together from available sources. For example, normalizing for GDP accounts for changes in the economy, but also requires a GDP estimate particular to a specific utility service territory. An initial assessment of data availability is addressed in Section 3.3.2 (see Figure 1), in our discussion of electric usage intensity metrics. In the near

[47] Sendout is the quantity measured at the output of the generators, effectively in "real time." Sales data is obtained from meters at the customer's site; in the case of sales data, the billing cycle must also be accounted for or there is a mismatch of degree days with sales.

term, it may be desirable to set up processes for tracking these metrics using an agreed upon methodology so that data on which to base normalization factors is available in the future.

We further note the possibility of embedding running averages within an outcome-oriented metric (e.g., using 3-to 5-year weather averages) or excluding outliers from the metric (e.g., eliminating the hottest and coldest days).[48] This option requires further analysis. Smoothing data in this manner may result in the illusion of precision, while in fact removing data that is important for accurate analysis.

## 4.3 Options for Econometric Methodologies

The Working Group emphasizes that for the purposes of specifying a utility performance (EAM) metric, significantly more work is needed to develop an appropriate econometric methodology that can be used to measure the net change in electricity usage over time that is attributable to energy efficiency impact, disentangled from other drivers of system load to the extent possible. We also note that as penetration of DERs increases, it may prove challenging to isolate the impacts of energy efficiency from other DERs that provide similar energy use reductions, and thus challenging to develop appropriate outcome-oriented metrics and targets for a single type of resource. The necessary work going forward includes developing an appropriate econometric model or models; testing promising methods by back-fitting with historical NYS utility data; and iterating toward a metric that is acceptable to the Commission, utilities, and interested parties.

### 4.3.1 Back-fit and Iterate to Refine Methodologies and Metrics

For any outcome-oriented metric under consideration, it is necessary to verify that the metric is appropriate for the purposes of measuring progress in the outcome being sought. This can be accomplished by “testing” the metric against historic data. The forecast for electricity consumption and load modification from DERs might be based on an econometric model that relates load to economic variables, demographics, weather, billing days, and penetration of DERs including energy efficiency. Such a model could then be used to derive an outcome-oriented metric measuring, for instance, growth in adoption of energy efficiency. Future targets for the metric measuring the energy efficiency outcome also could be set using the model.

To verify that the outcome-oriented metric selected is appropriate, the model parameters could be developed from historical relationships among variables (using historical data), with the future projections for the outcome-oriented metric determined by forecasts of the independent model variables and solving for the outcome-oriented metric; a description of an error inherent to the model is described in the following paragraph. Subsequently, the outcome-oriented metric that is developed could be calculated for historical periods and compared with known actual outcomes in those periods to verify that it was in fact an adequate measure of the outcome being sought.

A simple representation of the overall accuracy for any econometric model is the “error,” defined here as difference between the ex-post actual value of the dependent variable and the value that was

[48] Such smoothing is suggested by Orvis et al. (April 2016) in “Metrics for Energy Efficiency: Options and Adjustment Mechanisms, America’s Power Plan.”

previously projected as the forecast for that variable. To understand the sources of such error, it is necessary to "back-fit" the true values of the independent variables into the model to determine how much of the error was simply due to changes in the actual inputs versus model-related forecast errors. For example, if the actual weather was less severe than assumed and the DER installations were greater than projected, these would help to explain the sources of some of the variance between the forecast and the actual, in a situation where electricity consumption is lower than what was forecasted. Any remaining difference between the actual and the forecast after this "back-fitting" could then be considered an error inherent in the model. The magnitude of this error can be a useful indicator of the model's appropriateness for use in developing the outcome-oriented metric.

Additionally, adequate and reliable data related to projected variables becomes very important in analyzing the accuracy of the model used to assess the metric. For example, the outcome-oriented metric may have as one of its inputs an estimate of future electricity consumption reductions from solar photovoltaic (PV) installations, based on a projected number of installations and their expected energy savings per installation. However, if such assumptions were not accurate given divergent operational characteristics of the actual PV installations, and thus not representative of the true grid energy consumption reductions, it would be difficult to accurately back-fit the model. In such instances where there is a high level of uncertainty and lack of actual measured data to justify assumptions, it would be extremely difficult to disaggregate variances as a result of inappropriate assumptions from other variances such as, say, an increase or decrease in energy efficiency from what was forecasted.

With an increase in the number of types and magnitudes of the various DERs, it may become more difficult to appropriately determine the accuracy of the models used to assess an outcome-oriented metric – especially if targeted to one resource type, such as energy efficiency. For example, as the proliferation of other DERs increase, and as there are increases in multiple resource types with similar operational profiles, it may prove challenging to isolate the impacts of, say, energy efficiency from other DERs that provide similar energy use reductions, and thus challenging to develop appropriate outcome-oriented metrics and targets related to a single type of resource.

Further, any model(s) found appropriate and thereby adopted for the purpose of setting the baseline energy consumption against which energy savings are to be measured should be benchmarked annually against historical data to verify continued model accuracy. Benchmarking could be done in the form of a "back-cast," where model results are compared to actual data for the most recent historical year. During benchmarking, model parameters can be adjusted (within the confines of the model's theoretical and conceptual foundations) to achieve better agreement against actual historical data. Adjustments made to the model through such a benchmarking process would thus improve its forecasting accuracy. During such benchmarking exercises, both the model and the outcome-oriented metric should be evaluated for appropriateness of continued use.

### 4.3.2 Specific Econometric Modeling Approaches Investigated to Date

Below we briefly describe several options for econometric methodologies explored by the Working Group to date, with valued input from external experts. At this writing, <u>none of the approaches that are described in subsections 4.3.2.1 through 4.3.2.3 are recommended to establish an outcome-oriented metric</u>

and target for an energy efficiency EAM due to the challenges associated with developing an econometric model which is able to produce reasonably precise estimates of electricity sales forecasts and/or historical sales.

#### *4.3.2.1 Setting a Target in Advance based on a Uniform Sales Forecast Model*

The first option considered would use econometric sales forecast models – i.e., developing one model for each major end-use customer sector – to project an aggregate weather-normalized MWh volume "baseline forecast" for a given target year without adjustments for energy efficiency or other DERs. For an outcome-oriented consumption metric, this approach would then set an overall load target in advance such that for the target year 20XX, the utility's total weather-normalized MWh sales volume is expected to be [Target Normalized Load] or lower. Forecasted load reductions from on-site distributed generation would be included in setting the target; i.e., the target would be calculated as the unadjusted baseline forecast minus forecasted MWh reduction from distributed generation minus the target MWh reduction from aggregate energy efficiency activities. In contrast, it is recommended that fuel switching be addressed through an ex-post adjustment, as discussed in Section 4.4.

Under this option, if the utility's actual weather-normalized MWh load reported in target year 20XX (adjusted to be net of fuel switching) fall at or below the MWh load target that was set in advance for that year, then the utility has met or exceeded the energy efficiency performance target.

Here, the sales forecasting approach is comparable to that used in utility rate cases. However, we expect that there is significant variation among NYS utilities with respect to their rate case forecast models. To minimize the opportunity for gaming, a uniform set of baseline forecast models – i.e., using a consistent set of variables for each customer sector and the same number of years of historical data across utilities – could be used. We also note that some amount of naturally occurring energy efficiency would be built into the forecast based on historical usage trends. Furthermore, there is some uncertainty in the magnitudes and timing of historical energy efficiency used to reconstitute the baseline.

Overall, precision is a significant challenge with respect to utilizing a "top-down" econometric sales forecast in setting a performance target for energy efficiency in this manner. DPS and National Grid analysts cited a confidence interval of +/- 3% as being typical for load forecasts even one or two years out, suggesting that a (for example) 2% load reduction from energy efficiency activities may fall within the margin of error. This approach also would not make ex-post adjustments for economic variables that may in fact diverge from those used in the forecast model.

National Grid analysts questioned whether "top-down" econometric models alone could in fact disentangle, with a sufficient degree of accuracy, the aggregate MWh reduction attributable to energy efficiency in light of the multiple factors driving electricity load. They suggested that for the National Grid service territory, doing so is likely to become more feasible within the next five years as National Grid develops more sophisticated hierarchical (or integrated) forecasting methodologies and data analytic capabilities in order to integrate increasing levels of DER penetration into its system planning. Currently in development, National Grid's hierarchical modeling methodology in envisioned to integrate top-down econometric models with customer-specific load and DER growth models, ensuring that both models are in sync and enabling a comprehensive simulation environment that provides a spatial and temporal view of DER and load growth.[49]

### *4.3.2.2 Comparing Actual Normalized Sales to a Pooled Baseline Prediction Model.*

The second option considered would use pooled econometric prediction models, agreed upon upfront, to estimate MWh delivery volume "baseline predictions" over time without energy efficiency adjustments. For an outcome-oriented consumption metric for target year 20XX, the agreed upon model would then be re-estimated using actual year 20XX data for the independent variables that are included in the model. The difference between the baseline prediction MWh and the actual model-normalized MWh volumes in year 20XX – i.e., normalized using parameters from the agreed upon prediction model – would provide the measurement of the aggregate MWh attributed to energy efficiency savings.

Under this approach, a single model for each major customer sector would be estimated using data on electricity consumption and consumption trends (potentially including penetration trends for DERs other than energy efficiency), customers, and economic data, with data gathered from publically available sources and directly from utilities. Again, some amount of naturally occurring energy efficiency may be built into the model based on historical usage trends. The pooled, cross sectional (i.e., using data from all six utilities), time series (i.e., data spanning from the early 1990s to the present) model would be used to predict MWh delivery volumes for each utility. Since weather and economic variables specific to each utility's service area would be included as independent variables in the pooled model, the comparison between predicted and actual MWh in the target year 20XX for that utility would reflect normalization for weather and economic variables that otherwise may have diverged if a forecast model approach was used instead of an explanatory model.

This pooled econometric modelling approach also would directly calculate the confidence intervals for predicted utility electricity sales, allowing for assessment of whether the magnitude of load reduction that is expected to result from energy efficiency falls within the margin of error. However, as was the case for the sales forecasts noted above, initial prediction models developed by DPS Staff economists suggest that such models may produce similarly imprecise estimates of sales.

### *4.3.2.3 "Top-Down" Macroeconomic Modeling Evaluation*

The Working Group additionally considered the applicability of top-down macroeconomic modeling methodologies that comprise a relatively new approach in the energy efficiency evaluation literature. These models aim to measure net changes in energy consumption over time across an entire customer sector that are attributable to aggregate energy efficiency activity in that sector. To date, pilot analyses have been conducted in California and in Massachusetts.[50] Overall, these methodologies are

[49] For further information, see Case 14-M-0101, Initial Distributed System Implementation Plan of Niagara Mohawk Power Corporation d/b/a National Grid (Filed June 30, 2016; Errata filed July 1, 2016).

[50] GL and NMR, (March 31, 2015), Massachusetts Electric and Gas Program Administrators, Tetra Tech, NMR Group, Inc., and DNV GL, retrieved from: http://ma-eeac.org/wordpress/wp-content/uploads/Top-down-Modeling-Methods-Study-Final-Report.pdf. Russel, C., Ucar, F., et. al, (2015), The View from the Top: Top-Down Estimation

viewed as promising but still experimental. The Working Group does not consider this macroeconomic modeling approach to be appropriate for establishing an EAM metric and target because it uses ex-post analysis with fairly intensive data requirements, including a long time series of data (ideally 10+ years) on energy efficiency spending (or other variable for activity) at a geographically granular level. Further, the analyses examined typically have sought to verify energy efficiency achievements through programmatic activity (measured by programmatic spending) and not to develop an outcome-oriented metric that effectively captures all energy efficiency activity, including programmatic and market-initiated activity consistent with the State's policy direction. Net MWh reduction estimates moreover have tended to have wide error bands, or have failed to find statistically significant results in any sector, especially in the commercial and industrial sector.

### 4.3.3 Further Analysis is Needed

Additional analysis is clearly needed with respect to appropriate econometric methodologies. Subsequent analysis should include further investigation of using trend line estimates derived from an econometric model in setting an outcome-oriented energy efficiency target, a procedure which is expected to result in a measurable improvement in the metric.[51]

Concurrently with the development of this Working Group report, a trend-based approach to energy intensity was examined by a collaborative established under the Consolidated Edison Joint Proposal, which provides a basis upon which to build information and conduct additional analysis.[52] This approach is to use a ratio metric in the form of normalized sales per a denominator variable, where the denominator variable is selected based on the analyses that are deemed appropriate to the applicable customer class and applicable geographical area. Under this approach, the numerator or sales would be normalized for weather and billing frequency and adjusted ex-post for beneficial electrification such as from electric vehicle charging before a metric is formed. A historical trend for the intensity metric would then be established using a regression

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of Program Savings Using Utility-Level Data in Massachusetts, NMR Group, retrieved from http://www.nmrgroupinc.com/wp-content/uploads/2015/07/Russell_et_al_The_View_from_the_Top.pdf. Stewart, J., Haeri, H., (October 2012), CPUC Macro Consumption Metric Pilot Study, The Cadmus Group, Inc., retrieved from: http://www.calmac.org/publications/Cadmus_Macro_Consumption_Metric_Pilot_Study_Final_Report_19OCT2012.pdf. Horowitz, M., (November 2012), Macro Consumption Metrics Pilot Study Final Report, Demand Research LLC, California Public Utilities Commission Energy Division, retrieved from https://www.researchgate.net/publication/271502126_Macro_Consumption_Metrics_Pilot_Study_Final_Report_to_the_CPUC.

[51] For example, further analysis could explore an approach that would set outcome targets based upon the improvement beyond what would have otherwise occurred via the underlying trend, say for weather normalized per-customer residential kWh. The further analysis would involve (1) developing a consistent and adaptable method of weather normalizing residential kWh, (2) using linear regression analysis to estimate the trend in 12 month rolling weather normalized per-customer residential kWh for a pertinent historic period, (3) determining the appropriate confidence level or standard deviation or other appropriate measure of the weather normalized kWh projected by the trend slope, with the beginning point at the last actual measured per customer residential kWh at the beginning of the evaluation period (such as the beginning of a rate case year), and (4) setting incentive targets based upon confidence intervals, standard deviations or other appropriate measure that an improvement relative to what would have occurred via the historical trend slope resulted in each year.

[52] Consolidated Edison Rate Case. Joint Proposal, Comments Supporting Resolution of Outcome-based EAM Collaborative Issues (November 1, 2016).

approach. To develop a basis for the targets, the intensity metric at the last known actual measured value would be extended using the established trend slope to the end of the evaluation period (say, 1 year into the future). When setting targets using a historical trend line based on a regression analysis, however, it is important to assess if the general variations around the trend line are random. Additionally, under this approach, the estimated trend line should not be adopted for a longer period than three years in recognition of trend changes that may occur due to significant improvements achieved, saturation of improvements, and exogenous structural changes.

Additionally, the focus of our Working Group's investigation to date has been an outcome-oriented metric and target for energy efficiency, consistent with our Working Group Scope. The Working Group recognizes that there is merit in also considering outcome-oriented metrics and load reduction targets that do not attempt to disaggregate energy efficiency from other behind-the-meter load modifiers, including distributed generation. Some Working Group members, while acknowledging that merit, nonetheless note that energy efficiency is different enough from distributed generation that it is best analyzed and measured separately. One concern is that without distinct targets, energy efficiency could be undervalued and investments in energy efficiency could be insufficient to meet state policy goals.

## 4.4 Adjustments to Account for Fuel Switching

The Working Group further recommends that the Commission design and implement a mechanism to account for fuel switching, which encompasses "good load." Because fully accounting for fuel switching is a complex endeavor, we recommend that mechanisms to account for fuel switching be phased in incrementally. Initially, the most impactful forms of fuel switching can be tracked and an adjustment to the outcome-oriented energy efficiency metric can be applied (ex-post) to ensure that utilities are not discouraged from taking actions to facilitate the electrification of end-uses that have traditionally been powered by fossil fuels. This "environmentally beneficial electrification"[53] or "good load" should be incentivized, not discouraged.

Additional analysis is needed to assess whether or not an outcome-oriented metric is likely to meaningfully incentivize fuel switches away from electricity that may increase total carbon emissions or other forms of pollution. Some Working Group members observed that, without adjustment for fuel switching away from electrified end-uses, an outcome-oriented metric would credit such fuel switching in the exact same manner as load reductions caused by energy efficiency, despite the fact that the non-electrified end use could still create emissions. Working Group members are not sure the degree to which this poses a significant problem. As an interim step, the Working Group proposes that the Incentive Inventory which will be regularly updated by the CEAC Clean Energy Implementation & Coordination Working Group should include any utility or NYSERDA programs that provide incentives or comparable support for fuel switches away from electricity. In the longer-term, moving to a fuel-neutral metric that tracks total energy or emissions changes within a utility service territory also merits consideration.

[53] See Dennis et al., Environmentally Beneficial Electrification: The Dawn of 'Emissions Efficiency', The Electricity Journal 29 (2016), at 52.

### 4.4.1 The "Exemption" Approach

The simplest way to prevent discouragement of beneficial electrification is to exclude load changes arising from fuel switching from the outcome-oriented targets. Implementing such an exemption requires (1) developing criteria regarding what forms of fuel switching will be exempted in this manner (2) tracking load arising from such fuel switching, and (3) accounting for that load in the target setting and performance assessment process.

In theory, a comprehensive exemption to eliminate all inappropriate incentives and disincentives that would otherwise arise from the establishment of the outcome-oriented metric would track all fuel switching away from electricity, and would track any form of new "good load," defined as any new load for which the carbon emissions from the electrified end use are lower overall than the carbon emissions would be if the end-use were not electrified. This calculation would involve three key components: (1) the fuel source and efficiency of the end-use being switched away from; (2) the efficiency of the electrified end use; and (3) the generation mix supplying power to the electrified end use.

But because any load changes from fuel switching need to be tracked and accounted for, it is only prudent to track and exempt load where the benefits of aligning incentives more than outweigh the administrative costs of establishing and administering the tracking mechanism. Relevant factors for determining whether any given type of fuel switching should be tracked in this manner include: (1) the degree to which the type of fuel switching is currently taking place and is expected to take place in the future; (2)(a) the degree to which the electrification of a given end use is beneficial (i.e. reduces total emissions) or (b) the degree to which a fuel switch away from an electric end use causes new emissions; (3) the ease with which a tracking mechanism can be established; and (4) the accuracy of such a tracking mechanism. We recommend that exemptions be developed through holistic assessment and rough calculation of these factors rather than getting bogged down in the details of each one. The Commission's Benefit Cost Analysis (BCA) Order, which outlines specific steps for applying the Societal Cost Test to various DER technologies, is a starting point for assessment of the impact of fuel-switching technologies.

In the near term, a significant advantage of an exemption approach is that because it does not create any affirmative incentives associated with fuel switching and instead merely ensures that outcome-oriented efficiency targets will not themselves incent the exempted types of fuel switching, it should work seamlessly with any separate incentive programs that may be adopted with regard to such technologies. For instance, if the Commission were to establish a "TREC" requirement applicable to geothermal heat pumps,[54] or a separate EAM associated with electric vehicles, either would be able to operate seamlessly with an exemption from the outcome-oriented energy efficiency metrics.

#### *4.4.1.1 Identifying Types of Fuel Switching to be Exempt from the Efficiency Targets*

The primary sources of "good load" were identified by the Commission in its Order adopting the Clean Energy Standard: electric vehicles and heat pumps. We believe it is appropriate to initially focus on

[54] To be investigated pursuant to the CES Order, at 83.

these technologies. In the CES Order, the Commission ordered the development of a "mechanism for monitoring . . . penetration" of those technologies.[55] For each technology, parameters will need to be developed to determine what exact uses qualify. Defining electric vehicles is a relatively straightforward exercise. The category should include any vehicle that runs at least partially on electricity, including "plug-in hybrids." Heat pumps are a category of space conditioning devices that move heat as opposed to creating it (essentially air conditioners that can run in reverse to provide heating), such that "they can achieve a coefficient of performance (COP) many times higher than 1.0, which is the theoretical maximum efficiency for typical combustion heat sources and traditional electric resistance heat."[56]

#### *4.4.1.2 Tracking Fuel Switching and Accounting for it in the Target Setting Process*

For "good load," we recommend that outcome-oriented energy efficiency targets be set in a manner that assumes no load from electric vehicles or beneficial heat pumps.[57] In the near term, this should not present a problem because as found in the Clean Energy Standard Order, these sources do not yet constitute a significant fraction of the state's load. Setting the targets without reference to these sources of load in the long-term will give the utilities a natural incentive to ensure that processes for tracking and accounting for this load are established as soon as possible, before they begin to significantly impact utility achievement of outcome-based energy efficiency targets. Excluding "good load" further removes a source of uncertainty in the target setting process, since it may be difficult to accurately predict how quickly EVs and heat pumps will be adopted.

Assuming that actual (normalized) load is used for purposes of measuring achievement of the outcome-oriented targets, an ex-post adjustment will need to be made to subtract additional load from EVs and heat pumps for purposes of assessing achievement towards those targets. Absent meter data that specifically tracks load from these technologies, this adjustment process will require estimating the additional load from those sources.[58]

Currently, at least two processes have been set in motion to develop methodologies for tracking load from EVs and heat pumps. First, as discussed above, the Clean Energy Standard orders the development of a mechanism for monitoring EV and heat pump penetration. In addition, through the electric vehicles Distributed System Implementation Plan engagement group, stakeholders are examining mechanisms to forecast and monitor EV penetration. We recommend that the Commission take steps to ensure that these processes inform one another and are not duplicative, and to ensure that these tracking

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[55] CES Order, Appendix F at 3.

[56] Heat Pumps Potential for Energy Savings in New York State (revised March 2015), Prepared by Bower, S and Optimal Energy Inc. for the New York Energy Research and Development Authority (NYSERDA). Retrieved from: https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/EERE-Potential-Studies.

[57] If no exemption for good load is implemented, then targets must be set in a manner that accounts for the anticipated good load from these sources. The Staff White Paper on Clean Energy Standard (January 25, 2016), which assumes 8,615 GWh of EV and thermal heat pump load, is a useful data point.

[58] Heat pumps may be installed to replace non-electric technologies, to replace electric resistance heat, or to provide for cooling. Where a heat pump replaces electric resistance heating technology, it reduces load related to heating and therefore no exemption may be necessary. Accordingly, in tracking additional load from heat pumps, it is important to track load only from heat pumps that replace non-electric technologies and that increase load.

mechanisms are designed in a manner that facilitates the operation of an exemption to outcome-oriented efficiency metrics.

A decision must be made as to whether to track and account for only those load shifts that arise from utility and NYSERDA programs that incent "good load" and fuel switching away from electrified end uses, or whether to track the total amount of changes in load arising from these activities. It is sensible to consider making this determination on a technology-by-technology basis, considering both the feasibility of tracking and the potential for utility actions other than programs to incent such fuel switching. We anticipate that for electric vehicles, it will be possible and desirable to estimate market-wide penetration. For other technologies, including heat pumps and load switching away from electrified end-uses, it may be most feasible to track and account only for load shifts arising from utility and NYSERDA programs.

### 4.4.2 Tracking Total Energy Usage or Total Emissions

In time, the Commission may wish to consider moving from a metric that assesses electric load only to a unified metric that applies equally to other forms of fuel. Unlike the exemption approach, such a unified metric would credit different types of fuel switching differently, according to the outcomes they produce. Following a preliminary discussion of how such a unified metric might be established, the Working Group recognized that this is a complex topic that requires much further thought and analysis; it is not feasible to offer recommendations at this time.

Several considerations may complicate the development of an outcome-oriented metric that measures total energy use or energy intensity, or relatedly, carbon emissions intensity. First, there is not direct overlap between utility electric, gas and steam service territories; moreover, fuels such as heating oil are not delivered by regulated utilities. Thus, challenges may arise in collecting and attributing the relevant energy consumption data by utility service territory. Relatedly, it is necessary to identify the energy usage or emissions that will not be tracked for a utility-specific metric; for instance, most emissions from agriculture might be excluded. Finally, creating a unified metric requires additional methodological decisions. As noted in section 3.3.2, total energy can be defined in terms of *delivered* energy or *primary or source* energy. For a metric based on carbon emissions, meanwhile, one must decide upon the most appropriate emission conversion factors.

## 4.5 Consideration of Natural Gas Efficiency Targets was not Undertaken

The Working Group has not investigated the adoption of natural gas efficiency targets on an outcome-oriented basis. The Working Group believes that gas efficiency targets should exist and that the development of targets should commence after the Commission has determined electricity targets on an outcome-oriented basis. Once the principles for electricity targets and related mechanisms have been determined, the Working Group believes that the applicability of those principles to natural gas metrics and targets should be assessed in short order. In the medium term, the Working Group suggests analysis of potential unified metrics that measure total energy usage, total energy intensity, or total carbon intensity across electricity and fuels, so that fuel switching may be fully accounted for. The Working Group is not equipped to immediately extend its work to consider metrics and targets for natural gas efficiency.

# 5. EAM Structure and Terminology

As set forth in the REV Track 2 Order, the Commission noted that most EAMs "can be constructed as some variation on a line or other geometric function that links increasing performance to increasing reward."[59] The Commission further stated that "a linear slope for performance awards, with ceilings and floors reflecting a reasonable range of desired outcomes […] is the preferred approach."[60] The Working Group agrees that the EAMs linked to energy efficiency outcomes should be designed in this manner, rather than using simple pass/fail incentive mechanisms with abrupt cutoffs. We also agree that the EAMs should be designed with "ceilings and floors reflecting a reasonable range of desired outcomes."[61]

## 5.1 Definitions

The Working Group envisions an approach that establishes performance incentives that are linked to a range of outcomes. Such an approach, raises questions regarding the meaning of the term "target" in the context of setting goals to inform the establishment of efficiency EAMs. The term could conceivably mean (i) the base level at which utility shareholders begin to earn incentives, (ii) the maximum level, above which no additional incentives are awarded, (iii) the midpoint between these two outcomes, or (iv) a pre-designated "100% target" which may or may not lie at the midpoint of the minimum and maximum outcomes at which rewards are accrued.

To avoid confusion, we recommend that the Commission adopt a consistent set of terms to describe its performance targets and their associated EAMs. We have used the following terms in our report to describe various outcomes to be linked to the EAMs:

- "Minimum achievement level": the point at which EAMs begin to be accrued;[62]

- "Maximum earnings threshold": the point above which no further rewards can be earned, if applicable;

- "100% target" or "target": a pre-designated point between the minimum achievement level and maximum earnings threshold that may or may not lie at the midpoint between these two points.[63] When formulating a positive-only EAM, establishing a "target" is not strictly necessary. Nevertheless, doing so is useful so as to establish expectations of the utility and to avoid ambiguity

[59] REV Track 2 Order, at 69.
[60] Id. at 70.
[61] Id. at 70.
[62] In its Track 2 Order, the Commission specified that new EAMs should be positive-only. If, in the future, EAMs are adjusted to be symmetrical, the "minimum achievement level" should continue to describe the level at which the EAM applies in a positive or negative fashion.
[63] Should fully symmetric EAM be adopted, the 100% target would be at the inflection point where the incentive switches from negative possible. It is possible, however, to set an EAM that includes negative performance levels for which the 100% target does not lie at this inflection point (e.g. if the Commission determines that a utility should earn rewards even if it falls somewhat short of the 100% goal, but should be penalized if it misses the target by a wide margin).

that would otherwise be created surrounding whether the "target" is the minimum achievement level, the maximum earnings threshold, or the midpoint between the two.[64]

In recommending this terminology, with the exception of the 100% target, we have consciously avoided framing these lines in terms of utility goals. This is because it may be desirable to set the maximum earnings threshold at a level beyond even a reasonable "stretch goal" for utilities, so as to avoid a situation where a utility no longer receives incentives for better performance in the unlikely event that it exceeds all expectations. Conversely, a minimum achievement levels may be set lower than expectations in order to ensure that a utility retains an incentive to perform even if results are different than anticipated. We identify this possibility so as to make clear that the minimum and maximum levels for the EAM may be distinct from goals.

## 5.2 Slope of the Line

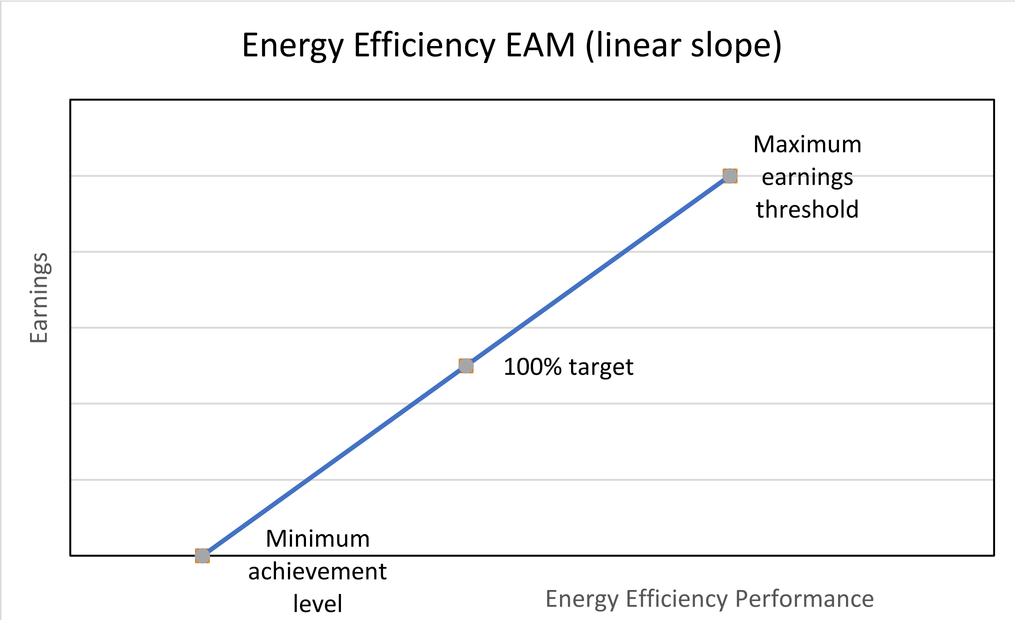
Assuming that the EAM is set in this manner, a decision needs to be made regarding how performance incentives will be awarded between the minimum achievement level and maximum earnings threshold. While there are myriad possible ways to structure the incentive, we discuss three potential options here: (i) a linear slope; (ii) a two-tiered EAM with a steeper slope after 100% achievement; and (iii) a quadratic function.

### 5.2.1. Linear Sloped EAM

The simplest way of structuring an EAM is to award incentives according to a straight line slope between these two points, as shown in Figure 2.1.

64 The term "target" should not be used to describe the minimum achievement level and maximum earnings threshold, as this will inevitably cause confusion.

**Figure 2.1: Energy Efficiency EAM (linear slope)**




Perhaps the most appealing feature of the linear sloped EAM is its simplicity. Under this structure, a utility would earn the same amount of incentive for any amount of energy savings between the minimum achievement level and maximum earnings threshold, regardless of where along the line the results in the utility's service territory fall. This ensures that the utility will receive a consistent incentive to promote electricity savings across a range of potential outcomes.

This simple linear structure easily facilitates annual earnings accrual, should the Commission choose to allow recovery on that basis.[65] Under such a structure, the Commission could set annual "100% targets" for a utility, paying the utility each year based on achievement against that annual target.

Many stakeholders in this Working Group find annual targets and metrics attractive because they incent consistent utility performance. Utilities may find annual targets and payments attractive because money is most valuable when made available immediately. If the Commission chose a multi-year EAM measurement and compliance period, a linear structure is adaptable to correcting for over- or under-payment made in the interim. A multi-year target could align with multi-year rate cases. While the multi-year approach may allow for longer-term efficiency investments that require long-term investment and oversight, it also may dampen utility motivation if incentives are considered by utilities and investors as distant or non-meaningful. A linear structure using normalized sales as the outcome-oriented metric simplifies the process of truing up the total compensation with the multi-year target, as the $/MWh in year 1 will be the same as the $/MWh in year 3.

So long as the utility is on track to fall within the minimum achievement level and maximum earnings threshold for each annual period and the slope of the line is held constant from year to year, utility shareholders would receive the same monetary incentive for savings achieved in any year. The Commission

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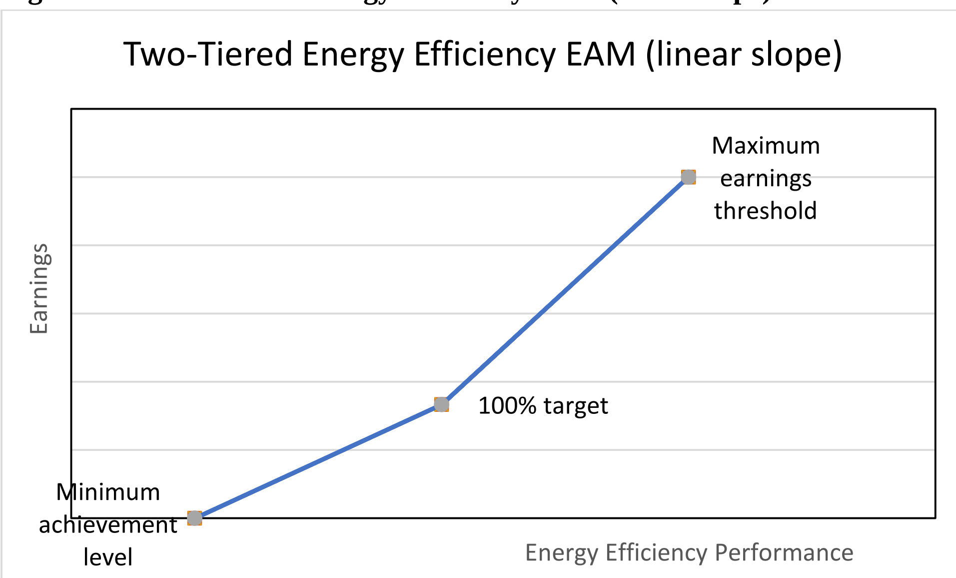
[65] The Working Group does not take a position on annual versus multi-year earnings accrual.

could, for example, set a constant slope for a utility's EAM for a given multi-year rate case period, and then allow recovery on an annual basis. Assuming that some of the savings were driven by a utility's ETIP or through a portfolio of utility energy efficiency programs funded in the rate case context, the constant nature of the incentive would allow for the Commission to be flexible in providing the utility a given pool of funds to be spent in any year. Should an unforeseen delay arise in administration of a given energy efficiency program, the utility could carry out the same program the following year using the funds allocated in year 1, in addition to whatever set of funds were earmarked for year 2 programs. A utility thereby could be afforded the opportunity to "catch up" should it miss savings in a given year.

### 5.2.2 Two-tiered EAM

Under a two-tiered EAM structure, utility shareholders would earn incentives at a higher rate once the 100% target is surpassed, as shown in Figure 2.2.

**Figure 2.2: Two-Tiered Energy Efficiency EAM (linear slope)**




As depicted in Figure 2.2, a two-tiered structure rewards utility shareholders more for achievements above the 100% target. This structure may be appropriate if (i) a significant amount of the savings being achieved are driven through a utility's ETIP, or through energy efficiency programs administered by the utility and/or NYSERDA; and (ii) a fixed amount of funding is available for those programs. The 100% target for a two-tiered EAM may be set at a level reflecting expectations given the amount of resources to be channeled toward energy efficiency.

Under these conditions, a utility will not yet have achieved the 100% target under two conditions: (i) the program budgets are not yet fully spent (in which case additional savings can be achieved by spending the remaining allocated funds, or by coordinating with NYSERDA to aid in effective deployment of funds allocated to NYSERDA); or (ii) all program funds have been spent (in which case the utility will have performed below expectations either in administering/facilitating programs, or will have achieved fewer savings through non-program related activities than expected). In this second case, lower shareholder returns are justified because electricity savings will not have been achieved in as cost effective a manner as expected. By contrast, savings above the 100% level are harder to come by. These savings reflect particularly cost-effective administration of programs, or other innovative activities that have achieved savings without any additional program funding. The utility's motivation to find these opportunities is higher under the two-tiered EAM.

This two-tiered structure may be less well-suited than a linear approach to being divided into annual targets or annual earnings accrual. This is because the elbow-like nature of the earnings could provide an incentive for the utility to concentrate savings into specific years so as to beat the 100% target in a given year and earn incentives at a higher rate. At the same time, this should not be a large problem so long as targets for later years are set in a cumulative manner that builds upon the target from the earlier year. In other words, so long as the Commission frames the target for each year in terms of changes in total load or an energy intensity metric over time, withholding spending in year 1 will have little benefit in year 2, because savings from year 1 actions will be reflected in year 2's load just as savings from year 2 actions would be. While, in using an elbow-shaped EAM, it would be unadvisable to make a pool of funds available to a utility to be spent in any year of a multi-year period because the utility could then spend all of the funds in year 1 in an attempt to receive the greater incentives above the 100% target for that year, the Commission could still allow for funds to be carried over from year 1 to year 2 for the utility to "catch up," because the lower savings in year 1 will have handicapped the utility and it will need to administer those programs simply to get to where it would have been had it administered the programs in year 1.

### 5.2.3 Quadratic Function EAM

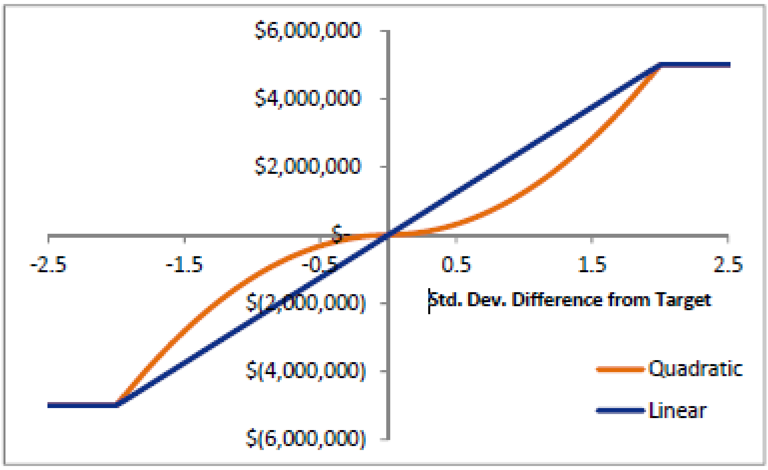
Quadratic function EAMs are discussed in Utility Performance Incentives: A Handbook for Regulators.[66] Quadratic (also called 'parabolic') functions provide increasing rewards or penalties as achievement deviates from the 100% target. The quadratic function recognizes that as results deviate more from this target, savings achievements are correspondingly more impressive (or underwhelming, in the case of underachievement). Massachusetts grants performance incentives according to a quadratic function.[67] Synapse's illustration of a quadratic function is provided below[68]:

[66] Synapse Energy Economics Inc. (March 9, 2015), at 43.
[67] Id.
[68] Id. at 44.

**Figure 2.3: Quadratic Function EAM**

Quadratic Function Compared to a Linear Function

Figure from Synapse Energy Economics Inc. (March 9, 2015), *Utility Performance Incentives: A Handbook for Regulators*.




In the case of a positive-only EAM, the quadratic function would begin where the x- and y-axis meet in the illustration above. This structure would reflect the increasing value of energy efficiency achievement with a fixed budget, and like the two-tiered approach would incent the utility to find more cost-effective efficiency opportunities and other innovative approaches to maximize performance. Like the two-tiered approach, inter-year adjustments may be difficult as the aggregate savings of multiple years will yield different incentives depending on the relative performance in each year.

# 6. Proposals for Setting and Achieving Energy Efficiency Targets

Members of the Working Group agreed on the value of recommending a trajectory of system-wide electric energy efficiency targets for 2017 to 2030. Members diverged, however, as to the appropriate approach for setting energy efficiency targets at the state level and for each of the state's utilities. In this section, we therefore describe options for target setting rather than a consensus recommendation on either the approach to be used or a trajectory of targets.

We recognize upfront that in order to develop an outcome-oriented EAM for energy efficiency, the specified EAM target needs to define the level of utility performance as measured by the EAM metric. Yet in this instance additional work is required to specify the metric itself. It is thus premature to propose specific EAM targets in this report. The discussion of target setting that follows is therefore focused on statewide energy efficiency achievement. The CEAC Steering Committee further posed the question of whether it is relevant for the Working Group to discuss energy efficiency targets when it has not recommended corresponding outcome-oriented metrics. The Working Group believes that this report's discussion of options for setting energy efficiency targets, albeit in terms of statewide achievement as opposed to utility-specific targets that correspond to a specific metric, provides useful insight into alternative stakeholder viewpoints.

The targets presented below should be considered *indicative* levels of achievement toward the State's clean energy goals, which further help to *illustrate* the alternative options for target setting. In general, in this section statewide energy efficiency achievement is discussed in terms of weather-normalized electric load reduction, in gigawatt hours (GWhs), relative to the NYISO statewide electric energy econometric forecast (which is unadjusted for new DER). This approach has the advantage of allowing for comparison with existing benchmarks. Consistent with this report's focus on an outcome-oriented approach, however, we anticipate that programmatic and policy interventions and market-initiated activity all would factor into the establishment and measurement of electric efficiency savings targets and achievement.

Working Group members held different viewpoints on whether statewide or utility-specific energy efficiency targets ultimately should be set on an annual or multi-year basis.[69] Many members felt annual targets provide an effective means to encourage and reward consistent utility performance. NYSERDA staff made a case for setting multi-year performance targets to allow adequate time for market animation and market transformation strategies to show results. Where this report describes alternative trajectories for electric efficiency targets, the Working Group decided to show *illustrative* targets on an annual basis for clarity in presentation. The presentation of illustrative annual targets also *does not* indicate a consensus among Working Group members that performance incentives should be *earned* on an annual basis. Rather, the Working Group members anticipate that EAM earnings will be addressed either in EAM-specific proceedings, or in individual utility rate cases, as envisioned under the Track 2 Order. Accordingly, for a three-year rate case, for example, achievement of the EAM could be assessed on an annual or a three-year

[69] The Working Group notes that a CEAC Steering Committee member suggested that multi-year targets (e.g., setting a trajectory to a five-year target) may be more appropriate than annual targets for an outcome-oriented approach that measures energy efficiency outcomes based on billed electricity sales over time, since there tends to be a lag between program interventions and longer-term changes to markets.

basis. As discussed in Section 5, the decision whether to have earnings accrual take place on a multi-year basis may depend on the shape of the EAM (e.g. linear, two-tiered, etc.).

Overall, the Working Group recognizes the high degree of uncertainty that exists with respect to load forecasts and market-initiated energy efficiency activity, among other factors, which makes it infeasible to set fixed outcome-oriented efficiency targets out to 2030. We support a process to periodically re-evaluate energy efficiency targets, similar to the approach that will be used in setting CES targets for renewables.

This section further discusses factors that could enable, or could put at risk, the increase in system-wide energy efficiency achievement needed to reach state policy goals. Working Group members acknowledge the opportunity of having both resource acquisition programs and market animation and market transformation activity as complementary tools. The majority of Working Group members concluded that in the near-term, the Commission should provide for cost recovery mechanisms that allow for ambitious and cost-effective utility investments in energy efficiency. This includes resources for established utility programs and, to the extent feasible, new REV market mechanisms. DPS and NYSERDA staff emphasized the Commission's clear policy direction of reducing surcharge-based program funding, while at the same time increasing utility energy efficiency deployment via other mechanisms such as utility REV Demonstration Projects and energy efficiency investment as an operational resource rather than a regulatory mandate.[70] The majority of the Working Group members, however, are concerned that absent an increase in proven energy investments in the short-run, even as NYSERDA reduces its resource acquisition programs, will increase the risk of backsliding from the State's clean energy goal. Thus, these members support mechanisms that provide for cost recovery that allow for ambitious and cost-effective utility investments in energy efficiency in addition to feasible new REV market mechanisms.

## 6.1 Options for Developing a Trajectory of Energy Efficiency Targets

One approach considered by the Working Group is to set a <u>minimum</u> statewide achievement level that is benchmarked against the levels of energy efficiency assumed in the CES Order, such that between 2016 and 2030 the state reaches or exceeds the 35,627 GWh of additional energy efficiency that is assumed in that Order. As used in this report, the term "minimum statewide achievement level" is not intended to make light of the associated energy efficiency outcomes; rather, it is used to convey the Working Group's discussion that for a given utility, if an EAM were to be defined in terms of the change in normalized electricity consumption across its service territory, then shareholder EAM earnings would begin to be accrued at some (to be determined) point that corresponds to that utility's "share" of the statewide minimum achievement level. Whereas the 2016 Staff White Paper on Clean Energy Standard assumed a constant level of energy efficiency savings annually to 2030, in discussions to date Working Group members have allowed for a non-linear trajectory of minimum energy efficiency achievement over the 2016-2030 period that reflects greater energy savings in the later years. This "backloading" of achievement is intended to reflect NYSERDA's recent shift to focus on longer-term market animation and transformation strategies, and the related potential to increase market-initiated energy efficiency to the extent that existing market barriers are mitigated. Some Working Group members, including DPS and NYSERDA staff and the Joint

[70] ETIPs Order, at pp. 27.

Utilities, also believe that some backloading may be appropriate considering that it helps to reduce, although not eliminate, the potential gap between energy efficiency savings outlined in the non-linear trajectory and the likely savings expected from all sources in the short-run based on current energy efficiency program funding levels and market expectations (see Section 6.2).

A second approach is recommended by Acadia Center, Alliance for Clean Energy New York, Association for Energy Affordability, Inc., CLEAResult, Lime Energy, Natural Resources Defense Council, Pace Energy & Climate Center, Sealed, TRC Solutions, and the Urban Green Council – collectively, the "Efficiency Ramp Up Advocates." Referred to herein as the "Efficiency Ramp Up Strategy," this approach is to set near-term targets by ramping up annual incremental energy efficiency at a reasonable rate to match levels achieved in other leading states. This approach accounts for the fact that other states do not use the outcome-based approach recommended herein, and accordingly translates similar target levels into the context of outcome-based targets. Long-term targets (out to 2030) would be set based on an energy efficiency potential study that would be divided by utility service territory and would incorporate market initiatives developed over time under New York's REV policy framework. A new energy efficiency potential study would be commissioned once every three years and used as a means to adjust these long-term targets. For the purposes of utility EAMs, minimum achievement levels and maximum earnings thresholds would be set based on a realistic range of outcomes on either side of the 100% targets established, to provide for reasonable assurance that utility shareholders would be incented to achieve better energy efficiency outcomes.

The Joint Utilities also generally support the near-term ramp up of energy efficiency although they do not endorse the specific ramp up rate as described in Section 6.1.2 of this report. In this report, the term "Joint Utilities" means the Working Group members from Central Hudson Gas and Electric Corporation (Central Hudson), Consolidated Edison Company of New York, Inc. (Con Ed), Niagara Mohawk Power Corporation d/b/a National Grid, Orange and Rockland Utilities, Inc. (O&R), and New York State Electric & Gas Corporation (NYSEG) and Rochester Gas and Electric Corporation (RG&E). The Joint Utilities view the level of energy efficiency assumed by 2030 in the CES Order as achievable through ramping up of successful of energy efficiency investments, including but not limited to funded utility-administered energy efficiency efforts which may include those funded through the rate base.

### 6.1.1 Benchmarking Statewide Minimum Energy Efficiency Achievement against CES Assumptions and State Energy Plan Efficiency Goals

In August 2016, the Commission adopted a Clean Energy Standard (CES) which mandates that 50% of New York State's electricity is to be generated by renewable sources by 2030, as part of a strategy to achieve a 40% reduction in greenhouse gas emissions from 1990 levels by 2030.[71] The load forecasts used to set CES renewable procurement targets (initially for the years 2017 through 2021) account for incremental electric energy efficiency savings that sum to 35,627 GWhs by 2030, a level of achievement that also is consistent with the New York State Energy Plan energy efficiency goal.

[71] CES Order.

To develop a trajectory of energy efficiency targets in alignment with State energy policy goals, the Working Group therefore considered the approach of setting minimum statewide energy efficiency achievement levels, on an annual or a multi-year basis, that cumulatively summed to at least 35,627 GWhs by 2030. The Working Group did not reach agreement on a level of energy efficiency that would represent a "100% target" for statewide or utility achievement under this approach.

The CES energy efficiency assumption subtracts 2,227 GWhs annually over the 2015-2030 period from the 2015 NYISO Econometric forecast (unadjusted for DER).[72] The Working Group understands this linear trajectory to be a simplifying analytic assumption, a point which was recognized by the CEAC Steering Committee Co-Chairs. The Staff White Paper on Clean Energy Standard also notes that 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."[73]

Specific steps taken to calculate an ***illustrative trajectory*** of statewide minimum energy efficiency achievement levels follow:

1. Rather than propose a trajectory of cumulative GWh savings based on linear year-over-year savings, this approach allowed for "backloading" of energy efficiency achievement. This decision is intended to reflect NYSERDA's recent shift to focus on market animation and transformation, which emphasizes longer-term strategies to address barriers to market adoption of energy efficiency (rather than near-term procurement of efficiency savings). In this scenario, efficiency gains from unsubsidized market activity are expected to make up an increasingly significant portion of the total energy efficiency achievement over time.

2. The resulting minimum statewide energy efficiency achievement levels correspond to the cumulative GWh reduction in wholesale sales shown in Figure 3 below, relative to the 2015 NYISO Econometric forecast for the 2016-2030 period (extrapolated as in the CES Order). Following this trajectory, the annual incremental electric efficiency savings would meet or exceed approximately 1.0% of the unadjusted NYISO-forecasted sales, on average, over the 2016-2020 period; this five-year average is lower than the annual efficiency savings in 2018, 2019, and 2020 (set at 1.3% of forecasted sales) due to the fact that the 2017 achievement level incorporates cumulative energy efficiency savings over the 2016-2017 period.[74] Annual incremental electric efficiency savings would then increase to 1.5% of the unadjusted NYISO-forecasted sales in each year from 2021-2025, and to 1.7% of the unadjusted forecasted sales in each year from 2025-2030.

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[72] 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.

[73] Id.

[74] It is important to note that under this trajectory, the 2017 minimum achievement level incorporates cumulative energy efficiency savings over the 2016-2017 period, an assumption intended to account for the potential shift toward an outcome-oriented metric for measuring energy efficiency at the same time that NYSERDA's program portfolio is under transition. Thus, over the five-year period of 2016-2020, energy efficiency accounts for just over a 5% incremental reduction in wholesale sales relative to the NYISO econometric forecast. The annual incremental electric savings is 1.3% for 2018, 2019, and 2020.

For reference, Figure 4 shows both (1) the “linear” CES assumption for the average range of energy efficiency over the 2015-2030 period that was used in the CES methodology to calculate base load and (2) the implied incremental CES energy efficiency assumption over the 2016-2030 period, provided that the 2015 savings assumption was achieved.[75]

3. The Working Group emphasizes that the minimum statewide achievement levels shown in Figure 3 should not be viewed as fixed, year-over-year expectations for energy efficiency savings out to 2030. This illustrative trajectory should be refined as more data becomes available, including on ETIPs and CEF achievement; to incorporate any additional utility energy efficiency targets that are negotiated in rate cases; and to reflect potential studies that may be conducted. Corresponding targets could be set on either an annual basis or a multi-year basis. The trajectory of targets also should be periodically re-evaluated, similar to the approach that will be used in setting CES targets for renewables. Presenting an illustrative trajectory out through 2030, however, suggests that adopting an achievement path that is “backloaded” in the manner shown does not require unreasonably aggressive achievement in later years to meet state energy policy goals that have been established for 2030.

[75] For simplicity, the far right column in Figure 4 assumes that the 2015 GWh savings assumption was achieved and then shows incremental savings assumptions going forward, for the 2016-2030 period. The Working Group did not attempt to determine a 2015 GWh savings estimate for statewide energy efficiency achievement since under the outcome-oriented approach, this estimate should be inclusive of savings from program administrators, codes and standards, and market-initiated activity. Comparing forecasted and actual load for 2015 suggests that the simplifying assumption adopted here for 2016-2030 incremental savings is reasonable. The Staff White Paper on Clean Energy Standard estimates the statewide energy need after energy efficiency is taken into account at 160,632 GWh in 2015; in comparison, the 2016 NYISO Gold Book reports actual statewide energy load of 159,930 GWh in 2015.

**Figure 3: Illustrative Trajectory for "Minimum Statewide Energy Efficiency Achievement Levels," 2016-2030 in Cumulative GWh**

| Year | Minimum Statewide Achievement in Cumulative GWh |
|---|---|
| 2016 | *incorporated into 2017* |
| 2017 | 2,139 |
| 2018 | 4,279 |
| 2019 | 6,418 |
| 2020 | 8,558 |
| 2021 | 11,155 |
| 2022 | 13,753 |
| 2023 | 16,351 |
| 2024 | 18,949 |
| 2025 | 21,547 |
| 2026 | 24,603 |
| 2027 | 27,659 |
| 2028 | 30,716 |
| 2029 | 33,772 |
| 2030 | 36,828 |

**Figure 4: Energy Efficiency Savings Assumption used in the Clean Energy Standard Order, in Cumulative GWh** (assumption represents center of a range of possible outcomes)

| Year | "Linear" CES Assumption for 2015-2030 | Incremental CES Assumption for 2016-2030 |
|---|---|---|
| 2015 | 2,227 | *(see footnote 74)* |
| 2016 | 4,453 | 2,227 |
| 2017 | 6,680 | 4,453 |
| 2018 | 8,907 | 6,680 |
| 2019 | 11,133 | 8,907 |
| 2020 | 13,360 | 11,133 |
| 2021 | 15,587 | 13,360 |
| 2022 | 17,813 | 15,587 |
| 2023 | 20,040 | 17,813 |
| 2024 | 22,267 | 20,040 |
| 2025 | 24,493 | 22,267 |
| 2026 | 26,720 | 24,493 |
| 2027 | 28,947 | 26,720 |
| 2028 | 31,173 | 28,947 |
| 2029 | 33,400 | 31,173 |
| 2030 | 35,627 | 33,400 |

The Working Group further considered an approach to allocate the statewide minimum energy efficiency achievement levels to utility service territory across the State's investor owned utilities and LIPA. This allocation was based on assigning each utility a proportion of the statewide GWh reduction level equivalent to its proportion of total 2014 electricity sales summed across the relevant utilities from the most recent sales data available from the U.S. Energy Information Administration (EIA-861 dataset).[76] The Joint Utilities consider this method of allocation across service territories inappropriate for the purposes of establishing targets for their service territories and stated that such targets should only be developed after bottom up potential studies are completed. However, some Working Group members found it to be a reasonable first approximation. NYPA was not assigned a proportion of the statewide GWh reduction. Rather, under this approach NYPA's energy efficiency activities are assumed to contribute to the aggregate load reduction in the utility service territory where each NYPA customer is located, to promote cooperation between the distribution utility and NYPA in assisting customers to pursue clean energy solutions. Likewise, NYSERDA's energy efficiency activities are assumed to contribute to achievement in each utility service territory.

Appendix B shows that on a statewide basis and across the indicative (first approximation) allocation to each utility service territory, the 2030 minimum energy efficiency achievement level derived through this approach is reasonably consistent with the achievable potential estimates from the Energy Efficiency and Renewable Energy Potential Study of New York State (April 2014, prepared for NYSERDA), and is significantly below the economic potential found in that study.[77] This is intended to provide an order-of-magnitude comparison given that the majority of the State's utilities do not have a current energy efficiency potential study available for their New York State service territory.

### 6.1.2 The Efficiency Ramp Up Strategy

The logic behind the Efficiency Ramp Up Strategy proposed by the Efficiency Ramp Up Advocates is that under REV, New York should ramp up energy efficiency levels at least as fast as has already been demonstrated to be achievable in other states. This proposal also holds that by 2030, New York should be able to achieve the amount of energy efficiency deemed achievable through a potential study that takes into account the potential for new REV market mechanisms. By ramping up as quickly as the most successful energy efficiency efforts from other jurisdictions as it implements REV, and by setting long-term goals that account for new REV policies, New York will position itself to become the national leader in this area.

In the view of the Efficiency Ramp Up Advocates, by facilitating as fast a ramp up in energy efficiency investment as has been demonstrated to be feasible, the Efficiency Ramp Up Strategy reflects the Commission's desire to set ambitious targets that drive achievement of the State Energy Plan and CES goals in a more cost effective manner. The Commission recognized in the CES Order that "[s]tudy after

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[76] U.S. Energy Information Administration (EIA). 2015. Electric power sales, revenue, and energy efficiency Form EIA-861 detailed data file. https://www.eia.gov/electricity/data/eia861/. See file "Sales_Ult_Cust_2014.xls".

[77] As described in the study, the economic efficiency potential includes all efficiency potential that is cost-effective, assuming there are no market barriers to adoption of efficiency measures. The achievable potential recognizes all real-world market barriers to the implementation of cost-effective energy efficiency and represents an estimate of what is actually possible for a given level of funding or other real-world policies.

study has shown that when deployed well, energy efficiency is the cheapest and most cost effective manner to reduce carbon emissions in the energy sector."[78]

The Efficiency Ramp Up Strategy thereby recognizes the Track 2 Order's clear directive that energy efficiency targets be set in a manner designed to "reduce the cost of achieving these goals,"[79] and the Commission's expectation, reflected in the CES Order, that the target recommended by the CEAC should be *higher* than currently-existing energy efficiency targets.[80] The Efficiency Ramp Up Advocates are deeply concerned that if the targets are instead indexed to the CES assumptions, or back-loaded as compared to those assumptions as would be the case in the CES Benchmarking approach articulated above, significant potential energy efficiency achievements will not be realized and achievement of the Clean Energy Standard and State Energy Plan greenhouse gas reduction goals will accordingly be significantly more costly than would otherwise be the case.

Indeed, even under the Efficiency Ramp Up Strategy, the cumulative target for the amount of energy efficiency to be achieved by 2019 is only slightly higher than the amount of energy efficiency *assumed* for that period in the Clean Energy Standard Order (while under the CES Benchmarking strategy, the minimum cumulative target for 2019 is significantly lower than CES assumptions). If achievement is any less than the amount assumed in the CES Order, either the renewables percentages achieved through CES procurement for those years will be less than the percentages set forth in the CES Order (putting the state on a trajectory that will require greater renewables ramps in later years to achieve 50 x 30, making achievement of the goal more difficult), or else the costs of achieving the CES' annual goals will be higher than anticipated. By contrast, if achievement exceeds the CES assumptions (a clear aspiration of the CES and Track 2 Orders), annual renewables supply targets will be exceeded and/or the costs of hitting the CES's annual targets will be reduced. Furthermore, all else equal, saving electricity in earlier years as opposed to later ones is a substantively better outcome in that a ton of $CO_2$ reduced in 2017 is more beneficial than a ton reduced in 2030, because it takes away heat-trapping gas for 13 additional years.

#### *6.1.2.1 Determining an Achievable Ramp Up Rate for Annual Incremental Energy Efficiency*

In the Efficiency Ramp Up Advocates' view, for purposes of setting both the 100% statewide energy efficiency target and 100% targets for individual utilities, an appropriate benchmark ramp up of annual incremental energy efficiency savings as a percentage of sales is 0.4% per year. Under the Efficiency Ramp Up Strategy, this annual ramp up in energy efficiency could be achieved through all types of efforts credited through the outcome-based approach (including programmatic and policy interventions and market-initiated activity that operates without direct utility or government incentives.

Numerous other jurisdictions have achieved annual increases of this magnitude through efficiency programs alone. Because the Efficiency Ramp Up Strategy is an outcome-based approach where a wider

[78] Clean Energy Standard Order, at 81-82.
[79] Track 2 Order, at 81-82.
[80] Clean Energy Standard Order, at 82 ("The achievement of higher levels than the current energy efficiency targets can clearly benefit individual consumers and create system-wide value through the cost effective achievement of the RES and carbon reduction goals.")

range of activities are able to drive achievement, the Efficiency Ramp Up Advocates think that even greater savings levels should be expected.

An August 2015 Environmental Protection Agency report summarizing data from a group of 26 high-achieving program administrators found that the *average* annual energy savings increases amongst the group was 0.38%.[81] One program administrator was able to achieve a first-year savings increase of 1.28%.[82] We found numerous instances of utilities that have achieved ramp rates of roughly 0.4%, including utilities that, prior to ramping up achievement levels, realized very little energy efficiency savings. Figure 5, based on EIA data, provides some illustrative examples:

**Figure 5: Examples of Average Annual Ramps**

| | Starting Point (est.) | Ending Point (est.) | Years | Average Annual Ramp |
|---|---|---|---|---|
| Eversource MA | 1.35% | 3.18% | 5 | 0.37% |
| National Grid MA | 1.34% | 3.03% | 5 | 0.34% |
| Fitchburg Gas and Electric Co. | 0.20% | 1.70% | 4 | 0.38% |
| Western MA Electric Co. | 0.50% | 2.10% | 4 | 0.40% |
| City of Anaheim | 0.30% | 1.10% | 2 | 0.40% |

While a 0.4% annual ramp up reflects the upper end of program administrator achievement in other states, the Efficiency Ramp Up Advocates believe that it is reasonable and appropriate for this level of savings increases to be used to set the 100% target for each utility in New York State, taking into account the outcome-based regime under which they will be measured. Maximum earnings thresholds that exceed these ramp rates will allow for utilities to earn higher incentives in the event that they are able to facilitate faster ramps by drawing upon the full range of tools at their disposal. The Efficiency Ramp Up Advocates and the Joint Utilities believe the information in Figure 5 shows the critical role that utility-run energy efficiency programs can play in achieving Clean Energy Standard objectives.

The Efficiency Ramp Up Advocates understand that New York is embarking upon a unique policy framework designed to drive unprecedented investments in energy efficiency, other states' programs nevertheless provide a benchmark against which New York's progress can and should be judged. New York's pioneering approach to setting outcome-based energy efficiency targets and developing market based mechanisms to incent private investment in energy efficiency ideally will enable the state to achieve even greater levels of energy efficiency in an even more cost effective manner. At the same time, if New York's policy framework is not able to provide at least as high of year-on-year gains in energy efficiency achievement as other states have already demonstrated is achievable, then it should be adjusted to provide for at least those levels of savings.

[81] EPA, Demand-Side Energy Efficiency Technical Support Document (Aug. 2015), at 81.
[82] Id.

The Efficiency Ramp Up Advocates recognize that some market transformation efforts may require more time to yield results, and accordingly may not contribute significantly to ramping up New York's levels of energy efficiency savings in the near term. But in the Efficiency Ramp Up Advocates' view, this should not provide an excuse for failing to achieve energy efficiency savings in the near term, as the Commission can provide for utility-administered mechanisms to channel investment towards energy efficiency to make up for this gap. Long-term market transformation strategies and short term approaches to channel investments towards energy efficiency are not mutually exclusive and can be implemented in tandem. The Efficiency Ramp Up Advocates believe that such a strategy is necessary in the near term to achieve the CES goals in as cost effective a manner as possible.

Using a 0.4% annual incremental ramp rate, we calculated *illustrative* 100% statewide targets for 2017-2019 under this approach by:

1. Beginning with the 2015 NYISO Econometric forecast (unadjusted for DER).

2. Assuming constant energy efficiency savings levels from 2015 to 2016.[83]

3. Setting a 2017 savings target of 1.4% annual savings relative to the NYISO forecast.[84] This target is roughly 0.4% above New York's net incremental savings from efficiency programs in 2015 – which was 1.05%, according to the 2016 State Energy Efficiency Scorecard released by the American Council for an Energy-Efficient Economy (ACEEE)[85] – and is also roughly equal to the annual incremental savings assumed in the CES Order.[86]

4. Increasing annual incremental savings levels by 0.4% per year thereafter.

Under this strategy, how the target is paired with EAM design ultimately determines how utility shareholders will be compensated and ultimately motivated to pursue cost-effective energy efficiency investment. For example, the flexibility and simplicity of the linear sloped incentive would mesh well with the ramping approach. The inter-year flexibility of the linear approach would mean that deficits in one year

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[83] This assumption reflects the fact that it is too late to carry out any policy changes to achieve increased savings in 2016. In practice, a cumulative target can be set by using actual 2016 savings numbers once they are available. To calculate an illustrative savings level for purposes of this report, we used the 2015 net incremental savings levels reported in the American Council for an Energy-Efficient Economy's 2016 State Energy Efficiency Scorecard (1,560 GWh), and scaled it up for line losses (to 1,681 GWh). See American Council for an Energy-Efficient Economy, The 2016 State Energy Efficiency Scorecard, at 28. This number is similar to NYISO's 2016 energy efficiency forecast (1,752 GWh). The ACEEE scorecard number does not take into account savings from non-program related activities, such as those achieved through tighter codes and standards. It includes only NYSERDA programs, utility EEPS savings data, and savings from NYPA and LIPA Programs. But many NYSERDA EEPS programs ended between 2015 and 2016, making it likely that achievement through programs was lower in 2016 as compared to in 2015. Thus, while the best approach for setting the cumulative target is to use actual 2016 data once it is available, the ACEEE provide a reasonable estimate for illustrative purposes.

[84] Using the 2015 NYISO econometric forecast for purposes of this report allows for easy comparison with the CES Benchmarking strategy and CES assumptions, because those approaches used that forecast. In practice, it may be more appropriate to use the most recent NYISO forecast available at the time the targets are set.

[85] American Council for an Energy-Efficient Economy, The 2016 State Energy Efficiency Scorecard, at 28.

[86] The Clean Energy Standard Order assumes 2,227 GWh of annual incremental savings, whereas 1.4% annual incremental savings equates to 2,321 GWh. See Clean Energy Standard Order, at 81.

will be comparable to surpluses in the next, meaning that utilities would receive equal incentive for long-term approaches that concentrate savings in later years during a given rate period. However, the two-tiered and quadratic approaches each amplify the early compliance incentive that the ramp-rate captures by starting low and ending high. Either approach would be adaptable annually or with a longer-term target.

#### *6.1.2.2 Setting Long-term Energy Efficiency Savings Goals*

Under the Efficiency Ramp Up Strategy, long term savings goals to 2030 would be set based on a new energy efficiency potential study. Because these long-term targets would inform the establishment of utility-specific EAMs, the potential study should assess the energy efficiency savings potential in each specific utility service territory. Further, in defining the amount of "achievable" energy efficiency, the study should take into account REV's unique policy framework, including the Benefit Cost Analysis framework adopted by the State.

Once this energy efficiency potential study is carried out, annual incremental savings for years 2020 – 2030 can be calculated so as to set targets that equate to the amount of "achievable" energy efficiency potential through 2030.[87] These goals would be revised based on new efficiency potential studies conducted on a triennial basis. Each new efficiency potential study would be better informed as to the potential of REV market mechanisms, as REV implementation occurs.

The Efficiency Ramp Up Advocates are confident that the energy efficiency potential study to be conducted pursuant to the Efficiency Ramp Up strategy should lead to long-term savings goals that equate to a ramp up of .4% additional incremental energy efficiency savings per year until at least roughly 3% annual incremental efficiency savings is achieved. Massachusetts is already achieving roughly 3% annual incremental savings from energy efficiency programs alone, not even accounting for efficiency attributable to other actions.

The Energy Efficiency and Renewable Energy Potential Study of New York State (April 2014) conducted on behalf of NYSERDA indicated that there is enough economic energy efficiency potential such that the state would not achieve the full potential even if it increased annual incremental energy efficiency savings by .4% *every year* until 2030, all the way to roughly 6.5% annual incremental savings in 2030.[88] While the amount of achievable energy efficiency potential found by the study was significantly less, it was limited by several factors: 1) It relied on energy efficiency program delivery, rather than a more neutral mechanism, as its structural frame for assessing achievable potential, and 2) the study did not

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[87] As set forth in the previous section, near-term targets (through 2019) should be set using the .4% ramp rate, as the total savings rate that would yield for 2019 of slightly more than 2% annual incremental savings is clearly feasible given that multiple states are already achieving significantly higher efficiency levels.

[88] Energy Efficiency and Renewable Energy Potential Study of New York State (2014), at 16 (showing 2030 economic electric energy efficiency potential to be 91,856 GWh; if New York were to achieve 1.4% savings in 2017 and ramp up to .4% more than that every year until 2030, it would achieve less than 90,000 GWh of efficiency savings). A small portion of this economic potential has likely been realized, as the initial year of the study period was 2013.

account for all energy efficiency measures across all sectors..[89] Given that REV is designed to eliminate market barriers and the gap between 'achievable' energy efficiency potential and economic energy efficiency potential is defined by the amount unachievable due to these barriers, a new potential study is expected to show significantly less separation between these amounts.

The Joint Utilities support the completion of bottom up potential studies. In their view, target-setting analysis can only be performed in an accurate manner with service territory specific data.

The significant cost saving potential of the Efficiency Ramp Up Strategy is supported by the conclusions of *Aiming Higher: Realizing the Full Potential of Cost-Effective Energy Efficiency in New York*, a Synapse Energy Economics Inc. report that examined the economic benefits of higher efficiency targets. Synapse concluded that "customers could save roughly $3 billion in electricity costs between now and 2030 with higher efficiency savings targets of roughly 3% of annual retail sales by 2020, remaining at that annual level through 2030."[90]

#### *6.1.2.3 Concerns Regarding the Cost of the Efficiency Ramp Up Strategy*

DPS, NYPA, and NYSERDA staff have reservations about the costs of relying on an expansion of utility resource acquisition programs to aggressively "ramp up" near-term targets. In this view, both the rate impacts and the bill impacts of pursuing aggressive annual energy efficiency savings goals through direct utility incentive programs should be taken into account. In Working Group discussions, Northeast states and California were common points of reference with respect to energy efficiency targets, savings, and program spending. Figure 6 provides data from the ACEEE 2016 State Energy Efficiency Scorecard. DPS, NYPA, and NYSERDA staff observe that while utilities and program administrators in states such as Massachusetts, Rhode Island, and Vermont achieve meaningful energy savings through their efficiency programs, electric efficiency program spending as a percentage of statewide utility revenues is much higher in these states as compared to in New York State. Moreover, the benefit/cost evaluations for some of these programs, particularly in Massachusetts, reflects benefit determinations that may be incongruent with the Commission's BCA framework.

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[89] For example, the potential study could have included more measures for agricultural, industrial, mining, streetlighting, whole building, and low income energy efficiency. There could also have been an increased focus on efficiency savings from behavioral measures, retrocommissioning, and operational energy efficiency.
[90] Aiming Higher, at ii.

**Figure 6: Electricity Efficiency Program Data by State**

| **2015 Electricity Efficiency Program Data by State**<br>**from the ACEEE 2016 State Energy Efficiency Scorecard**[91] | | | | | |
|---|---|---|---|---|---|
| **State** | **Electric Efficiency Program spending** | **% of utility revenues** | **Net incremental savings (MWh)** | **% of retail sales** | **$/MWh** spending/savings → First Year Cost of Saved Electricity |
| California | $ 1,378,200,000 | 3.34% | 5,040,603 | 1.95% | $273 |
| Connecticut | $ 173,900,000 | 3.32% | 435,740 | 1.48% | $399 |
| Massachusetts | $ 557,900,000 | 6.16% | 1,472,536 | 2.74% | $379 |
| New York | $ 375,700,000 | 1.66% | 1,559,665 | 1.05% | $241 |
| Pennsylvania | $ 217,200,000 | 1.43% | 904,238 | 0.64% | $240 |
| Rhode Island | $ 82,900,000 | 6.34% | 222,822 | 2.91% | $372 |
| Vermont | $ 54,400,000 | 6.89% | 110,642 | 2.01% | $492 |

Data available: http://database.aceee.org/sites/default/files/docs/spending-savings-tables.pdf

The Working Group notes that a complex relationship exists between the level of energy savings (e.g., % of retail sales) and the Cost of Saved Electricity (CSE) from energy efficiency program portfolios, as is documented in several studies. Higher savings targets can drive deeper and more comprehensive projects which could cost more, but high efficiency technologies and greater operational efficiencies in program delivery may reduce the cost of savings. Additionally, the CSE may be higher in states that have traditionally implemented energy efficiency programs due to market saturation. According to an April 2015 study by Lawrence Berkeley National Laboratory,[92] "…the actual relationship between the cost of saved electricity and the level of savings is more complicated, and some analyses have shown a negative slope (i.e., the cost of saved electricity has declined as savings have increased)." An April 2016 ACEEE study[93] explored this relationship in greater detail across 14 leading energy efficiency program administrators between 2005 and 2014, and concluded that there is a "…wide variation between these two variables, suggesting a weak relationship. A correlation coefficient of 0.2 also demonstrates a weak relationship between the two variables. This result indicates that as energy savings as a percentage of total sales increase, the L[evelized] CSE does not necessarily increase."

[91] ACEEE Spending and Savings Tables (2016), Source data from the ACEEE 2016 State Energy Efficiency Scorecard, retrieved from: http://database.aceee.org/sites/default/files/docs/spending-savings-tables.pdf.
[92] The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs: Estimates at the National, State, Sector and Program Level", pp. 19-20, Lawrence Berkeley National Laboratory, April 2015, https://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf
[93] "Big Savers: Experiences and Recent History of Program Administrators Achieving High Levels of Electric Savings", pp. 11-13, American Council for n Energy Efficient Economy, April 2016, http://aceee.org/sites/default/files/publications/researchreports/u1601.pdf

DPS and NYSERDA staff, however, note that the Commission expects that additional investments in energy efficiency will occur outside of the programmatic efforts of utilities. For example, in the REV Track 1 Order, the Commission noted:

> The State's greenhouse gas reduction goals demand that we achieve significantly more efficiency than is practical to achieve through current ratepayer-funded direct subsidy programs. Achieving greater efficiency gains will require more private capital, not only in the form of sharing contributions under efficiency programs, but in the form of unsubsidized market activity. Energy efficiency already presents attractive economic returns in many instances; our approach to removing barriers to scale must be enhanced and diversified. Some parties express concern that overall efficiency may suffer if current approaches are changed. In order to achieve more, however, change is required. Pp. 75-82

By animating markets and leveraging more private capital, the Commission seeks to increase the impact of available ratepayer funding for energy efficiency investments.

The Joint Utilities understand concerns expressed by DPS, NYPA, and NYSERDA staff. The Joint Utilities and the Efficiency Ramp Up Advocates note that the Consolidated Edison Joint Proposal that increases the amount of utility energy efficiency activities beyond that expected through the ETIP is appropriate and aligned with the State's policy goals of increasing energy efficiency savings. Further, the Joint Utilities and the Energy Efficiency Ramp Up Advocates are concerned that absent efforts to remedy the decrease in NYSERDA's resource acquisition activities through ramp up of proven energy efficiency investments, the risk of backsliding from the CES goal in the short term increases. Such increases in energy efficiency activities and cost recovery mechanisms should be considered in utility rate cases and related regulatory proceedings.

## 6.2 Near-Term Illustrative Targets Compared to Currently Expected Achievement

The Working Group compiled publicly available estimates of energy efficiency savings that are expected to be realized from currently funded programs across program administrators: i.e., from utility ETIPs, NYSERDA CEF filings, and estimates provided by LIPA and NYPA. For this simplified analytic exercise, the Working Group did not include estimates for electric efficiency savings procured through utility non-wires alternatives.[94] The Working Group also derived an estimate for efficiency savings from building codes and standards and appliance standards (C&S) that follows NYISO's C&S forecasting methodology. Appendix C further describes the data sources and assumptions applied.

For efficiency savings in the relatively near term, this data allowed us to roughly compare the estimated energy efficiency impacts from currently planned actions to (1) the Statewide Minimum Energy

[94] The Working Group also did not include the additional energy efficiency activities that are provided for in the Consolidated Edison Joint Proposal because this rate case proceeding was ongoing at the time of our work. We determined that the REV Demonstration Projects that establish online marketplaces are expected to support achievement of efficiency savings already included in the ETIPs targets.

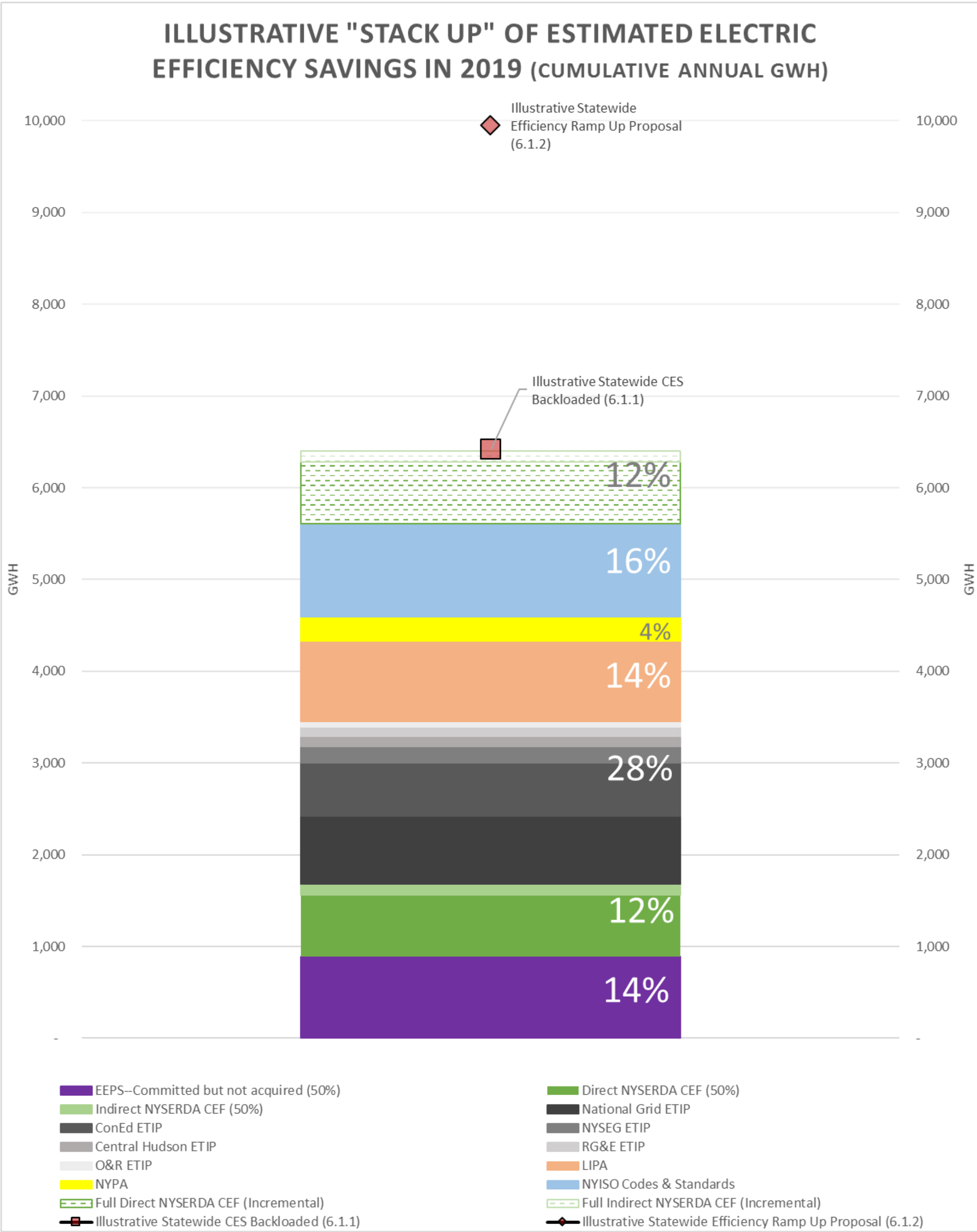
Efficiency Achievement Levels developed using the CES Benchmarking Option and (2) the Efficiency Ramp Up Strategy, as described above.

Figure 7 shows this comparison of illustrative targets to estimated electric efficiency achievement as a “stack up” graphic that shows savings in GWh for the year 2019. In Figure 7, estimated savings are shown as wholesale savings for consistency with the illustrative targets discussed in Section 6.1; since existing goals for program administrators typically are expressed in terms of efficiency savings “at the meter,” a line loss adjustment factor was applied as appropriate.

As discussed in this report, an outcome-oriented approach assesses energy efficiency outcomes based on changes that are measured in normalized electricity sales over time. Thus, an energy efficiency measure installed in December of 2017 would primarily impact an outcome-oriented metric from 2018 onward (rather than “counting” as 2017 achievement). To approximate this dynamic aspect of measuring reductions in GWh load, in Figure 7 a one-year “lag” is assumed from when CEF and ETIP program funds are “committed” to energy efficiency activities and their expected impact on load. In other words, the “stack up” graphic for 2019 includes estimated savings from CEF and ETIP program activity that is scheduled to be committed in 2016, 2017, and 2018; the same three years are used to estimate savings from NYPA activity. In contrast, for LIPA the estimated savings included in Figure 7 account for program activity that is scheduled to be committed over the 2016-2018 period plus 50% of the activity scheduled to be committed in 2019, following the convention adopted by LIPA/PSEG-Long Island for forecasting energy efficiency impacts in the LIPA service territory.

The savings estimated from direct and indirect NYSERDA CEF activities are divided in half, with 50% shown in the solid green “wedges” toward the bottom of the stack up graphic and the other half shown in lightly dotted wedges at the top of the stack. This presentation reflects that Working Group members hold significantly different views on the level of uncertainty associated with NYSERDA CEF achievement. Appendix C addresses distinction between direct and indirect savings from the NYSERDA portfolio.

**Figure 7: Illustrative "Stack Up" of Estimated Electric Efficiency Savings in 2019 (Cumulative Annual GWh over 2016-2019).**



Among Working Group members, analysis of the results from this "stack up" comparison varied, in part based on what level of uncertainty members assumed for various components of potential load reduction.

To some Working Group members, the Minimum Statewide Energy Efficiency Achievement Level trajectory appears reasonable to meet or exceed over the next several years, given the backloading employed. That is, the annual statewide wholesale savings of about 6,400 GWh by 2019 (cumulative from 2016) shown on Figure 7 appears within reach. In this analysis, it is appropriate to factor in an assumption for savings from codes and standards, following NYISO's methodology as introduced in the 2016 NYISO Gold Book.[95] Even allowing for some uncertainty regarding program achievement relative to commitments, this view holds that utilities could realistically increase the impact (in terms of MWh acquired per dollar) of their currently funded efficiency programs to fill any modest gap in the near term. Over the medium and longer-term, more market-initiated energy efficiency would be needed to keep pace with the expected trajectory of savings.

Other Working Group members believe that it is likely that the 2019 Minimum Statewide Achievement Level highlighted in the "stack up" graphic will not be met unless there is a sufficient increase in energy efficiency investments such as those made by utilities to enable increased adoption of energy efficiency.

The Joint Utilities note that Codes and Standards represents approximately 16% of the Statewide Minimum Achievement Level, a number based on a non-transparent[96] methodology utilized by the NYISO reliant on estimates and counterfactual assessments, as described to members of this Working Group.[97] The Joint Utilities believe that a more appropriate analytical approach would be to estimate energy reductions based on specific adoptions of building codes and their corresponding compliance rates. Based on experience in other states such as Massachusetts and Rhode Island, it appears building codes produced energy savings at levels significantly below that suggested by the methodology used by the NYISO; however, the NYISO estimate also accounts for appliance standards. In the Joint Utilities view, the NYISO estimates appear to be subject to significant uncertainties, including geographical allocation of energy reductions from building codes and standards across New York. The methodology also does not appear to consider other potential variables that cause changes in electricity consumption, which may shift in the future. Further, the Joint Utilities note that in the EEPS 2 period, NYSERDA's achieved electric efficiency

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[95] New York State Independent System Operator, Inc. (2016), 2016 Load & Capacity Data Report, (2016 NYISO "Gold Book"), Retrieved from: http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Planning_Data_and_Reference_Docs/Data_and_Reference_Docs/2016_Load__Capacity_Data_Report.pdf

[96] An analyst at the NYISO indicated that the methodology employed is not public. The geographic distribution of energy reductions from such codes and standards as well as details of assumptions is unclear to members of this Working Group.

[97] An analyst at the NYISO described using a triangulation method based on (i) a retrospective empirical analysis that compares historic normalized electric load counterfactual to actual reported contributions from energy efficiency programs with an attribution of the remaining, unexplained energy use reduction as one estimate of the impact of codes and standards: (ii) a comparison of the estimate with national and regional results reported in literature: and (iii) an estimate of NYSERDA's programs' codes and standards impact, as the basis for a discount factor to avoid double counting.

savings has averaged about 55% of its targets.[98] In Figure 7, 50% NYSERDA achievement is shown in the solid portion of the "stack up" graphic and the balance is shown as dotted to indicate uncertainty. NYSERDA's new market animation and market transformation activities have yet to demonstrate their viability in producing energy reductions.

Members of the Working Group broadly agreed that this "stack up" comparison indicates that the 100% statewide target level calculated pursuant to the Efficiency Ramp Up Strategy does not appear to be achievable in the near-term based on the State's currently-approved funding and existing suite of mechanisms to spur energy efficiency investments. The size of the gap perceived by Work Group members varied in the same manner that views differed regarding the feasibility of attaining the statewide minimum achievement level shown.

### 6.2.1 Conclusions Drawn from the "Stack Up" Comparisons

The Joint Utilities' and other Working Group members draw the following conclusions from the comparison of estimated energy efficiency impacts from currently planned actions to possible targets. First, because the contribution of some "stack up" resources could be overstated or otherwise subject to significant uncertainty, there could be a large gap between the target and energy savings actually delivered in the short run unless energy efficiency investments are ramped up. Second, in order to close the gap and not backslide on efficiency efforts, and to move on a trajectory toward achieving CES objectives, current efforts that have demonstrated success in enabling greater adoption of energy efficiency, such as utility programs, and related funding should be ramped up. Third, the Joint Utilities state that in the near term, energy efficiency related targets for the purposes of developing EAMs should be set based on realistic estimates of savings, including savings that reflect the ramp up of adequately funded utility investments in energy efficiency, with service territory targets later developed after utilities perform potential studies.

The Joint Utilities view the amount of energy efficiency assumed to be developed by 2030 in the CES Order as achievable through ramping up of successful of energy efficiency investments in the near term, such as those made by utilities' adequately funded efforts to enable increased adoption of energy efficiency. From the standpoint of the Joint Utilities, the ramp up should be supported through adequately funded utility energy efficiency investments because of the uncertainty related to the results expected from market transformation activities, as well as an unclear magnitude of contribution to be expected from improved codes and standards.

The Efficiency Ramp Up Advocates observe that according to the 2016 State Energy Efficiency Scorecard released by the American Council for an Energy-Efficient Economy, the NY Investor Owned Utility (IOU) ETIP filings and NYSERDA CEF framework equate to an estimated 0.7% annual savings.[99] While the ACEEE data is calculated separately from the stack up in this Working Group's report, this 0.7% total (for IOU and NYSERDA goals) is consistent with our analysis. The Efficiency Ramp Up Advocates feel strongly that the risk of backsliding as we build a bridge to the future energy vision is real, and that the

[98] Figure provided by NYSERDA staff.
[99] See ACEEE 2016 State Energy Efficiency Scorecard, at p. 141.

best way to prevent this is through more ambitious goals than are represented by current plans and the creation or funding of adequate investment mechanisms to achieve those goals.

In the Efficiency Ramp Up Advocates' view, while the Commission can to a certain extent accommodate uncertainty and disagreement regarding the level of energy efficiency achievement that is achievable under current policies by approving EAMs that include a wide gap between the Minimum Achievement Level and Maximum Earnings Threshold, it is clear that greater funding for energy efficiency (or greater cost recovery for energy efficiency investments) will be needed to allow for an increase in annual incremental efficiency of 0.4% per year, in line with the ramp ups that have been achieved in other leading states.

The Efficiency Ramp Up Advocates and the Joint Utilities thus find that additional mechanisms to spur energy efficiency investments, beyond those which have currently been approved, are needed to meet anticipated targets. The majority of Working Group members concluded that in the near-term, the Commission should provide for cost recovery mechanisms that allow for ambitious and cost-effective utility investments in energy efficiency. This includes resources for established utility programs and, to the extent feasible, new REV market mechanisms.

## 6.3 Mechanisms to Support Energy Efficiency Achievement

The Working Group recognizes that meeting New York State's clean energy goals will require a meaningful and sustained increase in statewide energy efficiency, with public institutions and utilities working with and alongside private sector markets.

A core objective of the REV policy framework is to create vibrant markets for DER – including energy efficiency as an attractive business opportunity, in turn driving greater market-wide levels of energy efficiency with less need for direct ratepayer support. REV seeks to enable market actors to develop energy efficiency solutions and value propositions that meet the needs (and the economics) of customers and building decision makers. At present, however, energy efficiency transactions are limited by a range of market barriers that dampen demand and impede scale, which vary across technologies and (fragmented) market segments.

The path from today to a truly vibrant energy efficiency market represents a fundamental shift from the current 'program-based' construct. In discussing energy efficiency targets in the face of unknown market-initiated contributions to overall energy efficiency achievements, our Working Group members put forth thoughtful ideas to achieve a successful outcome. As we worked to communicate candidly, the following were notable themes:

- Numerous Working Group members shared the view that the envisioned transition will take time and a ramp up of successful investments in energy efficiency is required in the short run to make meaningful progress on a trajectory toward the CES' 2030 goal. A variety of approaches could be considered in detail in utility rate cases or regulatory proceedings, including but not limited to a mechanism to recover energy efficiency investments through base rates coupled with an appropriate longer-term amortization of such investments.

- Numerous members, including those from the Joint Utilities, expressed that a timely and efficient approach for narrowing the gap between current commitments and higher energy efficiency targets is to ramp up adequately funded utility programs to achieve savings that are above the levels reflected in the ETIPs. In this view, such programs have a track record of providing meaningful increases in energy efficiency, and are well-positioned to help the State make progress, and not backslide, even as other approaches are investigated and developed. Such programs could include proven approaches in addition to new and innovative designs, and be made recoverable in base rates rather than through the SBC surcharge mechanism that currently provides support for ETIPs.

- Working Group members from DPS and NYSERDA pointed out that under the REV proceeding, the ETIPs currently provide an important base level of funding for energy efficiency, which the utilities are expected to augment through integrating energy efficiency into their core business operations.

- Members broadly recognized that our Working Group needs to better understand the components and aggregate level of customer bill savings that are expected to result from using energy efficiency as a means of achieving operational efficiencies via permanent load reduction and load shaping, including in areas without distribution-level grid constraints. This question is part of our ongoing work, and it is a prerequisite to considering how the expected customer savings could be shared among all ratepayers, customers who invest in energy efficiency, third party actors, and utility shareholders.

- Working Group members acknowledged the opportunity of having both resource acquisition activity (expected to be primarily administered by utilities going forward) and market animation and transformation activity (as NYSERDA's focus) as complementary tools. In turn, the Working group notes the importance of coordination across the utilities and NYSERDA. As discussed in the REV proceeding, all customer-funded strategies should serve to increase market penetration of efficient technologies and processes; moreover, resource acquisition procurements can be combined with third-party activities to drive greater value for customers. In the context of target setting, it also is important to recognize that market transformation activities require a multi-year time horizon to both develop and assess impact.

- The opportunities to apply the utilities' core capabilities and assets in facilitating energy efficiency extend beyond mere delivery of conventional efficiency programs. These capabilities include information on customer usage patterns, which can enable tailored offerings and marketing; regular customer contact and a trusted brand that facilitate a utility's role as a channel to market; relevant technical and engineering expertise; deep knowledge of their distribution system; and the potential to procure energy savings across a large portfolio of projects, thus mitigating technology performance risk through aggregation.

- Data access was recognized as an essential facilitator of clean energy market development. Ongoing and developing data issues are under consideration in multiple forums in New York State, to address the availability of customer and operational (system) data, the data needs among developers and service providers, and the utility's role in maintaining, assembling and disseminating essential data.

- NYSERDA welcomes ideas from and collaboration with utilities and market actors in setting priorities for NYSERDA and NY Green Bank investments in energy efficiency, with the aim of maximizing the impact of ratepayer funds made available through the Clean Energy Fund. Market barriers that NYSERDA will address through market transformation initiatives include lack of trust in technology performance by customers and financial institutions; limited and uneven awareness among consumers, vendors, and service providers; and financing gaps in current clean energy financing markets (the focus of NY Green Bank). NYSERDA is placing emphasis on the critical need to reduce "soft" costs and streamline implementation for energy efficiency projects, across government activities (e.g., permitting) and by encouraging market actors to coalesce around standardization.

- Working Group members further noted that to be motivated to invest in standardization, market players need to see the opportunity for steady revenue streams from a market at sufficient scale.

- This Working Group is currently investigating two critical focus areas that are necessary to develop strategies to create vibrant markets for energy efficiency as an attractive business opportunity, which are expected to drive greater market-wide levels of energy efficiency. The first is market design where we are identifying the key elements of a market to monetize and transact based on energy efficiency cashflows. Second, we are focusing on the value delivered via a unit of energy efficiency, who it's delivered to, and what it's worth. We also expect to uncover some potential new business models made possible via the selling of cashflows while recognizing the full value of a unit of energy. Our forthcoming report to the CEAC Steering Committee will provide recommendations related to the establishment of an energy efficiency market to procure savings, including the identification of thresholds or choice points we will need to be mindful of in order to get from here to there.

### 6.3.1 Perspectives on State Policy Direction

In undertaking the work synthesized in this report, Working Group members also shared broader perspectives on the direction of New York State policy with respect to energy efficiency.

#### *6.3.1.1 Perspective of the Efficiency Ramp Up Advocates*

As the Commission transitions to the outcome-oriented approach to energy efficiency metrics and targets discussed in this report, Working Group members including the "Efficiency Ramp Up Advocates" are concerned that a tension is emerging between the Commission's clear desire to facilitate energy efficiency achievements that promote the cost effective achievement of the Clean Energy Standard and other state energy policy goals, and the State's current funding framework and existing suite of mechanisms to spur energy efficiency investments.

While the Clean Energy Fund Order capped the amount of System Benefit Charge collections, no mechanism has yet been put in place that allows "the regulatory system . . . to properly value the" energy efficiency "attributes that the [System Benefit Charge] has been used to promote," as envisioned in the

Track 1 Order.[100] The Value of DER proceeding is anticipated to yield a new methodology for crediting distributed generation projects that attempts to align such credits more closely with the value that distributed generation provides. But in the view of the Efficiency Ramp Up Advocates, the methodology being considered by Staff does not seem applicable to the unique attributes of the energy efficiency resource, and the scope of the proceeding has become focused on non-energy efficiency DERs.

This Working Group is currently developing a report, to be issued in 2017, that will explore potential new market mechanisms for spurring energy efficiency investments. But these new mechanisms are at the early stages of development. For many of these mechanisms, pilots will be prudent prior to wide scale adoption. In the interim, without some means of providing for greater efficiency achievement, the Efficiency Ramp Up Advocates are concerned that the State will continue to lose time and thus risk backsliding on existing levels of achievement, potentially jeopardizing a feasible, near-term ramp up in energy efficiency investment to facilitate the State's energy policy goals.

Accordingly, to prevent this scenario from occurring and to instead ramp up efficiency savings levels, the Efficiency Ramp Up Advocates recommend that the Commission act, through individual utility rate cases or other means, to provide for greater investment for energy efficiency efforts in the near term. This channeling of new investment could take the form of not only the implementation of proven energy savings acquisition mechanisms, but also new mechanisms to spur energy efficiency investments by third party actors. The Working Group anticipates that many of the new procurement strategies to be recommended in its upcoming report will entail new utility-administered mechanisms that are more aligned with REV than traditional programs, but that nevertheless will necessitate new funding.

While the Efficiency Ramp Up Advocates believe that it is still unclear what the Commission means when it calls to "advance[] energy efficiency as an operational resource rather than a regulatory mandate," they are open to exploring this approach so long as provides utilities with a robust business case for significant increases in energy efficiency investments. Significant details must still be worked out regarding how such a mechanism could function. But should such a mechanism prove workable, the Efficiency Ramp Up Advocates believe that the ambitious targets outlined in the Efficiency Ramp Up Strategy would be well-suited for this approach. The robust targets outlined in the Efficiency Ramp Up Strategy would incent utilities to search for opportunities to advance energy efficiency wherever available. In this manner, the robust targets would serve as a catalyst to enable REV-aligned procurement mechanisms. The Efficiency Ramp Up Advocates look forward to exploring this idea and other similar ones through this Working Group in the coming months.

The Efficiency Ramp Up Advocates believe that regardless of the specific mechanism used for catalyzing efficiency investments, the Commission must adopt robust targets now. The Efficiency Ramp Up Advocates and Joint Utilities agree that a clear signal that cost recovery rules will be structured such that utilities are enabled to achieve those targets is critical to ensuring shared enthusiasm from the utilities for ambitious targets and active participation by third party market actors.

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[100] Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting Regulatory Policy Framework and Implementation Plan (REV Framework Order) (Issued and Effective February 26, 2015), at 18.

### *6.3.1.2 Perspective of the Joint Utilities*

The Joint Utilities support the State's CES goal and are concerned about a backsliding from the trajectory leading to achievement of those goals without a ramp up of successful and adequately funded energy efficiency investments, even as new and yet to be proven market transformation activities begin to yield results. The Joint Utilities support the approach in Consolidated Edison's Joint Proposal that created mechanisms to increase energy efficiency achievements cost-effectively. A similar approach could be adopted for other Joint Utility members to begin to make meaningful progress in meeting state policy goals. Such approaches should be considered in detail in utility rate cases or related regulatory proceedings.

### *6.3.1.3 Perspective of New York State Staff*

Working Group members from DPS, NYPA, and NYSERDA suggest that New York State policymakers and stakeholders should concentrate on supporting progress toward the State's clean energy goals over the medium and longer term, including the objective of developing vibrant markets for energy efficiency that require little or no out-of-market ratepayer subsidy, rather than focusing attention on rapidly increasing annual energy efficiency savings targets over the next several years. Annual savings goals encourage program administrators to focus most of their attention on "this year," and thus create a disincentive to make investments in efficiency technology or market intervention strategies that will take several years or more to begin to show results, even if the longer-term payoff could be very large.[101] Under the CEF's ten-year horizon, NYSERDA has the opportunity to invest in strategies designed to foster scale in energy efficiency markets over time, in order spur increased levels of energy efficiency without adding to ratepayer surcharges. In NYSERDA, NYPA, and DPS staff's view, it would be incorrect to characterize this transition of NYSERDA's portfolio as "backsliding" on the State's commitment to energy efficiency achievement.

With regard to increasing total investment in energy efficiency, State policymakers and staff stress that the portfolio of surcharge-funded programs and complementary public sector investments should not be viewed as the total support available for clean energy programs in New York State. The State expects utilities to increase direct utility investment in energy efficiency as an operational resource, i.e., by integrating efficiency into the planning and operation of electric distribution systems. Under this framework, associated costs would be recovered through rates and utilities would have opportunities to share in the savings realized through achieving greater system efficiencies, including through outcome-oriented performance incentives for energy efficiency. And as an indication of how utility programs are moving from a primary focus on annual savings goals toward a broader range of metrics, DPS Staff has recommended in Consolidated Edison's Joint Proposal collaborative using longer-term efficiency trends as a metric in determining an EAM for that company. DPS staff note that in the Con Edison Joint Proposal, additional energy efficiency deployment is contemplated coupled with incentives to encourage the utility to procure or otherwise facilitate greater amounts of energy efficiency, including cost recovery via distribution rates instead of surcharges; EAMs based on outcome-oriented metrics; reduced per kWh costs vis a vis the utility's ETIP; and streamlined reporting requirements.

[101] Neme, C., & Grevatt, J. (February 2016), The Next Quantum Leap in Efficiency: 30 Percent Electric Savings in Ten Years, The Regulatory Assistance Project: Montpelier, VT., retrieved from http://www.raponline.org/document/download/id/7944

In addition, the State expects the voluntary market for energy efficiency and other clean energy services to make substantial contributions to the overall goals over time. Ultimately, the Commission and the New York State Energy Plan emphasize that achievement of New York State's clean energy goals hinges upon the ability to animate markets that attract additional private capital investment in energy efficiency solutions that deliver value to customers and the grid.

DPS, NYPA, and NYSERDA staff concur with the Working Group's recognition that more work is needed to map out the components of value delivered through energy efficiency, what this value is worth at different locations and times, and how this value can be monetized and shared. A specific area for further analysis is to quantify how multiple scenarios for energy efficiency achievement would be expected to impact CES compliance costs, both through 2021 and over the longer term.

DPS, NYPA, and NYSERDA staff on the Working Group appreciate that increasing funding for established utility energy efficiency programs is a more familiar path to achieving incremental gains in energy efficiency savings. Placing emphasis on near-term savings targets and acquisition, however, risks diverting attention and resources from the challenging work of advancing the evolution in utility programs and State support for achieving energy efficiency at scale, as is called for under the REV initiative.

# 7. Analysis of the Potential Impacts of Energy Efficiency Measures on System Efficiency

Consistent with the Track 2 Order, this Working Group has been tasked with analyzing the potential impacts of energy efficiency measures on peak load reduction and load factor. This section of the report offers a framework for such an assessment. We discuss the development of representative hourly load impact profiles for each energy efficiency measure. These profiles could then be used to calculate coincidence factors for each specific energy efficiency scenario the utility is trying to achieve, taking into account factors including, but not limited to, weather and geographic/network location.

We envision that New York State utilities can use the analytical approaches discussed in this section to help optimize and balance goals across the metrics related to energy efficiency, peak load reduction, and load factor in order to fulfill the requirement stated in the Track 2 Order that each utility should: "propose system efficiency targets that include both peak reduction and load factor. These targets will accompany energy efficiency targets…and should be implemented in a manner that achieves an optimal balance among the policy goals."

The purview of this group has been to look only at the impacts of energy efficiency on peak load reduction and load factor and to create a framework to quantify those impacts. This work should eventually be expanded to include the impacts of other demand-side resources on peak load reduction and load factor. A similar framework should be developed to quantify the impacts of these resources as well. This will ultimately better reflect the goals and objectives of REV.

## 7.1 Framework for Assessing the Impacts of Energy Efficiency

Energy efficiency investments in the electricity sector in New York State have been driven by environmental policy goals primarily related to greenhouse gas emissions. Such investments have been generally undertaken through programs administered by utilities and NYSERDA, as well as NYPA and LIPA, and have typically been enabled through funds collected from utility customers. To date, energy efficiency programs have sought to maximize the overall energy reduction (in kWh) achieved through energy efficiency measures. Under the REV initiative, New York State is developing a policy framework through proceedings such as those related to REV, the BCA Order, the CES Order, and utility Distributed System Implementation Plans (DSIPs), which include Non-Wires Alternatives (NWAs), to enable customers to better manage energy use, enhance penetration of DER, improve utility infrastructure efficiency, and reduce overall emissions. Such policies have provided new opportunities for energy efficiency resources to provide benefits such as enabling deferral of utility infrastructure or reductions in system or more localized load peaks. On the other hand, energy efficiency has adverse impacts on a load factor metric when consumption troughs are reduced more than load peaks. In order to better understand such varied impacts of energy efficiency it is important to understand how energy efficiency impacts electric consumption as an integrated whole and what benefits and challenges an increasing penetration of energy efficiency presents.

At a fundamental level, implementation of energy efficiency at a particular location results in a reduction of overall energy use at that location. For example, if an air conditioner unit is replaced with a more efficient unit, it results in a reduction of overall energy use. In addition to the impact on overall energy use, the energy efficiency measure also results in a reduction of instantaneous energy demand during the times the EE measure is "operational". Going back to the example of the air conditioner, a more efficient air conditioner will consume less energy on an instantaneous basis for all the hours in use as compared to a less efficient air conditioner that would have otherwise been in use. Thus, in combination, an energy efficiency measure would result in reduced overall consumption (kWh), reduced instantaneous energy demand (kW) during hours of the day when the measure is operational, and no impact on energy demand when the energy efficiency measure is not operational.

The complexity of determining such energy efficiency impacts arises from the differential operational patterns of an energy efficiency measure down to the granularity of each and every installation. As an example, the replacement of an incandescent light bulb with a more efficient lighting technology such as a LED bulb could have a wide array of impacts depending on the end use. Two identical LED bulbs (replacing identical incandescent bulbs) that are each typically on for 9 hours each day would result in the same reduction in overall energy use; but if one of the bulbs is located inside a school and is operational between 8 am and 5 pm, and the other bulb is located outside of the same school building and is operational between 8 pm and 5 am, they would have entirely different impacts on peak load and on the load curve. The bulb in the school may contribute to reducing the system peak in the large wholesale control area where it is located if the control area peaked within the hours the bulb is operational and thus contribute to a reduction in bulk system generation or transmission need. However, it may not provide any benefit to the distribution network or local feeder if it is located in a locally night-peaking residential area. Similarly, the outdoor light may not contribute to reducing the wholesale system peak but may provide a benefit by reducing the distribution peak. Further, these two indicative energy efficiency installations impact the load curve, and thus system efficiency metrics, in different ways. The light bulb in the school will improve the load factor of the bulk system but adversely impact the load factor of the night-peaking distribution system by reducing energy demand during daytime hours alone; and vice versa for the outdoor bulb installation that improves the load factor of the distribution system but adversely impacts the load factor of the bulk system.

A clear and accurate understanding of the holistic impacts of energy efficiency are useful in encouraging specific energy efficiency measures to be located in specific areas when there are additional benefits in the form of peak reduction and capital infrastructure deferral. To accurately measure such "system impacts" of energy efficiency it is necessary to (i) develop representative hourly load impact profiles for an energy efficiency measure being installed for a specific end use in a specific customer segment (for example, a LED light bulb installation in the living room of an apartment in northeastern Brooklyn) on a peak day, and (ii) develop an ability to aggregate such representative curves of all energy efficiency measures in a given area in order to accurately predict the overall impact of all those measures collectively at various levels of the electrical system on a peak day. Figure 8 provides an illustration of the parameters that can be tracked for each energy efficiency measure through an hourly load curve. Such information can serve to illustrate the impact of the energy efficiency measure on system peak demand, network or local peak demand, energy use reduction during system peak hours, energy use reduction during network or local peak hours, the energy reduction during off-peak hours in addition to total energy reductions.

**Figure 8: Energy Efficiency Measure Parameters**

| EE Measure Area | Energy (kWh) | System Peak (kW) | Network Peak (kW) | System Peak (kWh) | Network Peak (kWh) | Off-Peak (kWh) |
|---|---|---|---|---|---|---|
| | | | | | | |

Additionally, it would be beneficial to develop simulation-based 8,760 hourly load impact profiles for a one-year period associated with each energy efficiency measure being installed for a specific end use for a specific customer segment. Such analyses are routinely performed for other DERs such as solar PV, but energy efficiency, with the attendant multiple end uses and customer segments, presents a high level of complexity with respect to data analysis and compilation. However, such analyses, when aggregated, provide significant benefits in estimating the impact of energy efficiency on not just all hours of a peak day but in estimating seasonal variations and impacts for a comprehensive understanding of system impacts.

Granular levels of information from an 8,760 hourly analysis of energy efficiency and associated aggregations providing impacts of energy efficiency on electricity demand both during a peak day and during different seasons is especially beneficial when an EE measure can have varied impacts at different levels of the system, as in the LED lighting example above. Such information can then inform decision making to appropriately balance multiple objectives in order to incent those installations where net positive impacts on the whole are maximized even if there is a negative impact on some levels of the electrical system.

Many utilities forecast the peak demand impact of a portfolio of energy efficiency measures on a utility service territory level, rather than on a more granular basis, since information on non-utility administered programs is more limited. Utilities may not know the location of customers reached by other entities, such as NYSERDA or NYPA, within their territory and therefore circuit or bank forecast impacts are unknown[102]. It is important that the collaboration between utilities, NYSERDA, and NYPA continue so the impact of programs within a utility service territory are understood on a more granular basis as is desirable when analyzing energy efficiency impacts on the distribution system. As NYSERDA's interventions shift increasingly to target market animation and transformation and the upstream supply chain (rather than specific homes and buildings), and as DER penetration grows, utilities will need to develop more sophisticated forecasting methodologies to account for significant new uncertainties, such as estimating real impacts on energy use from these activities.

Currently in New York, Con Edison has developed a framework for its energy efficiency programs, and has also used it for the Brooklyn Queens Demand Management (BQDM) program, to determine aggregate impacts on a peak day of energy efficiency measures in customer segments such as small businesses and multi-family apartments by consolidating hourly impacts of multiple measures used in multiple circumstances. Con Edison utilized an analytical tool which consists of pre-populated 8,760 hourly

[102] Case 14-M-0101, Initial Distributed System Implementation Plan, Orange and Rockland Utilities, Inc. (filed June 30, 2016).

load profiles for various energy efficiency technologies among a variety of building types. The 8,760 hourly load profiles are based on the U.S. Department of Energy's (DOE) benchmark building models, which were simulated using New York City Typical Meteorological Year (TMY) in 2009. The tool was also augmented to become capable of estimating impacts on peak load through a stand-alone peak calculator. Additional adjustments were made to the profiles so that the load curves would yield the demand savings prescribed by the New York State Technical Resource Manual. Con Edison has been performing hourly impact analyses for energy efficiency based on these load curves for both the system and network peaks. Simulations based on the 2013 DOE benchmark buildings with both the TMY file and actual 2013 weather readings provided the means for a sensitivity analysis of energy demand during unusually long heat-waves. Con Edison has developed a stand-alone load shape library that includes the hourly load profiles of the building and end-use types illustrated in the Figure 9 to estimate the load relief provided by various technologies.

**Figure 9: Con Edison Load Shape Library by Building and End-Use Type**

| Code | Segment |
|---|---|
| SFR | Single Family – Res |
| MFS | Small Multi-Family - Res (2-4 units) |
| MFL | Large Multi-Family - Res (>5 units) |
| OFL | Office-Large (> 50,000 sq. ft.) |
| OFS | Office-Small (<50,000 sq. ft.) |
| RES | Restaurant |
| RET | Retail |
| GRO | Grocery |
| WAR | Warehouse |
| EDU | Education |
| HOS | Hospital |
| NUR | Nursing Home |
| LOD | Lodging |
| ENT | Entertainment |
| MIS | Miscellaneous - Commercial |
| MFC | Multi-Family - Commercial (Common areas only) |
| IND | Industrial |
| **Code** | **End-use** |
| FAC | Total Facility (Electric) |
| LGT | Total Lighting (Electric) |
| LGI | Lighting Interior (Electric) |
| LGE | Lighting Exterior (Electric) |
| PLU | Plug Loads (Electric) |
| COO | Cooling (Electric) |
| HEA | Heating (Electric) |
| VEN | Fans/Ventilation (Electric) |

| | |
|---|---|
| **HVA** | **Total HVAC (Electric)** |
| **REF** | **Refrigeration (Electric)** |
| **DHW** | **Hot Water (Electric)** |
| **GFA** | **Total Facility (Gas)** |
| **GHE** | **Heating (Gas)** |
| **GDW** | **Hot Water (Gas)** |
| **GIE** | **Interior Equipment (Gas)** |

In an additional demonstration of complexity arising out of distinct local variations, Con Edison conducted a rigorous Measurement and Verification (M&V) pilot in the BQDM area to secondarily validate hourly energy efficiency load reductions and provide assurance that the estimates of hourly impacts of energy efficiency developed using existing tools were indeed accurate. The pilot was conducted by measuring load reductions at a statistically representative sample of installation locations. Results indicated variations from the energy efficiency load curves developed for New York City as a whole, implying that even within a territory such as New York City significant variations in energy efficiency impacts can be found, from borough to borough or even within a borough. Experience from the BQDM program's pilot implies that utilities and other entities providing incentives can appropriately balance objectives of accuracy that can be achieved through an increasingly granular analysis against the use of a simpler, less expensive approach employing broader geographic generalizations when such an approach would suffice.

As demonstrated in this section, energy measures produce different impacts both between measures (lighting versus insulation, etc.) as well as within measures (time of year, customer class, etc.). For example, the replacement of an inefficient bulb with an efficient bulb will only produce demand savings during the time that the bulb is operational but those hours of operation could vary among customer classes and by time of year while the actual measure is the same.

It is also important to note that energy efficiency programs in New York have traditionally been targeted at decreasing overall energy consumption (kWh), which is a critical component to reaching the clean energy goals and objectives of the state as discussed within this report. Therefore, energy efficiency measures that provide an overall energy consumption reduction, but that may negatively impact a distribution system efficiency metric and/or a bulk system efficiency metric through a reduction in the related load factor, should not automatically be precluded from receiving incentives based solely on their impact on the load factor metric. The Commission has outlined goals that are targeted at both carbon reduction and peak reduction. In order to create metrics and incentives that are not competing with each other in a manner as to preclude a reasonable and optimal balancing among objectives, strategies should be designed to optimally realize the benefits of both energy efficiency and system efficiency goals while at the same time recognizing competing factors. In a similar vein, a utility can leverage funding and resources available through both system efficiency and energy efficiency programs to implement measures that provide both a distribution benefit and overall energy savings.

The Working Group recommends that representative hourly load impact profiles be created for all energy efficiency measures that are included in utility system planning. As an interim step, when a utility puts out a Request for Proposals (RFP) for energy efficiency solutions to satisfy a non-wires alternative need, it could indicate what system need it is trying to fill (i.e., peak reduction, duration of need etc.) and require the third party energy efficiency provider to demonstrate, through an energy efficiency impact study, how their proposed measure fulfills that need. The utility might want to hire an independent third party consultant to verify that these energy efficiency impact studies seem reasonable and/or to conduct an M&V study after the measures have been installed to confirm that the energy efficiency measures had the desired impact. These energy efficiency impact studies will provide additional, more granular information about energy efficiency measures that will most likely precipitate the need for a better forecasting process to incorporate the greater level of energy efficiency detail (see Appendix E on forecasting).

## 8. Summary of Findings to Date and Additional Analysis Needed

This report documents our Working Group's research, analysis, and discussion in response to the Commission's direction to the CEAC to develop recommendations regarding metrics and targets to inform a utility performance incentive for energy efficiency, with specific attention to: (1) outcome-oriented metrics, including consideration of electric usage intensity metrics and normalization methodologies and (2) electric efficiency targets that go beyond those included in the existing utility ETIP and CEF programs. It further responds to the Commission's instruction to generically analyze the potential impacts of energy efficiency measures on peak load reduction and load factor metrics. These initial tasks are elements of the Working Group's overall work to develop strategies to create vibrant markets for energy efficiency as an attractive business opportunity, resulting in greater market wide levels of energy efficiency with less need for direct ratepayer support. The objectives above reflect the Commission's desire to implement new approaches that create a more lasting market structure to catalyze investment in clean energy and energy efficiency.

An overarching finding of this Working Group is that significantly more analytical work is needed in order to determine the most appropriate energy efficiency metrics and targets to support an outcome-oriented, performance-based incentive for utilities. In multiple instances, this report therefore presents options, preliminary recommendations from stakeholders (some as Working Group recommendations, others from defined group of stakeholders), or topics for consideration to inform additional analysis.

The Working Group defined and investigated two categories of outcome-oriented metrics for electric energy efficiency: (1) consumption metrics that measure the net change in normalized electricity use (e.g., wholesale or retail sales) across the utility service territory over time and (2) intensity metrics that measure the net change in normalized electricity use on a per unit level (e.g., usage per capita or per square feet of building floor area) across a sector over time. In both cases, the intent of the metric is to measure savings from aggregate energy efficiency activities, spanning programmatic and policy interventions and market-initiated activity that operates without direct utility or government incentives. Based on our analysis to date, the Working Group identified that one practical means to implement an outcome-oriented approach may be utilize a consumption metric that measures the reduction in normalized MWh sales for the service territory as a whole, with corresponding targets for each utility. As discussed in the normalization section, the exact approach to calculating this metric would need to be further developed. In implementing such a consumption metric, sector-specific intensity metrics could also be tracked, with electricity usage per capita in the residential sector and electricity usage per employee in the commercial sector assessed to be the most promising metrics.

Specifying an outcome-oriented metric for energy efficiency will require normalization of electricity sales for weather and certain other factors that drive load, including economic growth and anticipated increases in "good load" (i.e., beneficial heat pumps and electric vehicles). The Working Group is unable to recommend a precise method for normalization and underscores the need for further analysis by specialists. With respect to weather normalization, we propose for consideration the potential development of a regression model using daily electricity consumption data and weather data over a short period of time; subsequently, the weather-normalized data could be aggregated for the year and used either to directly construct an intensity metric or to develop an econometric model that further adjusts for economic variables.

We were unable to identify an econometric modeling approach that we felt comfortable recommending, in large part due to the challenges associated with developing a model capable of producing adequately precise estimates. In other words, confidence intervals were so wide under the methodologies that we examined that those methodologies may not be suitable for adequately measuring achievement of the specified energy efficiency outcomes. Subsequent analysis should include further investigation of using trend line estimates derived from an econometric model in setting an outcome-oriented energy efficiency target; the recently concluded Consolidated Edison rate case collaborative provides basis upon which to build. The Working Group recommends that any outcome-oriented metric under consideration should be tested against historic data to verify that the metric is appropriate for the purposes of measuring progress in the outcome being sought. Further, any econometric model(s) implemented should be benchmarked annually against historical data to verify continued model accuracy.

The Working Group recommends that mechanisms to account and adjust for fuel-switching be developed and phased in incrementally, with initial focus on “good load” from electric vehicles and heat pumps. We propose that outcome-oriented electric efficiency targets be set in a manner that assumes no load from beneficial heat pumps or electric vehicles. Assuming that actual (normalized) load is used for purposes of measuring achievement of the outcome-oriented targets, an ex-post adjustment then will need to be made to subtract estimated load from EVs and heat pumps for purposes of assessing achievement. The Working Group also identified the need for further study to assess whether or not an outcome-oriented metric is likely to meaningfully incentivize fuel switches away from electricity toward fuel sources that continue to create, and in fact may increase, carbon emissions or other forms of pollution (because under an outcome-oriented metric, without adjustment such fuel switches are credited equally to load eliminated through efficiency).

This Working Group’s investigation has centered on particular types of outcome-oriented metrics and targets for electric energy efficiency, consistent with our Working Group’s scope. The Working Group discussed the merit in considering outcome-oriented metrics and load reduction targets that do not attempt to disaggregate energy efficiency from other behind-the-meter load modifiers including distributed generation. We observe that with an increase in the number of types and the magnitude of DERs, it may become more difficult to appropriately determine the accuracy of the models used to assess an outcome-oriented metric – especially if targeted to one resource type, such as energy efficiency.

In time, the Commission also may wish to consider moving from a metric that assesses electric load only to a unified metric that measures total energy usage, total energy intensity, or total carbon intensity across electricity and fuels. Such a metric could be a means of tracking and incenting utilities to facilitate actions that decrease energy usage across all fuels or accelerate environmentally beneficial fuel switching. National energy intensity indicators reported in the United States and in Europe generally measure total energy usage. The Working Group emphasizes that this is a complex topic that requires much further thought and analysis; it is not feasible to offer recommendations at this time.

With respect to setting electric efficiency targets, the Working Group found it premature to propose utility-specific performance incentive (EAM) targets in this report since additional work is required to specify the outcome-based metric or metrics which would be used to measure progress toward the target level of performance. Our discussion of target setting focused on indicative levels of statewide energy efficiency achievement in terms of aggregate weather-normalized electric load reduction, in GWhs, relative to the NYISO statewide electric energy econometric forecast (which is unadjusted for new DER).

Working Group members diverged as to the appropriate approach for setting electric efficiency targets at the state level and for each of the state's utilities. This report describes options for target setting rather than a consensus recommendation.

One approach considered would develop <u>minimum</u> statewide energy efficiency achievement levels that cumulatively sum to the total efficiency assumed in the CES Order by 2030, while allowing for a non-linear trajectory over the 2016-2030 period with greater energy savings in the later years (i.e., backloading). The Working Group did not reach agreement on a level of energy efficiency that would represent a "100% target" for statewide or utility achievement above the minimum level under this approach.

A second approach recommended by multiple Working Group members would "ramp up" near-term targets such that annual incremental energy efficiency savings as a percentage of sales increases by 0.4% per year. Under this strategy, long-term targets to 2030 would be set based on a new energy efficiency potential study that would be divided by utility service territory.

The Joint Utilities generally support the completion of potential studies and the ramp up of adequately funded energy efficiency investments, although they do not endorse the specific ramp up rate as described in this report. The Joint Utilities advise that near-term utility energy efficiency targets for the purposes of an EAM should be established based on realistic estimates of savings, including savings that reflect the ramp up of adequately funded utility investments in energy efficiency.

In order to assess whether additional policies or funding mechanisms would be needed in order to achieve the targets set forth under each approach, the Working Group conducted a "stack up" comparison between (1) compiled estimates of energy efficiency savings that are expected to be realized from currently funded activities across program administrators and expected savings from codes and standards and (2) *illustrative* electric efficiency targets. Among Working Group members, analysis of this data varied, based on what level of uncertainty members assumed for various components of potential load reduction as well as what illustrative target members considered the most relevant to compare against. The majority of Working Group members concluded that in the near-term, the Commission should provide for cost recovery mechanisms that allow for ambitious and cost-effective utility investments in energy efficiency; this includes resources for established utility programs and, to the extent feasible, new REV market mechanisms. In this view, a cap on direct ratepayer support for energy efficiency in not realistic in the near-term, and risks backsliding on existing levels of achievement and jeopardizing cost-effective achievement of the State Energy Plan and CES goals. DPS, NYPA, and NYSERDA staff emphasized the need to take into account the cost-effectiveness of alternative approaches to achieving energy efficiency targets, and suggested that New York State policymakers and stakeholders should concentrate on supporting progress toward the State's clean energy goals over the medium and longer term, including the work of advancing the evolution in utility programs and State support to catalyze energy efficiency at scale.

In addition to considering targets for the overall energy reduction achieved through energy efficiency, the Working group analyzed the potential impacts of energy efficiency measures on peak load reduction and load factor metrics. The report finds that to accurately measure how energy efficiency installations affect "system efficiency" metrics it is necessary to (i) develop representative hourly load impact profiles for an energy efficiency measure being installed for a specific end use in a specific customer segment (for example, a LED light bulb installation in the living room of an apartment in northeastern Brooklyn) on a peak day, and (ii) develop an ability to aggregate such representative curves of all energy efficiency measures in a given area in order to accurately predict the overall impact of all those measures collectively at various levels of the electrical system on a peak day. The Working Group recommends that representative hourly load impact profiles be created for all energy efficiency measures that are included in utility system planning.

Given time and capacity constraints, the Working Group decided to limit its initial investigation to metrics and targets for electric efficiency, although we stress and acknowledge the importance of increasing efficiency savings across all fuels. Recognizing the additional analysis still required for electric efficiency metrics, the Working Group is not equipped to immediately extend its work to consider metrics and targets for natural gas efficiency.

# APPENDIX A: Assessment of Data Availability for Potential Energy Intensity Metrics

## 1. Residential Sector

### 1.1 kWh per Customer Meter

- Weather-normalized residential sales divided by a count of residential meters in a utility's territory.

The EIA publishes annually the retail sales and estimates of customer meter counts by utility. Utilities self-report these values, so they should be internally consistent in how they report sales and counts to ensure reliable comparisons to a baseline year.

### 1.2 kWh per Customer Premise

- Weather-normalized residential sales divided by a count of residential buildings in a utility's territory.

No reliable estimates for residential building counts exist. The decennial Residential Finance Survey, which provides data on properties, was last conducted in 2001 and aggregates NY results with the Northeast Census Region.

### 1.3 kWh per Capita

- Weather-normalized residential sales divided by estimates of a utility territory's population.

Population estimates at the county level are published annually by the US Census Bureau, which can be aggregated to utility service territory in a straightforward manner.

### 1.4 kWh per Household

- Weather-normalized residential sales divided by an estimate of the number of households in the utility territory.

The American Community Survey (ACS) publishes annually the number of occupied housing units at the county level. 1-year ACS estimates are less reliable than 5-year estimates because they use small sample sizes.

### 1.5 kWh per Square Feet of Occupied Housing Units

- Weather-normalized residential sales divided by an estimate of the floor area of occupied housing in the utility territory.

There are no publicly available time series data on residential floor space. The American Housing Survey data published biennially counts occupied housing units by square footage ranges for 25 metropolitan areas.

## 2. Commercial and Institutional Sector

### 2.1 kWh per Customer Meter

- Weather-normalized commercial sales divided by a count of commercial meters in a utility's territory.

Sales and counts of customer data are available through the EIA data. There may be categorization errors with apartment buildings and small industrial customers categorized as commercial, but this can be negated by internal consistency in reporting sales and counts.

**2.2 kWh per Customer Premise**

- Weather-normalized commercial sales divided by a count of commercial buildings in a utility's territory.

The Commercial Buildings Energy Consumption Survey (CBECS) provides estimates of commercial building counts every five years, but results are only reported down to the Census Division Level.

**2.3 kWh per Square Feet of Commercial Building Space**

- Weather-normalized commercial sales divided by an estimate of the floor area of commercial buildings in the utility territory.

There are no reliable publicly available time series estimates of commercial floor space. CBECS estimates are only conducted every five years and also lacks sufficient granularity because results are reported down to the Census Division level. Data from private companies is not updated with known frequency. Local tax assessors' offices may be able to provide data for certain jurisdictions, like the NYC PLUTO database which is updated twice annually.

**2.4 kWh per Employee**

- Weather-normalized commercial sales divided by an estimate of the number of employees in the commercial/services sectors in the utility service territory.

NYS Department of Labor reports monthly employment data by industry, statewide, by metropolitan area, and by minor county. Industries are classified according to their North American Industry Classification System (NAICS) code.

**2.5 kWh per Gross State Product (GSP)**

- Weather-normalized commercial sales divided by an estimate of the commercial-sector GSP in the utility service territory.

The Bureau of Economic Analysis produces GDP data by nation, states and metropolitan areas only, making it difficult to map GSP data to utility territory. BEA publishes state-level GDP data quarterly, and metropolitan-level data annually. No forecasts currently exist for GSP data.

## 3. Industrial Sector

3.1 kWh per Customer Premise

- Weather-normalized industrial sales divided by a count of industrial buildings in a utility's territory.

No reliable data for industrial building counts exists.

**3.2 kWh per GSP**

- Weather-normalized industrial sales divided by an estimate of industrial-sector GSP (manufacturing and non-manufacturing) in the utility service territory.

Industrial sales data can be obtained from the EIA data but no reliable data source currently isolates load and GSP for industrial sector.

**3.3 kWh per Value Added**

**-** Weather-normalized industrial sales divided by an estimate of value added in the utility service territory.

No data exists that isolates GDP for industrial sector at a level of granularity for reliable mapping to utility service territory.

**4. Commercial and Industrial (C&I) Sectors Aggregated**

**4.1 kWh per Gross State Product (GSP)**

**-** Weather-normalized commercial and industrial sales divided by an estimate of the GSP in the utility service territory.

BEA publishes state-level GDP data quarterly, and metropolitan-level data annually. However, the BEA does not currently provide GDP data by county, making it difficult to map this data to utility service territory.

# APPENDIX B: Minimum Energy Efficiency Achievement Levels Compared to Achievable and Economic Potential Estimates

The Working Group requested that Optimal Energy provide an approximate estimate of the electric energy efficiency potential in New York State by utility service territory using the results from the *Energy Efficiency and Renewable Energy Potential Study of New York State* (April 2014) prepared by Optimal Energy, Inc., ACEEE, and the Vermont Energy Investment Corporation under contract to NYSERDA.[103] The Working Group made this request after learning that the majority of the State's investor owned utilities do not have a current energy efficiency potential study for their New York State service territory.

Figure B-1 shows an indicative allocation to utility service territories of the "minimum statewide energy efficiency achievement level" by 2030 as discussed in Section 6.1.1 of this report, and provides approximate estimates of efficiency potential in those territories as derived by Optimal Energy. The allocation of energy efficiency achievement by utility service territory is based on an estimate of a given utility's share of 2014 electricity sales, and is considered an indicative (first approximation) allocation.

**Figure B-1: Illustrative Allocation of Energy Efficiency Achievement to Utility Service Territory**

| GWh values represent wholesale savings | | | *Optimal Electric Energy Efficiency Potential Study Results by Year 2030* | |
|---|---|---|---|---|
| | | Cumulative GWh savings over years 2016 - 2030 | *Achievable Potential* | *Economic Potential* |
| **NYS Minimum EE Achievement Trajectory** (report Sect. 6.1.1) | | 36,828 | *34,351* | *86,860* |
| | | | | |
| **Indicative Allocation of Minimum EE Achievement by Utility** | *% of statewide savings by utility* | Cumulative GWh savings over years 2016 - 2030 | *Achievable Potential* | *Economic Potential* |
| Central Hudson Gas & Elec Corp | *3.5%* | 1,304 | *1,228* | *3,109* |
| Consolidated Edison Co-NY Inc | *39.7%* | 14,627 | *15,428* | *39,260* |
| Niagara Mohawk Power Corp. | *24.2%* | 8,921 | *7,522* | *18,980* |
| New York State Elec & Gas Corp | *10.8%* | 3,974 | *3,377* | *8,523* |
| Orange & Rockland Utils Inc | *2.8%* | 1,035 | *974* | *2,466* |
| Rochester Gas & Electric Corp | *5.0%* | 1,852 | *1,562* | *3,941* |
| Long Island Power Authority | *13.9%* | 5,115 | *5,489* | *13,690* |

**Summary of Methodology used by Optimal Energy to Apportion Potential**

To estimate the electric energy efficiency potential by utility service territory, Optimal used a simplified apportioning of the potential estimated for the four original geographic analysis regions to each of the electric utilities within those regions. Municipal utilities and cooperatives reported by the EIA were

[103] Energy Efficiency and Renewable Energy Potential Study of New York State (April 2014), Volume 2: Energy Efficiency Methodology and Detailed Results. https://www.nyserda.ny.gov/-/media/Files/EDPPP/Energy-Prices/Energy-Statistics/14-19-EE-RE-Potential-Study-Vol2.pdf

included in the normalization process adopted, but the potential results for such utilities have been omitted from the results presented in Figure B-1.

The apportioning was based on an estimate of a given utility's share of total regional 2014 electricity sales. Using the most recent utility sales data available from the U.S. Energy Information Administration (EIA),[104] the apportioning process was conducted for each of the four original analysis regions (i.e., New York City, Long Island, Hudson Valley, and Upstate).

Each utility's share of total regional sales was distributed to the residential, commercial, and industrial sectors based on the relative distributions from the 2014 EIA sales data. Once regional sales were distributed by utility by sector, these same shares were applied to the results from the original potential analysis to estimate the electric energy efficiency potential by utility territory. To determine end-use and building type distributions, the appropriate end-use and building type distributions for each analysis region from the 2014 potential study were applied to the portion of a utility's potential within a given region. Finally, for utilities with territory across multiple analysis regions, the estimated potential in all regions were summed to develop the total potential for those utilities.

[104] U.S. Energy Information Administration (EIA). 2015. Electric power sales, revenue, and energy efficiency Form EIA-861 detailed data file. https://www.eia.gov/electricity/data/eia861/. See file "Sales_Ult_Cust_2014.xls".

## APPENDIX C: Data Sources and Methodology for the "Stack Up" Graphic

To estimate 2019 energy efficiency impacts from planned actions, publicly available estimates of savings by program administrator were compiled for program years 2016-2018. A one-year "lag" from commitment to impact on load was assumed unless otherwise indicated.

NYSERDA estimates were derived from the Clean Energy Fund Investment Plan Budget Accounting and Benefits Chapter filed on August 8, 2016. All direct 2016-2018 energy efficiency market development portfolio benefits from Table 5 were included except for savings attributed to CHP. These benefits are estimates of savings directly attributable to program activities. The direct benefits value was discounted by 50% to account for potential uncertainty in achieving stated goals. The remaining 50% of the direct savings is included as a line item in the "stack up," but coded to reflect uncertainty. Indirect market development portfolio benefits were also included, which are estimates of savings from market effects expected to accrue over the longer term as a result of NYSERDA's investment and follow on market activity. Annual indirect benefits were calculated by dividing the 2025 cumulative annual indirect market development portfolio benefits from Table 4 by seven to reflect 2019 as the first anticipated year these benefits will impact load. (Indirect savings from CHP were not included in this total, so no adjustments were necessary.) This annual value was discounted by 50% to account for some uncertainty in timing of benefits realization. The remaining 50% of annual indirect savings is included as a line item in the "stack up," but coded to reflect uncertainty. (Note that estimated indirect benefits published in Table 4 are already discounted by 50%.) NYSERDA expects to update its CEF estimated benefits on a regular basis as investment plans are updated.

Annual utility savings estimates for 2016-2018 derived from ETIPs filings were included. LIPA energy efficiency savings estimates for 2016-2019 derived from an energy efficiency forecast provided by PSEG Long Island. The LIPA forecast adopts a "half-year convention," in which half of committed energy efficiency program savings are assumed to be acquired in the same year. Estimated NYPA annual energy efficiency savings were derived by scaling statewide savings from 2014 through August 2016, based on data provided by NYPA.

Committed, but not acquired, energy efficiency EEPS 2 savings were estimated using energy efficiency EEPS 2 Program Administrator performance data for Q1 of 2016 provided by NYS DPS. All PA contributions were discounted by 50% to provide a conservative estimate of not-yet-realized impacts of EEPS programs on load by 2019.

Estimated energy efficiency savings from building codes and standards and appliance standards ("C&S") were derived from NYISO's C&S forecasting methodology. This approach reflects a conservative estimate of savings impact from Codes & Standards, which is included in the 2016 NYISO Gold Book forecast. To estimate energy efficiency savings from C&S, NYISO uses a "triangulation" approach involving retrospective empirical analysis, a comparison against national and regional results reported in the literature, and an estimate of NYSERDA C&S program impact. In the retrospective analysis, historic annual energy efficiency achievements from all New York State programs from 2001-2014 were compiled and used to reconstitute and electric load history without reductions from energy efficiency. This reconstituted electric load history was then compared to an econometric, normalized historic electric load counterfactual for 2001-2014. This analytical delta was assessed against national and regional results and adjusted to derive a range of percentage values of overall load that could be attributed to C&S. Values were projected through 2026. These percentage values were discounted by 30% to avoid double counting any C&S savings attributed NYSERDA C&S program performance.

# APPENDIX D: Assessment of Building Codes and Standards

The term "Codes and Standards (C&Ss)" refers to the broad set of rules (codes) and technical requirements (standards) governing buildings, as well as technical efficiency requirements established, reviewed, and adjusted for new energy-consuming devices and appliances over time. The requirements set forth in appliance standards influence energy consumption as equipment is retired and replaced over time. Likewise, building C&Ss, among other things, directly influence energy consumption over the life of buildings. C&Ss not only govern and influence choices made during a building's construction and design, they also impact a building's operation and maintenance after construction. Additionally, when buildings are renovated, there are often C&Ss that impose new requirements on the building that did not exist when the building was constructed. Although this appendix focuses on assessment of building C&Ss, appliance standards are also an important source of energy efficiency savings.

The United States has a unique process in the way building C&Ss are developed. The two primary characteristics of the process are: (i) it is a deliberative and democratic process that applies improvements incrementally, and (ii) it takes into account cost efficiency and investment value.[105] However, unlike other jurisdictions with similar carbon reduction goals, C&Ss in the United States are not explicitly tied to emissions targets, lowering the direct usefulness of C&Ss.[106] Typically, a new set of building C&Ss is developed through a stakeholder process and then evaluated by the U.S. Department of Energy before a set of recommended final model codes is released for consideration by the States. Individual states must adopt an energy code for commercial buildings (including any building taller than three stories, even those used as a residence) at least as stringent as the model code, and may choose to voluntarily adopt the model code for residential buildings, albeit with modifications based on local considerations.[107] Local jurisdictions are typically subject to State level building C&Ss, but in some instances may choose to adopt more stringent building C&Ss in order to accelerate adoption of rules and requirements aligned with beneficial policy goals such as sustainability, emissions, and resiliency. A review of the building C&Ss is conducted on a triennial basis so innovations are applied "gradually across the building sector, reducing the risk for individual builders and contractors."[108] But building C&Ss are only effective if "they are enacted into law and enforced by state and local governments."[109] Enforcement of building C&Ss, especially as new building C&Ss are adopted, requires state and local resources dedicated to the adequate training of highly skilled professionals such as building inspectors[110] who are able to be current with their knowledge and are able to report non-compliance so it may be remedied. During the current code cycle, NYSERDA provided funds for the training of both industry professionals and code officials.[111]

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[105] "The Value and Impact of Building Codes", pp. 1, Ellen Vaughan [Policy Director, Environmental and Energy Study Institute] and Jim Turner [Former Chief Counsel, Committee on Science and Technology, U.S. House of Representatives]
[106] "Worldwide Lessons: What NYC Can Learn From Five Peer Cities", Urban Green Council, http://urbangreencouncil.org/worldwidelessons
[107] "Building Energy Codes Program – Adoption", US Department of Energy, https://www.energycodes.gov/adoption
[108] See Id.
[109] See Id.
[110] See Id, pp. 8
[111] "Energy Code Training Website", NYSERDA, http://www.nyserdacodetraining.com/

Model codes in the United States are developed through the International Code Council (ICC) that include topical, geographically specific codes such as the International Building Code (IBC) and International Residential Code (IRC). ICC also publishes the International Energy Conservation Code (IECC) and the International Green Construction Code (IgCC) that are developed with partnerships with organizations such as American Institute of Architects (AIA) and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).[112] In most jurisdictions, the ANSI/ASHRAE/IES energy standard 90.1 is allowed as an alternate compliance path (perhaps with modifications) to the local energy code.

*Energy Usage Reduction from C&Ss*

At a national level, electricity consumption has been on a secular decline, especially so in recent years.[113] As highlighted in an ACEEE white paper, various authors have speculated about a number of reasons for the decline including economic recession and weakness, decline in manufacturing, energy efficiency programs, utility demand-side management, building codes and efficiency standards, fuel switching, and distributed generation.[114] While a regression analysis in that paper of key variables suggests that energy efficiency as well as C&Ss may explain a portion of the decline in electricity usage, the results must be viewed cautiously because of concerns related to high correlations between independent variables, impacts from variables that were not included, rebound effect (where energy efficiency related savings result in overall increased energy consumption for reasons such as similar levels of tolerance for energy related expenses from before installation of the energy efficiency measure), and less than a full realization of energy efficiency savings. Overall the analysis demonstrates the complexity of attributing drivers of electric use patterns to independents variables and exogenous factors.

While energy conservation codes result in energy use reductions and savings to customers, there is some ambiguity in its estimation. Expeditious adoption of national building C&Ss, or at levels more stringent than the national standard, in New York State would result in energy savings and economic benefits. Such savings are enhanced through better training and enforcement. It is also recommended that compliance rates be measured in all jurisdictions in New York to both help improve compliance and to conduct analysis of energy savings attributable to C&Ss. The U.S. Department of Energy (DOE) estimates historical national savings from energy codes (all fuels) at $44 billion and 4.2 quadrillion Btu between 1992 and 2012.[115] Projected savings are even larger, with newer codes saving energy consumers $230 billion by 2040 and reducing carbon emissions by 3,478 million tons.

For New York State specifically, DOE estimates code adoption and enforcement will save $250 million annually by 2030.[116] An analysis was done by the New York Independent System Operator (NYISO) in the most recent 2016 Gold Book. While details of the analysis are not public, NYISO has indicated that it employed a triangulation approach that utilized: (i) a retrospective empirical analysis that

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[112] "Building Energy Codes Program – Adoption", US Department of Energy, https://www.energycodes.gov/adoption

[113] "Why is electricity use no longer growing?, pp. 1, Steve Nadel and Rachel Young, ACEEE, February 2014

[114] Id.

[115] "Program Impact Analysis", Building Energy Codes Program, US Department of Energy, https://www.energycodes.gov/about/results

[116] "State Certification of Residential and Commercial Building Energy Codes", letter from US Secretary of Energy to Governor Andrew Cuomo, May 31, 2013, https://www.energycodes.gov/sites/default/files/documents/NewYorkDOEDeterminationLetter05312013.pdf

compared a historic normalized electric load counterfactual to actual reported contributions from energy efficiency programs with an attribution of the remaining, unexplained energy use reduction as one estimate of the impact of building C&Ss and appliance standards; (ii) a comparison of the estimate with national and regional results reported in literature: and (iii) an estimate of NYSERDA's programs' C&Ss impact (see Appendix C for more details). Such an approach is complex, non-transparent, and subject to uncertainties present for any econometric regression analysis, which could include non-consideration of pertinent independent variables.

The attribution of energy use reduction to building C&Ss is complicated by varying levels of compliance and enforcement across the state. An August 2014 article that highlighted the results of an audit of the architectural plans of New York City buildings by the Department of Buildings that showed 9 out of ten buildings in New York City failed to meet the energy code, some of which have been in place for 30 years[117], noting however that some of the violations could have been minor. In New York City, for instance, plan review for energy code compliance has increased in the past several years, ensuring closer adherence to code energy targets in building design. The Institute for Market Transformation has analyzed how local jurisdictions may cost-effectively improve enforcement.[118] Since manufacturers generally produce equipment that just meets or exceeds contemporary C&Ss, adoption of more stringent C&Ss can lower costs for adopting more efficient technology as manufacturers make improved products available to the market.[119] On the other hand, policymakers must guard against the potential of new C&Ss having a deterrent effect of preventing upgrading of inefficient "grandfathered" equipment, if the economic cost of "meeting code" exceeds the desired level of financial benefits accrued through lower energy expenses after the upgrade.

Results from reports in Massachusetts and Rhode Island, both states in Northeast sharing some similarities with New York, indicate a level of impact of building C&Ss that is significantly lower than the estimate suggested by the triangulation analysis employed by the NYISO, which also accounted for appliance standards. For example, the estimated 2016 savings in Massachusetts from building codes as publicly reported by utilities is 1,860 MWh statewide,[120] an amount that can be extrapolated for New York as about 5,580 MWh of savings (about 2% of the NYISO estimate which, however, also includes savings from appliance standards). In Rhode Island, the estimated 2016 savings from building codes reported by utilities is 6,837 MWh statewide,[121] which can be extrapolated to 136,740 MWh for New York (about 30 % of the NYISO estimate which includes building codes and appliance standards combined). A 2015 National Bureau of Economic Research (NBER) study to study the impact of building C&Ss in the residential sector in California found that there was no discernible reduction in energy use when comparing

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[117] "9 out of 10 building plans fail basic test", Crain's New York Business, Joe Anuta, August 18, 2014

[118] "Third-Party Performance Testing: A Case Study of Residential Energy Code Enforcement**",** Institute for Market Transformation (IMT), http://www.imt.org/resources/detail/case-study-1-third-party-performance-testing

[119] Urban Green Council study of available boilers using data from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) (https://www.ahridirectory.org/ahridirectory/pages/home.aspx) showed the vast majority met efficiency levels mandated by current code, with a small number of more efficient units available, and no boilers less efficient on the market.

[120] "Savings & Evaluation Methodology for Codes and Standards Initiative" prepared by Massachusetts Program Administrators, 10/20/2015, http://ma-eeac.org/wordpress/wp-content/uploads/Savings-Evaluation-Methodology-for-Codes-and-Standards-Initiative.pdf

[121] RI CCEI-Savings and Attribution Logic Evaluation.doc, Sept 2014, by NMR Group, Inc., Tetra Tech, Left Fork Energy, http://www.ripuc.org/eventsactions/docket/4580-NGrid-2016-EEPP(10-15-15).pdf

residences built before 1978 when the first building C&Ss were introduced and homes built after 1978 even after controlling for variables such as increase in home sizes, greater amounts of building in warmer areas and increase in the number of residents per home after 1978.[122]

Data collected through New York City's Benchmarking and Disclosure Law (Local Law 84 of 2009) suggests that building energy codes are having an effect. Some studies show that energy use in buildings generally increased each decade, until the advent of modern codes, at which point energy use begins to decline.[123] Further analytical study, specifically applicable to New York, able to correlate specific quantities of reductions in energy use to specific adoptions of code when combined with efforts to ensure compliance through enforcement, would be helpful. Such an analysis could also help in isolating and identifying other independent variable drivers that have been leading to lower energy use in recent years, and whose trajectory may change in the future.

[122] "How much energy do building codes save? Evidence from California", Arik Levinson, Georgetown Economics Department and NBER, November 2015.
[123] "The New York City Energy & Water Use Report", Urban Green Council, New York University, and The City of New York, http://urbangreencouncil.org/content/reports/new-york-city-energy-water-use-report, p. 34.

# APPENDIX E: Incorporating Energy Efficiency into Forecasting

Considering that our Working Group was tasked with creating a framework to quantify the impacts of energy efficiency measures on peak load reduction and load factor in a granular manner, it might be beneficial in the future to modify the way in which load is forecasted in order to consider energy efficiency in a more precise and granular manner as well. When our group sent a data request to the utilities we asked them to describe how energy efficiency is accounted for in their forecasting and planning processes. All of the utilities responded that this is done as a post-model adjustment, although in two slightly different ways. For some utilities historic energy efficiency savings are embedded in the load data used to build the models and are thus carried through the forecast. Then the incremental difference between historic energy efficiency savings and additional savings from future planned programs are subtracted from the forecasting model results[124]. For other utilities, historic energy efficiency savings are first added back to historic load data to avoid double counting these savings. Once the model is developed, the forecast is then adjusted to account for past and future energy efficiency savings. This prevents the model from assuming that the historical energy efficiency growth pattern will continue into the future, allowing the pattern to be adjusted.[125]

The NYISO energy efficiency peak load reduction forecasting process starts with the EEPS scorecards and monthly reports. It then uses those to compute load factors. The load factors are then used to produce forecasts of peak load reduction by market sector.

California might be a place to look for ideas to begin to modify the forecasting process. Chris Ann Dickerson, the facilitator of the Demand Analysis Working Group (DAWG), describes in her paper how California incorporates energy efficiency impacts into its demand forecasts.[126] The California Energy Commission (CEC) is responsible for producing a statewide "reference" demand forecast as a part of its Integrated Energy Policy Report (IEPR). An issue then became how to adjust the IEPR forecast to reflect the impacts of new demand-side policies, including energy efficiency. Ideally, this would be done by identifying any impacts included in both the IEPR forecast and the utility estimates of demand-side resources expected to occur in their service territories during the forecast period, and subtracting out any impacts or estimates that were double-counted. However, since the IEPR forecast and the utility estimates were prepared using different starting points and assumptions, it was basically impossible to determine where any overlap occurred. The DAWG was born out of these issues and the need to improve methods and processes for incorporating energy efficiency impacts into demand forecasts.

A key objective of the DAWG has been to estimate demand-side impacts that are incremental to the IEPR forecast. The "Additional Achievable Energy Efficiency (AAEE)" analysis provides annual estimates of energy efficiency savings (from programs, codes, and standards), likely to occur, but not already "committed." The AAEE estimates are developed primarily using data from the California Public

[124] This method is a variation on the "DSM Trend" Method identified in the "Incorporating DSM into the Load Forecast" (2010) paper by Itron. In the "DSM Trend" Method, the forecast is adjusted for net changes from the DSM trend line.

[125] This method is the same as the "Add Back" Method identified in the "Incorporating DSM into the Load Forecast" (2010) paper by Itron.

[126] Dickerson, Chris Ann. DAWG Days of the Summer Study: Demand Analysis Working Group. 2014.

Utility Commission's (CPUC) energy efficiency potential and goals studies. This study analyzes the statewide market potential from utility programs for electricity usage (GWh) and peak demand (MW). With each successive analysis, the IEPR and the energy efficiency potential forecasts have become more in line with each other, leading to an AAEE analysis that is better coordinated with both. The IEPR forecast and energy efficiency potential and goals studies now match well on inputs such as economic/demographic data, building stock and vintage, historic program accomplishments, projections for the current energy efficiency program cycle and adopted codes and standards, unit energy consumption/end-use intensity, rate forecasts, forecasts for emerging technologies, and adjustments for codes and standards taking effect over the forecast period. Ultimately, this improves the process for developing forecasts and the quality of those forecasts.

# APPENDIX F: Consideration of CEAC Steering Committee Comments

The Working Group appreciates and has considered comments received from the CEAC Steering Committee. This appendix documents how we have addressed each comment.

- Scott Weiner (NYS DPS) commented that he would prefer to see a more clearly articulated State view incorporated into the report, finding that much of the text emphasized specific participant viewpoints.
  - Additional text was incorporated into the report to articulate the viewpoints of the DPS, NYSERDA, and NYPA staff on the Working Group, including text in Section 6.3.1.

- Mr. Weiner conveyed the importance of being consistent with REV's objectives and lexicon in the recommendations provided. For example, the term "program" typically connotes utility resource acquisition programs funded through surcharges, whereas REV seeks to charge and empower utilities to incorporate energy efficiency as a core part of their business. Mr. Weiner asked what would happen if we started from the premise that the old approach should not be used, even if this means using proxy indicators while we try to identify a metric. A scorecard approach may be needed.
  - Working Group members reviewed and where appropriate refined the language used to communicate key recommendations provided by the group or in specific participant viewpoints.
  - While recognizing the merit of adopting several metrics for energy efficiency EAMs, the Working Group focused its analysis on the outcome-oriented metrics that are described in this report. We are unable to comment on additional metrics or proxy indicators at this time.

- Mr. Weiner questioned why utilities would be incentivized for achievement that is less than desired.
  - As discussed in Section 5 of the report, a minimum achievement level may be set lower than desired expectations in order to ensure that a utility retains an incentive to perform even if results are different than anticipated. The report identifies this possibility so as to make clear that the minimum and maximum levels for the EAM may be distinct from goals.

- Mr. Weiner asked the Working Group to sharpen up the recommendations in the report.
  - The Working Group endeavored to consolidate and sharpen up both its recommendations and the identification of areas where additional analysis is needed in Section 8 of the report.

- Frank Murray (Natural Resources Defense Council) noted that the outcome-based approach is not only new, but has potential to open opportunities for the private sector to step in with support of the utilities and reduces competition among entities. Stated that we shouldn't ignore those approaches that have demonstrated themselves as successful in the past, but that we should take what has worked effectively elsewhere and relate it to what we are trying to accomplish under REV. Noted that when looking at states that have achieved the greatest savings, there is an energy savings target applied to the utility programs.
  - The report recognizes the opportunity of having both resource acquisition activity and market animation and transformation activity as complementary tools, including approaches that have demonstrated success in New York State and elsewhere.

- Terry Sobolewski (National Grid): Noted that the Working Group is taking a more comprehensive and holistic view as compared to the past. Expressed support for the concurrent execution of multiple strategies at once, which "de-risks" the process. Noted the value of advanced analytics to understand complex problems such as those addressed in the report: National Grid is making rapid progress in putting activity-level and system-level models together, although many of the tools are still nascent.
  - The report notes in Section 4.3.2.1 that National Grid is developing more sophisticated hierarchical forecasting models and data analytic capabilities in order to integrate increasing levels of DER penetration into its system planning. With direct reference to the National Grid DSIP, we have added text to better explain that hierarchical models integrate activity-level and system-level models.

- Mr. Weiner questioned the discussion and relevance of targets when metrics haven't been decided.
  - The Working Group acknowledges that this posed a challenge. Clarifying text was added to the report in Section 6 that the Working Group believes that the report's discussion of options for setting energy efficiency targets provides useful insight into alternative stakeholder viewpoints. The targets presented are illustrative.

- David Margalit (NYSERDA) noted that the energy efficiency numbers specified in the Clean Energy Standard (CES) were simplifying analytic assumptions, which should not be confused with targets.
  - The Working Group concurs and clarifying text was added to the report in Section 6.1.

- Eric Walker (Erie County Department of Public Works) expressed interest in the development of potential studies. Mr. Walker also asked if the "stack up" figure will be used as a visual or for setting a more specific target.
  - The "stack up" figure is illustrative, offering an analytical tool and a comparison for illustrative targets as described in Section 6. It is not intended to be the basis for setting specific targets.
  - Potential studies are recommended in the report, but will require specific technical analysis which is beyond the scope of the Working Group.

- Mike Voltz (PSGG-LI) observed that an outcome-based approach that measures outcomes with respect to billed sales suggests a longer-term view, perhaps a five-year target to accommodate the one-to-four-year lag for some efforts such as market transformation and building code improvements.
  - Text was added to the report in Sections 5 and 6 to clarify alternative viewpoints among Working Group members with respect to annual or multi-year targets.

- Anthony Campagiorni (Central Hudson) asked what discussion had occurred in the Working Group about the expectation that utility program administrators are being asked to accomplish more savings with the same level of funding or less. Mr. Campagiorni noted that he's not an advocate for simply requesting additional funding.
  - The Working Group requested clarification from Central Hudson to address this comment. In response to this request, Central Hudson staff stated that: "Central Hudson is aligned with the Joint Utilities such that increased program funding is necessary if energy efficiency targets will be increased. However, top-down targets, without any data that represents the realistic achievable potential for future energy efficiency in each service territory, is a waste of rate-payer dollars."

# APPENDIX G: Working Group Members

The table below lists Energy Efficiency Procurement & Markets Working Group members and roles. Although this document is being presented through a collaborative process and prepared in response to our Working Group Scope as authorized by the CEAC Steering Committee (SC), it does not represent consensus agreement among all members of the Working Group. The views expressed in this report by members do not necessarily represent those of their company or organization. Specific alternative viewpoints of Working Group members have been identified in this report.

| Name | Role | Company/Organization |
|---|---|---|
| Raghusimha Sudhakara | Co-Chair | Consolidated Edison |
| Vanessa Ulmer | Co-Chair | NYSERDA |
| Elizabeth Weiner | SC Designee | CLEAResult |
| Robert Callender | Alternate SC Designee | TRC |
| Andy Frank | Secretary | Sealed |
| William Dornbos | Member | Acadia Center |
| Anne Reynolds | Member | Alliance for Clean Energy New York |
| Valerie Strauss | Member | Association for Energy Affordability |
| Darren Suarez | Member | The Business Council |
| Amanda Sucato | Member | Central Hudson |
| Susan Leeds | Member | City of New York |
| Marco Padula | Member | NYS Department of Public Service |
| Chris Wentlent | Member | Exelon |
| Adam Procell | Member | Lime Energy |
| Patricia Boudreau | Member | National Grid |
| Miles Farmer | Member | Natural Resources Defense Council |
| Kelli Joseph | Member | NRG Energy |
| Nathan Markey | Member | NYPA |
| Jen Turner | Member | NYSEG/RG&E |
| Kristen Barone | Member | Orange and Rockland Utilities (O&R) |
| Marisa Uchin | Member | Oracle |
| Roni Epstein | Member | Pace Energy and Climate Center |
| Beth Galante | Member | PosiGen |
| Dan Zaweski | Member | PSEG Long Island |
| Carl Hum | Member | Real Estate Board of NY |
| Cecil Scheib | Member | Urban Green Council |

## APPENDIX H: Acronyms and Abbreviations

AAEE – Additional Achievable Energy Efficiency

ACEEE – American Council for an Energy-Efficient Economy

BCA – Benefit Cost Analysis

BQDM – Brooklyn Queens Demand Management program

Btu – British Thermal Units

CCA – Community Choice Aggregation

CDD – Cooling Degree Days

CEAC – Clean Energy Advisory Council

CEF – Clean Energy Fund

CES – Clean Energy Standard

CHP – Combined Heat and Power

Commission – New York State Public Service Commission

CPUC – California Public Utility Commission

C&S – Codes and Standards

DAWG – Demand Analysis Working Group

DER – Distributed Energy Resource

DOE – U.S. Department of Energy

DPS – Department of Public Service

DSIP – Distributed System Implementation Plan

EAM – Earnings Adjustment Mechanism

EEPS – Energy Efficiency Portfolio Standard

EIA – U.S. Energy Information Administration

ETIP – Energy Efficiency Transmission Implementation Plan

EVs – Electric Vehicles

GDP – Gross Domestic Product

GSP – Gross State Product

GWh – Gigawatt Hour

HDD – Heating Degree Days

IEPR – Integrated Energy Progress Report

kWh – Kilowatt-hour

LIPA – Long Island Power Authority

MW – Megawatt

MWh – Megawatt-hour

NWA – Non-Wires Alternative

NYISO – New York Independent Systems Operator

NYPA – New York Power Authority

NYSERDA – New York State Energy Research and Development Authority

PV – Photovoltaic

REV – Reforming the Energy Vision

RFP – Request for Proposal

TMY – Typical Meteorological Year

VVO – Volt-Var Optimization technologies

Working Group – Energy Efficiency Procurement and Markets Working Group