

## **Build Smart NY**

### **Target Setting Methodology**

This memo describes the methodology that the Build Smart NY (BSNY) Central Management and Implementation Team (CMIT) has utilized to set energy savings targets for affected New York State agencies (“State Entities”), as required by Executive Order 88.

#### **1. Set base median target**

The Executive Order sets a 20% savings target for the State: “reduce the average [source Energy Use Intensity (EUI)] in State-owned and managed buildings by at least 20%”. In order to ensure that the State achieves this goal, the CMIT deemed it appropriate to build contingency into each State Entity’s individual target. Projects can be delayed or cancelled, budgets can be unpredictable, and engineering estimates of energy savings can be incorrect, all of which can lead to lower savings than expected. Therefore, the CMIT added a 10% contingency on top of the Governor’s stated 20% goal, creating a “base median target” of 22%, based on the following calculation:  $20\% + (10\%)(20\%) = 22\%$ .

#### **2. Normalize baseline year data for weather**

The Executive Order sets the State Fiscal Year 2010-2011 as the baseline year for measuring energy savings. Because weather conditions fluctuate from year to year, the CMIT deemed it appropriate to “normalize” the baseline year data for weather, thereby taking out any weather variation that occurred in the baseline year and creating a cleaner set of data to utilize. Optimal Energy, a consultant to the New York Power Authority, conducted the weather normalization, using coefficients and data from both the Environmental Protection Agency (“EPA”) and the National Oceanic and Atmosphere Administration. The resulting weather-normalized data for the baseline year were used when setting individual State Entity savings targets. Normalizing the baseline year data had a minimal effect – ranging from -1.6% to 0.6% for individual State Entities. The weather-normalized figures vary by State Entity depending on the particular locations of their facilities. Data reported from years after the baseline year will also be weather-normalized, utilizing the same methodology, in order to make a fair comparison when computing energy savings and progress towards the Executive Order goal.

Agency	Raw Baseline Source EUI	Weather-Normalized Baseline Source EUI	% Change
Agency 1	227.9	227.8	-0.02%
Agency 2	163.3	161.8	-0.97%
Agency 3	202.6	201.2	-0.69%
Agency 4	353.5	353.4	-0.01%

### 3. Determine weighted average expected source EUI

In order to accurately depict energy performance in the baseline year, the CMIT calculated an “expected” source EUI for each State Entity. For each building in the Build Smart portfolio, the CMIT assigned an EPA Portfolio Manager category (e.g., college/university, office, prison/incarceration, warehouse, etc.), each of which has a corresponding U.S. median source EUI reference value. This building categorization was vetted by Optimal Energy and reviewed by some of the largest State Entities, further refining the accuracy of the methodology. Utilizing the reported square footage of each building during the baseline year, the CMIT computed a weighted average of the Portfolio Manager reference values for each State Entity. This created an “expected” source EUI for each State Entity – in other words, the source EUI that each State Entity would be expected to have, given its collection of building types and their relative sizes, and assuming average energy performance.

Agency	Building / Facility Name	Portfolio Manager Category	Portfolio Manager Category Source EUI	Square Feet
Agency 5	Building A	Office	148.1	60,800
Agency 5	Building B	Other - Recreation	96.8	104,146
Agency 5	Building C	Museum	85.1	35,000
Agency 5	Building D	Office	148.1	31,050
Agency 5	Building E	Repair Services	100.4	29,585
Agency 5	Building F	Museum	85.1	42,000
Agency 5	Building G	Office	148.1	35,000
Weighted Average			113.7	

#### 4. Compare baseline performance and expected performance

The CMIT compared each State Entity’s weather-adjusted baseline source EUI with its weighted average expected source EUI, with the intention of using these comparisons to adjust the base median target of 22% upwards or downwards, depending on performance. If a State Entity’s baseline EUI was higher (worse) than its expected EUI, then its individual target would be higher than the base median target. If a State Entity’s baseline EUI was lower (better) than its expected EUI, then its individual target would be lower than the base median target.

The initial attempt to set State Entity targets using this comparison was very simple, and termed the “direct arithmetic method” by the CMIT. Where the baseline was higher than expected, that percentage difference was used to adjust the base median target; when it was lower than expected, the same computation was done, but in the other direction. For example, if a State Entity had an expected EUI of 100, but its baseline performance were 110, then it would have done 10% worse than expected; therefore, 22% would be adjusted upward by 10%, resulting in a savings target of 24.2%.

However, the divergence of results using this methodology was too wide to be useful. The mean difference between baseline and expected EUIs was around 60% (implying an average State Entity target of around 35%), and the standard deviation was nearly 150% of the mean – quite large for a data set of this type. The resulting targets were too divergent, and, in most cases, unreasonably large.

Agency	% Better (Worse) than Expected	2020 Target Improvement
Agency 6	4.7%	<b>21.0%</b>
Agency 7	-14.4%	<b>25.2%</b>
Agency 8	-32.6%	<b>29.2%</b>
Agency 9	-93.5%	<b>42.6%</b>

In place of this methodology, the CMIT experimented with a variant of it, termed the “adjusted arithmetic method”. This method used the same comparison, but instead used the baseline performance as the denominator when calculating the percentage difference – in essence, asking the question “What percentage would a given State Entity’s baseline performance have to improve/decline to be at its expected level?” Using the example above, a State Entity with an expected EUI of 100 and a baseline performance of 110 would be deemed 9.1% below expectations, and be given a savings target of 24%. This adjusted methodology resulted in a much tighter set of State Entity targets, with a more reasonable mean target below 28% and a standard deviation 20% of the mean.

Agency	% Reduction to Expected	2020 Target Improvement
Agency 6	-5.0%	<b>20.9%</b>
Agency 7	12.6%	<b>24.8%</b>
Agency 8	24.6%	<b>27.4%</b>
Agency 9	48.3%	<b>32.6%</b>

Ultimately, the CMIT decided that due to issues with data reporting and accuracy, the imperfect fit of many Portfolio Manager categories, and the idiosyncrasies of operating facilities in New York, it was inappropriate to put too strong of a reliance on the comparisons' precision. Therefore, the CMIT ranked the State Entities in order of this comparison – from best percentage differential between baseline and expected EUI to worst percentage differential between baseline and expected EUI – and broke the set into quartiles. Each quartile's savings target was then adjusted upward or downward from the base median target, depending on level and direction of quartile performance. This is termed the "quartile method" of setting savings targets.

Agency	% Better (Worse) than Median Performance	2020 Target Improvement
Agency 1	169.2%	20.5%
Agency 2	118.6%	20.5%
Agency 3	114.5%	20.5%
Agency 4	108.7%	20.5%
Agency 5	89.2%	20.5%
Agency 6	55.8%	20.5%
Agency 7	44.5%	21.5%
Agency 8	43.8%	21.5%
Agency 9	42.3%	21.5%
Agency 10	42.0%	21.5%
Agency 11	10.1%	21.5%
Agency 12	0.3%	21.5%
Agency 13	-0.3%	22.5%
Agency 14	-10.3%	22.5%
Agency 15	-28.6%	22.5%
Agency 16	-48.4%	22.5%
Agency 17	-60.5%	22.5%
Agency 18	-186.3%	22.5%
Agency 19	-187.4%	23.5%
Agency 20	-199.7%	23.5%
Agency 21	-227.5%	23.5%
Agency 22	-252.5%	23.5%
Agency 23	-691.8%	23.5%
Agency 24	-1027.6%	23.5%

Quartile 1

Quartile 2

Quartile 3

Quartile 4

A few State Entities, however, were not placed into quartiles based on performance. These break into two groups. First, the CMIT currently lacks baseline year data for a few agencies: the Olympic Regional Development Authority, the Convention Center Operating Corporation, the Department of Agriculture and Markets, the Battery Park City Authority, and the Roosevelt Island Operating Corporation. These agencies had been deemed Covered under EO 88 towards the end of 2013, and have therefore been given an extension on reporting their baseline data. Second, Portfolio Manager categories were deemed incompatible with the facilities of the Metropolitan Transportation Authority and the Niagara Frontier Transportation Authority; the CMIT concluded that using such categories for these State Entities would result in off-base and inaccurate benchmarking. In place of the quartile method, the CMIT assigned these seven Entities the base median target of 22%, further subject to the adjustment for size (below) in cases where that data was available.

## **5. Adjust for portfolio risk**

The Build Smart portfolio is in no way equally balanced between the few dozen State Entities that comprise it; just six State Entities account for more than 90% of the State's square footage and energy consumption, with just one State Entity (the State University of New York) accounting for more than 40% alone. Thus, if any of the smaller State Entities achieved savings above and beyond their stated targets, it would have a small impact on the State's overall goal. Conversely, if any of the largest State Entities failed to reach 20% savings, it would become very difficult for the State to achieve the Executive Order's objective. Due to this imbalance, the CMIT felt it appropriate and necessary to adjust the quartile method targets based on State Entity size. Once again, the State Entities were divided into quartiles, this time by weather-normalized baseline kBtu. Each quartile's savings target was then adjusted upward or downward from its previous "quartile method" target, depending on whether larger or smaller than the median size.

Agency	Quartile Method Target	Weather - Normalized Baseline kBtu	Size Adjustment	2020 Target Improvement
Agency 2	20.5%	21,982,678,418	1.5%	22.0%
Agency 15	22.5%	9,167,081,353	1.5%	24.0%
Agency 5	20.5%	5,355,050,379	1.5%	22.0%
Agency 12	21.5%	4,295,573,902	1.5%	23.0%
Agency 23	23.5%	4,208,982,805	1.5%	25.0%
Agency 8	21.5%	4,111,346,355	1.5%	23.0%
Agency 16	22.5%	1,509,199,376	0.5%	23.0%
Agency 17	22.5%	550,956,701	0.5%	23.0%
Agency 24	23.5%	490,513,023	0.5%	24.0%
Agency 4	20.5%	354,499,890	0.5%	21.0%
Agency 11	21.5%	260,651,470	0.5%	22.0%
Agency 18	22.5%	153,342,717	0.5%	23.0%
Agency 20	23.5%	147,560,681	-0.5%	23.0%
Agency 10	21.5%	120,368,054	-0.5%	21.0%
Agency 14	22.5%	114,504,445	-0.5%	22.0%
Agency 22	23.5%	82,391,552	-0.5%	23.0%
Agency 13	22.5%	72,239,719	-0.5%	22.0%
Agency 9	21.5%	62,682,148	-0.5%	21.0%
Agency 21	23.5%	52,838,221	-1.5%	22.0%
Agency 1	20.5%	44,955,180	-1.5%	19.0%
Agency 19	23.5%	38,878,179	-1.5%	22.0%
Agency 6	20.5%	37,771,001	-1.5%	19.0%
Agency 7	21.5%	11,537,963	-1.5%	20.0%
Agency 3	20.5%	3,104,124	-1.5%	19.0%

Quartile 1

Quartile 2

Quartile 3

Quartile 4

While through this methodology most State Entities receive targets greater than 20%, it should be noted that the CMIT considers achieving 20% source EUI improvement compliance with the Executive Order, even in cases where a given Entity has been issued a target greater than 20%. The targets are just that – targets – and will be used for planning purposes and to guide State Entity activities.

## 6. Set annual savings targets

In addition to setting targets for the duration of the program, the Executive Order requires the CMIT to set annual targets for each State Entity. In order to do so, the CMIT mapped out when the various Executive Order and Guidelines requirements will occur between now and April 1, 2020, and attempted to quantify the magnitude of the associated activities. For example, since audits of all targeted facilities need to be completed by the end of 2015, and because implementation of cost-effective portfolios of projects stemming from those audits need to be completed within two years from that time, many of the core Build Smart retrofits and replacements are projected to be completed by the end of 2017. Similar assumptions were

made about submetering, retrocommissioning, operations and maintenance activities, and so on. In the end, the general “savings curve” generated through this analysis was:

State Fiscal Year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
% of Remaining EUI Improvement	10%	20%	25%	20%	12.5%	12.5%

The percentages above refer to the portion of EUI improvement remaining *entering the 2014-15 State Fiscal Year*. So, if a State Entity’s full-program target improvement was 22%, and it was deemed to have already accomplished a 2% improvement, it would have 20% EUI improvement remaining. It would then have 10% of that 20% remaining improvement (or 2%) as its target improvement for SFY 2014-15, and 20% of that 20% remaining improvement (or 4%) as its target improvement for SFY 2015-16 – and so on until the program ends on April 1, 2020.

Because six State Entities consume more than 90% of State facilities’ energy, however, the CMIT deemed it necessary to perform further analysis when determining those Entities’ savings curves. The CMIT looked at a variety of factors when doing so, including energy management programs already underway, the varying building stock of the Entities, submitted auditing plans, operations and maintenance plans being drafted, the varying potential for on-site generation, and the feedback of the Entities themselves. Ultimately, the CMIT devised the following savings curves for the six State Entities in question (with all other Entities receiving the standard curve noted above):

State Entity	State Fiscal Year					
	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
SUNY	10%	20%	25%	20%	12.5%	12.5%
DOCCS	10%	20%	25%	20%	12.5%	12.5%
CUNY	15%	15%	20%	20%	15.0%	15.0%
MTA	10%	18%	18%	18%	18%	18%
OMH	15%	15%	20%	25%	12.5%	12.5%
OGS	15%	15%	20%	25%	12.5%	12.5%
All Others	10%	20%	25%	20%	12.5%	12.5%