BuildSmartNY

EXECUTIVE ORDER 88 GUIDELINES
NEW YORK STATE GOVERNMENT BUILDINGS

New York Power Authority

SEPTEMBER 2013
Version 1.0

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Cover photos from top right: New York State House in Albany, Grand Central Station in New York City, City Hall in Yonkers, the Albany skyline, the Edward A. Rath County Office Building in Buffalo, City Hall in Rochester and SUNY Upstate Medical University in Syracuse.

Background

Build Smart NY is New York Governor Andrew M. Cuomo's program for aggressively pursuing energy efficiency in New York State government buildings while advancing economic growth, environmental protection, and energy security in New York State.

The centerpiece of Build Smart NY is Executive Order 88 **(the "Executive Order" or "EO 88")**, which was issued by Governor Cuomo on December 28, 2012. The Executive Order mandates a 20 percent improvement in the energy efficiency performance of State government buildings by April 2020. Source Energy Use Intensity, a leading industry indicator for measuring all energy use on a square foot basis, is the metric that will be used to assess State buildings' collective energy performance and to monitor the progress of various agency portfolios toward the Governor's 20 percent target.

The Executive Order designates the New York Power Authority ("NYPA") to coordinate compliance and drive the State to the Order's 20 percent target. NYPA, the largest state public power organization in the nation, has a long history of supporting the advancement of energy efficiency in governmental facilities. Within NYPA, a Central Management and Implementation Team ("CMIT") has been established to administer the Executive Order.

The Executive Order indicates that the NYPA CMIT is responsible for a number of tasks, including developing annual milestones to achieve the 20 percent target; engaging stakeholders to refine policy, and assess and mitigate risk; providing strategic and technical assistance and oversight to State Agencies and Authorities which are subject to EO 88 ("Affected State Entities", or "State Entities"); reporting progress results to the Governor's Office and the public; and creating a Guidelines document to clarify and specify requirements, and facilitate EO 88 compliance. This document provides the guidelines for State Entity compliance with the requirements of EO 88.

Program Governance

The organizations subject to EO 88 are **"(i) all State Entities and departments over which the Governor has Executive Authority, and (ii) all public-benefit corporations, public authorities and commissions, for which the Governor appoints the Chair, the Chief Executive, or the majority of Board Members, except for the Port Authority of New York and New Jersey."** A current working list of Affected State Entities can be found in Appendix A. More than 90 percent of the State's building square footage as well as energy consumption in facilities owned or managed by six State Entities: State University of NY ("SUNY"); Department of Corrections & Community Supervision ("DOCCS"); City University of NY ("CUNY"); Office of Mental Health ("OMH"); Office of General Services ("OGS"); and Metropolitan Transportation Authority ("MTA"). There are a number of smaller State Entities subject to EO 88, and many State Entities that occupy buildings which are either owned or operated by OGS, as is their related energy consumption. While a large number of State Entities are subject to EO 88, much of the Guidelines document is geared towards State Entities with the largest portfolios of buildings. Some of the content herein will only partially pertain to State Entities with smaller facility portfolios. That said, the underlying policies established in the Guidelines are generally relevant and applicable to all State Entities, as they are rooted in industry best practices.

Per a memorandum issued by the Governor's Office, all State Entity heads must officially designate both an Executive Sponsor and a Responsible Lead for Build Smart NY. A copy of the memorandum can be found in Appendix B. The Executive Sponsor must be a direct report to the State Entity, or State Entity head, and shall be accountable for compliance with EO 88. The Responsible Lead shall serve as the day-to-day contact for EO 88 in each organization and will be the central point of contact to NYPA's CMIT. The CMIT and the Governor's Office must be promptly notified of any personnel change in these key roles.

To ensure Executive Order 88 accountability at the highest levels of each affected State Entity, an Executive Steering Committee (the "Committee") has been established. The Committee is chaired by the NYPA President and CEO, and includes key policy and operations personnel from the Governor's Office. The balance of the Committee is comprised of direct reports to State Entity heads; such as Vice Chancellors and Deputy Commissioners (the complete current membership of the Committee can be found on page 1). Staffed and supported by the NYPA CMIT, the Committee provides general oversight, addresses risks and emerging issues, and advises on implementation policy. Initially convened May 2013, the Committee currently meets on a quarterly basis.

General Approach and Timeline

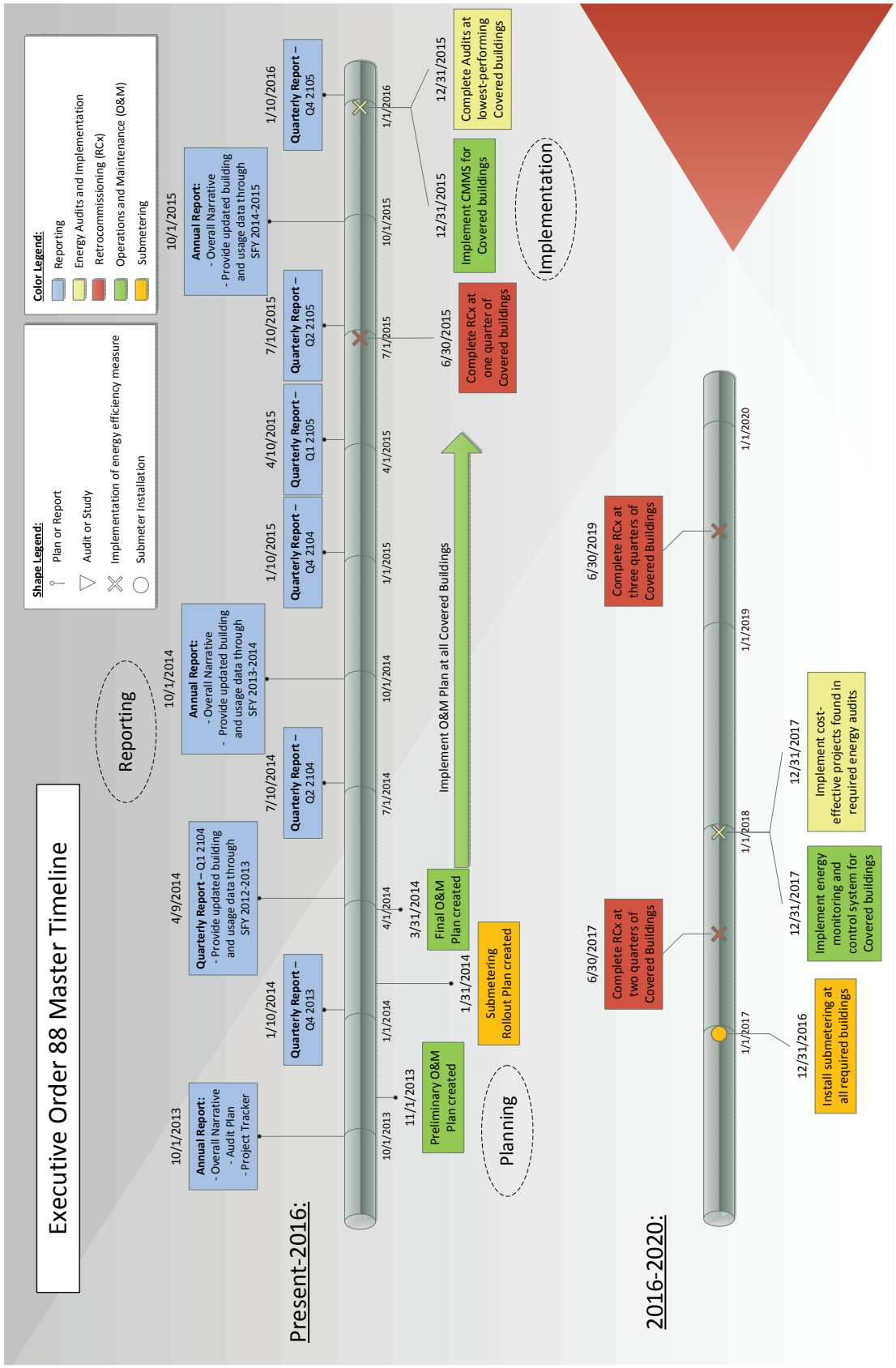
The enclosed EO 88 Guidelines ("Guidelines") document elaborates on the requirements established in the Executive Order and creates roles and responsibilities for the State's stakeholders and participants, details the policies and protocols for EO 88 implementation. The purpose of the Guidelines is to institute basic programmatic rules and policies so that all affected stakeholders are aware of what they are responsible for and how progress towards the Executive Order's target will be gauged. The Guidelines are not intended to be a set of energy efficiency best practices, although they will refer the reader to a number of sources containing such information. The Guidelines will be updated periodically to address the changing landscape of energy efficiency and any issues or opportunities that arise during program administration.

The development of the Guidelines has been a highly interactive process. More than 50 executives and facility/engineering managers from a dozen State Entities have worked with NYPA throughout the summer of 2013 to provide input on the Guidelines. Functional working groups and steering committees will convene regularly to assess the progress of EO 88 and discuss whether the Guidelines need to be modified to advance the State toward the larger goals of Build Smart NY in a practical manner.

The requirements, deadlines, and engineering standards contained in this document will serve as the administrative and procedural backbone of EO 88. This document defines much of what shall be done with respect to monitoring energy use, identifying energy saving opportunities, implementing projects, and improving operations of State buildings. No singular guideline, rule, or requirement, however, can prompt EO 88 to function as the transformational initiative it needs to be; effective leadership and management, data-driven decision-making, and strong organizational culture need to be institutionalized across State government in order to foster efficient building operations and energy performance.

To address the major requirements of Executive Order 88, the Guidelines have largely been structured to mirror the Order itself. With a few exceptions, the Guidelines are divided into sequential sections that reflect the timeline of the Order and standard energy efficiency practices.

Both Executive Order 88 and these Guidelines establish a large number of deadlines relevant to actions required for EO 88 compliance. These deadlines can be found throughout the Guidelines, but the timeline document here provides a high-level snapshot of all current requirements and milestones. There are multiple, parallel critical paths of activity which shall be required in order to implement the measures required to achieve the Governor's 20 percent target. The required milestones seek to ensure that many of the early key steps are taken on a timely basis to ensure that there is adequate time to fully implement as many strategies as possible to improve building performance. In addition, a comprehensive list of EO 88 milestones is provided in Appendix C.


Executive Order 88 Master Timeline
Shape Legend:
Plan or Report
Audit or Study
Implementation of energy efficiency measure
Submeter Installation
Color Legend:
Reporting
Energy Audits and Implementation
Retrocommissioning (RCx)
Operations and Maintenance (O&M)
Submetering
Reporting
Planning
Implementation
Present-2016:
2016-2020:
10/1/2013
Annual Report:
- Overall Narrative
- Audit Plan
- Project Tracker
1/10/2014
Quarterly Report – Q4 2013
4/9/2014
Quarterly Report – Q1 2104
- Provide updated building and usage data through SFY 2012-2013
7/10/2014
Quarterly Report – Q2 2104
10/1/2014
Annual Report:
- Overall Narrative
- Provide updated building and usage data through SFY 2013-2014
1/10/2015
Quarterly Report – Q4 2104
4/10/2015
Quarterly Report – Q1 2105
7/10/2015
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Quarterly Report – Q4 2105
10/1/2013
1/1/2014
4/1/2014
7/1/2014
10/1/2014
1/1/2015
4/1/2015
7/1/2015
10/1/2015
1/1/2016
11/1/2013
Preliminary O&M Plan created
1/31/2014
Submetering Rollout Plan created
3/31/2014
Final O&M Plan created
Implement O&M Plan at all Covered Buildings
6/30/2015
Complete RCx at one quarter of Covered buildings
12/31/2015
Implement CMMS for Covered buildings
12/31/2015
Complete Audits at lowest-performing Covered buildings
6/30/2017
Complete RCx at two quarters of Covered Buildings
12/31/2016
Install submetering at all required buildings
6/30/2019
Complete RCx at three quarters of Covered Buildings
12/31/2017
Implement energy monitoring and control system for Covered buildings
12/31/2017
Implement cost-effective projects found in required energy audits
1/1/2017
1/1/2018
1/1/2019
1/1/2020

AFFECTED STATE ENTITIES: All State Entities and departments over which the Governor has Executive Authority, and all public-benefit corporations, public authorities and commissions, for which the Governor appoints the Chair, the Chief Executive, or the majority of Board Members, except for the Port Authority of New York and New Jersey. Affected State Entities shall comply with the requirements set forth in Executive Order 88.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE): A building technology trade society focused on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability.

BENCHMARKING: The process of capturing a building's current energy performance and comparing it with its baseline energy performance, or the energy performance of similar buildings (such as comparing the energy performance of a hospital to that other hospitals). Benchmarking is used to compare a building's energy performance over time, and assess performance amongst similar buildings.

BRITISH THERMAL UNIT (BTU): The quantity of heat required to raise the temperature of one pound of liquid water by one degree Fahrenheit at the temperature at which water has its greatest density. All forms of energy used in buildings (electricity, natural gas, heating oil, steam) can be translated into BTU. BTU measurements are often expressed by the thousand (kBTU) or the million (MMBTU).

CONTINUOUS COMMISSIONING℠ (CCx℠): An ongoing process to resolve operating problems, improve comfort, optimize energy use and identify retrofits for existing commercial and institutional buildings and central plant facilities. CCx℠ focuses on improving overall system control and operations for the building, as it is currently utilized, and on meeting existing facility needs. It goes beyond an operations and maintenance program. It does not ensure that the systems function as originally designed, but ensures that the building and systems operate optimally to meet the current requirements.

COVERED BUILDINGS: For the purposes of EO 88, Covered Buildings are all buildings that are required to comply with EO 88 requirements. Covered Buildings consist of all buildings with a floor area greater than 20,000 gross square feet that are owned or managed by Affected State Entities. Until such time that a Master-Metered Campus (defined below) is submetered, the entire campus shall be treated as a Covered Building under EO 88, regardless of the corresponding gross floor area of any of the individual structures

ENERGY AUDIT: An engineering study that quantifies how energy is used in a building and identifies opportunities to improve the building's energy efficiency and reduce utility expenses.

ENERGY USE INTENSITY (EUI): EUI expresses the energy consumed by a building as a function of the building's size. EUI is commonly measured in thousands of Btu (kBtu) per gross square foot of building area.

ENERGY BASELINE: An initial period of metered energy consumption used as a point of reference for comparison purposes. The Executive Order 88 Energy Baseline year is State Fiscal Year 2010-2011. Energy reduction targets will be set for the Affected State Entity based on their Energy Use Intensity for the baseline year.

ENERGY STAR PORTFOLIO MANAGER: A web-based measurement and benchmarking tool that enables users to track building energy use and compare energy efficiency performance to similar buildings.

GROSS FLOOR AREA: Gross floor area is considered the total square foot of building space as measured from the principal exterior surfaces of the enclosing fixed walls. It should include main activity space, entrance ways, stairways, elevators, hallways, occupant kitchens, storage area, and any other common spaces the building.

LIFE CYCLE COST ANALYSIS (LCCA): Life-Cycle Cost Analysis (LCCA) evaluates the costs and savings that occur from owning, operating, maintaining, replacing, and disposing of an efficiency measure over its lifetime. This method typically discounts costs and savings to reflect the time value of money. Because it accounts for all costs and savings over the full life-cycle of the measure, LCCA provides the most accurate assessment of a project's long-term cost-effectiveness.

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED): A green building rating system that is trademarked and administered by the United States Green Building Council.

MASTER- METERED CAMPUS: A group of buildings served by the same utility meter, generally utilizing a central cooling and heating plant. Until such time that a Master-Metered Campus is submetered, the entire campus shall be treated as a Covered Building (defined above) under EO 88, regardless of the corresponding gross floor area of any of the individual structures.

RETROCOMMISSIONING (RCx): The process of assessing, analyzing, and adjusting the operational parameters of systems in an existing building to optimize the system's performance and satisfy current operational needs.

SITE ENERGY: The amount of heat and electricity consumed by a building as commonly reflected in utility bills.

SOURCE ENERGY: Represents the total amount of fuel consumed in the generation and use of energy consumed at a building, such as electricity and natural gas. It incorporates generation, transmission, and storage losses, thereby enabling a complete assessment of energy use in a building.

STATE FISCAL YEAR (SFY): The reporting period beginning on April 1 and ending on March 31 of the following year. State Entities are expected to report energy usage on the New York State Fiscal Year period unless otherwise specified.

SUB-METERED BUILDING: A building in a master-metered campus that has had additional metering installed so that the energy use within that particular building can be determined. EO 88 requires buildings having an area larger than 100,000 square feet on master-metered campuses be sub-metered for all fuels and other energy sources by December 31, 2016.

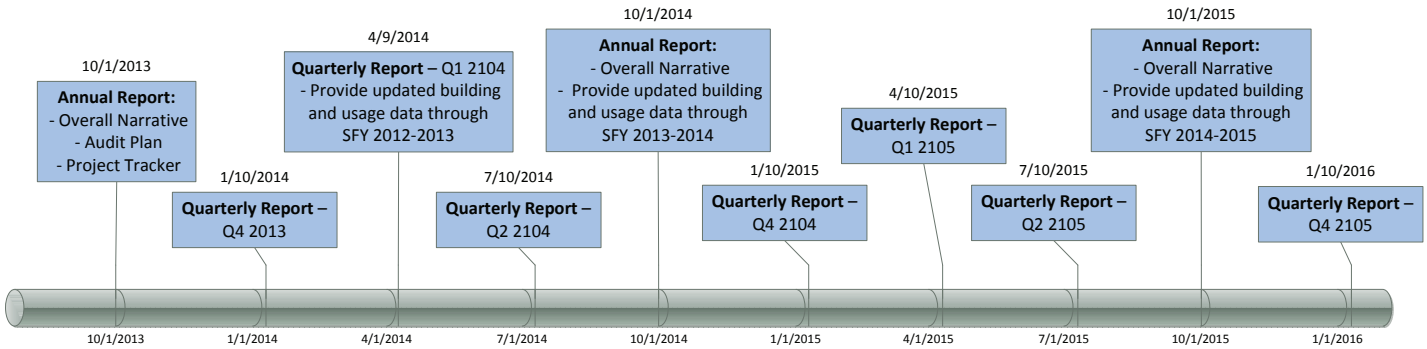
WITH REGARD TO REPORTING, EXECUTIVE ORDER 88 STATES:

"(7) **REPORTING.** No later than October 1st of each calendar year, each Affected State Entity shall submit all information requested by the CMIT on all State-owned and managed buildings having an area over 20,000 square feet, as well as any other information related to assessing compliance with this Executive Order."

WITH REGARD TO BENCHMARKING, EXECUTIVE ORDER 88 STATES:

"(1) **BENCHMARKING.** For each State fiscal year, each Affected State Entity shall measure the energy use in State-owned and managed buildings having an area greater than 20,000 square feet. Buildings on master-metered campuses shall be benchmarked at the campus level until they are sub-metered at the building level, after which point those buildings shall be benchmarked at the building level."

REPORTING TIMELINE THROUGH Q1 2016:



REPORTING & BENCHMARKING OUTLINE:

1. **Why is reporting required?**
2. **Which State Entities and buildings are subject to reporting requirements?**
3. **What are the reporting deliverables?**
4. **When is reporting due?**
5. **How will buildings be benchmarked?**

1 WHY IS REPORTING REQUIRED?

1.1 Reporting is essential in order to assess progress towards the energy efficiency targets of EO 88. The baseline energy performance of Covered buildings has been provided for State Fiscal Year ("SFY") 2010-2011 and this data will serve as the baseline condition against which the CMIT will set energy reduction targets and monitor the incremental progress of State Entity initiatives to meet those targets. The quality and consistency of energy data is integral to effectively assessing programmatic success, which makes adherence to the reporting guidelines vitally important.

2 WHICH STATE ENTITIES AND BUILDINGS ARE SUBJECT TO REPORTING REQUIREMENTS?

2.1 Any State Entity with at least one building with a gross floor area greater than 20,000 square feet is subject to EO 88 reporting requirements.

2.2 All Covered buildings are subject to reporting requirements. Covered buildings are those with a gross floor area greater than 20,000 square feet and not otherwise determined to be exempt by the CMIT.

2.3 Buildings may be exempted from the reporting requirements at the discretion of the CMIT. All requests for exemptions shall be transmitted to the CMIT by State Entities for review and approval, along with any requested backup documentation substantiating the exemption claim.

2.3.1 Leased space is exempt from EO 88 requirements but energy savings realized at leased buildings may be eligible for credits towards EO 88 energy savings targets.

2.4 All master-metered campuses will be reported and benchmarked on the campus level until the buildings within the campus' portfolio have been submetered. After submeters have been installed, building level reporting will be required for all buildings where submeters are installed.

2.4.1 If submetered buildings within a campus have a footprint of 20,000 gross square feet or less they may be eligible for exemption upon written request to, and approval from, the CMIT. Any submetered buildings that are being counted in master-meter readings must have their energy consumption deducted from the master-metered data prior to submittal to the CMIT.

2.4.2 If a master-metered campus consists only of buildings with areas under 20,000 gross square feet, then the campus may be exempt from EO 88 requirements. A formal request for exemption must be submitted to the CMIT for consideration along with any relevant supporting documentation.

3 WHAT ARE THE REPORTING DELIVERABLES?

3.1 Annual Reporting – State Entities shall submit Annual Reports no later than October 1st of each year to the CMIT that detail energy consumption and cost data for all fuels, along with updated building characteristic information for all Covered buildings. Annual Reports may also include energy audit plans, lists of energy efficiency projects, and submetering plans.

3.1.1 Annual Reporting requirements for 2013 will be different from subsequent years; details on specific reporting requirements can be found in Table 1.

3.2 Quarterly Reporting – State Entities shall submit Quarterly Reports to the CMIT which illustrate progress towards savings targets and highlight other initiatives relevant to meeting EO 88's requirements. Quarterly Reports should include a list of completed energy audits, energy efficiency projects, progress in operations & maintenance (O&M) or retrocommissioning (RCx) activities, progress toward meeting EO 88 submetering requirements, and other relevant activities.

3.3 The CMIT will hold meetings, either in person or via teleconference, with select State Entity leads approximately once per month, or as deemed necessary, to receive updates from the State Entity on progress towards the EO 88 goals.

3.4 Other Reporting Requirements

3.4.1 Estimated meter readings: Estimated meter readings can skew reporting of progress; therefore it is incumbent upon the State Entities to minimize estimated meter reading to the greatest extent practicable.

3.4.2 Delivery data for heating fuels: Many State Entities use delivery data for heating fuels as a proxy for actual fuel consumption. Since fuel delivery is not synchronous with fuel consumption, delivery data is an ineffective proxy that can lead to inaccurate fuel consumption estimates. Therefore, by the reporting date of October 1, 2017, delivery data will not be sufficient as a proxy for usage, and actual fuel usage data must be provided.

4. WHEN IS REPORTING DUE?

4.1 Table 1 provides the schedule for Annual and Quarterly State Entity reporting through 2014. A complete list of reporting deadlines can be found in Appendix C. Please note that the reporting requirements for 2013 are different than subsequent years to allow State Entities to review final baseline data and bring benchmarking data requirements up to date.

5 HOW WILL BUILDINGS BE BENCHMARKED?

5.1 The CMIT will benchmark buildings and campuses to better assess energy performance and to help focus resources. Buildings and campuses will be benchmarked against ENERGY STAR Portfolio Manager national averages, and other relevant measurements as applicable.

5.2 Benchmarking will be performed at the campus level, for master-metered campuses, and at the building level for individually-metered buildings. As master-metered campuses are submetered, and the CMIT begins receiving building-level consumption information, benchmarking will be performed by building within the campus.

5.3 Based on the benchmarking performed by the CMIT, each State Entity's building portfolio will be divided into performance quartiles to prioritize energy audits and retrocommissioning.

5.4 The CMIT will continue to use ENERGY STAR Portfolio Manager whenever applicable, and will seek to leverage additional benchmarking systems as they become available.

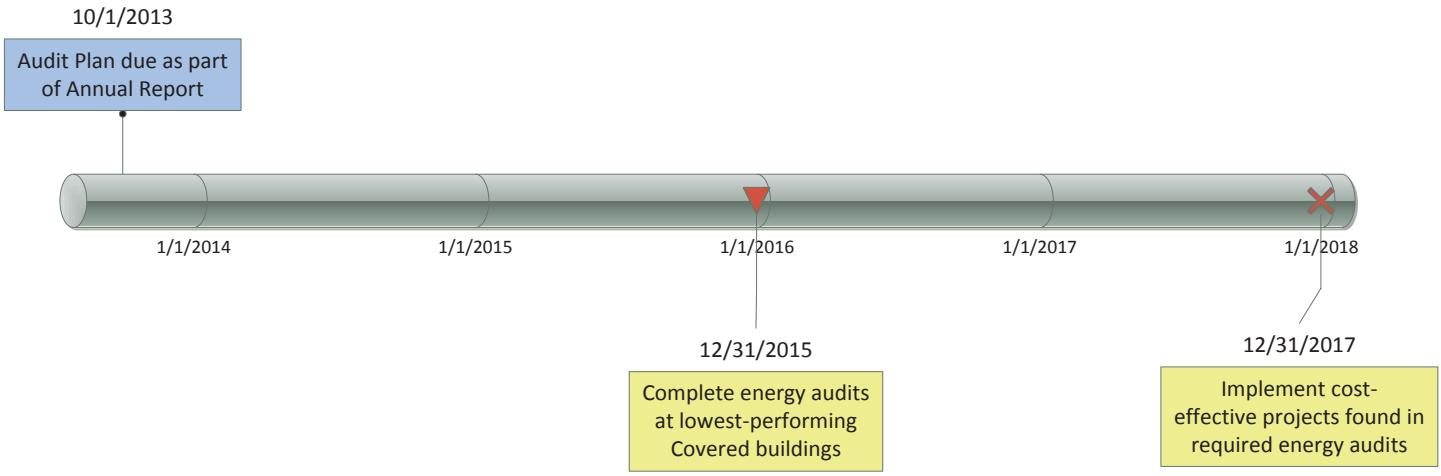
TABLE 1. Annual Reporting Deliverables—2013 and 2014 Requirements

DUE DATE	REPORT TYPE	REPORTING DELIVERABLES
Tuesday, October 01, 2013	Annual Report	Finalize all SFY 2010-2011 baseline building and utility data; Provide SFY 2011-2012 building and utility data, if available.
	Energy Auditing Plan	Provide a multi-year plan for complying with EO 88 auditing requirements, detailing the audits in process, scheduled, and planned to be performed
	Energy Efficiency Project Tracker	List all energy efficiency projects planned, underway, or completed since SFY 2010-2011 including those in Capital Plan.
Monday, March 31, 2014	For 2014 only: Provide data through SFY 2012-2013	Provide detailed building and utility data for applicable buildings through SFY 2012-2013.
Wednesday, October 01, 2014	Annual Report	Provide detailed building and utility data for applicable buildings through SFY 2013-2014 along with other program updates as specified by the CMIT.

WITH REGARD TO ENERGY AUDITS, EXECUTIVE ORDER 88 (EO 88) STATES:

"(2) **AUDITS.** Buildings that receive low benchmark scores, as defined by the Guidelines, shall undergo an American Society of Heating, Refrigeration, and Air-Conditioning Engineers ("ASHRAE") Level II energy audit, or any other comparable audit that the CMIT approves. Campuses that have above-average EUIs or poor benchmark scores, as defined by the Guidelines, or are otherwise prioritized by the Affected State Entities and the CMIT, shall undergo a campus-wide ASHRAE Level II energy audit or any other comparable audit approved by the CMIT. In addition to energy efficiency measures, the audits shall identify opportunities for cost-effective on-site renewable generation and high-efficiency combined heat and power."

ENERGY AUDITING TIMELINE:



ENERGY AUDITING OUTLINE:

1. **What are Energy Audits and why are they necessary?**
2. **Which State Entities and facilities require Energy Audits?**
3. **How do State Entities plan their Energy Audits and report these plans and progress to the CMIT?**
4. **When must all Energy Audits be completed and when are they deemed complete?**
5. **What should be included in Energy Audits?**
6. **What are the requirements around implementing energy efficiency measures identified in the Energy Audits?**

1 WHAT ARE ENERGY AUDITS AND WHY ARE THEY NECESSARY?

1.1 Energy audits and energy master plans are effective tools for identifying, and prioritizing energy efficiency upgrades in buildings. To comply with EO 88's energy reduction goals, energy audits and master plans will be used to analyze energy use in State buildings with a focus on "Low Performing Buildings" as defined by the CMIT.

1.2 ASHRAE Level 2[1] energy audits (as defined in *"Procedures for Commercial Building Energy Audits,"* 2011 Edition, published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers) are required to meet EO 88's energy auditing requirements. ASHRAE Level 2 energy audits provide detailed analysis of energy usage, energy costs, and building characteristics, and make recommendations for energy conservation measures that consider both the operational needs and financial constraints of the facilities and State Entities involved.

1.3 Energy master plans consist of a savings and cost analysis of all practical energy efficiency measures that meet building and campus constraints, and consider State Entities' financial requirements. Energy master plans take a holistic look at campus-wide operations, accounting for interactive effects between buildings and providing comprehensive recommendations for capital and operational improvements.

2 WHICH STATE ENTITIES AND FACILITIES REQUIRE ENERGY AUDITS?

2.1 Low-performing buildings are defined as the lowest-performing quartile of buildings and campuses for each State Entity, based on the benchmarking performed by the CMIT. All low-performing buildings and/or campuses shall have an energy audit, while the remaining three-quarters of buildings will be retrocommissioned (see the Retrocommissioning section for more details). The final result will be that all Covered buildings will have been either audited or retrocommissioned by 2020.

2.2 Audits of low-performing buildings may be deferred if an ASHRAE Level 2 audit has been completed at that building using baseline utility data from SFY 2010-2011 or sooner. All audit documentation must be transmitted to the CMIT for a facility to be considered for an exemption.

2.3 State Entities may propose substitutions to the CMIT, whereby low-performing buildings may have their auditing requirement deferred in exchange for identifying other buildings deemed by the State Entity to have greater energy efficiency opportunities.

3 HOW DO STATE ENTITIES PLAN THEIR ENERGY AUDITS AND REPORT THESE PLANS AND PROGRESS TO THE CMIT?

3.1 State Entities must provide an Energy Auditing Plan to the CMIT by **October 1, 2013** for review and approval. Progress on the Energy Audit Plan shall be provided by the CMIT as appropriate.

3.2 The CMIT shall provide the Energy Auditing Plan template and other plan requirements to State Entities. The auditing plan shall nominally include the start date, completion date, and means of executing audits of each low-performing building identified by the CMIT.

4 WHEN MUST ALL ENERGY AUDITS BE COMPLETED AND WHEN ARE THEY DEEMED COMPLETE?

4.1 By **December 31, 2015**, State Entities shall have performed, or have scheduled, energy audits at all buildings in the lowest-performing quartile, or as determined by the CMIT and State Entities.

4.2 Energy audits for additional buildings may be required by the CMIT based on updated annual energy usage information submitted by the State Entities, or other factors.

4.3 A detailed RCx study may be performed in lieu of an energy audit for select buildings. These exceptions will be approved by the CMIT on a case-by-case basis but will generally be in situations where an audit has already been performed within the past five years, and/or the buildings energy use can be largely attributed to limited equipment.

4.4 Energy audits must be submitted to the CMIT for review to be counted towards the compliance requirement.

5 WHAT SHOULD BE INCLUDED IN ENERGY AUDITS?

5.1 All energy audits shall be consistent with ASHRAE's definition of a Level 2 energy audit as defined in *"Procedures for Commercial Building Energy Audits,"* 2011 Edition, published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

5.2 In addition, energy audits should identify opportunities for cost-effective on-site renewable energy generation and high-efficiency combined heat and power whenever these technologies are feasible and reasonable opportunities exist for their implementation.

5.3 The audit should also identify and recommend opportunities for retrocommissioning: see the Retrocommissioning section for more details on retrocommissioning requirements. Once an audit has been completed at a building, the auditing requirement for that building under EO 88 will be satisfied. Buildings will not need to be audited more than once if the audit requirements have been met; however, State Entities may decide to update an energy audit report if it has aged, or if significant facility or operational changes have taken place since the initial energy audit was conducted.

1 "Procedures for Commercial Building Energy Audits" 2011 Edition, defines energy audit levels with numbers (e.g. "2") rather than roman numbers (e.g. "II"). An ASHRAE "Level 2" energy audit is equivalent to a "Level II" energy audit, as described in the text of Executive Order 88.

6 WHAT ARE THE REQUIREMENTS AROUND IMPLEMENTING ENERGY EFFICIENCY MEASURES IDENTIFIED IN THE ENERGY AUDITS?

6.1 State Entities shall implement a cost-effective portfolio of measures identified and recommended in the energy audit and shall complete or make substantial progress toward completion of such measures within two years of completion of the audit.

6.2 Although typically not required for ASHRAE Level 2 energy audits, "cost-effective" measures will be determined using Life Cycle Cost Analysis ("LCCA"). A portfolio may include, but shall not be limited to, no- and low-cost operational improvements, retro-commissioning, capital energy efficiency retrofits, on-site renewable and high-efficiency combined heat and power, and other measures identified by the CMIT (see the Capital Projects Implementation section and Appendix D for more detail defining cost effectiveness).

6.3 For the purposes of EO 88, "substantial progress" towards implementing required capital projects will depend based on the type of project and its level of investment.

6.3.1 Significant retrofits or equipment replacements that are planned to be part of the capital budget must be on the capital plan within two years of being identified.

6.3.2 Significant retrofits or equipment replacements that are financed through channels other than the State Entity's capital plan (e.g. through a third party financing program) must be in design phase within two years of being identified.

6.3.3 Minor retrofits, and low/no-cost operations related upgrades (e.g. retrocommissioning and O&M measures) must be completed or in process within two years of being identified.

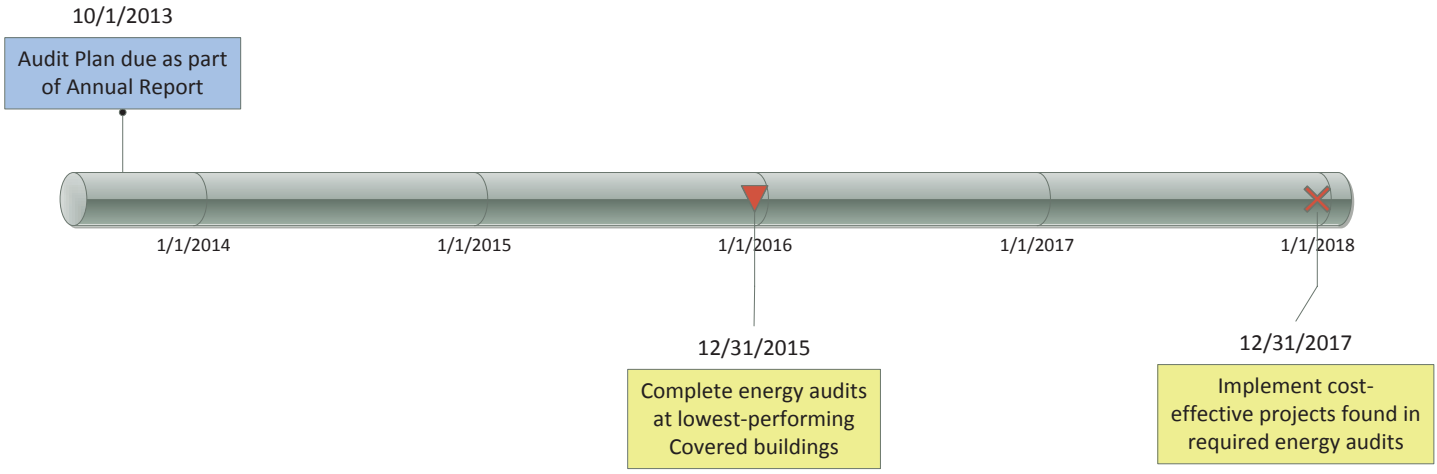
6.4 Although the Executive Order's focus is on cost-effective measures, it is expected that State Entities will consider implementing other measures that may not meet the LCCA cost-effective definition, although these measures do not have to be implemented within two years.

WITH REGARD TO CAPITAL PROJECT IMPLEMENTATION, EXECUTIVE ORDER 88 (EO 88) STATES:

(3) Required Capital Projects and Energy Optimization Measures. Affected State Entities shall implement a cost-effective portfolio of measures identified and recommended in the audit and shall complete or make substantial progress toward completion of such measures within two years of completion of the audit. A portfolio may include, but shall not be limited to, no- and low-cost operational improvements, retrocommissioning, capital energy efficiency retrofits, on-site renewable and high-efficiency combined heat and power, and other measures identified by the CMIT.

(5) Incorporating Energy Efficiency Analysis in the Capital Planning Process. As part of the capital planning process, all Affected State Entities shall include an energy efficiency analysis in the design phase of all capital project plans. The capital project should include energy efficient measures or technologies determined to be the most cost-effective, as defined by the Guidelines.

CAPITAL PROJECT IMPLEMENTATION TIMELINE:



CAPITAL PROJECT IMPLEMENTATION OUTLINE

1. **How are "Required Capital Projects" defined?**
2. **How will Executive Order 88 be integrated into the State's capital plan development cycle?**
3. **What are the requirements for new construction projects?**

1 HOW ARE "REQUIRED CAPITAL PROJECTS" DEFINED?

1.1 Any energy efficiency measure, or combination of energy efficiency measures, which result from an energy audit, and are deemed "cost-effective" shall be considered a required capital project. State Entities shall complete, or make substantial progress toward completion, any cost-effective measures identified during an energy audit or similar study within two years of the study's completion.

1.1.1 Cost-effectiveness shall be determined by a Life Cycle Cost Analysis ("LCCA"). Specific parameters for the LCCA can be found in the Savings Methodology section; of Appendix D in general, a LCCA accounts for:

- Initial Costs—Purchase, Acquisition, Construction Costs
- Fuel Costs
- Documented Operation, Maintenance, and Repair Costs
- Replacement Costs
- Residual Values—Resale or Salvage Values or Disposal Costs
- Finance Charges—Loan Interest Payments

1.1.2 For the purposes of EO 88, "substantial progress" towards implementing required capital projects will depend based on the type of project and its level of investment.

1.1.2.1 Retrofits or equipment replacements which are planned to be part of the State-Financed Capital Program **must be added to the capital plan** within two years of being identified from Energy Audits.

1.1.2.2 Significant retrofits or equipment replacements that are financed through channels other than the State Entity's capital plan (e.g. through a third party financing program) **must be in the design phase** within two years of being identified.

1.1.2.3 Minor retrofits, and low/no-cost operations related upgrades (e.g. retrocommissioning and O&M measures) **must be completed** within two years of being identified.

1.2 A project shall be considered cost-effective if the calculated Savings-to-Investment Ratio ("SIR") is greater than or equal to 1.20. Additionally, when evaluating multiple mutually exclusive alternatives, the alternative with the lowest life-cycle cost ("LCC") is the most cost-effective and should be selected for installation. See Appendix D for more specifics and for a rationale of this approach.

1.3 The LCCA shall be applied to comprehensive packages of measures identified during an energy audit, rather than to individual measures. If an individual measure is not considered cost-effective by the LCCA, but can be packaged with a group of measures that are considered cost-effective in aggregate, then the entire group of measures shall be considered cost-effective.

1.4 If a project has been deemed cost-effective during the design phase, but is no longer cost-effective after bids are received from implementation contractors (general contractors, construction firms, etc.) then the project will no longer be considered cost-effective and the two year implementation requirement does not apply.

2 HOW WILL EXECUTIVE ORDER 88 BE INTEGRATED INTO THE STATE'S CAPITAL PLAN DEVELOPMENT CYCLE?

2.1 Build Smart NY and EO 88 will function as an extension of "NY Works," Governor Cuomo's initiative aimed at redesigning the State's capital budget process into a more holistic and strategic multi-discipline infrastructure planning exercise which will drive regional economic development across the State. Both Build Smart NY and NY Works are aimed at promoting thoughtful investment in State assets in a way which improves state government service delivery, reduces operating costs, stimulates the economy, and creates jobs.

The Governor's Office, CMIT, Division of Budget ("DOB"), and the NY Works Task Force are working to integrate Executive Order 88 requirements into the revised State capital planning process. Capital improvement projects with energy efficiency items in their scopes of work shall be flagged in the capital budget by the State Entities, and considered for at least partial financing through NYPA's energy efficiency programs, and incentive funding through NYSERDA and investor-owned utility ("IOU") programs, if applicable.

2.2 The CMIT will work with DOB and the State Entities covered by EO 88 to estimate energy savings associated with traditional capital projects, and identify scope of work enhancements that fully exploit cost-effective energy efficiency opportunities.

2.3 The CMIT will work with NYPA, NYSERDA, and IOU energy efficiency program administrators to ensure that maximum levels of ratepayer-funded incentives administered by NYSERDA and the investor-owned utilities are realized by the State Entities to subsidize these projects. Taken together, these alternatives will serve to alleviate limitations on traditional capital appropriations while maintaining more adequate investment levels for State facilities.

2.4 Other investments necessary to comply with EO 88 which may not have direct energy savings returns, such as energy audits, retrocommissioning studies, and submetering projects, may need to be prioritized within State Entities' own capital budget appropriations, but some supplemental funding may be available.

2.5 The revised capital budget process is a work in progress, as is it relates to EO 88 capital planning requirements. State Entities shall be consulted as the work of the CMIT, DOB, and NY Works teams develops. A future release of the Guidelines shall contain updated guidance in this area.

3 WHAT ARE THE REQUIREMENTS FOR NEW CONSTRUCTION PROJECTS?

3.1 While there are no formal new construction standards or requirements specified in Executive Order 88, the CMIT expects all new buildings to be built to the New York State energy code, current at the time of design, or better. Ultimately, each State Entity is responsible for achieving their energy savings targets and emphasizing energy efficiency in new construction projects will play a significant role in meeting these targets. The CMIT supports the use of green building standards (such as LEED, ENERGY STAR, and ASHRAE 90.1) in new construction projects as a means of increasing building energy efficiency.

3.2 For the purposes of EO 88, the new construction guidelines refer to both new construction projects and substantial renovations; definitions for both are listed below.

3.2.1 New Construction: Defined as a new building, or space within an existing building, for which a licensed professional architect or engineer has prepared and certified building plans.

3.2.2 Substantial Renovation: Defined as a capital project in which the scope of work includes work affecting at least two of the primary building systems and the building area is unable to remain occupied due to the nature of the construction for 30 days or more. Primary building systems are defined for purposes of this explanation as:

- HVAC
- Electrical and/or lighting
- Exterior Walls and/or Windows
- Roofing and/or Ceiling
- Plumbing

3.3 All new construction projects must have an energy efficiency analysis performed early in the design phase of project development.

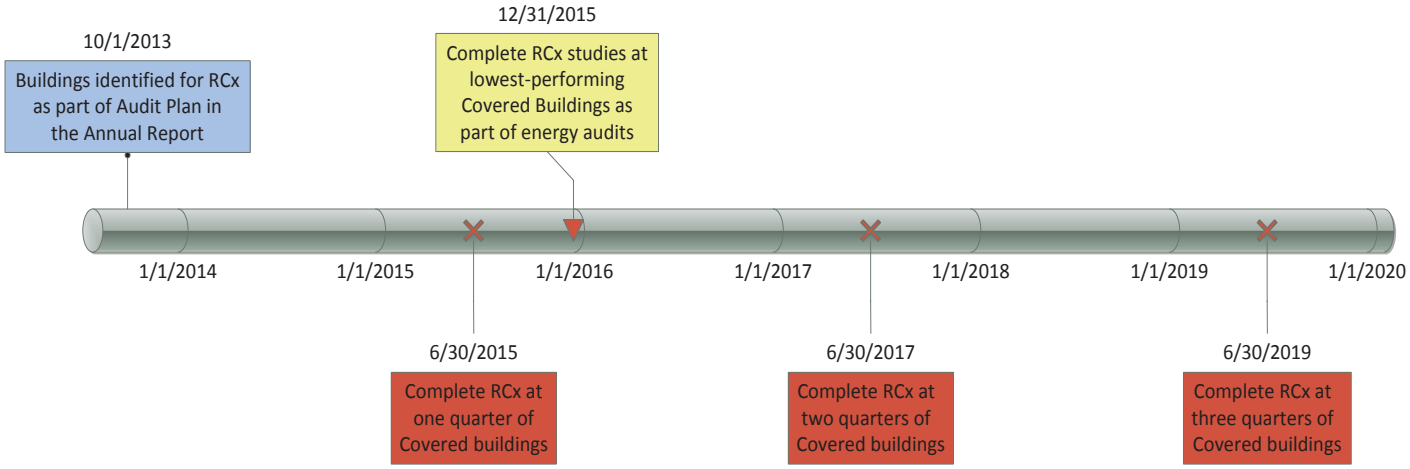
3.4 State Entities shall assign a responsible party to confirm that an energy efficiency analysis was performed during the project design phase.

3.5 A Commissioning Authority (CxA) shall be assigned by the State Entity to commission all new construction projects. Commissioning shall commence in design phase (no later than 60% design) with document review, continue in construction phase with pre-functional testing, functional performance testing, and post-occupancy review. Commissioning shall take place at two points in time: (1) immediately after construction, and (2) again twelve months after the building has been occupied and operational.

WITH REGARD TO RETROCOMMISSIONING, EXECUTIVE ORDER 88 (EO 88) STATES:

"(3) Required Capital Projects and Energy Optimization Measures. Affected State Entities shall implement a cost-effective portfolio of measures identified and recommended in the audit and shall complete or make substantial progress toward completion of such measures within two years of completion of the audit. A portfolio may include, but shall not be limited to, no- and low-cost operational improvements, retrocommissioning, capital energy efficiency retrofits, on-site renewable and high-efficiency combined heat and power, and other measures identified by the CMIT."

RETROCOMMISSIONING TIMELINE:



RETROCOMMISSIONING OVERVIEW

This section of the Guidelines is intended to describe the retrocommissioning ("RCx") requirements for State Entities, and create a framework for CMIT assistance to State Entities in identifying and implementing RCx opportunities. All energy audits performed as part of EO 88 shall contain a section on RCx energy efficiency measures, and State Entities should act on these items immediately as they are being identified in the field. RCx measures tend to be very cost-effective and quick to implement, making them powerful tools for State Entities to achieve their energy savings targets.

RETROCOMMISSIONING OUTLINE

1. What is retrocommissioning and why is it important?

2. What are the retrocommissioning requirements for State Entities?

3. What is Continuous Commissioning and how does it apply to EO 88?

4. What is the role of the CMIT and State Entities with regard to retrocommissioning?

5. What are the retrocommissioning study requirements?

1 WHAT IS RETROCOMMISSIONING AND WHY IS IT IMPORTANT?

1.1 Retrocommissioning ("RCx") is a process that looks at how and why a building's systems are operated and maintained as they are, and then identifies ways to improve overall building performance. Since operational parameters in equipment settings naturally change over time, RCx is an effective efficiency strategy that saves energy while improving building performance. RCx relies on building and equipment documentation, along with functional testing and covers a range of technical depth.

1.2 Retrocommissioning measures have been shown to save between 5% and 15% on building energy usage[2] and on average have short payback periods. Due to the cost-effectiveness and quick paybacks of RCx measures they can be a very effective tool in helping State Entities reach their energy savings goals under EO 88.

2 WHAT ARE THE RETROCOMMISSIONING REQUIREMENTS FOR STATE ENTITIES?

2.1 Low-performing buildings are defined as the lowest-performing quartile of buildings and campuses for each State Entity, based on the benchmarking performed by the CMIT. All low-performing buildings and/or campuses shall have an energy audit, while the remaining three-quarters of buildings will be retrocommissioned (see the Retrocommissioning section for more details). The final result will be that all Covered buildings will have been either audited or retrocommissioned by the Executive Order's target date of 2020.

2.2 By June 30, 2015, State Entities shall have implemented retrocommissioning at one quarter of buildings not being audited.

2.3 By June 30, 2017, State Entities shall have implemented retrocommissioning at two quarters of buildings not being audited.

2.4 By June 30, 2019, State Entities shall have implemented retrocommissioning at three quarters of buildings not being audited.

2.5 Exemptions to the retrocommissioning requirement may be granted for buildings if State Entities can demonstrate little opportunity for retrocommissioning exists at the building. Exemptions will be review by the CMIT upon written request by State Entities.

2.6 Any new building constructed after the baseline reporting year will be subject to the audit requirement, once it has been reported to the CMIT as part of the Annual Report.

3 WHAT IS CONTINUOUS COMMISSIONING AND HOW DOES IT APPLY TO EO 88?

3.1 Per FEMP, "Continuous Commissioning SM ("CCx^{SM}") is an ongoing process to resolve operating problems, improve comfort, optimize energy use and identify retrofits for existing commercial and institutional buildings and central plant facilities. CCx focuses on improving overall system control and operations for the building, as it is currently utilized, and on meeting existing facility needs. It goes beyond an operations and maintenance program. It does not ensure that the systems function as originally designed, but ensures that the building and systems operate optimally to meet the current requirements."[3]

3.2 At buildings and campuses where State Entities are currently implementing a robust and demonstrable Continuous Commissioning program, the requirement for retrocommissioning may be waived if the State Entity can demonstrate a CCx plan is being implemented.

4 WHAT IS THE ROLE OF THE CMIT AND STATE ENTITIES WITH REGARD TO RETROCOMMISSIONING?

4.1 CMIT Role:

4.1.1 Provide guidance, general best practices, and additional resources to the State Entities to facilitate the implementation of RCx studies. Additional resources provided by the CMIT may include identifying project incentives and training opportunities, and establishing standby contract vehicles which may support State Entity's RCx efforts.

4.1.2 Facilitate meetings between energy and facility managers of different buildings and State Entities and establish other informational resources to exchange best practices and lessons learned regarding RCx.

4.2 State Entity Role:

4.2.1 Perform RCx studies, both as part of energy audits and as a stand-alone approach, and implement all cost-effective RCx measures identified within two years of the study completion date.

5 WHAT ARE THE RETROCOMMISSIONING STUDY REQUIREMENTS?

5.1 Retrocommissioning studies and recommendations will differ slightly based on the building or equipment analyzed; however, all RCx studies should contain the following components.

5.1.1 List of all systems and equipment including heating systems, cooling systems, related controllers and sensors, all motors, fans, pumps, valves and dampers, hot water systems, lighting systems, and all related system equipment.

5.1.2 List of all actions to ensure the proper functioning of equipment, and to calibrate and replace/repair equipment. Include operating protocols, calibration, sequencing, and repairs.

5.1.3 Co-generation review (if applicable) – any co-generation plants currently in operation shall be reviewed to ensure that they are operating at maximum effectiveness.

2 A Retrocommissioning Guide for Building Owners. Portland Energy Conservation, Inc. and U.S. Environmental Protection Agency, 2007. http://www.peci.org/sites/default/files/epaguide_0.pdf

3 Federal Energy Management Program: Continuous Commissioning Guidebook for Federal Energy Managers. Energy Systems Laboratory, Texas A&M University System and Nebraska University, October 2002. Retrieved from http://www1.eere.energy.gov/femp/pdfs/ccg01_covers.pdf

WITH REGARD TO OPERATIONS AND MAINTENANCE, EXECUTIVE ORDER 88 (EO 88) STATES:

The CMIT is hereby directed and authorized to: "…Develop a comprehensive operations and maintenance plan for the State's building portfolio to help achieve no cost and low cost efficiency improvements and ensure that efficiency savings are sustained…"

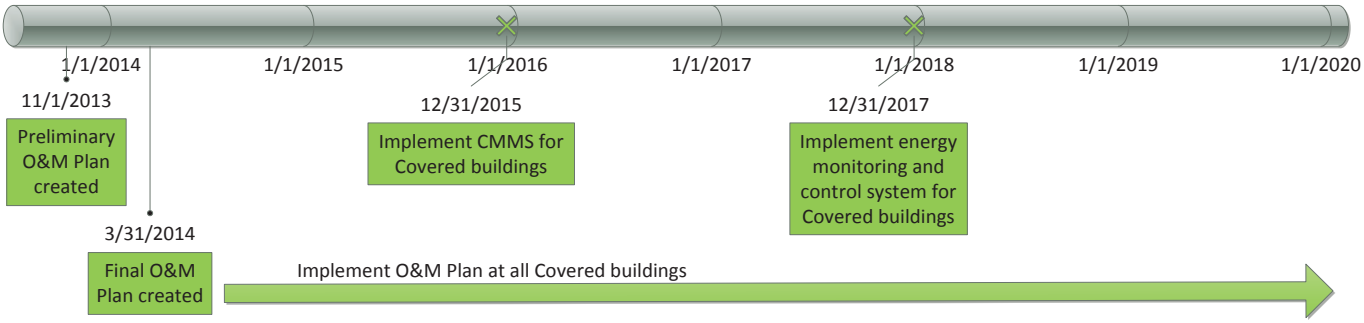
OPERATIONS & MAINTENANCE OVERVIEW

This section of the Guidelines is intended to provide basic, high-level operations and maintenance ("O&M") requirements for State Entities and create a framework for CMIT assistance to State Entities in developing more detailed O&M plans. The CMIT recognizes that agency operations are integral to the agencies' functions and include considerations beyond energy efficiency. However, efforts to improve operational procedures in tend to save energy, and similarly, efforts to improve the energy efficiency of operations tend to improve overall operations. Therefore, it is expected that Agencies will seek to save energy through operational improvements.

A strong O&M program with a well-defined preventive maintenance ("PM") strategy can result in significant energy savings. When an adequate PM system is not in place, and PM activities are not performed on systems and equipment, there is a decline in their condition and performance, which reduces their energy efficiency.

Information contained in this document pertaining to strategies and best practices was drawn from external sources, including the Federal Energy Management Program's ("FEMP") Operations and Maintenance Best Practices document. This document is a valuable reference tool, and the CMIT will continue to make O&M resources like these available to the State Entities during the implementation of EO 88.

OPERATIONS & MAINTENANCE TIMELINE:



OPERATIONS & MAINTENANCE OUTLINE

1. **What are O&M energy efficiency measures and why are they important?**
2. **What is the role of the CMIT and State Entities with regard to the O&M Plan?**
3. **What are the O&M Plan requirements?**

1 WHAT ARE O&M ENERGY EFFICIENCY MEASURES AND WHY ARE THEY IMPORTANT?

Operations and Maintenance ("O&M") are the decisions and actions regarding the control and upkeep of property and equipment. These are inclusive of, but not limited to, the following: (1) actions focused on scheduling, procedures, and work/systems control and optimization; and (2) performance of routine, preventive, predictive, scheduled, and unscheduled actions aimed at preventing equipment failure or decline with the goal of increasing efficiency, reliability, and safety[4]. For the purposes of these Guidelines, "Operations & Maintenance" refers only to energy- and utility-related activities; it does not include activities such as painting, carpentry, and other repairs. O&M measures as they pertain to energy efficiency are generally cost-effective actions that can be performed with in-house staff (or requirements contractors) and have very short-term or immediate paybacks.

It is critical that O&M practices be a major part of each State Entity's overall plan to meet the savings targets of EO 88. O&M is generally an area ripe with energy efficiency opportunities, across many facilities, even new and recently commissioned buildings. O&M initiatives are generally far more cost-effective than capital upgrades, in some cases providing the same energy savings at a cost twenty times less than a capital upgrade[5].

Additionally, as each State Entity performs retrofits and larger capital projects in facilities to improve energy performance, a strong O&M program is critical to ensure the sustained benefit of these investments. The absence of robust O&M procedures poses serious risks of non-compliance with EO 88, even after significant funds have been expended. Regardless of the origins of energy savings, or when it was first achieved, any gains from energy conservation measures need to persist and be accounted for through the April 2020 target date in the Executive Order. To ensure this persistence of energy savings, strong O&M procedures must be established as a permanent component of State Entity operations.

2 WHAT IS THE ROLE OF THE CMIT AND STATE ENTITIES WITH REGARD TO THE O&M PLAN?

2.1 CMIT Role:

2.1.1 Provide guidance, general best practices, and additional resources to the State Entities to facilitate the establishment of effective O&M plans. Additional resources provided by the CMIT may include planning and training resources as well as standby contract vehicles which may support State Entity efforts.

2.1.2 May perform a needs assessment with State Entities to review the current status of O&M programs and identify areas for improvement where the CMIT could provide assistance.

2.1.3 Facilitate meetings between energy and facility managers of different buildings and State Entities and establish other informational resources to exchange best practices and lessons learned regarding O&M.

2.1.4 Help develop and support campaigns and initiatives, including energy conservation competitions, and communicate practices across the State Entity.

2.2 State Entity Role:

2.2.1 To develop and implement comprehensive O&M plans for their complete building portfolio. The level and granularity of O&M Plans may vary by State Entity depending on the need and nature of building portfolios. O&M Plans shall provide a level of detail and specificity that will sufficiently hold facility managers accountable for their building's energy performance.

2.2.2 If State Entities currently have an O&M program in place, they may present it to the CMIT for review to determine if it sufficiently addresses the O&M Guideline requirements. The CMIT may propose modifications to the State Entity's existing O&M program, as needed.

2.2.3 Once O&M measures are identified and implemented, it is contingent on the State Entity and its facility staff to sustain the improved energy performance. Improvements which erode before 2020 will not contribute to the EO 88 energy reduction targets.

3 WHAT ARE THE O&M PLAN REQUIREMENTS?

3.1 Each State Entity shall develop and transmit a Preliminary O&M Plan by **November 1, 2013**. The CMIT shall provide a template and additional guidance to assist each State Entity with its submittal.

3.2 By **March 31, 2014**, each State Entity shall develop a Final O&M Plan which will further detail activities and expected results. Additional guidance as to the content of the Final Plan shall be provided at least 90 days prior to the final plan submittal deadline.

3.3 The O&M Plan shall address, at minimum, the following topics:

- Energy Management
- Organizational Structure
- Training
- Development and updating of operating procedures and preventative maintenance schedules
- Use and deployment of Computerised Maintanance Management System, ("CMMS")..

4 Federal Energy Management Program: Operations & Maintenance Best Practices, A Guide to Achieving Operational Efficiency. Pacific Northwest National Laboratory for the Federal Energy Management Program, August 2010. Retrieved from http://www1.eere.energy.gov/femp/pdfs/ccg01_covers.pdf

5 Hunt, D. 2007. Energy Savings Expert Team (ESET) Benefits Assessment. Presentation to the Federal Energy Management Program, May 2007. Pacific Northwest National Laboratory, Richland, Washington

3.4 Documenting Work Completed – State Entities shall develop and employ checklists for specific O&M tasks to be performed. Checklists shall be used by facility staff at and copies of completed checklists shall be kept on file. The CMIT reserves the right to review these completed checklists periodically. State Entity leads are responsible for ensuring that individual locations are adhering to checklist protocol; this additional step is intended to ensure compliance and ensure documentation is in place if an external audit were to occur. O&M Plan checklists shall address the following activities for all relevant equipment:

3.4.1 Operating protocols, calibration, and sequencing – including checking schedule of operation and setbacks; temperature and humidity set points; sensor calibration; heating and cooling system sequencing; and confirming adequate airflow rates and lighting levels.

3.4.2 Cleaning and repair – including checking and cleaning HVAC equipment (vents, ducts, etc.), filters, and light fixtures; inspecting all motors, fans, pumps, and their components to ensure functionality – repair as needed; checking that steam traps have been replaced; checking that boilers are tuned.

3.4.3 Co-generation review – any co-generation plants currently in operation shall be reviewed to ensure that they are operating at maximum effectiveness.

3.5 Tracking and Management Tools – State Entities shall employ energy monitoring and O&M documentation software tools:

3.5.1 By **December 31, 2015**, State Entities shall employ some form of Computerized Maintenance Management Systems ("CMMS") or have a deployment plan underway (i.e., procurement, if necessary, already launched). Many State Entities and facilities already own and operate CMMS applications, but may not use the functionality which assists in meeting O&M energy efficiency objectives. If a CMMS is currently being used in this limited fashion, functionality to implement energy efficiency preventative maintenance shall be activated. For State Entities presently not operating a CMMS, a temporary spreadsheet or other tool may be necessary.

3.5.2 By **December 31, 2017**, State Entities shall be required to use a monitoring and control system that is capable of real-time monitoring of energy use for electricity and primary heating fuels and can provide alerts to facility staff. This monitoring and control system shall be applied to, at a minimum, all buildings that State Entities have submetered under EO 88. See the Submetering section of the Guidelines for further information.

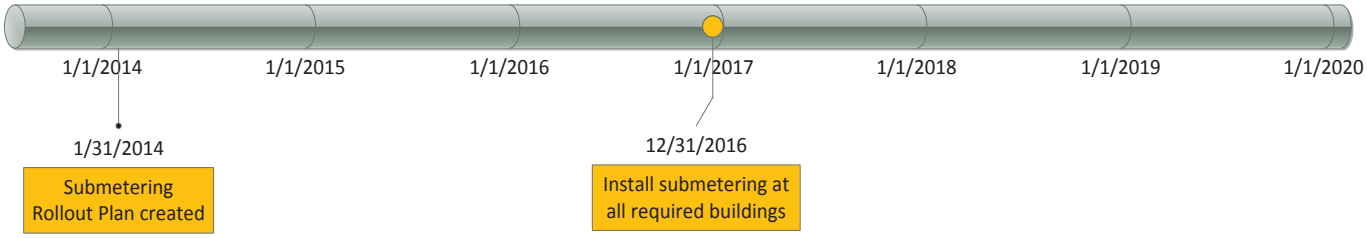
3.6 Training: State Entity leads, or designated O&M leads within the State Entity, shall develop a training schedule for facilities staff throughout the State Entity's building portfolio. The Plan shall document specific training courses the State Entity plans to provide for their staff, and estimated completion dates for the training. The CMIT shall seek to make cost-effective arrangements for training providers, and will provide a detailed list of potential training opportunities.

3.7 Energy Manager: Knowledgable internal staff or third-party resources are important to the successful implementation of both the O&M Plan and other EO 88 initiatives. Certain State Entities have demonstrated that third-party energy management resources have proven a cost-effective means of reducing energy use. The CMIT and New York State Office of General Services ("OGS") are pursuing standby contract vehicles and other resources which may support State Entity O&M efforts.

WITH REGARD TO SUBMETERING, EXECUTIVE ORDER 88 (EO 88) STATES:

"(4) Submetering. Affected State Entities shall work with the CMIT to prioritize sub-metering for all relevant energy sources of buildings larger than 100,000 [gross] square feet on a master-metered campus to identify ways to finance such sub-metering. All buildings having an area larger than 100,000 [gross] square feet on master-metered campuses shall be sub-metered for all fuels and other energy sources by December 31, 2016, to enable individual building benchmarking, unless the Affected State Entity that owns or operates the building can demonstrate to the CMIT that it is not cost-effective or feasible to do so."

SUBMETERING TIMELINE:



SUBMETERING OUTLINE:

1. **Why submetering is important?**
2. **What are the EO 88 submetering requirements for State Entities?**
3. **CMIT and State Entity Submetering Responsibilities**
4. **Recommended submeter performance specifications**
5. **Other submetering recommendations**

1 WHY SUBMETERING IS IMPORTANT

1.1 Installing submeters in facilities provides energy usage data at a building level allowing facility managers and decision-makers to analyze designated buildings or areas on an individual basis.

1.2 Submetering allows for a more targeted analysis of energy usage which will help State Entities identify the best opportunities for energy savings. Additionally, by measuring energy use at the building level it is easier to manage how energy is used.

2 WHAT ARE THE SUBMETERING REQUIREMENTS FOR STATE ENTITIES?

2.1 By **January 31, 2014**, State Entities shall provide the CMIT with a Submetering Plan. The Plan will list all Covered buildings that require submetering, an inventory of buildings that are already submetered, and estimated installation dates for buildings that still require submeters. The type of fuel being submetered shall be described for all components of the Submetering Plan.

2.2 Submetering is required to be installed for all buildings with and floor area over 100,000 gross square feet that are currently on a master-meter by **December 31, 2016**.

2.3 Buildings shall be submetered for all fuels and other energy sources including, but not limited to, electricity, natural gas, steam, and oil. Steam, hot water, and chilled water generated from a central plant shall also be submetered.

2.4 If State Entities can demonstrate submetering a specific building or group of buildings is not feasible, they may submit a request to the CMIT for exemption from the submetering requirement at those facilities. The CMIT will review each request on a case-by-case basis and determine building exemptions.

2.5 State Entities are encouraged to submeter buildings greater than 20,000 gross square feet and/or those facilities with high energy intensity (e.g., data centers, laboratories) to maximize the benefits of submetering and increase overall energy monitoring capability at the building level.

2.6 Beginning with the October 1, 2014 State Entity reporting requirement, updates of the Submetering Plan must demonstrate intent to comply with the December 31, 2016 submeter installation deadline.

2.7 By **December 31, 2017**, State Entities shall be required to use a monitoring and control system that is capable of real-time monitoring of energy use for electricity and primary heating fuels and can provide alerts to facility staff. This monitoring and control system shall be applied to, at a minimum, all buildings that State Entities have submetered under EO 88.

3 CMIT AND STATE ENTITY SUBMETERING RESPONSIBILITIES

3.1 CMIT Responsibilities:

3.1.1 Provide guidance, general best practices, and additional resources to the State Entities to facilitate the implementation of submetering. For example, the CMIT will seek to establish standby contract vehicles which may support State Entity's submetering efforts.

3.1.2 The CMIT shall provide a template for the Submetering Plan to the State Entities.

3.1.3 Monitor State Entities' progress towards submetering goals on a regular basis to ensure compliance with EO 88 requirements.

3.1.4 Evaluate State Entity requests to waive submetering requirements due to feasibility issues.

3.2 State Entity Role:

3.2.1 Create comprehensive list of all buildings that require submetering within the State Entity.

3.2.2 Provide periodic updates on submetering progress as part of the quarterly and annual reports transmitted to the CMIT.

3.2.3 Ensure all buildings that have been identified for submetering have been submetered, or have progressed significantly towards submetering, on or before the December 31, 2016 deadline.

4 RECOMMENDED SUBMETER PERFORMANCE SPECIFICATIONS

4.1 Submeters shall be permanent in nature – temporary data loggers do not count towards the submetering requirement.

4.2 Data must be recorded by electric submeters must be in at least 15 minute intervals.

4.3 Submeter components shall fully comply with applicable safety standards, including NFPA 70 (NEC) and UL 61010.

4.4 Submeters shall have internal data storage, or utilize and external store and forward device, to accommodate no less than 2 megabytes of data logging to hold interval measurements in the event there is a communications interruption with the base station.

4.5 Data logged from submeters must include date and time stamps from the sending device.

4.6 All devices should ultimately role up to an Ethernet based network using a standard industrial protocol. OPC compliant devices are also acceptable.

5 OTHER SUBMETERING RECOMMENDATIONS

5.1 It is recommended all electric submeters have expandable I/O to support a signal compatible with building energy management systems to facilitate future real time energy data transfer capability for utilization in demand side management reduction efforts.

5.2 Consideration should be given to utilization of the facility or campus fiber network through creation of a virtual local area network ("VLAN") dedicated to support the submetering efforts including appropriate firewall protection and secure user access authentication requirements for overall submeter system security.

5.3 The CMIT recommends all data transmitted from submeters shall be encrypted using 256-bit (or greater) Advanced Encryption Standard ("AES-256").

APPENDIX A: LIST OF EO 88 AFFECTED STATE ENTITIES, EXECUTIVE SPONSORS, AND RESPONSIBLE LEADS[1]

AGENCY	EXECUTIVE SPONSOR	RESPONSIBLE LEAD
Adirondack Park Agency	Elaine M. Caldwell	Clarence "George" Hare
Agriculture and Markets	Jim Bays	Lucy Roberson
Aging, Office for the	Jack Lynch	Rebecca Frament
Alcoholism and Substances Abuse Services, Office of	Michael Lawler	David Sawicki
Alcoholic Beverage Control, Division of	Chad Loshbaugh	Kim Ciccone
Arts, Council on the	Brenda Brown	Jerry Pecchia
Bridge Authority	Tara Sullivan	Bob Russo
Chief Information Officer/Information Technology Services	Theresa Papa	Dan Healy
Children and Family Services, Office of	Derek Holtzclaw	Raymond Farina
Civil Service	Deirdre Taylor	Brian Bopp
Corrections and Community Supervision, Department of	Daniel Martuscello	Keith Rupert
Criminal Justice Services	Mark Bonacquist	Tim O'Neill
City University of New York	Iris Weinshall	Art Fasolino
Dormitory Authority	Joel Pierre-Louis	Jodi Smits Anderson
Empire State Development Corp	Ed Hamilton	Brenda Grober
Employee Relations	Mary Hines	Mary Hines
Energy Research Development Authority	Tom Barone	Scott Smith
Environmental Conservation	Anne Reynolds	Jim Morier
Financial Services, Department of	Eric Madoff	Lori Fraser
Gaming Commission	Gardner Gurney	Michael Houlton
General Services, Office of	Franklin Hecht	Bob Lobdell
Health, Department of	Michael Nazarko	Charles McElrath
Homeland Security	Jerry McCarty	Andrew Feeney
Homes and Community Renewal	Forrest Taylor	Ted Minissale
Human Rights, Department of	Luis Burgos Jr.	Stephen Rolani
Inspector General, Office of	Michael Clarke	Peggy Gaudet
Insurance Fund, NYS	Joseph Mullen	Alan Angelo
Jacob Javits Center	Edward Macdonald	Rebecca Marshall
Labor, Department of	Mario Musolino	Paul Danaher
Long Island Power Authority	Kate Burson	Kate Burson
Medicaid Inspector General	Vittoria Parry	Nancy Conroy
Mental Health, Office of	Emil Slane	Ed Killeen
Metropolitan Transportation Authority	Nuria Fernandez	Ernest Tollerson
Military and Naval Affairs, Division of	Michael Friess	Benjamin Fox

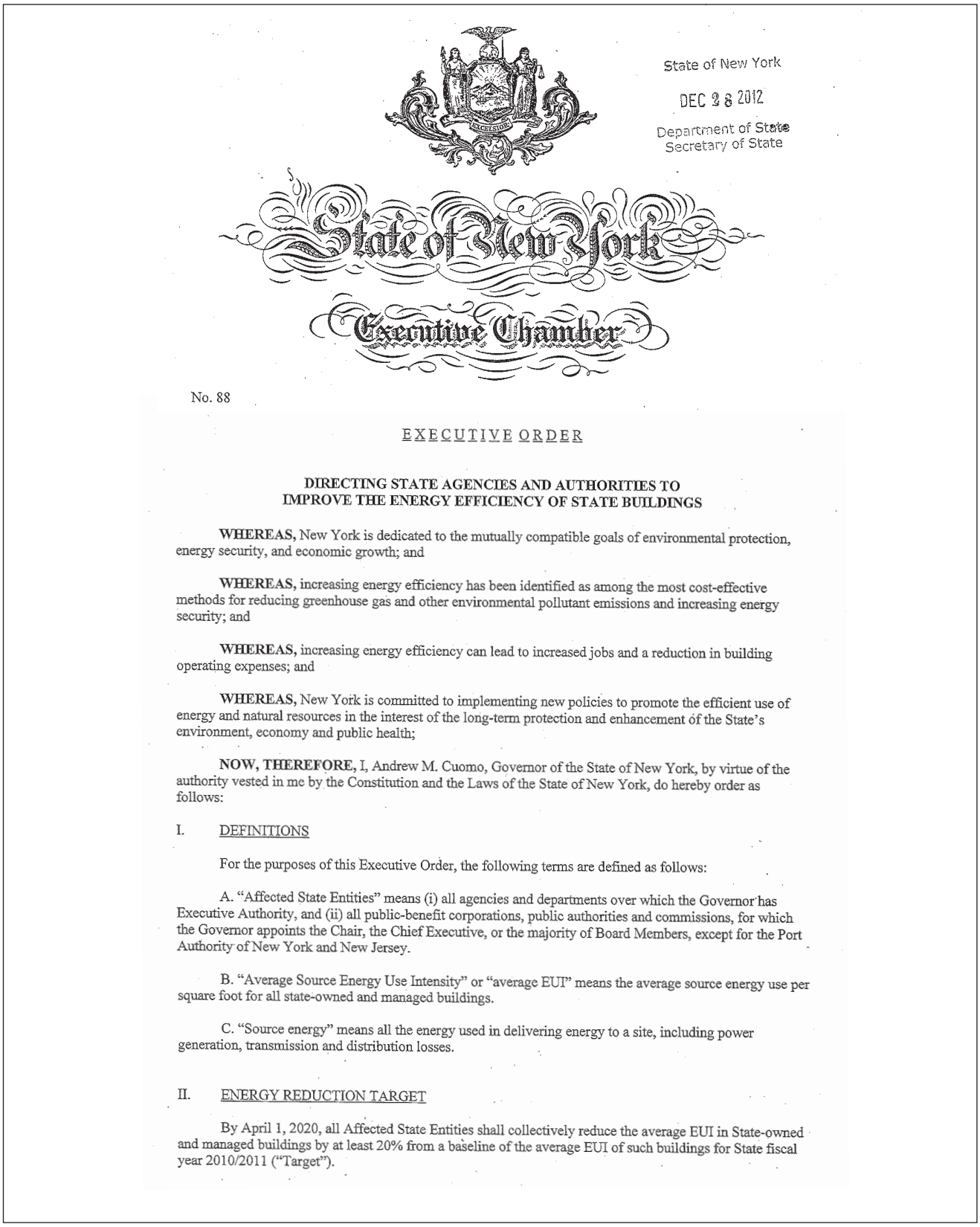
1 Responsible Leads as of October 1, 2013.

APPENDIX A: LIST OF EO 88 AFFECTED STATE ENTITIES, EXECUTIVE SPONSORS, AND RESPONSIBLE LEADS[1] continued

AGENCY	EXECUTIVE SPONSOR	RESPONSIBLE LEAD
Motor Vehicles, Department of	Gregory Kline	Meghann O'Connell
New York Power Authority	Gil Quiniones	Lloyd Kass
Niagara Frontier Transportation Authority	Michael Bykowski	Dennis Lupp
Olympic Regional Development Authority	Ted Blazer	Bob Hammond
Parks, Recreation and Historic Preservation, Office of	Tom Alworth	Michael Wise
People with Developmental Disabilities, Office for	Kevin Valenchis	Don Hughes
Public Employees Relations Board	Anthony Zumbolo	Anthony Zumbolo
Public Service Commission	Judith Lee	Sorelle Brauth
Roosevelt Island Operating Corporation	Steve Chironis	Sean Singh
State Police	Terence O'Mara	Mark Chaffee
State, Department of	Daniel Shapiro	Becky Sebesta
State University of New York	Robert Haelen	Karren Bee-Donohoe
Tax and Finance	Jamie Woodward	Eric Mostert
Temporary and Disability Assistance, Office of	Eric Schwenzfeier	Teri Vazquez
Thruway Authority	John Barr	Joe Stahl
Transportation, Department of	Rod Sechrist	Bob Winans
Victim Services, Office of	Danny Morgan	Danny Morgan
Veterans Affairs, Division of	Todd Rosenfield	Sharon Van Wagner
Workers' Compensation Board	Uluss (Gus) Thompson	Cheryl Contento

1 Responsible Leads as of October 1, 2013.

APPENDIX B: EXECUTIVE ORDER 88 AND MEMO FROM THE GOVERNOR'S OFFICE



State of New York
DEC 28 2012
Department of State
Secretary of State

State of New York
Executive Chamber

No. 88

EXECUTIVE ORDER

DIRECTING STATE AGENCIES AND AUTHORITIES TO IMPROVE THE ENERGY EFFICIENCY OF STATE BUILDINGS

WHEREAS, New York is dedicated to the mutually compatible goals of environmental protection, energy security, and economic growth; and

WHEREAS, increasing energy efficiency has been identified as among the most cost-effective methods for reducing greenhouse gas and other environmental pollutant emissions and increasing energy security; and

WHEREAS, increasing energy efficiency can lead to increased jobs and a reduction in building operating expenses; and

WHEREAS, New York is committed to implementing new policies to promote the efficient use of energy and natural resources in the interest of the long-term protection and enhancement of the State's environment, economy and public health;

NOW, THEREFORE, I, Andrew M. Cuomo, Governor of the State of New York, by virtue of the authority vested in me by the Constitution and the Laws of the State of New York, do hereby order as follows:

I. DEFINITIONS

For the purposes of this Executive Order, the following terms are defined as follows:

A. "Affected State Entities" means (i) all agencies and departments over which the Governor has Executive Authority, and (ii) all public-benefit corporations, public authorities and commissions, for which the Governor appoints the Chair, the Chief Executive, or the majority of Board Members, except for the Port Authority of New York and New Jersey.

B. "Average Source Energy Use Intensity" or "average EUI" means the average source energy use per square foot for all state-owned and managed buildings.

C. "Source energy" means all the energy used in delivering energy to a site, including power generation, transmission and distribution losses.

II. ENERGY REDUCTION TARGET

By April 1, 2020, all Affected State Entities shall collectively reduce the average EUI in State-owned and managed buildings by at least 20% from a baseline of the average EUI of such buildings for State fiscal year 2010/2011 ("Target").

APPENDIX B: EXECUTIVE ORDER 88 AND MEMO FROM THE GOVERNOR'S OFFICE

III. OBLIGATIONS TO MEET TARGET

A. Central Management and Implementation Team: The New York Power Authority ("NYPA") shall establish a central management and implementation team ("CMIT") to administer this Executive Order.

(1) The CMIT is hereby directed and authorized to:

(a) Take all appropriate measures to ensure that the Target is met;

(b) Direct Affected State Entities to comply with the requirements of this Executive Order;

(c) Create guidelines ("Guidelines") within nine months of the issuance of this Executive Order to assist Affected State Entities in complying with this Executive Order, and thereafter update such Guidelines as necessary;

(d) Provide strategic, technical, and other assistance to each Affected State Entity to support implementation of this Executive Order;

(e) Develop annual milestones for achieving the Target over the next seven years within 12 months of the issuance of this Executive Order;

(f) Develop and implement reporting requirements to document each Affected State Entity's progress toward meeting the Target;

(g) Develop a comprehensive operations and maintenance plan for the State's building portfolio to help achieve no cost and low cost efficiency improvements and ensure that efficiency savings are sustained; and

(h) Submit an annual report to the Governor by January 15th of each year, beginning in 2014, detailing the overall progress Affected State Entities are making toward meeting the Target. Requirements for the annual report shall be contained in the Guidelines.

(2) The Office of General Services and the New York State Energy Research and Development Authority are hereby directed to provide technical assistance to the CMIT and each of the Affected State Entities with respect to complying with and implementing the requirements of this Executive Order and those established by the CMIT pursuant to this Executive Order.

B. Affected State Entities

In addition to the requirements established above, each of the Affected State Entities shall comply with the following:

(1) Benchmarking. For each State fiscal year, each Affected State Entity shall measure the energy use in State-owned and managed buildings having an area greater than 20,000 square feet. Buildings on master-metered campuses shall be benchmarked at the campus level until they are sub-metered at the building level, after which point those buildings shall be benchmarked at the building level.

(2) Audits. Buildings that receive low benchmark scores, as defined by the Guidelines, shall undergo an American Society of Heating, Refrigeration, and Air-Conditioning Engineers ("ASHRAE") Level II energy audit, or any other comparable audit that the CMIT approves. Campuses that have above-average EUIs or poor benchmark scores, as defined by the Guidelines, or are otherwise prioritized by the Affected State Entities and the CMIT, shall undergo a campus-wide ASHRAE Level II energy audit or any other comparable audit approved by the CMIT. In addition to energy efficiency measures, the audits shall identify opportunities for cost-effective on-site renewable generation and high-efficiency combined heat and power.

(3) Required Capital Projects and Energy Optimization Measures. Affected State Entities shall implement a cost-effective portfolio of measures identified and recommended in the audit and shall complete or make substantial progress toward completion of such measures within two years of completion of the audit. A portfolio may include, but shall not be limited to, no- and low-cost operational improvements, retrocommissioning, capital energy efficiency retrofits, on-site renewable and high-efficiency combined heat and power, and other measures identified by the CMIT.

APPENDIX B: EXECUTIVE ORDER 88 AND MEMO FROM THE GOVERNOR'S OFFICE

(4) Submetering. Affected State Entities shall work with the CMIT to prioritize sub-metering for all relevant energy sources of buildings larger than 100,000 square feet on a master-metered campus to identify ways to finance such sub-metering. All buildings having an area larger than 100,000 square feet on master-metered campuses shall be sub-metered for all fuels and other energy sources by December 31, 2016, to enable individual building benchmarking, unless the Affected State Entity that owns or operates the building can demonstrate to the CMIT that it is not cost-effective or feasible to do so.

(5) Incorporating Energy Efficiency Analysis in the Capital Planning Process. As part of the capital planning process, all Affected State Entities shall include an energy efficiency analysis in the design phase of all capital project plans. The capital project should include energy efficient measures or technologies determined to be the most cost-effective, as defined by the Guidelines.

(6) Credits. Affected State Entities may receive credit towards the Target for increasing energy efficiency in leased space. In addition, Affected State Entities may receive credit towards meeting the Target for installing on-site renewable generation if the host site for such renewable generation has deployed all cost-effective energy efficiency improvements consistent with the goals of this Executive Order. Affected State Entities shall consult with and apply to the CMIT concerning such credits.

(7) Reporting. No later than October 1st of each calendar year, each Affected State Entity shall submit all information requested by the CMIT on all State-owned and managed buildings having an area over 20,000 square feet, as well as any other information related to assessing compliance with this Executive Order.

C. Exemptions

Electric usage attributable to vehicle charging shall not be included in the Target and requirements of this Executive Order. The CMIT is authorized to provide other exemptions for good cause shown pursuant to criteria and procedures established in the Guidelines, including exceptions associated with buildings that have obtained and maintained ENERGY STAR or similar certification, or have benchmark scores placing such buildings in the top quartile of comparable buildings for the particular year at issue. Affected State Entities shall submit requests for annual exemptions to the CMIT. Any such request for exemptions and resulting determination by the CMIT shall be included in the annual report.

IV. REPEAL OF PRIOR EXECUTIVE ORDERS

Executive Order No. 111, promulgated on June 10, 2001, is hereby revoked and superseded by this Executive Order as of the date hereof.

GIVEN under my hand and the Privy Seal of the State in the City of Albany this twenty-eighth day of December in the year two thousand twelve.

BY THE GOVERNOR

Secretary to the Governor

APPENDIX B: EXECUTIVE ORDER 88 AND MEMO FROM THE GOVERNOR'S OFFICE

STATE OF NEW YORK
EXECUTIVE CHAMBER
ALBANY 12224

ANDREW M. CUOMO
GOVERNOR

HOWARD B. GLASER
DIRECTOR OF STATE OPERATIONS

MEMORANDUM

TO: All Commissioners and Agency Heads

FROM: Howard Glaser, Director of State Operations

SUBJECT: "Build Smart NY" and the Implementation of Executive Order 88

DATE: March 5, 2013

The Governor's commitment to reducing energy use in State-owned and managed facilities has been codified with the issuance of Executive Order 88 on December 28, 2012 (www.governor.ny.gov/executiveorder/88).

Executive Order 88 delegates the New York Power Authority (NYPA) to lead the initiative. All agencies should give NYPA full support to ensure that the State meets the 20% energy reduction by April 1, 2020 required by the Order.

All agency heads must officially designate both a member of their executive staff and a day-to-day manager for BSNY. The executive staffer must be a direct report to you and shall be accountable for the achievement of BSNY goals. The day-to-day manager shall serve as the contact for BSNY in your organization and the central point of coordination.

Your designees will be engaged to finalize the baseline energy-use calculations for the facilities in your organization against which the mandated twenty percent (20%) reduction required over the next seven (7) years will be computed. Representatives from the Governor's Office and NYSERDA have made significant progress with your staff already to gather much of the necessary data for the baselines. However, we need your designees identified and involved immediately to ensure that the baseline figures are set at the appropriate levels for your organization.

Both of your agency's designees must be identified by March 11, 2013. The individuals and their contact information should be communicated to Michael Cassidy at michael.cassidy@exec.ny.gov. Any questions on this matter can be directed to the NYPA Build Smart NY Director, Lloyd Kass, who can be reached at lloyd.kass@nypa.gov or (914) 681-6403. Thank you.

APPENDIX C: TABLE OF EXECUTIVE ORDER 88 DEADLINES

DATE	DELIVERABLE	DESCRIPTION
2013		
October 1, 2013	**Annual Report** to NYPA CMIT Contains:	Finalize SFY 2010-2011 baseline for Covered buildings, and provide as much additional usage and building data as available through March 2013.
	Energy Audit Plan	Multi-year Energy Auditing Plan for Covered buildings
	Energy Efficiency Project Tracker	List all energy efficiency projects planned, underway, or completed since SFY 2010-2011 Including those in Capital Plan.
November 1, 2013	**Preliminary Operations & Maintenance plan**	Brief transmittal outlining current existing building operations and maintenance practices as they relate to energy efficiency, and plans for improvement of these practices
2014		
January 10, 2014	**Quarterly Report to NYPA CMIT**	Quarterly Status of all EO 88 activities. Highlighting progress, challenges and risks
February 1, 2014	**Sub-metering Rollout Plan**	Inventory of all sub-metered buildings (by energy type) and plan for meeting sub-metering mandate for buildings > 100,000 sqft.
March 31, 2014 **ONLY**	**Reporting for 2014 only**	Provide detailed Covered building utility data through SFY 2012-2013
March 31, 2014	**Final Operations and Maintenance Plan**	Detailed O&M plan to address maintenance schedules. Deployment of CMMS and BMS software. O&M Training plan.
April 10, 2014	**Quarterly Report**	Quarterly Status of all EO 88 activities
July 10, 2014	Quarterly Report	Quarterly Status of all EO 88 activities
October 1, 2014	**Annual Report** to NYPA CMIT	Submit Covered building energy consumption and costs for SFY 2013-2014. 2014 Energy Audit Plan. 2014 Project Tracker.

APPENDIX C: TABLE OF EXECUTIVE ORDER 88 DEADLINES continued

DATE	DELIVERABLE	DESCRIPTION
2015		
January 10, 2015	**Quarterly Report**	Recurring Quarterly reports of EO 88 progress
April 10, 2015	**Quarterly Report**	Quarterly Status of all EO 88 activities
June 30, 2015	**Retro-Commissioning Deadline**	Complete RCx studies and measure implementation for one-quarter of portfolio
July 10, 2015	**Quarterly Report**	Quarterly Status of all EO 88 activities
October 1, 2015	**Annual Report**	Submit Covered building energy consumption and costs for SFY 2014-2015. 2015 Energy Audit Plan.2015 Project Tracker. 2015 Submetering plan.
December 31, 2015	**Energy Audits of lowest performing buildings**	ASHRAE II Audits of lowest performing quartile of buildings.
December 31, 2015	**Implement CMMS for Operations and Maintenance Activities**	All Agencies deploy a new or updated CMMS with energy related preventative maintenance protocols in place
2016		
January 10, 2016	**Quarterly Report**	Recurring Quarterly reports of EO 88 progress
April 10, 2016	**Quarterly Report**	Quarterly Status of all EO 88 activities
July 10, 2016	**Quarterly Report**	Quarterly Status of all EO 88 activities
October 1, 2016	**Annual Report**	Submit Covered building energy consumption and costs for SFY 2015-2016. 2016 Energy Audit Plan.2015 Project Tracker. 2016 Sub meter plan
December 31, 2016	EO 88 **Submetering** requirement **complete**	Covered buildings larger than 100,000 gross sqft. shall be submetered for all fuels.
2017		
January 10, 2017	**Quarterly Report**	Recurring quarterly reports of EO 88 progress
April 10, 2017	**Quarterly Report**	Quarterly Status of all EO 88 activities
June 30, 2017	**Retro-Commissioning Deadline**	Complete RCx studies and measure implementation for one half of portfolio
July 10, 2017	**Quarterly Report**	Quarterly Status of all EO 88 activities
October 1, 2017	**Annual Report**	Submit Covered building energy consumption and costs for SFY 2016-2017. 2017 Project Tracker. 2017 RCx plan
October 1, 2017	**Fuel Consumption Data Required**	Fuel Oil delivery data will no longer be acceptable as a proxy for actual consumption data when reporting and benchmarking facilities.
December 31, 2017	**Energy monitoring and Control System**	State Entities shall be required to implement energy monitoring and control system

APPENDIX C: TABLE OF EXECUTIVE ORDER 88 DEADLINES continued

DATE	DELIVERABLE	DESCRIPTION
2018		
January 10, 2018	**Quarterly Report**	Recurring quarterly reports of EO 88 progress
April 10, 2018	**Quarterly Report**	Quarterly Status of all EO 88 activities
July 10, 2018	**Quarterly Report**	Quarterly Status of all EO 88 activities
October 1, 2018	**Annual Report**	Submit Covered building energy consumption and costs for SFY 2017-2018. 2018 Project Tracker. 2018 RCx plan
2019		
January 10, 2019	**Quarterly Report**	Recurring quarterly reports of EO 88 progress
April 10, 2019	**Quarterly Report**	Quarterly Status of all EO 88 activities
June 30, 2019	**Retro-Commissioning Deadline**	Complete RCx studies and measure implementation for three quarters of portfolio
July 10, 2019	**Quarterly Report**	Quarterly Status of all EO 88 activities.
October 1, 2019	**Annual Report**	Submit Covered building energy consumption and costs for SFY 2018-2019. 2019 Project Tracker. 2019 RCx plan.
December 31, 2019	EO 88 **Retro Commissioning** requirement **Complete**	All EO 88 covered buildings shall have completed at least one RCx study.
2020		

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88

DETERMINING PROJECT COST-EFFECTIVENESS

Executive Order 88 explicitly requires that buildings with low benchmark scores must undergo an ASHRAE Level 2 energy audit. State Entities must then implement a cost-effective portfolio of measures and complete or make substantial progress toward completion of such measures within two years of the audit.[1] For the purposes of EO 88, a project shall be considered cost-effective if the calculated Savings-to-Investment Ratio ("SIR") is greater than or equal to 1.20. Additionally, when evaluating multiple, mutually exclusive alternatives, the alternative with the lowest life-cycle cost ("LCC") is considered the most cost-effective and should be selected for installation.[2]

The following overview of the calculation of LCC and SIR, and examples of LCCA illustrate the general process; however, real-world analyses can become far more complicated as component replacement costs, energy price escalation, planning/construction periods, and multiple fuels, and multiple alternatives with different efficiency levels are considered. Because of this added analysis complexity, in practice, LCCA is rarely performed by hand. Several computer software applications, such as the Federal Energy Management Program's Building Life-Cycle Cost ("BLCC") Program, are available at no cost and greatly reduce the burden of performing LCCA.[3]

LIFE CYCLE-COST ANALYSIS OVERVIEW

Life-Cycle Cost Analysis ("LCCA") evaluates the costs and savings that occur from owning, operating, maintaining, replacing, and disposing of an efficiency measure over its lifetime. This method typically discounts costs and savings to reflect the time value of money. Because it accounts for all costs and savings over the full life-cycle of the measure, LCCA provides the most accurate assessment of a project's long-term cost-effectiveness. Applying LCCA ensures that State Entities maximize savings opportunities and will ultimately help achieve the goals of EO 88.

LCCA typically requires the following general project information:

- Base Date
- Service Date[4]
- Study Period
- Discount Rate
- Energy Prices
- Cost Escalation

The general formula for the LCC present-value model is as follows:

$$LCC = \sum_{t=0}^{N} \frac{C_t}{(1+d)^t} \quad (1)$$

where:

LCC = Total LCC in present-value dollars of a given alternative,
C_t = Sum of all relevant costs, including initial and future costs, less any positive cash flows, occurring in year t,
t = Year of occurrence (where 0 is the base date),
N = Number of year in the study period, and
d = Discount rate used to adjust cash flows to present value.

For most analyses, a more straightforward formulation of the general equation may be used:

$$LCC = I + Repl - Res + E + W + OM\&R \quad (2)$$

where:

LCC = Total LCC in present-value dollars of a given alternative,
I = Present-value investment costs,
Repl = Present-value capital replacement costs,
Res = Present-value residual value (resale value, scrap value, salvage value) less disposal costs,
E = Present-value energy costs,
W = Present-value water costs, and
OM&R = Present-value non-fuel operating, maintenance, and repair costs.

1 New York State website, Governor Andrew M. Cuomo, "Directing State Agencies and Authorities to Improve the Energy Efficiency of State Buildings." <http://www.governor.ny.gov/executiveorder/88>. Accessed June 27, 2013.

2 There may be cases where non-monetary considerations justify pursuing an alternative other than that with the lowest LCC; however, in general, the least cost alternative should be pursued.

3 See http://www1.eere.energy.gov/femp/information/download_blcc.html#blcc

4 The service date is the date on which the project is expected to be implemented. Typically, the base date is the point in time to which all project-related costs are discounted; this is usually the date that the LCCA is performed. The service date may differ from the base date if the planning/construction period is included in the analysis.

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88 continued

The present value of the various cost components can be found using the general present value equation:[5]

$$PV = \frac{F_t}{(1+d)^t} \quad (3)$$

where:

PV = Present-value of a future cost,
F_t = Future cost, occurring in year t,
t = Year of occurrence (where 0 is the base date),
d = Discount rate used to adjust cash flows to present value.

SAVINGS-TO-INVESTMENT RATIO OVERVIEW (SIR)

The Savings-to-Investment Ratio ("SIR") is a related metric for assessing the economic performance of a project alternative by expressing savings and increased investment cost as a ratio. It is a special formulation of the Benefit-to-Cost Ratio for use when benefits occur primarily as reductions in operation-related costs. Since the SIR is a relative metric, it must be used to assess a given alternative with respect to a designated base case. SIR should be used only to determine whether or not a selected alternative meets the EO 88 definition of cost-effectiveness and should not be used to compare the economic merits of competing alternatives. In other words, the alternative with the highest SIR will rarely be the most cost-effective.

The general formula for SIR is as follows:

$$SIR_{A:BC} = \frac{\sum_{t=0}^{N} \frac{S_t}{(1+d)^t}}{\sum_{t=0}^{N} \frac{\Delta I_t}{(1+d)^t}} \quad (4)$$

where:

$SIR_{A:BC}$ = Ratio of present value savings to additional present value investment costs of the (mutually exclusive) alternative (A) to the base case (BC),
S_t = Savings in year t in operational costs attributable to the alternative,
ΔI_t = Additional investment-related costs in year t attributable to the alternative,
t = Year of occurrence (where 0 is the base date),
d = Discount rate, and
N = Length of study period.
As for the LCC equation, a more straightforward formulation of the general SIR equation may be used:

$$SIR_{A:BC} = \frac{\Delta E + \Delta W + \Delta OM\&R}{\Delta I_0 + \Delta Repl - \Delta Res} \quad (5)$$

where:

$SIR_{A:BC}$ = Ratio of present value savings to additional present value investment costs of the (mutually exclusive) alternative (A) to the base case (BC),
$\Delta E = (E_{BC} - E_A)$; Savings in energy costs attributable to the alternative,
$\Delta W = (W_{BC} - W_A)$; Savings in water costs attributable to the alternative,
$\Delta OM\&R = (OM\&R_{BC} - OM\&R_A)$; Savings in OM&R costs,
$\Delta I_0 = (I_A - I_{BC})$; Additional initial investment cost required for the alternative relative to the base case,
$\Delta Rep1 = (Rep1_A - Rep1_{BC})$; Additional capital replacement costs,
$\Delta Res = (Res_A - Res_{BC})$ Additional residual value, and
where all amounts are in present value.

5 Additional general equations exist for calculating the present value of annually recurring uniform amounts and annually recurring non-uniform amounts. These equations can greatly simplify the LCCA and can be found in National Institute of Standards and Technology, "NIST Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program." 1995.

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88 continued

COST-EFFECTIVENESS ANALYSIS EXAMPLES

EXAMPLE 1 – Required Equipment Replacement

Consider a hypothetical HVAC replacement project. A facility's existing space-cooling system is past its effective useful life and is in imminent need of replacement. An energy audit identifies two options for replacement: a base case (BC) system consisting of a minimally Energy Conservation Construction Code of New York State-compliant water-cooled, electrically operated, centrifugal chiller without night-time setback and economizer cycle, and an efficient alternative (A) system consisting of a high-efficiency, VFD-equipped water-cooled, electrically operated, centrifugal chiller with night-time setback and economizer cycle.[6]

The general project information for this example is as follows:

Base Date: January 2013
Service Date: January 2013[7]
Study Period (N): 20 years[8]
Discount Rate (d): 5.5%
Energy Prices: $0.14 per kWh
Cost Escalation: None[9]

Project specific information for the base case and alternative systems is as follows:[10]

	Base Case (BC)	Alternative (A)
Initial Investment Costs	$150,000	$195,000
Replacement Costs	$0	$0
Residual Value	$4,000	$4,200
Annual Electricity Costs	$83,160 (594,000 kWh at $0.14/kWh)	$72,800 (520,000 kWh at $0.14/kWh)
Annual OM&R costs	$8,000	$9,000

6 While this example only considers two alternatives for illustrative purposes, a more robust energy audit will typically identify several mutually exclusive alternatives.

7 For simplicity, the base and service dates are assumed to be the same in this example. For a detailed description of the analysis procedure when this is not the case, see National Institute of Standards and Technology, "NIST Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program." 1995.

8 The study period is assumed equal to the effective useful life of the proposed equipment.

9 For the purposes of this example, no energy price escalation is assumed; however, more complex analyses may require such escalation estimates. See National Institute of Standards and Technology, "NIST Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program." 1995 for a more detailed explanation of LCCA.

10 The residual value of the equipment is any resale, salvage, or disposal costs at the end of the study period.

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88 continued

The present value of each individual cost component can be calculated with Equation 3 and substituted into Equation 2 to determine the total LCC for each option. Explicitly, for the residual value of the alternative system:[11]

$$PV = Res_A = \frac{F_t}{(1+d)^t} = \frac{\$4{,}200}{(1+0.055)^{20}} = \$1{,}439$$

If this process is repeated for each cost component, it is determined that the base case has a total LCC of $1,238,026 and the alternative has a total LCC of $1,171,102. Therefore, from an LCC perspective, the alternative is the better investment as it has the least LCC. It should be noted that using Equation 3 to calculate the present value of annually recurring uniform amounts is cumbersome. For example, calculating the present value of the annual electricity costs of the base case over the 20-year study period using Equation 3 would proceed as follows:

In practice, Equation 3 would not be used in such cases. Equations exist that can greatly simplify the analysis when annually recurring uniform amounts are involved. These equations can be found in National Institute of Standards and Technology, "NIST Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program." 1995.

Finally, to determine whether or not the alternative would be required by EO 88, the SIR is calculated using Equation 3 for each cost component for both the base case and alternative. Finally, the differences of the calculated present values are substituted into Equation 5 to calculate the SIR. Explicitly, for the residual value of the base case and alternative systems:

$$PV = Res_{BC} = \frac{F_t}{(1+d)^t} = \frac{\$4{,}000}{(1+0.055)^{20}} = \$1{,}371$$

$$PV = Res_A = \frac{F_t}{(1+d)^t} = \frac{\$4{,}200}{(1+0.055)^{20}} = \$1{,}439$$

$$\Delta Res = Res_A - Res_{BC} = \$1{,}439 - \$1{,}371 = \$68$$

If this process is repeated for each cost component and substituted into Equation 5, it is determined that the alternative has an SIR of 2.49. Therefore, since the SIR exceeds the 1.20 cost-effectiveness requirement of EO 88, this would be considered a required project.

$$PV = E_{BC} = \sum_{t=1}^{N} \frac{F_t}{(1+d)^t} = \frac{\$83{,}160}{(1+0.055)^1} + \frac{\$83{,}160}{(1+0.055)^2} + \cdots + \frac{\$83{,}160}{(1+0.055)^{20}} = \$993{,}794$$

11 Note that this analysis assumes end-of-year cash flow convention in that all one time or annually recurring costs are assumed to occur at the end of the year in which they occur.

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88 continued

EXAMPLE 2 – Early Equipment Retirement

Consider a hypothetical boiler replacement project. A facility's existing boiler system is still operational and currently meets the functional requirements of the facility; however, the boiler is nearing the end of its effective useful life and requires considerable annual maintenance to remain operational. An energy audit identifies three options. First, the base case (BC) alternative represents a "do-nothing" option where the existing boiler will continue to be maintained. However, since the equipment's life is finite, a new boiler will be required in 5 years. In 5 years, a minimally Energy Conservation Construction Code of New York State-compliant gas-fired, hot water boiler without a modulating burner would be installed. Second, alternative 1 (A1) would immediately install a minimally Energy Conservation Construction Code of New York State-compliant gas-fired, hot water boiler without a modulating burner. Finally, alternative 2 (A2) would immediately install a high-efficiency, gas-fired, hot water boiler with a modulating burner.

The LCCs of the three options are calculated using the same general procedure as presented in Example 1 and the following general project information:

- Base Date: January 2013
- Service Date: January 2013
- Study Period (N): 20 years[12]
- Discount Rate (d): 5.5%
- Energy Prices: $9.00 per MMBtu
- Cost Escalation: None

Project specific information for the base case and alternative systems is as follows:

	Base Case (BC)	Alternative (A1)	Alternative (A2)
Initial Investment Costs	$0	$130,000	$149,500
Replacement Costs in Year 5	$130,000	N/A	N/A
Residual Value	$32,500	$5,000	$5,400
Annual Natural Gas Costs (Year 1-5)	$67,500 (7,500 MMBtu at $9.00/MMBtu)	$63,000 (7,000 MMBtu at $9.00/MMBtu)	$55,800 (6,200 MMBtu at $9.00/MMBtu)
Annual Natural Gas Costs (Year 6-20)	$63,000 (7,000 MMBtu at $9.00/MMBtu)	$63,000 (7,000 MMBtu at $9.00/MMBtu)	$55,800 (6,200 MMBtu at $9.00/MMBtu)
Annual OM&R Costs (Year 1-5)	$15,000	$6,500	$7,500
Annual OM&R Costs (Year 6-20)	$6,500	$6,500	$7,500

12 The study period is assumed equal to the effective useful life of the proposed equipment.

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88 continued

The present value of each individual cost component can be calculated with Equation 3 and substituted into Equation 2 to determine the total LCC for each option. Explicitly, for the replacement cost of the base case:

$$PV = Repl_{BC} = \frac{F_t}{(1+d)^t} = \frac{\$130{,}000}{(1+0.055)^5} = \$99{,}467$$

If this process is repeated for each cost component, it is determined that the base case has a total LCC of $974,394, alternative 1 has a total LCC of $958,838, and alternative 2 has a total LCC of $904,108. Therefore, from a LCC perspective, alternative 2 is the best investment as it has the least LCC.

Finally, to determine whether or not alternative 2 would be required by EO 88, the SIR is calculated using Equation 3 for each cost component for both the base case and alternative 2. Finally, the differences of the calculated present values are substituted into Equation 5 to calculate the SIR. Explicitly, for the residual value of the base case and alternative 2:

$$PV = Res_{BC} = \frac{F_t}{(1+d)^t} = \frac{\$32{,}500}{(1+0.055)^{20}} = \$11{,}139$$

$$PV = Res_{A2} = \frac{F_t}{(1+d)^t} = \frac{\$5{,}400}{(1+0.055)^{20}} = \$1{,}851$$

$$\Delta Res = Res_{A2} - Res_{BC} = \$1{,}851 - \$11{,}139 = -\$9{,}488$$

If this process is repeated for each cost component, it is determined that alternative 2 has an SIR of 2.18. Therefore, since the SIR exceeds the 1.20 cost-effectiveness requirement of EO 88, this would be considered a required project.

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88 continued

METHODOLOGY FOR MEASURING SAVINGS FOR THE EXECUTIVE ORDER 20 PERCENT TARGET

Per Executive Order 88 ("EO 88"), State Entities shall reduce their average source Energy Use Intensity ("EUI") in buildings by at least 20% by April 1, 2020, as compared to a baseline calculated using energy consumption data from New York State Fiscal Year ("SFY") 2010-2011 data. SFY 2010-2011 is defined as the period from April 1, 2010 to March 31, 2011. This document provides a methodology for measuring savings towards energy reduction targets, and the process by which targets will be set for each State Entity.

To accurately measure progress towards EO 88 energy reduction goals, all State Entities have reported their baseline energy use for SFY 2010-2011 and total gross square footage for all buildings with areas larger than 20,000 square feet. The Central Management and Implementation Team ("CMIT") has created a source EUI baseline for these "Covered" buildings, using the conversion factors in Table 1, which will be confirmed by the Entities and serve as the standard by which future energy reporting will be compared. State Entities will continue to submit updated energy usage and building characteristic data for all Covered buildings on an annual basis, and the CMIT will generate updated source EUI estimates for each building/campus as well as the average source EUI for the each individual State Entity. The CMIT will compare the current and baseline year source EUI estimates and determine the percentage reduction from the baseline value. This percentage reduction will be measured against an Entity's annual energy savings targets to determine progress toward meeting the requirements of EO 88. **Progress towards State Entities' energy savings targets will be measured using annual reported consumption data adjusted for weather, as provided by the State Entities.** Energy savings targets for each State Entity will be developed by the CMIT; see the Savings Target section for more details.

Basic components of the EO 88 savings methodology:

- Create a baseline Source EUI for each State Entity (adjusted for weather)
- Establish savings targets for each State Entity
- Calculate subsequent Source EUI from State Entity annual reporting (adjusted for weather)
- Compare change in Source EUI to baseline to assess progress against targets

In addition to source EUI, the CMIT will consider other metrics to assess progress towards the EO 88 goals. For example, State Entities that manage colleges and universities may choose to provide kBtu per student enrolled. These alternative metrics will be State Entity-specific, and will be created and reported by the State Entity; the CMIT will review requests for alternative metric use but will not proactively determine which metrics to use. Alternative metrics will not be used to alter the source EUI they will serve as a supplemental, stand-alone measurement of energy performance. The CMIT may determine to track and present additional metrics, which will generally be consistent across State Entities, such as total kBtu saved and total greenhouse gas ("GHG") emissions avoided. The CMIT will also request comprehensive lists of energy efficiency project information from the State Entities that document project scope and energy savings for work performed since the baseline year. This information will provide an additional indication of efforts planned and under way, including the funding level of investments in infrastructure, which will likely impact future EUI levels and be a key means by which the Governor's 20 percent target will be reached.

Table 1. Conversion factors for calculating Source EUI[1]

Fuel Type	Site to Source Conversion Factor	Fuel to kBtu Conversion Factor
Electricity (grid purchase)	3.34	3.412
Electricity (on-site generation)	1	3.412
Natural Gas (therms)	1.047	100
Natural Gas (ccf)	1.047	102.8
Fuel Oil #1 (gallons)	1.01	139
Fuel Oil #2 (gallons)	1.01	138
Fuel Oil #4 (gallons)	1.01	146
Fuel Oil #5 and #6 (gallons)	1.01	150
Propane and Liquid Propane (gallons)	1.01	91
Steam (thousand lbs)	1.21	1,194
Diesel (gallons)	1.01	138
Kerosene (gallons)	1.01	135
Hot Water (therms)	1.28	100
Chilled Water (ton hours)	1.05	12
Wood (tons)	1	15,380
Coal - anthracite (tons)	1	25,090
Coal - bituminous (tons)	1	24,930
Coke (tons)	1	24,800

1 All conversation factors are based on information from the Environmental Protection Agency's ENRGY STAR program.

APPENDIX D METHODOLOGY FOR DETERMINING PROJECT COST-EFFECTIVENESS AND MEASURING SAVINGS FOR EXECUTIVE ORDER 88 continued

ESTABLISHING SAVINGS TARGETS

By December 31, 2013, savings targets will be established for each of the State Entities on an individual basis. Targets will be based primarily on building energy performance as compared to similar buildings within and outside of New York State. Targets will be set and presented in terms of source EUI reductions but the corresponding estimate of required site kBtu reduction will also be provided to aid in interpreting the target. The kBtu metrics will serve as guidelines and actual EUI reduction achieved will depend on what fuels are saved in what proportions. Ultimately, source EUI reduction will be the binding requirement, and the State Entities will be responsible for ensuring that the source EUI target reduction is met.

Since source EUI is a rate-based metric that is recalculated annually, it is possible for a State Entity to achieve their savings target in a given year and then increase their EUI in a subsequent year to the point their source EUI is no longer at target levels. In order to comply with EO 88, State Entities must achieve and maintain their savings through 2020. If a State Entity achieves their savings target prior to 2020, it is expected they will continue to pursue all planned energy efficiency projects and comply with other EO 88 requirements, such as those relating to submetering and O&M, and will maintain achieved levels of EUI reduction through April 1, 2020 in order to be compliant with EO 88.

ADJUSTING FOR ANNUAL WEATHER VARIATION

Weather can have a significant impact on energy use across all building types. If the number of heating degree days (“HDD”) or cooling degree days (“CDD”) in a given year vary from historical averages, energy use is likely to be affected. As a result, the EUI for that year may appear higher than that of a typical year even though, when normalized for climatic differences, the EUI remains unchanged or even reduced as compared to prior years. Therefore, in order to establish a normalized EUI that is not impacted by weather variations, it is necessary to adjust for the HDDs and CDDs in a given year.

As part of its ENERGY STAR Portfolio Manager benchmarking program, the EPA has performed extensive regression analyses for 15 building types to examine how heating and cooling degree days relate to EUI. The CMIT will use the coefficients found by the EPA’s regression analysis in order to adjust the State Entities’ observed EUI measurements for the base year and the comparison year. Where possible, the CMIT will perform adjustments based on individual building types. A Microsoft Excel-based tool has been developed to normalize EUI measurements for weather using coefficients and data from both EPA and the National Oceanic and Atmospheric Administration (“NOAA”).

ADJUSTING FOR OTHER FACTORS

There are many non-weather factors that affect a building’s expected EUI and thus may make direct year-over-year comparisons misleading. These factors may conspire to give a distorted view of a building’s or State Entity’s true efficiency progress as measured by EUI. Further, it is likely that no matter how comprehensive a list of specific exemptions, valid yet unforeseen exemptions will arise in the future. It is therefore infeasible to produce a specific list of exemptions along with prescriptive formulae on how to adjust the EUI based on each exemption. As situations arise, the CMIT will work with State Entities to address these unique situations on a case-by-case basis. As reoccurring scenarios are observed, the Guidelines will be updated with additional policies.

CREDITS

Credit towards energy reduction targets will be considered for State Entities that improve their energy efficiency in areas not covered by the Executive Order, such as in leased space or in equipment related to process load. Credits for such activities will be considered by the CMIT on a case-by-case basis, and must be supported by documentation submitted by the State Entities.

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www.nypa.gov/BuildSmartNY/Guidelines.pdf

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