



Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
DEPARTMENT OF ENERGY RESOURCES



**LEADING BY EXAMPLE: DECARBONIZING AND MINIMIZING
ENVIRONMENTAL IMPACTS OF STATE GOVERNMENT
(Executive Order No. 594)**

Section 4 Guideline
Existing Buildings

Guideline Effective Date: March 25, 2022

Background and Purpose

On April 22, 2021 Governor Baker signed [Leading by Example Executive Order 594, Decarbonizing and Minimizing Environmental Impacts of State Government](#) (the “Order”).

The Order sets forth targets and establishes policies, programs, and strategies to substantially reduce greenhouse gas emissions from state government operations at state owned and managed buildings, facilities, and campuses, as well as enhance their resilience. This will be achieved by advancing high performance buildings for new construction; expanding energy efficiency and decarbonizing fuels in existing buildings; acquiring fuel efficient and zero emission vehicles and continuing the deployment of new renewable energy.

This document is intended to provide guidance regarding Section 4 of the Order, which relates to planning, designing, and deploying projects that affect energy use in existing state-owned buildings (including renovations and comprehensive energy projects) as well as building operations and leased space. Additional LBE Executive Order 594 guideline documents can be downloaded from the LBE web page at <https://www.mass.gov/info-details/leading-by-example-executive-order-594-decarbonizing-and-minimizing-environmental-impacts-of-state-government>.

Scope

The existing building requirements of Section 4 of the Order apply to facilities owned and operated by Massachusetts executive branch agencies and all public institutions of higher education. Executive branch departments that fund or manage projects not owned by the state or not sited on state lands are encouraged to incorporate these existing building requirements into their funding and management processes.

Definitions

- a) **Alternative electricity technologies** - Electrified, non-combustion solutions and technologies for space heating and cooling and domestic hot water, such as air- and ground-

source heat pumps and solar thermal systems. See the ‘Eligible Renewable Thermal Technologies for Space Heating’ portion of the [Section 3 Guideline on the Massachusetts LEED Plus 2.0 Standard for New Construction](#) for minimum performance specifications.

- b) **Biofuels** - Substitutes for liquid petroleum fuels (such as gasoline, diesel, and heating oil) that are derived from renewable organic matter such as corn, soy, switchgrass, agricultural waste, wood, and waste vegetable oil. Biofuel is another term for biodiesel, but typically used to refer to substitutes for gasoline, diesel, and heating oil.
- c) **Biomass** - Materials that are biological in origin, including organic material (both living and dead) from above and below ground.
- d) **Building envelope** - Physical separator between the indoor and outdoor environments that limits heat transfer.
- e) **Commonwealth Energy Intelligence System (CEI)** - The Commonwealth’s real-time metering program. This central, web-based Energy Information System (EIS) is managed by DCAMM with support from DOER. Utilizing real-time energy monitoring and utility bill information, CEI provides insight into building-level consumption at sites across the Commonwealth, providing opportunities for reduction and savings by tracking and recording data for electricity, natural gas, steam, hot and chilled water, oil, and water consumption.
- f) **Comprehensive energy project** – Comprehensive building renovations or energy upgrades that involve multiple measures and are targeted towards achieving significant energy savings, including 1) those that address district energy systems and/or 2) building renovations where significant electrical, heating, ventilation, or air conditioning infrastructure are included in the project scope.
- g) **Energy use intensity (EUI)** – A building’s gross annual site energy relative to its gross square footage. Site EUI is measured as kBtu per square foot (kBtu/sf). All energy consumed by the building, regardless of the source, shall be included in the EUI calculations. Energy used for zero emission vehicle charging is excluded from building total energy consumption for EUI calculations.
- h) **Environmental criteria and certifications** - Ratings frameworks and approaches applied to evaluate building sustainability with the goal of integrating environmentally friendly elements into building design and construction. Examples may include, but are not limited to, Leadership in Energy and Environmental Design (LEED), ENERGY STAR®, Living Building Challenge, and Passive House Certification.
- i) **Existing buildings / existing facilities** - For the purposes of the Order and this Guideline, refers to existing building structures sited on state land and/or for state use.
- j) **Low-carbon fuels** - Any fuel or blend of fuels that replaces a fossil fuel in use but results in significantly less net greenhouse gas emissions.

- k) **MassEnergyInsight (MEI)** - Online software tool that provides state entities with access to site and building energy consumption. Using automated monthly utility usage data, MEI can be leveraged to develop an energy use baseline, examine energy use by facility and fuel type, illustrate the impacts of energy efficiency investments, develop a GHG emissions inventory, facilitate communication and awareness about energy use, and generate user reports.
- l) **Municipal energy disclosure ordinances** - Building energy disclosure ordinances implemented by municipalities may require commercial buildings to share annual energy usage data with the city; this data may also be made publicly available.
- m) **Onsite fossil fuel emissions / Scope 1 emissions** - See also Scope 1 emissions. In the context of the Order and this Guideline, refers to the emissions associated with the operation of assets owned and operated by the Commonwealth, including both buildings and vehicles.
- n) **Resilience** – Ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner.
- o) **Scope 1 emissions** - Direct greenhouse gas (GHG) emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles).
- p) **Solar-ready** – Designed and built to accommodate the installation of a solar energy system as defined by the current Massachusetts Building Energy Code. Solar-readiness includes but is not limited to identified locations, reduced shading, structural capacity, inverter locations, conduit, and grid interconnect locations.
- q) **Zero-carbon fuels / net zero-carbon fuels** - Liquid or gaseous fuels that contain no carbon (such as hydrogen) or were created from carbon sourced from the atmosphere (rather than fossil reservoirs), resulting in no net change in atmospheric CO₂ concentrations when combusted. As low- and zero-carbon fuels continue to evolve, this Guideline will be updated accordingly.

Existing Buildings Requirements: Guidance on Section 4 of the Order

Language directly from the Order is italicized below.

All agencies shall take the targets enumerated in this Order into account when planning for, designing, and deploying projects that affect energy use. These efforts shall prioritize:

- 1. Substantial reduction or elimination of emissions from onsite fossil fuels.*
- 2. Optimized building performance through efficient operations.*

3. *Participation in all available energy efficiency and clean energy incentive and rebate programs.*
4. *Regular monitoring of building energy performance.*
5. *Installation of highest efficiency equipment.*
6. *Incorporation of energy performance into leasing decisions.*

The existing building requirements of the Order are intended to set the stage for decarbonization in both the near term, and when that is not feasible, over the long term.

Addressing existing building decarbonization relies on a multitude of strategies to substantially reduce and ultimately eliminate emissions from onsite fossil fuels to the greatest extent possible. This requires state entities to identify opportunities for emissions reductions at all stages of project development and could include evaluating building systems/equipment to identify technology options and strategies to substantially reduce or eliminate use of fossil fuels, assessing and altering facility operations if appropriate, and identifying key decision-making points to ensure that decarbonization priorities are taken into account.

Part I: Planning

Agencies shall ensure that greenhouse gas (GHG) reductions, energy efficiency, renewable and clean energy, and emissions reduction strategies are incorporated into their equipment replacement and capital and master planning efforts in support of the goals of this Order.

DCAMM shall conduct an energy consumption and emissions analysis of the largest state facilities comprising at least 50% of total state government emissions every five years, with similar analyses conducted for the remainder of the state portfolio every ten years. Such analyses will be used to identify opportunities for emissions reduction projects.

DCAMM, LBE, and all agencies shall work collaboratively to support these efforts and shall utilize all available energy data to develop plans, prioritize efforts, and track progress.

The energy consumption and emissions analyses to be conducted by DCAMM every five years will fall in the following calendar years: 2026, 2031, 2036, 2041, and 2046. The decennial portfolio analyses will be conducted in calendar years 2026, 2036, and 2046. The analyses are intended to track progress and create a summary of ongoing action plans as well as to identify opportunities and areas in need of support.

Part II: Renovations and Comprehensive Energy Projects

This section applies to any applicable projects initiated after the effective date of the Order, which is July 1, 2021.

All comprehensive energy projects, including those that address district energy systems, and building renovations where electrical, heating, ventilation, or air conditioning infrastructure are included in the project scope, must:

- i. Include as a design option an alternative to fossil fuels for thermal energy that includes low- or zero-carbon fuels or alternative electricity technologies that meet the minimum performance specifications as defined in LBE guidance and implement said option where technically and fiscally feasible;*
- ii. When such options are not practicable, projects shall ensure that steps are taken to develop and incorporate plans to facilitate the future transition to low- or zero-carbon fuels;*
- iii. Evaluate building envelope upgrades and implement said upgrades where technically and fiscally feasible;*
- iv. Establish and adhere to a low target energy use intensity (EUI) for overall building or site performance;*
- v. Where appropriate, design and install renewable energy and energy storage, while building the infrastructure necessary to support future renewable energy and storage installations;*
- vi. Maximize resilient design to protect critical infrastructure and continued operation when modeled for long-term climate impacts.*

Fossil Fuel Alternatives

Eligible project designs shall evaluate one or more design options, early in schematic design of a project, that reduce or eliminate onsite fossil fuel emissions. If low-carbon design alternatives are not technically or fiscally feasible in a project, the design shall incorporate elements that enable and facilitate this transition in the future. Examples of preparing for a non-fossil fuel future include lowering heating and cooling loads through efficiency, executing building envelope upgrades, installing low temperature hot water distribution systems, and appropriately sizing electric infrastructure.

Building Envelope Upgrades

Efforts to improve building envelope should be identified during applicable projects and considered as a pivotal efficiency strategy to reduce demand and improve the feasibility of current or future decarbonization activities.

Although building envelope improvement strategies can be technically and fiscally challenging, project proponents should seek to identify possible envelope modifications as part of project planning processes and prioritize upgrades to the thermal envelope, even if incremental. This may range from capitalizing on the opportunity to incorporate lower-cost measures during energy efficiency projects (such as weatherization, sealing ductwork and air-distribution systems, adding secondary windows, and solar screens or shading devices), to addressing broader-scale issues

(such as insulation, building-wide heat loss/recovery, reflective roofs, window replacements, and pressure imbalances).

EUI Targets

Setting targets for EUI reductions is part of a broader process to dramatically reduce or eliminate fossil fuel use in existing buildings. Such EUI reductions result in lower energy demand and associated emissions and help to facilitate the future deployment of low or zero carbon solutions that can meet the building's thermal needs and improve cost-effectiveness. Existing building projects shall establish aggressive EUI targets in order to reduce fossil fuel use and ready the buildings for low carbon fuels.¹

Renewable Energy and Storage

Where technically and financially possible, projects at existing state facilities shall work to ensure that renewable electricity generation technologies are installed during or following project completion, with a prioritization of solar PV deployment; for more information, see the [Section 6 Guideline on Renewable and Clean Energy Resources](#). Renewable energy attributes do not need be retained; see the U.S. Environmental Protection Agency's [Solar Power Use Claims Guidance](#) for best practices in making renewable energy use claims. When onsite renewable energy is not possible (e.g., not technically or fiscally feasible²) as part of the project, buildings must be designed to be solar-ready when applicable. Existing building projects shall also evaluate energy storage where appropriate or plan for the location and interconnection of future³ energy storage solutions where possible. Installed energy storage may be Commonwealth-owned or owned by a third party and should prioritize use with onsite renewable energy generation whenever possible.

Resilient Design

Resilience involves preparing physical assets and energy systems to account for projected changes in precipitation, temperature, sea level rise, and extreme weather events to position the Commonwealth to effectively reduce the risks associated with natural hazards and the impacts of climate change. Projects at existing facilities should assess resilience using the Massachusetts State

¹ While the process for establishing EUI targets for existing buildings may vary widely, project proponents may consider a range of options to inform target-setting including percent better than current EUI, identifying existing building examples of similar type that have achieved significant EUI reductions, and incorporating technologies and strategies that have been deployed in new construction of similar building types.

² Examples of solar not being technically feasible might include, but not be limited to a lack of sufficient roof or other space to host solar, a site that is mostly or fully shaded, building or site orientation not conducive to solar, and/or a site that cannot interconnect.

³ For example, a solar system can be designed with the intention of adding energy storage later by specifying an inverter that can easily integrate a battery into the setup, ensuring that interconnection and electrical requisites are addressed accordingly, and incorporating the intended location of the battery as part of the design.

Hazard Mitigation and Climate Adaptation Plan ([SHMCAP](#)) and/or the Resilient MA Action Team [Climate Resilience Design Tool](#), and develop appropriate design strategies to address identified risks.

Part III: Tracking Energy Performance and Increasing Operational Efficiencies

In collaboration with LBE and DCAMM, agencies shall support efforts to track the energy performance of existing buildings or sites and take concrete steps to reduce building energy use through operational efficiencies.

Regular tracking of building and facility energy consumption is critical to tracking overall progress toward EO 594 goals as well as monitoring building and facility performance that helps to prioritize projects that target energy and emissions reductions. To aid these efforts, LBE will continue to release a data tracking form for the prior fiscal year in the late summer/early fall that selected state entities will be asked to fill out. This form will request a wide range of data and information, including energy consumption data and energy efficiency efforts at existing state facilities; see the [Section 9 Guideline on Program Administration](#) for further details. LBE tracking and reporting will also leverage data from current databases, such as MassEnergyInsight (MEI) and Commonwealth Energy Intelligence (CEI), to track agency fuel and energy use. In addition, these programs can aid in bolstering operational efficiency efforts at state facilities. State entities shall make every effort to utilize energy monitoring systems and comply with LBE data requests, including but not limited to, the completion of the annual tracking form.

Additional guidance on building energy monitoring and operational efficiencies such as demand management can be found in the [Section 7 Guideline on Additional Sustainability Priorities](#).

Part IV: MAFMA

DCAMM and its Massachusetts Facilities Management Association (MAFMA) will provide regular training and professional development for agencies' facilities personnel regarding energy and water efficiency, emissions reduction, and related topics.

MAFMA is a network of state facilities personnel that meets periodically to discuss specific topics of interest with the aim toward increased information sharing and problem solving, disseminates information on training opportunities and new technologies, and provides information about proposed regulatory or statutory changes that may affect facilities operations. In addition, MAFMA members have established working committees to address issues of interest to facilities operators and managers. State facility personnel who are interested in participating in this informal association should visit the [MAFMA website](#) for more information and resources. Training sessions developed by MAFMA will support agencies in the implementation of strategies designed to meet the goals of this Order as well as other applicable environmental topics.

Part V: Heating Oil

All agencies still utilizing heating oil as of July 1, 2021, shall ensure that any heating oil product purchased shall consist of at least 10% biofuels (i.e., B10). Said biofuels must meet the minimum fuel content specifications outlined in LBE guidance. Agencies shall work with LBE to identify opportunities to increase biofuel consumption to as high a level as is practicable. Agencies may be exempt from this requirement if biofuels are not readily available or are cost prohibitive, or if a specific performance constraint is identified.

The heating oil requirements of the Order are further detailed in the [Sections 4D and 5D Guideline on Biofuels](#).

Part VI: Leasing

DCAMM and other agencies responsible for leasing space shall evaluate such space for agency use by including the following elements in the selection criteria:

- *Compliance with or exceeding current building energy codes.*
- *Meeting environmental criteria and receiving applicable environmental certifications.*
- *Compliance with municipal energy disclosure ordinances.*
- *Compliance with recycling requirements.⁴*
- *Access to electric vehicle charging stations.⁵*
- *Siting near public transportation and accessibility for pedestrians and cyclists.*
- *Other elements that contribute to reduced greenhouse gas emissions and/or reduced environmental impacts.*

When disposing of state assets for lease or sale, DCAMM and other relevant agencies shall take into account the GHG emissions of future use and consider applying the standards of this Order to said dispositions as applicable.

The leased site evaluation criteria above apply to any new leases of facilities for state use as of July 1, 2021, (the effective date of the Order) as well as existing leases as they roll over after this date.

⁴ Leased facilities shall adhere to current state and federal waste management statutes, current Massachusetts Department of Environmental Protection regulations and standards, and any local mandatory recycling bylaws and ordinances. See the [Executive Order Section 7 Guideline on Additional Sustainability Priorities](#) for more information on recycling at state facilities.

⁵ See the [Section 5C Guideline on Electric Vehicle Supply Equipment](#) for further guidance.