

1. PURPOSE

1.1 This standard establishes ~~building greenhouse gas (GHG) emissions and~~ energy consumption performance levels for existing *buildings*. This standard provides compliance requirements that will result in improved energy efficiency and reduced *GHG emissions* of existing *buildings*. ~~In adopting this standard, the Oregon Department of Energy seeks to maximize reductions of greenhouse gas emissions from covered commercial buildings.~~

Commented [A1]: Oregon's BPS is based on energy consumption, so references to GHG emissions-based standards have been removed for clarity and to reduce confusion.

Commented [A2]: Part of direction to ODOE under HB 3409

1.2 This standard is directed toward

- a. Setting *performance targets* based on operational ~~GHG emissions and~~ energy consumption
- b. Accommodating progressively more stringent *performance targets*
- c. Providing a technical basis for setting *building performance* standards
- d. Providing procedures and programs essential to energy-efficient operation, maintenance, management, and monitoring
- e. ~~increasing the energy efficiency of the energy-using systems and components~~
- f. ~~upgrading the thermal performance of the building envelope~~
- d.g. ~~and promoting the use of district energy system decarbonization plans aligning with district energy policy in coordination with statewide building performance standards policies to reduce commercial and building emissions~~

2. SCOPE

~~This standard is mandatory for all covered buildings located in the state of Oregon. This standard applies to existing buildings, portions of buildings, and building complexes, including the envelope and all systems in the building, and campus district energy systems. Owners of a campus district energy system may opt-in to compliance with the standard through the alternative decarbonization plan compliance pathway. Participating campuses must comply with all of the decarbonization plan requirements in accordance with Normative Annex W.~~ This standard excludes industrial and agricultural processes in *buildings* for which the energy consumption and emissions targets do not include those processes.

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3. DEFINITIONS

3.1 **General.** Certain terms, abbreviations, and acronyms are defined in this section for the purposes of this standard. These definitions are applicable to all sections of this standard.

Terms that are not defined herein, but that are defined in standards that are referenced herein, shall have the meanings as defined in those standards.

Other terms that are not defined shall have their ordinarily accepted meanings within the context in which they are used. Ordinarily accepted meanings shall be based on American Standard English language use, as documented in an unabridged dictionary accepted by the *authority having jurisdiction*.

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"Agricultural building": a structure that is used for:

- (A) Storing, maintaining or repairing farm or forestry machinery and equipment;
- (B) Raising, harvesting and selling crops or forest products;
- (C) Feeding, breeding, managing and selling livestock, poultry, fur-bearing animals or honeybees or the produce of livestock, poultry, fur-bearing animals or honeybees;
- (D) Dairying and selling dairy products; or
- (E) Any other agricultural, forestry or horticultural use or animal husbandry, or any combination of agricultural, horticultural or animal husbandry uses, including preparing and storing produce raised on the farm for human use and animal use, preparing, processing and storing agricultural and forestry products and goods and disposing, by marketing or otherwise, of farm produce or forest products.

"Agricultural building" does not include:

- (A) A dwelling;
- (B) A structure used for a purpose other than growing plants in which 10 or more persons are present

at any one time;

(C) A structure regulated by the State Fire Marshal pursuant to ORS chapter 476;

(D) A structure used by the public; or

(E) A structure that is subject to the National Flood Insurance Act of 1968 (42 U.S.C 4001 to 4127), as amended, and regulations promulgated under that Act.

analog control: a control loop in which data is expressed or measured by means of one or more physical properties that can express any value along a continuous scale. All types of control systems may provide analog control.

Applicable building codes: the building codes of the state of Oregon, as adopted by the Oregon Department of Consumer and Business Services, Building Codes Division

authority having jurisdiction (AHJ): the Oregon Department of Energy the agency or agent responsible for enforcing this standard.

baseline: the first-year energy use intensity for the building at the beginning of the compliance determination process.

benchmarking: the practice of comparing the measured performance of a device, process, facility, or organization to itself, its peers, or established norms, with the goal of informing and motivating performance improvement. When applied to building energy use, benchmarking serves as a mechanism to measure energy performance over time, relative to other similar buildings

building: a structure, including mobile homes, manufactured homes, and other factory-built buildings, wholly or partially enclosed within exterior walls, or within exterior and party walls, and a roof, that affords shelter to persons, animals, or property.

building GHG emissions: GHG emissions associated with building energy use, calculated from gross energy use data using the applicable GHG emission conversion factor for each energy form used. The GHG emission conversion factors for different fuels, including electricity, are those specified by the Oregon Department of Environmental Quality. Emissions related to electricity use shall be calculated using utility-specific emissions factors for the corresponding year. When emissions factors for the corresponding year are not available, the most recent year available shall be used. include GHG emissions associated with the extraction, processing, and transportation of source energy forms such as coal, oil, natural gas, biomass, and nuclear fuel; energy consumed in conversion to other energy forms; and energy consumed or lost in transmission an distribution to the building site.

building manager: the person responsible for maintaining the building, its envelope, and its energy-using systems. The building manager may also be the person responsible for expending funds on capital improvements to the building.

building operator: the person or persons who have responsibility to inspect, operate, and maintain the building systems and components that fall within the scope of this standard. The building operator may be an employee of the building owner, the building manager, or a contractor.

building owner: the holder of the property title for the building and/or the land upon which the building sits.

building tenant: a person or entity occupying or holding possession of a building or premises pursuant to a rental agreement.

campus: a collection of buildings served by a campus district heating, cooling, water reuse, and/or power system owned by the same building owner.

Campus district energy system: A district energy system that provides heating, cooling, or heating and cooling to a campus through a distributed system providing steam, hot water, chilled water, or cool water to three or more buildings with more than 100,000 square feet of combined conditioned space, where the system and all buildings connected to the system are owned by:

(a) A single entity;

(b) A public-private partnership in which a private entity owns the systems providing heating, cooling, or heating and cooling to buildings owned by one public entity; or

(c) Two private entities in which one private entity owns the buildings connected to the system and another private entity owns the system providing heating, cooling, or heating and cooling to the

Commented [A5]: Addition similar to language used in WA

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buildings.

campus district heating and/or cooling system: a district heating and/or cooling system that serves a campus and is owned by the building owner.

building performance: energy use intensity (EUI) or greenhouse gas intensity (GHGI).

capital management plan: a financial plan to set aside capital to replace or upgrade building systems at the end of their useful life and/or to improve performance and energy efficiency.

carbon cost: the total cost of the economic damages that would result from emitting one additional unit of carbon dioxide, as quantified by the AHJ. Where the AHJ has not quantified a carbon cost, the cost shall match a value quantified at a national level. (**Informative Note:** It is recommended that, during adoption, the AHJ define a carbon cost for the jurisdiction.)

carbon emissions: see greenhouse gas (GHG) emissions.

certified commissioning professional: a person who is certified by an ANSI/ISO/IEC 17024:2012 accredited organization to lead, plan, coordinate, and manage commissioning teams and implement the commissioning process, and with experience commissioning at least two projects of similar size and of similar equipment to the current project and at least one in the last three years. This experience includes the writing and execution of verification checks and functional test plans

complex: a group of individual or interconnected buildings on contiguous property.

conditional compliance: a temporary method that a building owner can use to demonstrate that the building owner has implemented required energy use reduction strategies when the building owner cannot demonstrate full compliance with a required energy use intensity target or investment criteria. Conditional compliance represents a compliance level between the completion of implementation in Section 9.1 and verification of compliance in Section 9.2. Conditional compliance expires 15 months following the completion of implementation.

conditioned space: a space that is provided with heating and/or cooling capable of maintaining the temperature of the space between 50°F (10°C) and 86°F (30°C).

conditioned space: a cooled space, heated space, or indirectly conditioned space defined as follows:

a. **cooled space:** an enclosed space within a building that is cooled by a cooling system whose sensible output capacity is ≥ 3.4 Btu/h-ft² of floor area.

b. **heated space:** an enclosed space within a building that is heated by a heating system whose output capacity relative to the floor area is greater than or equal to the criteria in Table 3.2.

c. **indirectly conditioned space:** an enclosed space within a building that is not a heated space or a cooled space, which is heated or cooled indirectly by being connected to adjacent spaces, provided

1. the product of the U-factors and surface areas of the space adjacent to connected spaces exceeds the combined sum of the product of the U-factors and surface areas of the space adjoining the outdoors, unconditioned spaces, and to or from semiheated spaces (e.g., corridors) or
2. that air from heated or cooled spaces is intentionally transferred (naturally or mechanically) into the space at a rate exceeding 3 ach (e.g., atria).

connected buildings: a collection of buildings with shared energy meter(s) on contiguous property.

contiguous property: adjoining property under sole ownership

Covered commercial building: a Tier 1 building or a Tier 2 building.

crawl spaces: a shallow, unfinished space beneath the first floor or under the roof of a building.

daylight harvesting: the automatic control of electric light levels in response to the amount of daylight in the space.

daylight hours: the period from 30 minutes after sunrise to 30 minutes before sunset.

dimmer: a device that varies the current through an electric light in order to control its level of illumination and energy usage.

direct digital controls (DDC): a control system consisting of microprocessor-based controllers that monitor and control building systems equipment through input devices (such as sensors), output devices (such as switches and actuators), and programmed control sequences.

Decarbonization plan: A plan to comply with clean building performance standard in accordance with Normative Annex W.

director: the director of the State Department of Energy or the director's designee.

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Commented [A9]: Modifications to align with HB 3409 and Washington. Conditional compliance timelines/expiration are removed from the definition as they will be addressed in those sections of the standard.

Commented [A10]: Definition to align with Oregon Energy Code / ASHRAE 90.1

Commented [A11]: Definition from HB 3409

discounted payback: the time when the accumulated savings achieved by an investment, discounted by the appropriate discount rate, equals the initial cost of the investment. The appropriate discount rate is determined by the *facility owner* to reflect the owner's investment criteria.

District energy system: A system that provides heating, cooling, or heating and cooling to a campus through a distributed system providing steam, hot water, chilled water, or cool water to buildings.

District energy system, campus: See campus district energy system.

Eligible building owner:

(a) An owner of a tier 1 building that must comply with the standard established in section 9 of this 2023 Act; or

(b) An owner of tier 2 building.

emissions reduction measure (ERM): an action taken in the operation of equipment in the *building* or energy supply to the *building* that reduces the *greenhouse gas (GHG) emissions* of the *building* without negative impact within the *building*. ERMs may also be *energy efficiency measures (EEMs)*.

Energy:

(a) Electricity, including electricity that is delivered through the electric grid and electricity that is generated at a building site using solar or wind energy resources;

(b) Natural gas;

(c) Steam, hot water or chilled water used for heating or cooling;

(d) Propane;

(e) Fuel oil;

(f) Wood;

(g) Coal; or

(h) Any other fuel that meets a covered commercial building's energy load

energy and emissions accounting system: a system for measuring, collecting, and documenting the *building's* energy use and its calculated *GHG emissions*.

energy auditor: see *qualified energy auditor*.

energy cost: the total cost for energy supplied to a *building* or *building site*, including such charges as base charges, consumption charges, demand charges, customer charges, power factor charges, and miscellaneous charges such as sales taxes.

energy efficiency measure (EEM): an action taken in the operation of equipment in a *building* that reduces the energy use of the *building* without negative impact within the *building*. EEMs may also be *emissions reduction measures (ERMs)*.

energy manager (EM): the individual, identified by the *building owner*, who has responsibility for ensuring that energy use in the *building* is minimized without compromising the indoor environmental quality (*building* indoor air quality, thermal comfort, visual acuity and comfort, sound quality). The *EM* may be the *building owner*, a tenant, an employee of the owner or tenant, or a contractor retained by the owner or tenant.

energy use intensity (EUI): a measurement that weather normalizes a building's site energy use relative to the building's size, calculated by dividing the total net energy the building consumes in one year by the building's gross floor area, excluding any parking garage, and that is reported in thousands of British thermal units per square foot per year. an expression of building energy use per year in terms of gross energy divided by gross floor area.

EUI target: the *EUI* (of a *building*) that has been established for compliance with this standard.

Greenhouse gas: has the meaning given that term in ORS 468A.210. Greenhouse gas means any gas that contributes to anthropogenic global warming including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride.

greenhouse gas (GHG) emissions: a measure used to determine and compare the emissions of various greenhouse gases based on their global warming potential (GWP), including carbon dioxide equivalent (CO₂e) emissions from carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The CO₂e emissions for a gas are calculated by multiplying the weight of the gas by its associated GWP.

greenhouse gas intensity (GHGI): an expression of *building GHG emissions* per year measured as *building*

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Commented [A14]: Definition from HB 3409

Commented [A15]: Definition from HB 3409 and other Oregon statute, reproduced here for clarity.

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GHG emissions divided by gross floor area.

~~GHGI target: the GHGI (of a building) that has been established for compliance with this standard.~~

gross energy: the sum of the metered energy entering the *building* plus the metered energy delivered from active on-site renewable energy minus metered energy leaving the *building* for beneficial use elsewhere; this also applies to portions of *buildings* with submetering. Bulk fuels are included using Equation 5-2 in Section 5.2.2.1.

Gross floor area: the total number of square feet of a building, measured from the exterior surfaces of a building's fixed enclosing walls, including all floor space used as offices, lobbies, restrooms, equipment storage areas, mechanical rooms, break rooms and elevator shafts. Conditioned basements are included in gross floor area totals.

~~**gross floor area for nonresidential buildings:** the sum of the floor areas of all the spaces within the building with no deductions for floor penetrations other than atria. It is measured from the exterior faces of exterior walls or from the centerline of walls separating buildings, but it excludes covered walkways, open roofed-over areas, porches and similar spaces, pipe trenches, exterior terraces or steps, roof overhangs, parking garages, surface parking, and similar features.~~

~~**gross floor area for residential buildings:** the sum of the floor areas of all the conditioned (heated and/or cooled) spaces within the building, including conditioned garages, conditioned basements, and conditioned attics. It is measured from the exterior faces of exterior walls or from the centerline of walls separating buildings. It excludes crawl spaces, covered walkways, open roofed-over areas, porches and similar spaces, exterior terraces or steps, and roof overhangs.~~

~~"Gross floor area" does not include bays or docks outside the building, exterior spaces, covered walkways, open roofed-over areas, outdoor play courts, porches, exterior terraces or steps, roof overhangs, balconies, decks, patios, pipe trenches, interstitial plenum space between floors (which houses pipes and ventilation, driveways, parking garages, or surface parking.~~

Grouped buildings: Buildings that comply at the connected or campus-level as noted in Tables 7-2a and 7-4, Footnote #9, campuses, and connected buildings.

high-efficacy lamps: lamps with a minimum efficacy of 60 lm/W for lamps over 40 W, 50 lm/W for lamps over 15 to 40 W, or 40 lm/W for lamps 15 W or less.

HVAC system: the equipment, distribution systems, and terminals that provide the processes of heating, ventilating, or air conditioning to a *building* or portion of a *building*.

industrial process: a systematic series of mechanical or chemical operations that produce or manufacture something.

interactive effect: the change in resultant energy-savings estimates or actual energy savings due to analyzing or implementing multiple *EEMs* that interact with one another.

internal rate of return (IRR): the discount rate in a capital project that makes the net present value of all cash flows from a particular project equal to zero. The higher a project's *IRR*, the more desirable it is to undertake the project. *IRR* can be used to rank several prospective projects under consideration. *IRR* is defined by the following equation:

$$0 = -CF_0 + \sum_{t=1}^n \frac{CF_t}{(1 + IRR)^t}$$

where

Commented [A18]: Oregon targets are based on site energy use, so GHGI targets are not applicable.

Commented [A19]: Remove ASHRAE 100 components of definition, similar to Washington and to be consistent with HB 3409, align with Energy Star Portfolio Manager and Washington State Guidelines.

n = the useful life of the measure in years
 CF_t = the annual cost savings of the measure in year t (cash flow in year t)
 CF_0 = the initial cost of the measure (cash flow initial)

lamp: a replaceable component of a *luminaire*, such as an incandescent light bulb, that is designed to produce light from electricity.

lighting schedule: a list that provides a count of all *luminaires* in the *building*, their *lamps*, lighting controls, fixture types, and product information.

lighting power density: the lighting power per unit area of a *building* or a space in a *building*.

luminaire: a complete lighting unit consisting of a *lamp* or *lamps* (and ballasts and/or drivers when applicable) together with the housing designed to distribute the light, position and protect the *lamps*, and connect the *lamps* to the power supply.

maintain: the process of keeping equipment and components operating or functioning in accordance with manufacturers' recommendations and industry standards over their service lives. It involves but is not limited to carrying out observation, lubrication, adjustment, calibration, testing, cleaning, replacement, and repair at appropriate intervals as applicable to the specific equipment or component.

motion sensor: an *occupancy sensor* used for exterior areas.

multiscene control: a lighting control device or system that allows for two or more predefined lighting settings, in addition to an all-off setting, for two or more groups of *luminaires* to suit multiple activities in the space, and allows the automatic recall of these settings.

Net energy use: the sum of metered and bulk fuel energy that enters a building, minus the sum of metered energy that leaves the building.

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nighttime hours: the period from 30 minutes before sunset to 30 minutes after sunrise.

nonrenewable energy: energy other than renewable energy or *recovered energy*.

nonresidential building: as used in this standard, any *building* that does not match one of the types of *residential buildings* listed in the Table 7-1.

Nontarget buildings: Buildings with building activity type(s) without an energy target or not listed in Table 7-1 in more than 50 percent of the gross floor area.

Nontarget space: Space within a building with a building activity type without an energy target or not listed in Table 7-1.

Participating campus: A campus pursuing compliance through a decarbonization plan in accordance with Normative Annex W.

occupancy sensor: a device that detects the presence or absence of people within an area and causes lighting, equipment, or appliances to be regulated accordingly.

optimized bundle of EEMs: a collection of *EEMs* that maximizes the energy savings at a facility within the cost-effectiveness criteria of the standard. It excludes any measure with a *simple payback* that exceeds the life of the measure. A bundle of measures is optimized by including the maximum number of *EEMs* within the bundle while still meeting the cost-effectiveness criteria. The process for determining the *optimized bundle of EEMs* may be an iterative one due to *interactive effects* of individual *EEMs*.

optimized bundle of ERMs: a collection of *ERMs* (including the *optimized bundle of EEMs*) that maximizes the *GHG emissions* reduction at a facility within the cost-effectiveness criteria of this standard. It excludes any measure with a *simple payback* that exceeds the life of the measure. A bundle of measures is optimized by including the *ERMs* with the largest total *GHG emissions* reduction within the bundle while still meeting the cost-effectiveness criteria. The process for determining the *optimized bundle of ERMs* may be an iterative one due to *interactive effects* of individual *ERMs*.

performance: manner in which an individual, a *building*, a system, or a component fulfills specified behavior.

performance target: the *EUI target* or *GHG target* for a *building* that has been established for compliance with this standard.

photosensor: a device that detects the presence of and/or measures the amount of visible light, infrared (IR) transmission, and/or ultraviolet energy, and emits a signal based on the presence, absence, and/or amount of these entities.

physical occupancy: space that is used by an owner or tenant regardless of occupant density and frequency of use. A building does not have physical occupancy and is considered unoccupied when 50% or more of the conditioned floor area is not leased or is otherwise vacant.

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primary energy: see source energy.

qualified energy auditor: A person acting as the auditor of record having training, expertise and three years professional experience in building energy auditing and any one of the following: a person having training and expertise in building energy auditing. A qualified energy auditor is any of the following:

- a. A licensed professional architect or engineer in the state of Oregon jurisdiction where the project is located
- b. A Building Energy Assessment Professional (BEAP) certified by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
- c. A Certified Energy Auditor (CEA) certified by the Association of Energy Engineer. An energy auditor/assessor/analyst certified by ASHRAE or AEE for all building types, or certified by BPI or RESnet for residential buildings
- d. A certified energy manager (CEM) in current standing, certified by the Association of Energy Engineers (AEE).
- e. An energy management professional (EMP) certified by the Energy Management Association (EMA).
- f. The AHJ may prescribe additional certifications and training to meet the minimum qualifications of a qualified energy auditor. When the AHJ prescribes such additional qualifications, it will provide notice of the determination on the agency website and will periodically update these rules to reflect additional qualifications of qualified energy auditors.

Commented [A22]: Oregon is the applicable jurisdiction

Commented [A23]: Licensed professional, ASHRAE BEAP, AEE CEA, CEM, and EMP certifications are criteria to be eligible in WA. Edits made here are to align with WA.

e. A person qualified by the AHJ

qualified energy manager (OEM): an individual designated by the building owner who:

- a. Has two years of experience, including educational and/or professional experience, with commercial building operations and/or building energy management in addition to successful completion of training as specified by the AHJ, or
- b. Meets the definition of a qualified person

qualified person: a person having training and expertise in building energy use analysis. A qualified person is any of the following:

Commented [A24]: These modifications are similar to WA.

- a. A licensed professional architect or engineer in the state of Oregon or licensed contractor in the jurisdiction where the project is located
- b. A certified qualified energy auditor or
- c. energy manager
- d. A Certified Energy Manager (CEM) in current standing, certified by the Association of Energy Engineers
- e. A person qualified by the AHJ
- f. A person with Building Operator Certification (BOC) Level II by Building Potential
- g. A building commissioning professional certified by an ANSI/ISO/IEC 17024:2012 accredited organization
- h. An energy management professional (EMP) certified by the Energy Management Association (EMA)
- i. A person with Lane Community College Energy Management with Building Controls program degree, or as approved as equivalent by the AHJ
- j.

The AHJ may prescribe additional certifications and training to meet the minimum qualifications of a qualified person. When the AHJ prescribes such additional qualifications, it will provide notice of the determination on the agency website and will periodically update these rules to reflect additional qualifications of qualified persons.

recommissioning: an application of the commission process requirements to a project that has been delivered using the commissioning process

recovered energy: energy reclaimed for useful purposes that would otherwise be wasted.

Renewable natural gas: A gas consisting largely of methane and other hydrocarbons derived from the

decomposition of organic material in landfills, wastewater treatment facilities, or anaerobic digesters and that is fully interchangeable with conventional natural gas.

residential building: for the purposes of this standard, any *building* matching one of the descriptions for *building* types 49 through 53 in Table 7-1.

Savings to investment ratio: the ratio of the total present value of savings to the total present value of costs to implement an energy conservation measure or water conservation measure, in which the numerator of the ratio is the present value of net savings in energy or water or in maintenance costs not related to fuel use or water use that are attributable to the energy conservation measure or water conservation measure and the denominator of the ratio is the present value of the net increase in investment and replacement costs, less the salvage value, of the energy conservation or water conservation measure.

Semiheated space: an enclosed space within a covered commercial building that is heated by a heating system with an output the Department of Consumer and Business Services specifies in an applicable specialty code.

service log: a document in which service and maintenance work performed for a given piece of equipment is recorded, and that contains a date, the service technician's name, and a description of work performed.

simple payback (years): the estimated incremental initial cost of an EEM divided by the estimated incremental annual cost savings of the measure expressed in years. The cost savings may include energy cost savings and incremental routine operations and maintenance costs. The simple payback calculation shall be in accordance with NIST Handbook 135, Section 6.4.4, Equation 6-13.

site: a building, portion of a building, or group of buildings, and surrounding area of land inside the boundary that is contiguous or separated only by public rights-of-way, all of which are under the same ownership or control.

site energy: energy consumed by a *building* as measured at the boundaries of the *building* site.

source energy: *site energy* plus the estimated energy consumed or lost in the extraction, processing, and transportation of *primary energy* forms such as coal, oil, natural gas, biomass, and nuclear fuel; energy consumed in conversion to other energy forms; and energy consumed or lost in transmission and distribution to the *building* site. See also *primary energy*.

state equipment standards: appliance and equipment standards listed in Oregon Administrative Rule Chapter 330, Division 92.

Tier 1 building: a building in which the sum of gross floor area for hotel, motel and nonresidential use equals or exceeds 35,000 square feet, excluding any parking garage.

Tier 2 building:

(A) A building with gross floor area, excluding any parking garage, that equals or exceeds 35,000 square feet and that is used as a multifamily residential building, a hospital, a school, a dormitory or a university building; or

(B) A building in which the sum of gross floor area for hotel, motel and nonresidential use exceeds 20,000 square feet but does not exceed 35,000 square feet, excluding any parking garage.

"Tier 2 building" does not include a covered commercial building that is classified as a Tier 1 building.

Unconditioned space: an enclosed space within a covered commercial building that is not:

(a) Heated by a heating system or cooled by a cooling system with output capacities the Department of Consumer and Business Services specifies in an applicable specialty code; or

(b) Indirectly heated or cooled in accordance with standards the department specifies in an applicable specialty code.

useful life: The expected-service life of building systems or equipment as published by the AHJ. For EEMs not included, the qualified energy auditor will be responsible for determining useful life. Used interchangeably with service life.

Weather normalized: a method for modifying a building's energy use intensity in a specific year to account for deviations from the building's energy use intensity as the energy use intensity ordinarily occurs during a year in which the weather does not fluctuate substantially or vary as a consequence of extreme weather events.

Commented [A25]: Definition from HB 3409

Commented [A26]: Definition from HB 3409

Commented [A27]: Alignment with WA

Commented [A28]: Added definition of "site" from ASHRAE 228

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Commented [A30]: Definition from HB 3409

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weather normalized energy use intensity (WNEUI): measurement that normalizes a building's site energy use relative to its size based on the building's weather normalized site energy use. A building's energy use intensity is calculated by dividing the total net weather normalized energy consumed in one year by the gross floor area of the building, excluding the parking garage. Weather normalized energy use intensity is reported as a value of a thousand British thermal units per square foot per year.

X

zone: a space or group of spaces within a *building* for which the heating, cooling, or lighting requirements are sufficiently similar that desired conditions can be maintained throughout by a single controlling device.

3.2 Abbreviations and Acronyms

AHJ *authority having jurisdiction*-(*Oregon Department of Energy*)

ASE annual sunlight exposure

DRAFT

ASH	antisweat heating
CAV	constant air volume
CO ₂ e	carbon dioxide equivalent
DDC	direct digital controls DOAS dedicated outdoor air system
DX	direct expansion
EEM	energy efficiency measure
EM	energy manager
ERM	emissions reduction measure
EUI	energy use intensity
EUI _t	energy use intensity target
FDD	fault detection and diagnosis
GHG	greenhouse gas
GHGI	greenhouse gas intensity
GHGI _t	greenhouse gas intensity target
GWP	global warming potential
HID	high-intensity discharge
IRR	internal rate of return
JSM	jurisdiction-specific methodology
LCC	life-cycle costing
O&M	operations and maintenance
sDA	spatial daylight autonomy
SEER	seasonal energy efficiency ratio
VAV	variable air volume
VFD	variable-frequency drive
VSD	variable-speed drive

4. COMPLIANCE REQUIREMENTS

4.1 Compliance Forms. Forms for recording information used for demonstrating compliance with standard are located in Normative Appendix A, Appendix Y and Appendix Z. Submittal to the authority having jurisdiction, AHJ, will be done electronically in a manner specified by the AHJ.

4.2 Building Type Requirements

4.2.1 Nonresidential Building Tier 1 Buildings

4.2.1.1 A building or complex of buildings whose majority of gross floor area has activities number 1 through 50 and/or 55 in Table 7-1 has performance targets and shall comply with the requirements of Sections 4.3, 4.4-1, and 4.4-2, and 4.5.

4.2.1.2 For Tier 1 buildings, the qualified person determining compliance shall

- Determine whether or not the building seeking compliance has performance targets according to Section 7,
- If applicable, establish the performance targets according to Section 7
- Complete Form B Submit information as specified in Normative Appendix Z to the AHJ, in a manner specified by the AHJ.
- Indicate on Form A if this compliance is for the whole building or for individual tenant spaces in a multi-tenant building
- Submit Forms A, B, C-1, C-2, and C-3 to the authority having jurisdiction (AHJ)

4.2.2 Tier 2 Buildings

4.2.1.1 For Tier 2 buildings, the qualified energy manager submitting compliance documents shall:

- Determine whether or not the building seeking compliance has an energy use intensity target (EUI_t) according to

Commented [A32]: Standard 100 includes a pathway for individual tenant compliance, but Oregon's BPS is based on whole buildings.

Commented [A33]: This is covered in item c. in this section

Section 7;

- b. Establish the energy use intensity target (EUI_t) according to Section 7; and
- c. Submit forms as specified in Normative Annex Y to the AHJ.

4.2.2 Residential Building

4.2.2.1 A building with activities number 49 through 52 in Table 7-1 shall comply with the requirements of Section 10.

4.2.2.2 The qualified person determining compliance shall indicate on Form A if this compliance is for the whole building or for individual dwellings in a multi-dwelling building and submit Forms A, B, C-1, C-2, and C-3 to the AHJ.

4.2.3 Buildings with Residential and Nonresidential Activities

4.2.3.1 Individual dwelling units in a multi-tenant building seeking compliance apart from the building shall comply with Section 10.

4.2.3.2 The qualified person determining compliance for buildings with both residential and nonresidential activities shall comply with Section 4.2.1.2.

4.2.3 District Energy Systems Decarbonization

4.2.3.1 Participating campuses shall comply with the requirements of Sections 4.3 and 4.4.

4.2.3.2 For participating campuses, the qualified person determining compliance shall:

1. Determine whether or not the campus seeking compliance has an energy use intensity target (EUI_t) according to Section 7;
2. Establish the energy use intensity target (EUI_t) according to Section 7;
3. Submit forms in accordance with Normative Annex W to the AHJ; and
4. Submit decarbonization plan as specified in Normative Annex W to the AHJ.

4.3 Energy and Emissions Management Plan and Operations and Maintenance Program

4.3.1 Operations and Maintenance. The building manager shall comply with the operations and maintenance (O&M) requirements of Section 6.

4.3.1.1 For Tier 1 Covered Buildings. The qualified person determining compliance shall state in writing on Form A that the O&M requirements of Section 6 have been met according to the following subsections:

1. For first-time applicants, for the previous year.
- ~~2.~~
- ~~3-2.~~ For previously compliant buildings other than first-time applicants, since the previous end of the previous compliance period validation of compliance.

4.3.1.2 For Tier 2 Covered Buildings, there is no requirement for an operations and maintenance plan.

4.3.1.3 For grouped buildings, the qualified person determining compliance shall state in writing on Form J that the operations and maintenance requirements of Section 6 have been met:

1. For first-time grouped building applicants, follow the compliance schedules in
 - a. Section Z3.2 for Tier 1 covered buildings
 - b. for participating campuses only by July 1, 2030, for buildings not covered, connected to the district energy system
2. For previously compliant grouped buildings, since the previous validation of compliance.

4.3.1.4 For grouped buildings, the qualified person determining compliance may submit a single operations and maintenance program. The O&M program implemented for participating campuses through a decarbonization plan shall include all campus buildings. The O&M program implemented at a connected building or campus-level shall include all covered buildings.

4.3.2 Energy and Emissions Management Plan. The building manager shall comply with the energy management plan (EMP) requirements of Section 5. The qualified person determining compliance shall state in writing on Form A that the energy and emissions management program described in Section 5 has been developed and is being maintained as of the date on Form A.

4.3.2.1 For Tier 1 covered buildings, the qualified person determining compliance shall state in writing on

Commented [A34]: Standard 100 has a pathway for residential buildings. Residential Multifamily are Tier 2 and not included in Oregon's BPS requirements.

Form A that the EMP described in Section 5 has been developed and is being maintained as of the date on Form A.

4.3.2.2 For Tier 2 covered buildings, there is no requirement for an EMP.

4.3.2.3 For grouped buildings, the qualified person determining compliance shall state in writing on Form J, that the EMP described in Section 5 has been developed and is being maintained as of the date on Form J.

4.3.2.4 For grouped buildings, the qualified person determining compliance may submit a single EMP. The EMP implemented for participating campuses through a decarbonization plan shall include all campus buildings. The EMP implemented at a connected building or campus-level shall include all covered buildings.

5-

5.14.4 Building Performance

4.4.1 Measured Energy Use Intensity and Greenhouse Gas Intensity. The qualified person shall calculate the building's measured energy use intensity (EUI) and greenhouse gas intensity (GHGI) by completing Forms C-1, C-2, and C-3 according to Section 5.2.

4.4.1.1 For Tier 1 covered buildings, the qualified person shall calculate the building's measured energy use intensity (EUI) by completing Form C according to Section 5.2.

4.4.1.2 For Tier 2 covered buildings, the qualified energy manager shall calculate the building's measured energy use intensity (EUI) by completing Form C according to Section 5.2.

5.1.1.4.4.1.3 For grouped buildings, the qualified person submitting compliance documents shall calculate the grouped buildings' measured energy use intensity (EUI) by completing Form C according to Section 5.2.

5.1.2.4.4.2 Buildings with Performance Targets

5.1.2.4.4.2.1 Compliance Process. Tier 1 Buildings with performance targets shall comply with the requirements of Sections 4.4.2.2 and 4.4.2.3. Figure 4-1 illustrates the compliance process for Tier 1 buildings with performance targets.

5.1.2.4.4.2.2 Building Meets the Performance Targets. If the building's measured EUI is less than or equal to its EUI target, and the building's measured GHGI is less than or equal to its GHGI target, then the building complies.

5.1.2.4.4.2.3 Building Does not Meet the Performance Targets. If either the building's measured EUI is greater than the EUI target or the building's measured GHGI is greater than the GHGI target, then an energy audit with decarbonization assessment shall be performed. A qualified energy auditor shall complete an energy audit according to Section 8. EEMs and ERMs that will reduce energy use and GHG emissions to meet the EUI target and GHGI target shall be implemented according to Section 9. Upon completion of the implementation of all required EEMs to meet the EUI target and ERMs, a building shall be granted conditional compliance.

Exception to 4.4.2.3:

No individual requirement need be met that would compromise the historical integrity of a building or part of a building designated by a government body for long-term preservation in its existing state, such as historical monuments.

5.1.2.4.4.2.4 Verification of Compliance. Within fifteen months after the completion of Section 4.4.2.3, the EUI and GHGI shall be recalculated by the energy manager from 12 consecutive months of measured energy use, and Form A shall be resubmitted to the AHJ. If the building's postimplementation EUI is less than or equal to the EUI target, and the building's postimplementation GHGI is less than or equal to the GHGI target, the building complies with the standard. If the building's postimplementation measured EUI is greater than the EUI target, or the building's postimplementation measured GHGI is greater than the GHGI target, the building does not comply with the standard and the conditional compliance is suspended until either

- Additional EEMs and ERMs have been implemented that reduce the subsequently measured EUI and GHGI to less than or equal to the EUI target and GHGI target, respectively, and a new Form A is submitted to the AHJ or
- The AHJ revokes conditional compliance

5.1.34.4.3 Buildings without Performance Targets

Commented [A35]: Removed requirements to calculate GHG intensity, as the BPS is based on site energy

Commented [A36]: Forms C-2 and C-3 are for source energy and GHG intensity, respectively, and are not necessary for Oregon.

Commented [A37]: WA requires "more recently built buildings" to meet a target that is 15% more efficient than other buildings. This is not currently proposed for Oregon due to differences in nature between EUI targets and desire for target consistency.

5.1.3.14.4.3.1 Compliance Process. Buildings without performance targets shall comply with the requirements of Sections 4.4.3.2 and 4.4.3.3. Figure 4-2 illustrates the compliance process for buildings without performance targets.

5.1.3.14.4.3.2 A qualified energy auditor shall conduct an energy audit with decarbonization assessment according to Section 8, and the optimized bundle of ~~ERMs-EEMs~~ shall be identified according to Section 9.1.1.2.

5.1.3.14.4.3.3 Implement Energy Efficiency Measures and Emissions Reduction Measures. The entire optimized bundle of ~~ERMs-EEMs~~ shall be implemented. Upon completion of the implementation of the optimized bundle of ~~ERMs-EEMs~~, a building shall be granted conditional compliance in accordance with Section 9.1.1.2.

Exception to 4.4.3.3: No individual requirement need be met that would compromise the historical integrity of a building or part of a building designated by a government body for long-term preservation in its existing state, such as historical monuments.

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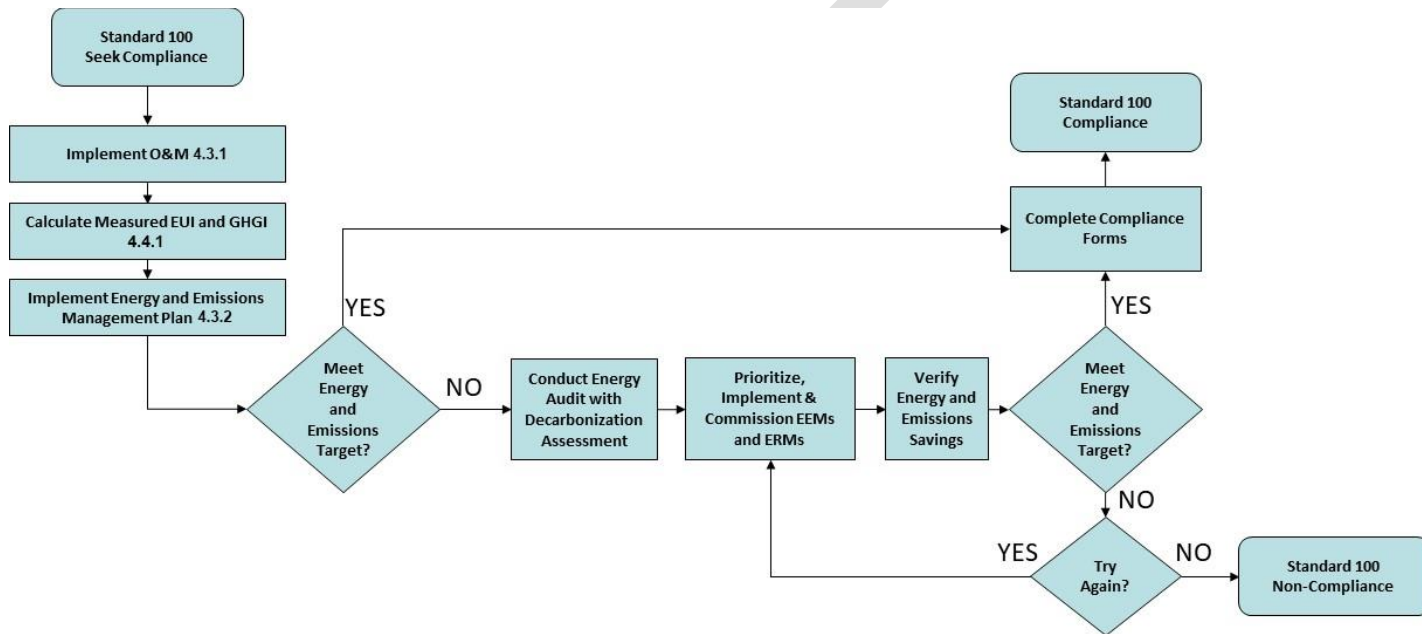


Figure 4-1 Flowchart for buildings with performance targets.

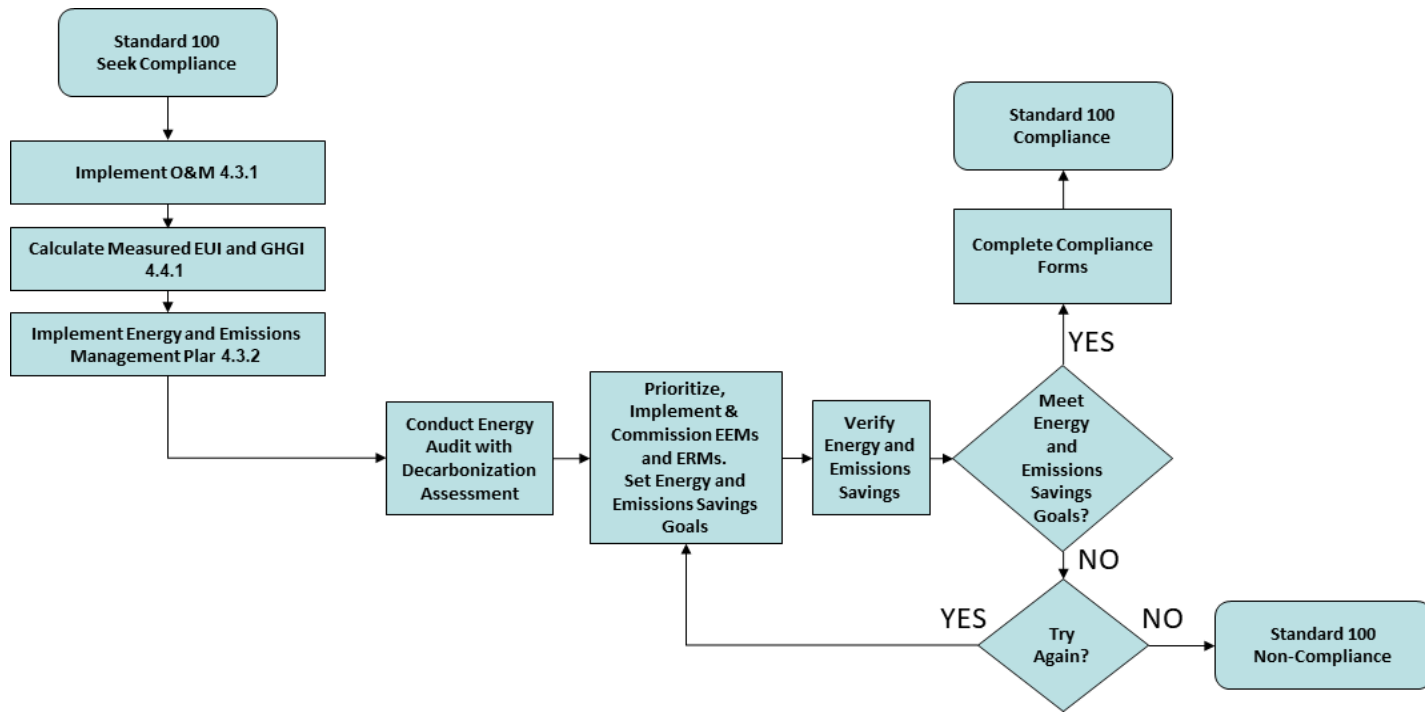


Figure 4-2 Flowchart for buildings without performance targets.

5.1.3.44.4.3.4 Verification of Compliance for Buildings with Building Energy Monitoring in Compliance with Section 5.2. If the *building* complies with Section 4.3, then within 15 months following the completion of implementation of the *optimized bundle* of ~~ERMs/EEMs~~, *building owners* with *conditional compliance* or the *qualified person* representing the *building owner* shall submit verification that measured postimplementation energy savings ~~and GHG emissions reduction~~ meet or exceed 75% of the energy savings ~~and GHG emissions reduction~~ projected in the energy audit with decarbonization assessment report to the AHJ. Energy savings ~~and GHG emissions reduction~~ shall be compared at the whole-*building* consumption level in common units for electricity, fossil fuels, and other sources. If the measured postimplementation energy savings ~~and GHG emissions reduction~~ of the *optimized bundle* of ~~ERMs/EEMs~~ do not meet or exceed 75% of the energy savings ~~and GHG emissions reduction~~ projected in the energy audit with decarbonization assessment, the *conditional compliance* is suspended until either

- a. Additional ~~EEMs and/or ERMs~~ are implemented that reduce the subsequently measured energy savings ~~and/or GHG emissions reduction~~ of the *optimized bundle* of ~~ERMs/EEMs~~ so that it meets or exceeds 75% ~~and GHG emissions reduction~~ of the energy savings projected in the energy audit with decarbonization assessment; or
- a.b. Verification of energy savings using the methods of the *International Performance Measurement & Verification Protocol, Concepts and Options for Determining Energy and Water Savings Volume I, Options A through D*. If the measurement and verification protocol identified any outstanding performance issues, they shall be corrected and the verification protocol shall be repeated to ensure optimal performance;
or
- c. The AHJ revokes *conditional compliance*

5.1.3.54.4.3.5 Verification of Compliance for Buildings without Building Energy Monitoring in Compliance with Section 5.2. Verification of energy savings using the methods of the *International Performance Measurement & Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Volume I, Options A through D*. If the measurement and verification protocol identified any outstanding performance issues, they shall be corrected and the verification protocol shall be repeated to ensure savings estimated in the original audit are realized.

5.24.5 General

5.2.14.5.1 Administrative Requirements. *Building owners* shall demonstrate compliance with the standard by following the administrative requirements in Normative Appendix Z for *Tier 1 covered buildings*. Administrative requirements relating to permits; enforcement by the AHJ; locally adopted energy standards, including energy performance targets; interpretations; claims of exemption; and rights of appeal are specified by the AHJ.

5.2.2 Alternative Energy Use Intensity Targets. The *qualified person* determining compliance shall demonstrate to the AHJ that they have met the required *EUI targets* on either a *site energy* or *source energy* basis in accordance with Section 7 or Section 10 or have met the requirements in Section 4.4.3 for *buildings* without *EUI targets*. Alternative performance requirements, such as those in Normative Appendix B, are permitted to be specified by the AHJ.

6.5. ENERGY AND EMISSIONS MANAGEMENT PLAN

6.15.1 Establish the Energy and Emissions Management Plan

6.1.15.1.1 The *Tier 1 covered building owner* shall designate an *energy manager (EM)* to develop and maintain an energy and emissions management plan for the *building*. The emissions portion of the plan shall consider *greenhouse gas (GHG) emissions* associated with the *building's* energy consumption.

~~7. Exception to 5.1.1: Buildings smaller than 5000 ft² (465 m²) are not required to have an EM or an energy and emissions management plan.~~

7.1.15.1.2 The energy and emissions management plan shall incorporate the following.

7.1.1.15.1.2.1 An *energy and emissions accounting system* to record the energy use and *GHG emissions* in accordance with Section 5.2.

7.1.1.25.1.2.2 In the initial year of compliance, the *building's energy use intensity (EUI)* ~~and greenhouse gas intensity (GHGI)~~.

7.1.1.35.1.2.3 Annual updates of the ~~gross net~~ energy use ~~and~~, *EUI*, ~~and~~ *GHGI*.

Commented [A38]: Similar pathway to WA for verifying compliance for buildings with building energy monitoring to determine energy improvement

Commented [A39]: ERM's are "Emissions Reduction Measures", not applicable to energy-based BPS. The focus is on EEMs.

Commented [A40]: Pathway similar to WA to verify compliance for buildings without building energy monitoring.

Commented [A41]: This size of building will not be covered by Oregon's BPS.

Commented [A42]: Note that this section 5.1.2 includes items that "shall" be part of the energy and emissions plan.

Commented [A43]: ASHRAE references "gross" energy use for all energy measurements, but Oregon will need to reference "net" energy

7.1.1.45.1.2.4 For buildings with performance targets, annual comparison of the building's EUI to its EUI target ~~and comparison of the building's GHGI to its GHGI target.~~

7.1.1.55.1.2.5 For buildings without performance targets, annual comparison of the building's EUI ~~and GHGI~~ to the adjusted EUI ~~and adjusted GHGI~~ established by its most recent energy audit with decarbonization assessment. (Refer to detailed requirements in Sections 8 and 9.)

7.1.1.65.1.2.6 Documentation of original, current, and changes in number of occupants, weekly operating hours, or time of day scheduled for occupancy, ~~production rates~~, and energy-using equipment that would have caused change in the measured EUI ~~or GHGI~~.

5.1.2.7 Energy audit with decarbonization assessment reports ~~if required based on section 4.4.2 if applicable~~ and recommended energy efficiency measures (EEMs) ~~from those audits and emission reduction measures (ERMs)~~. (Refer to Section 8.)

7.1.1.75.1.2.8 Contact information for serving utilities and programs that may offer incentives for energy efficiency measures.

7.1.1.85.1.2.9 A list of EEMs ~~and ERMs~~ that have been implemented and dates of implementation, including the following:

- a. An operations and maintenance (O&M) program as defined in Section 6 for the EEMs ~~and ERMs~~
- b. An implementation plan for EEMs ~~and ERMs~~, including commissioning
- c. Staff training plan for EEMs ~~and ERMs~~
- d. Ongoing commissioning plans for the EEMs ~~and ERMs~~

7.1.25.1.3 ~~The energy and emissions plan may also incorporate, but is not limited to, the following:~~

7.1.2.15.1.3.1 A method to inform occupants about the benefits of efficient energy use, and to instruct them in the use and adjustment of operable windows, HVAC system controls, and lighting system components and controls. This shall include materials (electronic or printed) as appropriate.

7.1.2.25.1.3.2 A training plan for the O&M personnel to operate the building systems to achieve established indoor environmental targets with optimum energy efficiency.

7.1.2.35.1.3.3 A capital management plan identifying the following:

- a. EEMs ~~and ERMs~~ not selected for implementation that were designated as future opportunities in Section 9
- b. Equipment and systems for replacement in case of failure that will result in the maximum reduction in energy use and GHG emissions consistent with reasonable financial performance, including ENERGY STAR[®] rated equipment

Exception to (b): Equipment intended for standby or emergency use only.

- c. Estimated end of useful life for envelope, lighting, space heating and cooling, and water heating systems
- d. Sizing calculations for the replacement of heating and cooling equipment based on the building as modified by the EEMs identified in Section 5.1.2.7
- e. Opportunities for addition of updated system controls and demand response integration
- f. Restrictions on the use and application of electric resistance heat for space and water heating
- g. Recommendations on use of dual-fuel systems to ease building transition off fossil fuel
- h. A phase-out plan for all on-site fossil-fuel combustion equipment and systems

Exception to (h): Equipment intended for standby or emergency use only.

- i. Plan for fuel-gas pipe testing every five years and at the time of installation of new or replacement combustion equipment
- j. Opportunities for installation of on-site renewable energy

7.1.2.45.1.3.4 A contact list of suppliers and manufacturers' local representatives of energy efficient equipment, low GHG equipment, qualified installers, qualified energy auditors, the EM, and the building owner.

5.1.3.5 The current lighting schedule and the calculated lighting power density along with the potential savings from any potential EEMs.

Exceptions to 5.1.2.133.5:

1. Buildings and grouped buildings that meet the EUI.

2. Buildings that have implemented a utility program lighting upgrade covering 75% of the

Commented [A44]: Note that this section 5.1.3 includes items that "may" be (but would not necessarily be required to be) part of the energy and emissions management plan.

Commented [A45]: These exceptions are similar to WA

building's GFA, within the previous five years, can use the lighting schedule provided by the utility program.

5.1.3.6 The current lighting satisfaction survey and lighting checklist as described in *Performance Measurement Protocols for Commercial Buildings*¹, Appendix D.

Exceptions to 5.1.2.14:

1. Buildings that meet the EUI.

2. Buildings that have implemented a utility program lighting upgrade covering 75% of the building's GFA, within the previous five years.

7.1.35.1.4 The EM shall provide notification and access to a copy of the energy and emissions management plan to the *building* occupants and other stakeholders annually.

7.1.45.1.5 The *building owner* shall review and sign the energy and emissions management plan annually.

7.25.2 Building Energy and Emissions Monitoring. Covered Building gross-net energy use and GHG emissions shall be monitored and recorded in accordance with following sections.

7.2.45.2.1 Provide measured gross-net energy consumption use data for each *building*, including all forms of imported energy; and exported energy, and energy generated from active on-site renewable energy systems from at least 12 consecutive months of data monitored in a period not to exceed two years prior to the date an application for compliance is submitted to the *authority having jurisdiction (AHJ)*. The gross-net energy concept is illustrated in Figure 5-1, Table 5-1, Table 5.2, and is calculated in accordance with Section 5.2.4. A *building's net-gross energy use* is illustrated in Figure 5-1 and Table 5-1 and shall be calculated using Equation 5-1:

Building Gross-Net energy use =

Metered and bulk fuel Energy that enters delivered to the a building – On-site renewable energy produced and delivered to the building – Excess energy exported from building for beneficial use
Metered energy that leaves the building

$$\text{Net energy use} = (1a + 1b + 1c + 1d) - (3a + 3b + 3c + 3d + 3e) \quad (5-1)$$

where 1a, 1b, 1c, and 1d are metered energy supplies that are used in the *building* (this includes bulk energy sources), and 3a, 3b, 3c, 3d, and 3e are metered energy excesses that are supplied to another *building* or grid as useful energy.

Connected Buildings: Where energy consumption is not monitored at the covered building level,

1. Tier 1 covered buildings: net energy consumption data may be provided at the connected building level.

2. Tier 2 covered buildings: net energy consumption data shall be provided at the connected building level.

5.2.1.1 End Use Deductions. Where submetered from a *building's* meter, the following end use energy consumption may be deducted from the *building's* measured net energy use,

1. Electric vehicle charging equipment that transfers electricity to batteries or other energy storage devices in electric vehicles.

2. Electric loads related to broadcast antennas, onsite cell phone towers or other communications equipment that is unrelated to the primary purpose of the building

3. The AHJ may add additional end use deductions based on technological advancements.

5.2.1.2 Connected Buildings: Where energy use is not monitored at the covered building level,

1. Tier 1 covered buildings: net energy use data may be provided at the connected building level.

2. Tier 2 covered buildings: net energy use data shall be provided at the connected building level.

5.2.1.3 Campuses. Campuses with district energy systems use the campus net energy use outlined in Table 5-2. Provide measured net energy use data for the campus including all forms of imported and exported energy from at least 12 consecutive months of data monitored in a period

Commented [A46]: Modifications to this section are to incorporate "net" energy use and remove equations and references for "gross" energy.

not to exceed two years prior to the efficiency audit. Provide measured energy on the input side of the district energy system and include net energy use data for each covered building. Campus net energy use is calculated as follows:

$$\text{Campus net energy use} = (1a + 1b + 1c + 2a + 2b + 2c) - (4a + 4b + 4c + 4d + 4e)$$

5.2.1.4 Decarbonization Plan. Participating campuses' net energy use data shall include all buildings on the campus. Thermal energy for the campus shall be measured at the input side of the district energy system.

Informative Notes:

1. As shown in Figure 5-1, a *building's gross-net energy use* is the sum of ~~on-site building renewable energy production provided to the building (if any) plus~~ purchased energy delivered to the *building* minus any excess energy exported from *building* for beneficial use.
2. Examples of excess energy exported from *building* for beneficial use are as follows:
 - a. Energy used for recharging battery-powered electric vehicles
 - b. Energy directed to another *building* on the same plot of land or campus that will be accounted as metered energy delivered to that *building*
 - ~~b.c. On-site renewable energy generation that is delivered to the electric grid and is not used by the *building*.~~

7.2.25.2.2 Energy use data for each type of energy imported into and exported from the *building* shall be collected from utility or energy delivery bills (that must include the quantity of energy or fuel delivered) or by monitoring local energy meters (either utility or owner provided). If the exported energy cannot be measured, it shall be estimated using a methodology that is acceptable to the AHJ.

Commented [A47]: This language could allow for a means for “subtracting” out electricity related to transportation (EV-charging) through estimation, where it is not directly metered.

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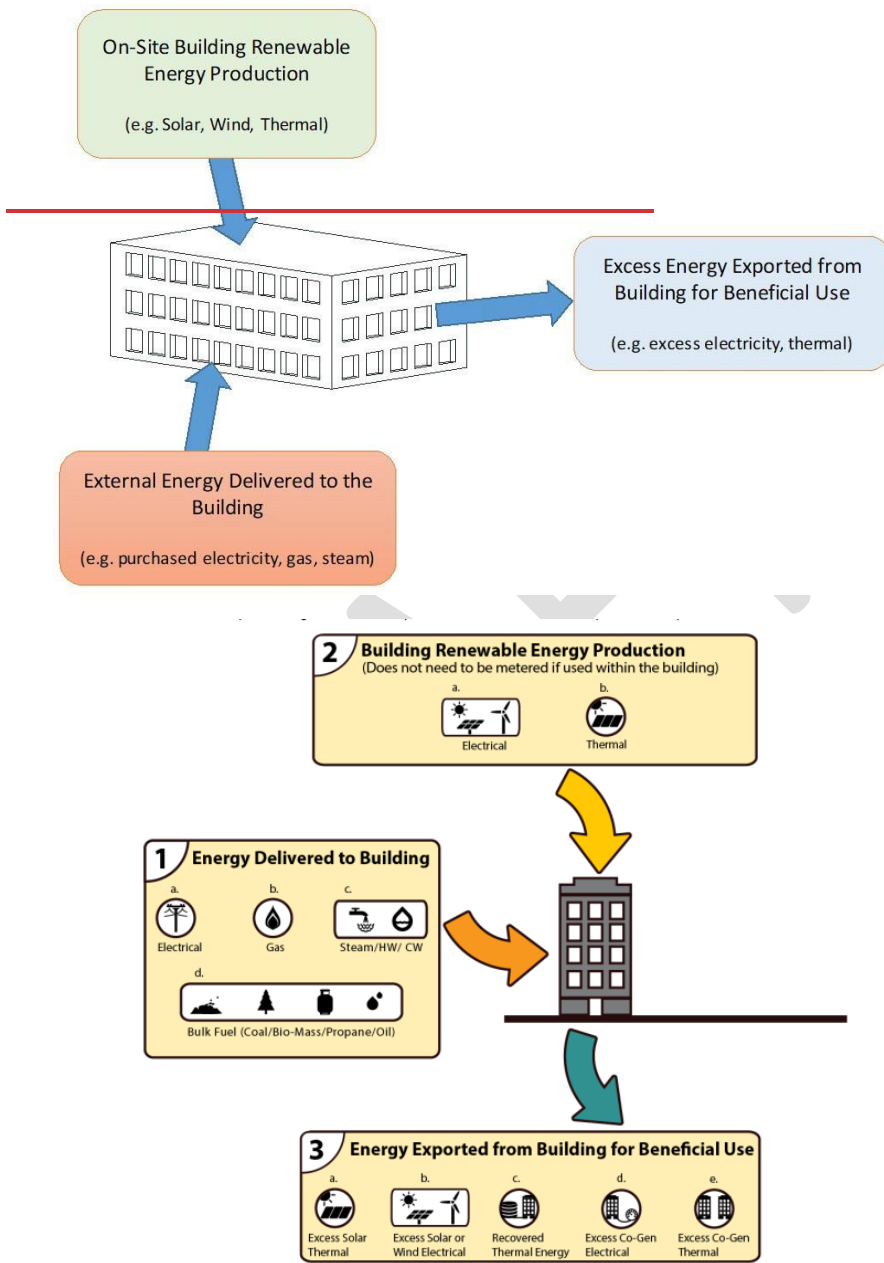


Figure 5-1 Net energy concept.

Figure 5-1-Gross Net energy concept.

Table 5-1 Energy Flow Definitions

Energy Delivered to Building	Building Renewable Energy Production	Energy Exported from Building for Beneficial Use
1a. Electrical	2a. Electrical	3a. Excess solar thermal
1b. Gas	2b. Thermal	3b. Excess solar or wind electrical
1c. Steam/hot-water (HW)/chilled and hot water (CHW)		3c. Recovered thermal energy
1d. Bulk fuel (coal/biomass/propane/oil)		3d. Excess co-gen electrical
		3e. Excess co-gen thermal

Table 5-2 Campus Energy Flow Definitions

Energy Input in to District Energy System	Energy Delivered to Buildings (other than from District Energy System)	Campus Renewable Energy Production	Energy Exported from Campus for Beneficial Use
1a. Electrical	2a. Electrical	3a. Electrical	4a. Excess solar thermal
1b. Gas	2b. Gas	3b. Thermal	4b. Excess solar or wind electrical
1c. Bulk fuel	2c. Bulk fuel (coal/biomass/propane/oil)	3c. Waste heat	4c. Excess or recovered thermal energy
			4d. Excess cogeneration electrical
			4e. Excess cogeneration thermal

7.2.2.15.2.2.1 When an energy type such as oil, solid fuels, or biomass is delivered in bulk to the building for storage prior to actual use, the annual energy use for that energy type shall be calculated using Equation 5-2:

$$\text{Annual bulk energy use} = A + B - C \quad (5-2)$$

where

- A = measured inventory of the energy type at the beginning of the 12-month period, converted to energy equivalent (Refer to Section 5.2.3.)
- B = amount of the energy type delivered to the building during the 12-month period, converted to energy equivalent (Refer to Section 5.2.3.)
- C = measured inventory of the energy type at the end of the 12-month period, converted to energy equivalent (Refer to Section 5.2.3.)

7.2.2.25.2.2.2 If the annual energy consumption of an inventoried energy type is less than twice its on-site storage capacity, the inventory measurement accuracy and methodology shall be reported as part of the energy and emissions accounting system documentation.

7.2.35.2.3 Site Energy, Source Energy, and Greenhouse Gas Emissions Calculation. Gross-Net energy shall be converted to site energy, source energy, and GHG emissions according to Sections 5.2.3.1 through 5.2.3.3.

8. Informative Note: Forms C-1, C-2, and C-3 can be used to calculate site energy, source energy, GHG emissions, site EUI, source EUI, and GHGI.

8.1.1.15.2.3.1 Site Energy. Site energy shall be calculated by converting the amount of each form of purchased energy from the purchased unit to the standard site energy unit using the conversion factors incorporated into Energy Star Portfolio Manager. If site energy conversion factors are not provided by the utility or fuel supplier, the conversion factors in Table 5-1 shall be used. (See also Informative Appendix K.)

Source Energy Conversion Factors. Source energy shall be calculated using Equation 5-3:

$$\text{Source energy} = \text{Site energy}_1 \times \text{SEF}_1 + \dots + \text{Site energy}_n \times \text{SEF}_n \quad (5-3)$$

where

- Site energy_i = site energy associated with energy form i, where i equals 1 to n
- SEF_i = source energy conversion factor associated with energy form i, where i equals 1 to n

Commented [A48]: Since Portfolio Manager will be used for reporting, refer to the conversion factors in that program to eliminate any possibility for discrepancies (although any discrepancies would be minor)

Table 5-1 Site Energy Conversion Factors

Fuel Oils	kJ/L	Btu/U.S. gal
#1	37,600	135,000
#2	38,700	139,000
#4	40,700	146,000
#5L	41,300	148,000
#5H	41,800	150,000
#6	42,900	154,000
Gas	kJ/m ³	Btu/ft ³
Natural Gas	38,400	1030
	kJ/L	Btu/U.S. gal
Propane	25,500	91,600
Electricity	kJ/kWh	Btu/kWh
	3600	3412

Informative Note: Energy accounting and conversion factors shown in Table 5-1 are based on site energy.

Commented [A49]: Remove this conversion factor table and defer to Energy Star Portfolio Manager

Table 5-2 U.S. Source Energy and Greenhouse Gas Emissions Conversion Factors

Energy Form	Source Energy Conversion Factor	Greenhouse Gas Emissions Factor, GWP ₁₀₀ (lb CO ₂ e/kBtu)	Greenhouse Gas Emissions Factor, GWP ₁₀₀ (kg CO ₂ e/MJ)
Grid electricity	2.74	0.326	0.140
Grid natural gas	1.09	0.147	0.063
Grid fuel oil	1.19	0.196	0.084
Grid liquefied petroleum gas (LPG) or propane	1.15	0.169	0.073
Coal	1.10	0.242	0.104
Other	Note a	Note a	Note a
Purchased district energy	Hot water	1.25	0.234
	Steam	1.45	0.247
	Chilled Water	1.04	0.083
On-site renewable thermal energy production	Note b	Note b	Note b
On-site renewable electricity production	Note b	Note b	Note b

Notes:

- a. To be approved by the AHJ. Default values are 1.10 for source energy conversion factor and 0.242 lb CO₂e/kBtu (l-P) or 0.104 kg CO₂e/MJ (S-I) for GHG emissions factor.
 - b. To be approved by the AHJ. Default values for qualified renewables are 1.00 for source energy conversion factor and 0.000 lb CO₂e/kBtu (l-P) or 0.000 kg CO₂e/MJ (S-I) for GHG emissions factor.
- Informative Note:* Energy accounting and conversion factors shown in Table 5-1 are based on site energy. For further information about these approaches, please see Appendix J and Appendix K of ANSI/ASHRAE Standard 105. The AHJ may use the 20-year GWP time horizon (GWP20) or the 100-year GWP time horizon (GWP100) for GHG emissions factors. Refer to ANSI/ASHRAE Standard 105, Section J2.2 for further information on GWP20 approaches. To reference a full set of GHG emissions factors for the United States using 20-year GWP time horizon, refer to ANSI/ASHRAE Standard 228, Informative Appendix E or ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2023, Section 7.6.

Commented [A50]: No source energy or GHG emissions conversion factors needed.

The AHJ shall be permitted to

- a. Substitute the national electricity source energy conversion factor in Table 5-2 with the appropriate regional factor in Table 5-3 applicable to the building location
- b. Substitute other source energy conversion factors for electricity and other energy forms following the processes and procedures incorporated within ANSI/ASHRAE Standard 105.²
- c. Substitute other locally appropriate source energy conversion factors

Table 5-3 U.S. Regional Electricity Source Energy Conversion Factors

eGrid-2018-Sub-region-Acronym	eGrid-2018-Subregion-Name	Source-Energy-Conversion-Factor—Captured-Energy-Efficiency-Approach	Source-Energy-Conversion-Factor—Infinite-Energy-Efficiency-Approach
AKGD	ASCC-Alaska-Grid	2.66	2.46
AKMS	ASCC-Miscellaneous	1.91	1.21
ERCT	ERCOT-All	2.51	2.31
FRCC	FRCC-All	2.77	2.62
HIMS	HICC-Miscellaneous	2.90	2.51
HIOA	HICC-Oahu	3.51	3.06
MROE	MRO-East	3.07	2.88
MROW	MRO-West	2.69	2.35
NYLI	NPCC-Long-Island	3.36	2.79
NEWE	NPCC-New-England	2.77	2.26
NYCW	NPCC-NYC/Westchester	2.94	2.88
NYUP	NPCC-Upstate-NY	2.23	1.72
RFCE	RFC-East	2.95	2.83
RFCM	RFC-Michigan	2.97	2.82
RFCW	RFC-West	3.08	3.01
SRMW	SERC-Midwest	3.14	3.08
SRMV	SERC-Mississippi-Valley	2.78	2.71
SRSQ	SERC-South	2.86	2.72
SRTV	SERC-Tennessee-Valley	2.94	2.81
SRVC	SERC-Virginia/Carolina	2.99	2.81
SPNG	SPP-North	2.67	2.37
SPSQ	SPP-South	2.61	2.31
CAMX	WECC-California	2.07	1.55
NWPP	WECC-Northwest	1.93	1.28
RMPA	WECC-Rockies	2.59	2.27
AZNM	WECC-Southwest	2.87	2.71

Commented [A51]: No source energy conversion factors needed for Oregon’s BPS. These have been removed for clarity.

Informative Note: Energy accounting and conversion factors shown in Tables 5-2 and 5-3 are based on site energy using conversion factors in Table 5-1 converted to source energy for buildings in the United States. Section 4.5.2 of this standard allows alternative EUI targets established by the adopting AHJ. The AHJ may use the captured energy efficiency approach or the infinite energy efficiency approach for regional conversion factors. The AHJ may use the 20-year GWP time horizon (GWP20) or the 100-year GWP time horizon (GWP100) for GHG emissions factors. For further information about these approaches, please see ANSI/ASHRAE Standard 105.

Greenhouse Gas Emissions. GHG emissions shall be calculated using Equation 5-4:

$$GHG\ emissions = Site\ energy_1 \times GEF_1 + \dots + Site\ energy_i \times GEF_i + \dots + Site\ energy_n \times GEF_n \quad (5-4)$$

where

Site energy_i = site energy associated with energy form *i*, where *i* equals 1 to *n*

GEF_i = GHG emissions conversion factor associated with energy form *i*, where *i* equals 1 to *n*, as listed in Table 5-2

The AHJ shall be permitted to

- a. Substitute the national grid electricity GHG emissions conversion factor in Table 5-2 with the appropriate regional factor in Table 5-4 applicable to the building location
- b. Substitute other GHG emissions conversion factors for electricity and other energy forms following the processes and procedures incorporated in ANSI/ASHRAE Standard 105.²
- c. Specify GHG emissions conversion factors for energy sources not listed in Table 5-4
- d. Allow buildings to use GHG emissions conversion factors for any or all energy forms procured from specific energy providers

Table 5-4 U.S. Regional Electricity Greenhouse Gas Emissions Factors

eGrid 2018 Sub-region Acronym	eGrid 2018 Subregion Name	Greenhouse Gas Emissions Factor, lb CO ₂ e/kBtu	Greenhouse Gas Emissions Factor, kg CO ₂ e/MJ
AKGD	ASCC Alaska Grid	0.372	0.160
AKMS	ASCC Miscellaneous	0.192	0.083
ERCT	ERCOT All	0.328	0.141
FRCC	FRCC All	0.322	0.139
HIMS	HICC Miscellaneous	0.433	0.186
HIOA	HICC Oahu	0.592	0.254
MROE	MRO East	0.563	0.242
MROW	MRO West	0.416	0.179
NYLI	NPCC Long Island	0.435	0.187
NEWE	NPCC New England	0.202	0.087
NYCW	NPCC NYC/Westchester	0.230	0.099
NWUP	NPCC Upstate NY	0.101	0.044
RFCE	RFC East	0.258	0.111
RCM	RFC Michigan	0.441	0.189
RCW	RFC West	0.395	0.170
SRMW	SERC Midwest	0.534	0.229
SRMV	SERC Mississippi Valley	0.312	0.134
SRSO	SERC South	0.359	0.154
SRTV	SERC Tennessee Valley	0.351	0.151
SRVC	SERC Virginia/Carolina	0.263	0.113
SPNO	SPP North	0.388	0.167
SPSO	SPP South	0.399	0.172
CAMX	WECC California	0.178	0.077
NWPP	WECC Northwest	0.215	0.093
RMPA	WECC Rockies	0.424	0.183
AZNM	WECC Southwest	0.355	0.153

Commented [A52]: No source energy conversion factors needed for Oregon's BPS. These have been removed for clarity.

8.1.2 The energy and emissions accounting system shall be Energy Star Portfolio Manager perform the following:

8.1.2.1 Record annual gross energy consumption data for each building, including all forms of purchased, on-site generated, and exported energy from at least 12 consecutive months of data.

8.1.2.2 Record total gross energy use expressed as Btu/year (MJ/year).

8.1.2.3 Record each nonresidential building's EUI as follows, as applicable:

^a Annual gross energy use, MJ/gross floor area for nonresidential buildings, m²

^b Annual gross energy use, kBtu/gross floor area for nonresidential buildings, ft²

8.1.2.4 Record each residential building's EUI as follows, as applicable:

^a Annual gross energy use, MJ/gross floor area for residential buildings, m²

^b Annual gross energy use, kBtu/gross floor area for residential buildings, ft²

8.1.2.5 Record each nonresidential building's GHGI as follows, as applicable:

^a Annual GHG emissions, kg CO₂e/gross floor area for nonresidential buildings, m²

^b Annual GHG emissions, lb CO₂e/gross floor area for nonresidential buildings, ft²

8.1.2.6 Record each residential building's GHGI as follows, as applicable:

^a Annual GHG emissions, kg CO₂e/gross floor area for residential buildings, m²

^b Annual GHG emissions, lb CO₂e/gross floor area for residential buildings, ft²

Commented [A53]: ESPM will be used to report and account energy usage

8.25.3 Energy Manager. The EM ~~shall~~ *may* be responsible for the following:

8.2.15.3.1 Conducting technical, policy-related planning related to energy efficiency.

8.2.25.3.2 Purchasing energy for spaces under his or her control.

8.2.35.3.3 Public relations matters related to energy.

8.2.45.3.4 Implementing the results of energy audits and *EEMs* outlined in the energy management plan.

8.2.55.3.5 Evaluating energy efficiency of proposed new construction, facility expansion, remodeling, or new equipment purchases.

8.2.65.3.6 Reviewing *building* O&M procedures for optimal energy management.

8.2.75.3.7 Adhering to energy codes and standards.

8.2.85.3.8 Reporting regularly to management and other stakeholders.

8.2.95.3.9 Developing and implementing an energy efficiency plan according to Section 9.1.

6. OPERATIONS AND MAINTENANCE REQUIREMENTS

6.1 Scope. Section 6 applies to the *building* envelope, *building* systems, and *building* equipment that directly or indirectly consume energy.

6.2 Operations and Maintenance Program. A formal operations and maintenance (O&M) program shall be established and implemented in order that the *building* energy-using systems achieve their intended energy efficiency throughout their service life.

The program documents the O&M objectives, establishes the criteria for evaluation, and commits the *building operator* and maintenance personnel to basic goals of *performance* (such as minimizing equipment failures, ensuring ongoing efficient operation, and performing identified maintenance requirements).

6.3 Operations and Maintenance Implementation. The O&M program shall be implemented in accordance with Normative Appendix C.

Exception to 6.3: O&M programs developed and implemented by the building's serving utility or local government and approved as equivalent or more stringent by the AHJ may be used as an alternative to the requirement in Section 6.3. Where local government programs are more stringent than applicable utility programs, local government programs shall be selected over utility programs.

6.36.4 Operations and Maintenance Tasks

6.3.16.4.1 Maintenance for all equipment, components, and systems shall be in accordance with applicable manufacturers' requirements and shall also include tasks that minimize failures, *maintain* energy consumption efficiency, and reduce *building GHG emissions*, such as those found in Informative Appendix I for the following *building* systems:

- *Building* envelope
- Domestic hot water
- Heating, ventilation, and air conditioning
- Refrigeration
- Lighting
- Controls
- Electric power distribution and on-site power generation

6.3.26.4.2 Safe and reasonable access shall be provided to all equipment covered by the O&M program for inspection, maintenance, and repairs.

6.3.36.4.3 The O&M requirements shall be reevaluated when *building* use changes or renovations/alterations are made that affect the facility's operations.

6.46.5 Tenant Improvements. The *energy manager* shall put in place a formal process to ensure that any tenant improvements involving a change in space use or the relocation of partitions (including partial height partitions) do not change the annual energy use or *GHG emissions* except to the extent that the annual energy use or *GHG emissions* change (increase or decrease) is consistent with any change in the *building's performance targets*.

6.56.6 Equipment and Component Replacement

6.5.16.6.1 Equipment and component replacement shall be performed in accordance with the *capital management plan*, *if applicable*, described in Section 5.1.2.11. Replacement equipment shall meet all applicable energy efficiency requirements in the federal equipment standards, state equipment standards,

Commented [A54]: Edited from "shall" to "may" so as not to explicitly define other organizational personnel roles not related to BPS compliance. These are, however, best practices that could benefit building operations.

Commented [A55]: Similar exception in WA

Commented [A56]: Addition similar to language in WA

and the applicable building code.

Exception to 6.6: Equipment intended for standby or emergency use only.

6.6.1 Lighting Replacement

6.6.1.1 When lighting equipment is replaced, the replacement equipment shall meet ~~the most stringent~~ all applicable energy efficiency requirements in ~~both the~~ federal equipment standards, state equipment standards, and in the *applicable building code*.

6.6.1.2 The replacement of any lighting equipment shall not increase the existing installed lighting power demand.

Exception to 6.6.1.2: The existing installed lighting power may proportionally increase when the current light levels are below those recommended in the IES *Lighting Handbook* ⁴.

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7. ENERGY USE AND GREENHOUSE GAS EMISSIONS ANALYSIS AND TARGET REQUIREMENTS

7.1 Building Type, Energy Use Intensity Targets, and Greenhouse Gas Intensity Targets

7.1.1 Building Type. Buildings are divided into 55 activity types with activities as shown in Table 7-1. Buildings with one or more activities listed in Table 7-1 have energy use intensity (EUI) targets as shown in Table 7-2 or 7-3.

7.1.2 Energy Use Intensity Targets. EUI targets based on site energy are shown in Table 7-2 in both I-P and SI units. EUI targets based on source energy are shown in Table 7-3 in both I-P and SI units. Site energy electricity use and fossil fuel use targets listed in Table 7-5 and 7-6, respectively, are for use in target calculations by authorities having jurisdiction.

All EUI targets and greenhouse gas intensity (GHGI) targets were derived from 2012 Commercial Building Energy Consumption Survey (CBECS)³ and 2015 Residential Energy Consumption Survey (RECS)⁴ data by Oak Ridge National Laboratory (ORNL) and the U.S. Department of Energy (DOE) and represent the 25th bottom (low energy) percentile of energy use by each building category.

The median numbers for each building category from CBECS and RECS data representing all buildings in the building type/activity across all climatic conditions were extrapolated to 20 DOE climate zones using multipliers generated through simulation of a representative building for each group of building categories. Informative Appendix G gives a detailed explanation of EUI target table derivation.

7.1.2.1 Source Energy Use Intensity Targets with Custom Source Energy Conversion Factors. When an authority having jurisdiction (AHJ) uses a custom source energy conversion factor (any factors other than those in Table 5-2), it shall use Tables 7-5 and 7-6 to generate source EUI targets in conjunction with the source energy conversion factors used to calculate source energy in Section 5.2. Performance targets shall be calculated using Equation 7-1:

$$EUI_{t1} = (ELUI_{t1} \times SEF_{el}) + (FEUI_{t1} \times SEF_{fe}) \tag{7-1}$$

where

ELUI_{t1} = electricity EUI target from Table 7-5

SEF_{el} = local source energy conversion factor for electricity use

FEUI_{t1} = fossil fuel EUI target from Table 7-6

SEF_{fe} = local source energy conversion factor for fossil fuel energy use

Informative Note: Tables 7-5 and 7-6 should not be applied separately for individual energy sources.

7.1.3 Greenhouse Gas Intensity Targets. GHGI targets are shown in Table 7-4 in both I-P and SI units. GHGI targets were derived from EUI targets based on site energy as described in Section 7.1.2 using the GHG conversion factors shown in Table 5-2.

7.1.3.1 Greenhouse Gas Intensity Targets with Custom Greenhouse Gas Emission Conversion Factors. When an AHJ uses a GHG emission conversion factor other than those in Table 5-2 for calculating GHG emissions, Tables 7-5 and 7-6 shall be used to generate GHGI targets in conjunction with the GHG emission conversion factors used to calculate GHG emissions in Section 5.2. Performance targets shall be calculated using Equation 7-2:

$$GHGI_{t1} = (ELUI_{t1} \times GEF_{el}) + (FEUI_{t1} \times GEF_{fe}) \tag{7-2}$$

where

ELUI_{t1} = electricity EUI target from Table 7-5

GEF_{el} = GHG conversion factor for electricity use

FEUI_{t1} = fossil fuel EUI target from Table 7-6

GEF_{fe} = GHG conversion factor for fossil fuel energy use

7.2 Determining Energy Use Intensity Target

7.2.1 The energy manager (EM) or qualified person shall determine the EUI target according to Section 7.2.2 for single-type/activity buildings and Section 7.2.3 for mixed-use buildings, and shall complete Form B.

NOTE: Covered buildings in participating campuses pursuing compliance at the connected building through Normative Annex W or at the connected building or campus-level shall determine the EUI at the connected building level as an area-weighted aggregate of the building-level EUI. Development of the EUI shall not include nontarget buildings.

Commented [A57]: Table 7-3 is for source energy targets and is not applicable

Commented [A58]: No SI (joules, meters) unit tables are needed, nor are electricity or fuel-specific targets

Commented [A59]: This is not applicable for Oregon-specific targets

Commented [A60]: Text related to custom source energy and GHG targets has been removed.

Commented [A61]: Similar “connected building” pathway to WA.

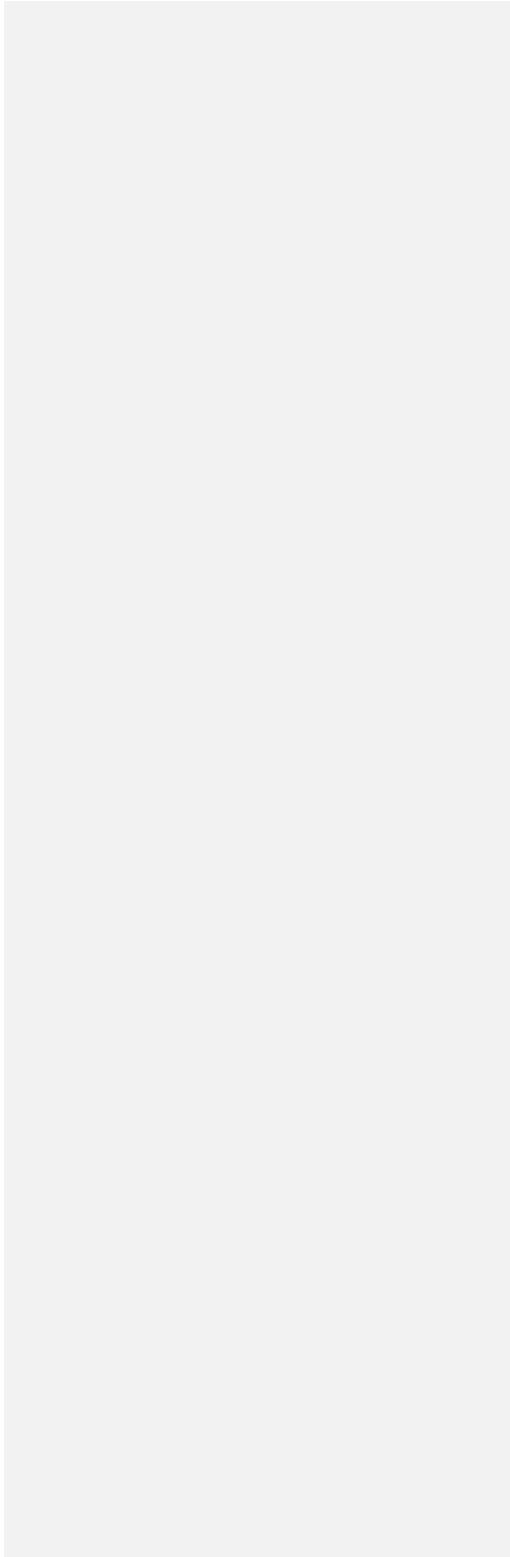
7.2.2 *EUI targets for buildings with a single activity shall be calculated using Equation 7-3:*

$$(EUI_t) = S \times (EUI_{t1}) \quad (7-3)$$

where (EUI_{t1}) is the *building activity EUI target value* in Table 7-2 ~~or 7-3~~ for the appropriate *building activity/type* and climate, and S is the *building operating shifts normalization factor* in Table 7-7.

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Table 7-1 Commercial and Residential Building Types/Activities; [Adopted as modified and published in Section Z7.](#)



7.2.3 EUI targets for buildings with multiple activities shall be determined using weighted averages of building activity EUI target (EUI_i) for each area with a single activity using Equation 7-4 and shall be reported on Form B:

$$EUI_t = A_1 \times S_1 \times (EUI_{t1})_1 + \dots + A_j \times S_j \times (EUI_{t1})_j + \dots + A_n \times S_n \times (EUI_{t1})_n \quad (7-4)$$

where

- A_i = percentage of the gross floor area with single building activity i
- $(EUI_{t1})_i$ = building activity target from Table 7-2 ~~or 7-3~~ for space i
- S_j = operating shifts normalization factor from Table 7-7 for space i

Exceptions to 7.2.3: ~~The energy use intensity target (EUI) of a building may be modified using the following exceptions. These exceptions shall not be applied at the grouped building level. To develop the EUI for grouped buildings, apply the exceptions at the building level, then calculate the weighted average EUI for the grouped buildings. None of these exceptions may be used to change the total gross floor area as it applies to Normative Annex Z, Section Z3.1, "Compliance Schedule.~~

Commented [A62]: Alignment with WA

- ~~1. **Majority of Building is Single-Use:** Spaces where more than 75% of the gross floor area has a single building activity type listed in Table 7-1 shall be reported as a single-use building or as a multiuse building in accordance with either Section 7.2.2 or Section 7.2.3~~
- ~~2. **Similar Building Activity Types:** Spaces less than 10% of the gross floor area with building activity type listed in Table 7-1 can combine their floor area with the floor area within the building that has a similar building activity type and similar EUI as determined by the qualified person.~~
- ~~3. **Nontarget Spaces 10%:** Nontarget spaces in buildings with multiple activities can be excluded from building energy target calculations if the nontarget spaces total combined area $\Sigma A_{nontarget}$ comprise less than 10% of the building gross floor area A_{gross} and both:

 - a. Energy use of such space is metered separately.
 - b. Nontarget spaces comply with Sections 4.1 and 4.2.~~

~~The energy target for the remaining part of the building shall be calculated after deducting the floor area of the nontarget spaces from the building gross floor area ($A_{gross} - \Sigma A_{nontarget}$). Nontarget spaces shall be limited to the floor area occupied by the nontarget activity and shall not include supporting spaces such as corridors, common areas, or other building activity types listed in Table 7-1.~~

- ~~4. **A Nontarget Spaces 50%:** Nontarget spaces in buildings with multiple activities can be excluded from building energy target calculations if the nontarget spaces total combined area $\Sigma A_{nontarget}$ comprise less than 50% of the building gross floor area A_{gross} and both:

 - a. Energy use of such space is metered separately.
 - b. Nontarget spaces comply with Sections 4.1, 4.2, 4.3.1, and 4.3.3.~~
- ~~5. **Nontarget Buildings in Grouped Buildings:** Nontarget buildings within grouped buildings shall:

 - a. Be metered separately and not included in the EUI_t development.
 - b. Nontarget buildings shall comply with Sections 4.1, 4.2, 4.3.1, and 4.3.3.~~

~~The energy target for the remaining grouped buildings shall be calculated after deducting the floor area of the nontarget buildings from the grouped building gross floor area ($A_{gross} - \Sigma A_{nontarget}$)~~

- ~~1. Spaces where more than 75% of the gross floor area has a unique building activity shall be reported as a single use building or as a multiuse building in accordance with either Section 7.2.2 or Section 7.2.3.~~
- ~~2. Spaces less than 10% of the gross floor area with a unique building activity can combine their floor area with the floor area within the building that has a similar building activity as determined by the EM or other qualified person.~~
- ~~3. Spaces in buildings with multiple activities that are not listed in Table 7-1 and have a total combined~~

area $A_{nontarget}$ comprising less than 10% of the building gross floor area A_{gross} , can be excluded from building EUI target calculations if the energy use of such space is metered separately. The EUI target for the remaining part of the building shall be calculated after deducting the unlisted building type floor area from the building gross floor area ($A_{gross} - A_{nontarget}$). Nontarget spaces shall be limited to the floor area occupied by the nontarget activity and shall not include supporting spaces such as corridors, common areas, or other space types listed in Table 7-1.

4. Spaces in multiple activity buildings, with activities not listed in Table 7-1, comprising more than 10% but not more than 50% of the gross floor area shall comply with either Section 7.2.3, Exception 3, or Sections 4.2, 4.3, 4.4.1, and 4.4.3. The energy target for the remaining part of the building shall be calculated after deducting the unlisted building type floor area from the building gross floor area ($A_{gross} - A_{nontarget}$). Nontarget spaces shall be limited to the floor area occupied by the nontarget activity and shall not include supporting spaces such as corridors, common areas, or other activity types listed in Table 7-1.

Commented [A63]: Provides some boundaries for this exception, similar to WA.

Commented [A64]: Provides guidance and boundaries for this exception, similar to WA.

7.2.4 Energy Use Intensity Targets for Vacant and Partially Vacant Buildings

Exception to 7.2.4: If the building did not have physical occupancy by owner or tenant for at least 50% of the conditioned floor area throughout the consecutive 12-month period prior to the building compliance date, the building owner may apply for an exemption as specified in Appendix Z.

7.2.4.1 Vacant Space – use unchanged: The EUI target for a 100% vacant building shall be based on its prevacancy activity if the intended use of the building will be unchanged.

7.2.4.2 Vacant space – unconditioned: If the total floor area of a nonheated, noncooled, and nonilluminated vacant part of a building is less than 3050% of the gross floor area, then it shall be excluded from the gross floor area, and the EUI target shall be determined based on the remainder of the building as described in Section 7.2.3. This allowance may not be used to change the total gross floor area as it applies to a building’s compliance schedule or status as a covered building.

7.2.4.3 Vacant space – conditioned: If the vacant part of a building is heated and/or cooled and the building energy use data for a recent 12 consecutive 12-month period when the building was occupied within two years prior to the compliance date is not available, compliance of this part of the building will be determined after it becomes occupied and energy use data become available for 12 consecutive months. The vacant space shall be included in the gross floor area, and the energy target for the vacant space shall be determined based on Section 7.2.4.1.

7.3 Determining Greenhouse Gas Intensity Target

7.3.1 The energy manager (EM) or qualified person shall determine the GHGI target according to Section 7.3.2 for single type/activity buildings and Section 7.3.3 for mixed-use buildings, and shall complete Form B.

7.3.2 GHGI targets for buildings with a single activity shall be calculated using Equation 7-5:

$$GHGI_t = S \times (GHGI_{t1}) \tag{7-5}$$

where

$GHGI_{t1}$ = building activity GHGI target value in Table 7-4 for the appropriate building activity/type and climate

S = building operating shifts normalization factor in Table 7-7

7.3.3 GHGI targets for buildings with multiple activities shall be determined using weighted averages of building activity GHGI target for each area with a single activity using Equation 7-6 and shall be reported on Form B:

$$GHGI_t = A_1 \times S_1 \times (GHGI_{t1})_1 + \dots + A_i \times S_i \times (GHGI_{t1})_i + \dots + A_n \times S_n \times (GHGI_{t1})_n \tag{7-6}$$

where

A_i = percentage of the gross floor area with single building activity i

$(GHGI_{t1})_i$ = building activity target from Table 7-2 or 7-3 for space i

S_i = operating shifts normalization factor from Table 7-7 for space i

Exceptions to 7.3.3:

1. Spaces where more than 75% of the gross floor area has a unique building activity shall be reported as

Commented [A65]: GHGI Targets are not applicable for Oregon

- a single-use *building* or as a multiuse *building* in accordance with either Section 7.2.2 or Section 7.2.3.
2. Spaces less than 10% of the gross floor area with a unique *building* activity are permitted to combine their floor area with the floor area within the *building* that has a similar *building* activity as determined by the *EM* or other *qualified person*.
 3. Spaces in *buildings* with multiple activities that are not listed in Table 7-1 and have a total combined area, $\Sigma A_{\text{nontarget}}$, comprising less than 10% of the *building* gross floor area, A_{gross} , are permitted to be excluded from *building GHGI target* calculations if the energy use of such space is metered separately. The *GHGI target* for the remaining part of the *building* shall be calculated after deducting the unlisted *building* type floor area from the *building* gross floor area ($A_{\text{gross}} - \Sigma A_{\text{nontarget}}$).
 4. Spaces in multiple activity *buildings*, with activities not listed in Table 7-1, comprising more than 10% but not more than 50% of the gross floor area shall comply with either Section 7.2.3, Exception 3, or Sections 4.2, 4.3, 4.4.1, and 4.4.3.

Table 7-2a Building Activity Site Energy Use Intensity Targets (EUI_{12}) (I-P) – Adopted as modified and published in Section Z7

Table 7-2b Building Activity Site Energy Use Intensity Targets (EUI_{12}) (SI) – Not adopted

Commented [A66]: S-I (metric) units are not needed

Table 7-3a Building Activity Source Energy Use Intensity Targets (EUI_{12}) (I-P) – Not adopted

Commented [A67]: Source energy targets are not needed

Table 7-3b Building Activity Source Energy Use Intensity Targets (EUI_{12}) (SI) – Not adopted

Table 7-4a Building Activity Greenhouse Gas Intensity (GHGI) Targets (I-P) – Not adopted

Commented [A68]: GHGi targets not needed in Oregon.

Table 7-4b Building Activity Greenhouse Gas Intensity (GHGI) Targets (SI) – Not adopted

Table 7-5a Building Activity Electricity Site Energy Use Intensity Targets (EUI_{12}) (I-P) – Not adopted

Commented [A69]: Site electricity-specific targets are not needed.

Table 7-5b Building Activity Electricity Site Energy Use Intensity Targets (EUI_{12}) (SI) – Not adopted

Table 7-6a Building Activity Fossil-Fuel Site Energy Use Intensity Targets ($FEUI_{12}$) (I-P) – Not adopted

Commented [A70]: Site fuel-specific targets are not needed

Table 7-6b Building Activity Fossil-Fuel Site Energy Use Intensity Targets ($FEUI_{12}$) (SI) – Not adopted

Table 7-7 Building Operating Shifts Normalization Factor – Adopted as published in Section Z7

~~7.3.4 Greenhouse Gas Intensity Targets for Vacant and Partially Vacant Buildings~~

~~7.3.4.1 The GHGI target for a 100% vacant building shall be based on its prevacancy activity if the intended use of the building will be unchanged.~~

~~7.3.4.2 If the total floor area of a nonheated, noncooled, and nonilluminated vacant part of a building is less than 30% of the gross floor area, then it shall be excluded from the gross floor area, and the GHGI target shall be determined based on the remainder of the building as described in Section 7.3.3.~~

~~7.3.4.3 If the vacant part of a building is heated and/or cooled and the building energy use data for a recent 12 consecutive month period when the building was occupied is not available, compliance of this part of the building will be determined after it becomes occupied and energy use data become available for 12 consecutive months.~~

Commented [A71]: Remove section related to GHGI targets.

8. ENERGY AUDIT WITH DECARBONIZATION ASSESSMENT REQUIREMENTS

8.1 The qualified energy auditor shall complete Forms D ~~and/or E~~ and submit ~~them~~ to the authority having jurisdiction (AHJ) ~~in a manner as specified by the AHJ~~. If an energy audit with decarbonization assessment is required (see Section 4), a copy of the audit summary results shall be included in the compliance documentation. Compliance with this standard shall be achieved by adopting *energy efficiency measures (EEMs)* that collectively reduce annual *building energy use*. ~~The AHJ retains the ability to review and reject energy audits submitted for program compliance. The AHJ also retains the ability to monitor and evaluate energy auditors who perform energy audits for program compliance. Where energy auditors demonstrate repeated failure to produce accurate and comprehensive audits, the AHJ may disqualify that auditor from performing future audit for program compliance. and by adopting emission reduction measures (ERMs) that reduce annual building greenhouse gas (GHG) emissions.~~

8.1.1 Decarbonization Assessment. The energy audit with decarbonization assessment determines achievable levels of *GHG emissions* reductions in a *building* through energy efficiency, electrification, fugitive *GHG emissions* reduction, and onsite renewable energy. Beyond identification of *EEMs* as in a typical energy audit, the decarbonization assessment considers additional *ERMs*, including electrification measures (even partial electrification solutions), fugitive *ERMs*, and further renewable energy measures.

8.1.2 Requirements for Measures. The *optimized bundle of ERMs-EEMs* shall not increase the *energy use intensity (EUI)* or *greenhouse gas intensity (GHGI)* of the *building*.

8.2 Energy Audit with Decarbonization Assessment Requirements for Buildings without Performance Targets

8.2.1 Overall Process. An energy audit with decarbonization assessment shall be conducted for all *buildings* not having a *performance target*. The energy audit with decarbonization assessment and the associated report shall be completed by a *qualified energy auditor* practicing within their field of competency. The energy audit with decarbonization assessment shall be a Level 2 audit (as described in Section 8.4) ~~unless otherwise allowed by the AHJ. For a building having a gross floor area $\geq 10,000$ ft² (1000 m²) or less, either a Level 1 audit or a Level 2 audit (as described in Section 8.4) shall be conducted.~~

Exception to 8.2.1: *Buildings* that have completed an energy audit with decarbonization assessment within the previous ~~three~~ **five** years may use the results of the previous audit, provided that the scope of the energy audit with decarbonization assessment meets the requirements of this section and that there have been minimal changes to the systems within the audit scope. ~~The energy audit must be evaluated consistent with the investment criteria in Normative Appendix X.~~

8.2.2 Following the completion of the energy audit with decarbonization assessment, the *building owner* will select and implement *EEMs* ~~and ERMs~~ per the requirements of Section 9.

8.3 Energy Audit with Decarbonization Assessment Requirements for Buildings with Performance Targets

8.3.1 Buildings that Meet Their Performance Targets. *Buildings* that meet their *performance targets* under Section 7 are not required to perform an energy audit with decarbonization assessment.

8.3.2 Buildings that Do not Meet Their Energy Use Intensity Targets Overall Process. An energy audit with decarbonization assessment shall be conducted, and an associated report shall be provided, for all *buildings* that do not meet their *performance target*. The energy audit with decarbonization assessment shall be completed by a *qualified energy auditor* practicing within their field of competency. The energy audit with decarbonization assessment shall be ~~shall be a Level 2 audit (as described in Section 8.4) unless otherwise allowed by the AHJ at an audit level specified by the qualified energy auditor to be sufficient to identify and evaluate the EEMs and ERMs that, if implemented, would result in the building meeting its performance target.~~ The *qualified energy auditor* may refer to the list of potential *EEMs* in Informative Appendix H.

After the completion of the energy audit with decarbonization assessment and the selection of ~~EEMs and ERMs~~ to be implemented, the applicant must calculate an adjusted *EUI* according to Section 8.3.2.1 ~~and an adjusted GHGI according to Section 8.3.2.2~~ for the *building* based on the estimated energy savings ~~and GHG emissions reductions~~ from the selected ~~EEMs and ERMs~~ and the historical energy use ~~and GHG emissions~~ of the *building*. The adjusted *EUI* is compared to the *EUI target* for the *building*, ~~and the adjusted GHGI is compared to the GHGI target for the building.~~ If the adjusted *EUI* is less than the *EUI target*, ~~and if the adjusted GHGI is less than the GHGI target,~~ the applicant shall proceed with implementation (see Section 9). If ~~either~~ the adjusted *EUI* is greater than the *EUI target* ~~or the adjusted GHGI is greater than the GHGI target,~~ a more rigorous energy audit with decarbonization assessment investigation is required to identify

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Commented [A72]: Buildings of this size are not covered buildings.

Commented [A73]: Edit to align with WA and also with compliance period length.

additional ~~EEMs and ERM~~s. This process is repeated until the *building's* adjusted EUI is less than its EUI target ~~and the building's adjusted GHGI is less than its GHGI target.~~

Exception to 8.3.2: Buildings that have completed an energy audit with decarbonization assessment within the previous ~~three-five~~ years may use the previous energy audit with decarbonization assessment to identify ~~EEMs and ERM~~s for implementation, provided that the scope of the energy audit with decarbonization assessment meets the requirements of this section and there have been minimal changes to the systems within the audit scope. In this case, the same comparison of adjusted EUI to EUI target ~~and GHGI to GHGI target~~ shall be made by the applicant. If the ~~EEMs and ERM~~s identified in the audit are still applicable, have not been implemented, and if implemented would result in the *building* meeting its EUI target ~~and GHGI target~~, these measures shall be implemented by the *building*, and the project shall follow the procedures in Section 9. If the identified ~~EEMs and ERM~~s do not result in an adjusted EUI less than the EUI target ~~and a GHGI less than the GHGI target~~, a new energy audit with decarbonization assessment shall be conducted as described Section 8.3.2.

8.3.2.1 Adjusted EUI shall be calculated using Equation 8-1:

$$EUI_{adj} = (Energy_{hist} - Energy_{saved}) / GFA \quad (8-1)$$

Where

- Energy_{hist} = historical annual *gross energy* use, kBtu ~~(M)~~
- Energy_{saved} = estimated annual *gross energy* savings, kBtu ~~(M)~~
- GFA = gross floor area, ft² ~~(m²)~~

~~8.3.2.2 Adjusted GHGI shall be calculated using Equation 8-2:~~

~~$$GHGI_{adj} = (GHG_{hist} - GHG_{saved}) / GFA \quad (8-2)$$~~

~~where~~

- ~~- GHG_{hist} = historical annual *GHG emissions*, kBtu ~~(M)~~
 - GHG_{saved} = estimated annual *GHG savings*, kBtu ~~(M)~~
 - GFA = gross floor area, ft² ~~(m²)~~~~

8.4 Energy Audit with Decarbonization Assessment. This section outlines the general requirements for ~~Level 1 and~~ Level 2 energy audits for *buildings*. If required for compliance, the energy audit with decarbonization assessment shall be performed. A ~~Level 1 and~~ Level 2 energy audit with decarbonization assessment is a ~~Level 1 and~~ Level 2 *building* decarbonization assessment per all normative requirements in ANSI/ASHRAE/ACCA 211⁵, including Informative Appendix H, "Building Decarbonization Assessment." ~~Building GHG emissions and GHG emissions reductions shall be calculated using the methodology defined in Section 5.2.3.3 of this standard.~~

8.4.1 Audit Results. The energy audit report shall define the actions necessary for the building owner to achieve the energy and cost savings that are recommended in the report. Energy audit results shall be presented in a summary table that includes, at a minimum, an estimate of each of the following:

- A list of recommended EEMs that, if implemented, will either meet the energy target for the building if it has a target or, if it does not have an energy target, will meet the economic criteria set by the standard in Section 9.
- The estimated energy savings and peak demand savings associated with each recommended EEM, expressed in the cost units used on the building owner's energy bills, and the units used for comparison with the energy target.
- The estimated (modeled) energy cost savings associated with each recommended EEM.
- The estimated cost of implementation for each recommended EEM. The costs of implementation shall include the required monitoring of energy savings per the requirements of Section 9. The economic evaluation of measures is required by Normative Annex X.

8.4.2 Interactive Effects. Energy savings analysis shall include interactive effects of all selected EEMs. When considering multiple EEMs with interactive effects, the order of analysis shall start with load reduction measures and proceed through distribution systems and associated equipment efficiencies and then plant and heat-rejection systems. Any interactive effects on equipment sizing and part-load performance of equipment shall be accounted for due to reduced loads on subsequent systems.

- 8.4.3 Optimized Bundling. The EEMs recommended in the energy audit report shall consist of an optimized bundle of EEMs.
- 8.4.4 Financial Analysis. Financial analysis shall be made using current utility rate charges for the site. For customers who are charged based on time-of-use or peak demand (kW), cost analysis of those EEMs shall include appropriate treatment of the costs savings associated with the measures and reflect peak demand or time-of-use cost savings.
- 8.4.5 End-Use Analysis. The energy audit shall include an end-use analysis that compares the estimated energy use of the facility after implementation of all selected EEMs to historical utility consumption. The intent of this requirement is to ensure that estimates of the base-case end-use energy estimates and potential energy-savings estimates in the energy audit report are reasonable. For Level 2 audits, the qualified energy auditor is required to estimate the energy use of all end uses that individually comprise more than 5% of total historical building energy use. The energy estimates for these end uses shall be summed and compared to historical energy consumption for the facility. The sum of the base-case end-use energy estimates must be between 90% and 100% of the historical energy use at the site. This comparison shall be conducted separately for each fuel type, such as electricity, natural gas, or fuel oil, for which EEMs are identified. On-site energy sources such as solar, photovoltaic, geothermal, and wind shall be included. Correction for historical weather for the base year versus average weather used in baseline estimates may be used. The same energy-use estimates that comprise the end-use analysis shall also be used as the basis for energy savings calculations. The qualified energy auditor shall verify that each EEM savings estimate is reasonable in comparison to the historical energy consumption of that end use based on energy consumption survey data or experience with similar sites. The qualified energy auditor shall verify that the combined savings from multiple EEMs shall take into account interactive effects among measures. Miscellaneous plug loads may be estimated on average equipment power density and building area. (See Form D in Normative Annex Z.)
- 8.2.38.4.6 Baseline. The baseline for energy- and cost-savings estimates shall be taken to be the condition of the existing building at the time of the initial comparison with the building's energy target or at the time of the initial required audit. The energy-savings estimates shall be calculated as the difference between the energy use of proposed systems and the baseline energy use estimates of those systems.

9. IMPLEMENTATION AND VERIFICATION REQUIREMENTS

9.1 Developing and Implementing an Energy and Emissions Management Plan

9.1.1 **Requirements.** Buildings that have performance targets shall comply with the requirements of Section 9.1.1.1. Buildings that do not have performance targets shall comply with the requirements of Section 9.1.1.2. All covered buildings larger than 5000 ft² (465 m²) shall implement an energy and emissions management plan as described in Section 5. ~~The energy and emissions management plan shall be integrated into the building's capital management plan as described in Section 5.~~ The energy and emissions management plan shall include the elements listed in Section 5.

9.1.1.1 **Buildings with Performance Targets.** For buildings having performance targets, energy efficiency measures (EEMs), ~~and emissions reduction measure (ERMs)~~ identified from the energy audit with decarbonization assessment shall be implemented in order to meet the building's energy use intensity (EUI) target ~~and greenhouse gas intensity (GHGI) target.~~ Develop a written plan for maintaining the building's EUI ~~and GHGI~~ at or below the EUI target ~~and GHGI target.~~ Implementation of the EEMs ~~and ERMs~~ and the plan for maintaining the building operations below the targets shall not result in an increase in ~~either the building's EUI, or GHGI.~~

Exceptions to 9.1.1.1:

1. Investment Criteria EEMs: Buildings may demonstrate compliance by implementing all of the EEMs that achieve the investment criteria in Appendix X.
2. District energy system EEMs: Implementation of EEMs to campus district heating and/or cooling energy system(s) in lieu of or in combination with EEMs implemented directly to campus buildings is

Commented [A74]: Requirements of the Energy and Emissions Management Plan are listed in Section 5, this section is duplicative.

Commented [A75]: Pathway for Investment Criteria

Commented [A76]: Exceptions 2 and 3 similar to WA to address campus scenarios

~~acceptable, provided the energy audit demonstrates the energy savings from the campus district heating and/or cooling energy system EEMs will be equal to or greater than the EEMs identified for the buildings. Energy savings shall be measured as a reduction in Btu per year.~~

- ~~3. Grouped buildings EEMs: Implementation of EEMs to non-Tier 1 covered buildings complying at the grouped buildings level is acceptable, provided the energy audit demonstrates the energy savings from the EEMs implemented at the grouped building level will result in a WNEUI be at or below the energy target of the grouped buildings.~~

9.1.1.2 Buildings without Performance Targets. Buildings that do not have performance targets shall implement the EEMs that achieve the investment criteria in Appendix X and EEMs identified from the energy audit with decarbonization assessment within four years from the application of compliance. Implementation of the EEMs and EEMs shall not result in an increase in either the building's EUI or GHGI.

~~9.1.1.2.1 District energy system EEMs: For nonfederal buildings, the qualified energy auditor shall first determine the optimized bundle of EEMs and then determine the optimized bundle of EEMs.~~

~~9.1.1.2.2 The optimized bundle of EEMs shall use all EEMs with a combined simple payback less than or equal to five years.~~

~~Exceptions to 9.1.1.2.2:~~

- ~~1. A life cycle approach may be used with the optimized bundle of EEMs with an internal rate of return (IRR) greater than or equal to 20% using the Federal Energy Management Program's BLCC5⁶ software with the current BLCC5 defaults.~~
- ~~2. EEMs that have simple payback greater than the effective useful life of the equipment shall be excluded from the optimized bundle of EEMs.~~

- ~~1. Implementation of EEMs to campus district heating and/or cooling district energy system(s) in lieu of or in combination with EEMs implemented directly to campus buildings is acceptable, provided the energy audit demonstrates the energy savings from the campus district energy heating and/or cooling system EEMs will be equal to or greater than the energy saved from EEMs identified for the buildings. Energy savings shall be measured as a reduction in Btu per year'~~

- ~~3.2 EEMs that are no longer appropriate due to deeper retrofits specified for the same equipment in the optimized bundle of EEMs described in Section 9.1.1.2.2 can be excluded from the optimized bundle of EEMs.~~

Informative Note: For example, an EEM for a variable-speed-fan retrofit on a rooftop unit would no longer be appropriate if the optimized bundle of EEMs included an EEM to replace the entire rooftop unit with a heat-pump rooftop unit with a variable-speed fan. In this case, the variable-speed-fan retrofit EEM should not be included in the optimized bundle of EEMs.

~~9.1.1.2.3 The optimized bundle of EEMs shall use all EEMs identified in Section 9.1.1.2.2 and EEMs with a combined simple payback less than or equal to ten years. For the purposes of this combined simple payback calculation, EEM energy savings shall be translated into GHG emissions reductions and shall include carbon cost to account for the impact of the measures where the energy cost does not already include carbon costs.~~

~~Exceptions to 9.1.1.2.3:~~

- ~~1. A life cycle approach may be used with the optimized bundle of EEMs with an internal rate of return (IRR) greater than or equal to 15% using BLCC5 with the current BLCC5 defaults. BLCC5 is a freemarket tool and can be found online.~~
- ~~2. EEMs that have simple payback greater than the effective useful life of the equipment shall be excluded from the optimized bundle of EEMs.~~
- ~~3. EEMs that require the replacement of equipment that has an estimated useful life of greater than five years shall not be required to be implemented. Where the EEM is not implemented, a specific plan for replacement of equipment at the end of its useful life shall be filed with the authority having jurisdiction (AHJ) and included in the capital management plan, and the measure shall be excluded from verification under Section 9.2. On end of life of the equipment, the EEM must be implemented.~~

~~9.1.1.2.4 Federal buildings shall follow the National Institute of Standards and Technology (NIST) Building Life Cycle Cost (BLCC) Program, and the optimized bundle of EEMs shall use all EEMs with a savings to investment ratio (SIR) to meet federal requirements.~~

~~9.1.1.2.5 Identified EEMs and EEMs that are not selected for implementation and have simple~~

Commented [A77]: Alignment with Washington. The detailed specifications for the Investment Criteria are moved to an appendix, rather than as exceptions in this section.

Commented [A78]: This section includes exceptions that are contained in the Investment Criteria appendix. Instead of structuring them as exceptions, they are an appendix and referenced at the start of this section. This is similar to Washington's approach.

~~payback less than the effective useful life of the equipment shall be listed as future opportunities and included in the building's capital management plan, including discussion of timeframe and triggers for measure implementation.~~

9.1.2 Implementing the Energy and Emissions Management Plan. The sequence in which measures are implemented shall be evaluated so that ~~EEMs and ERMs~~ take into account the impact of previously implemented ~~EEMs and ERMs~~ and do not result in an increase in ~~either the building's EUI or GHGI~~.

9.1.2.1 Training of Building Staff. An ongoing written training plan shall be implemented. *Building* occupants and staff shall be trained, at a minimum, as established by the operations and maintenance (O&M) program defined in Section 6.

~~Exception to 9.1.2.1: Buildings 5000 ft² (465 m²) and less.~~

9.1.2.2 Multiple Buildings. For campuses having multiple *buildings* connected through one billing meter, a multiple-*building* plan shall be implemented to coordinate ~~EEM and ERM~~ implementation among the *buildings* and measurement of the ~~EUI and GHGI~~ of the campus.

9.1.2.3 Implementation and Commissioning of Energy Efficiency Measures and Emissions Reduction Measures. ~~EEMs and ERMs~~ shall be implemented and commissioned. The *qualified energy auditor* or *qualified person* shall review the commissioning report and certify that the ~~EEMs and ERMs~~ are functioning as intended.

Informative Note: For guidance on commissioning protocols, refer to ASHRAE Guideline 0 and ASHRAE Guideline 1.1.

9.1.2.4 Energy Efficiency and Emissions Reduction Priorities. Implementation of ~~EEMs and ERMs~~ shall be prioritized to take advantage of the life cycle of *building* systems and to minimize the disruption to *building* occupants.

9.2 Verification of Implemented Energy Efficiency Measures and Emissions Reduction Measures

9.2.1 Verification of Energy Efficiency Measures and Emissions Reduction Measures for Buildings with Performance Targets. Upon implementation of ~~EEMs and ERMs~~, the *building's EUI and GHGI* shall be monitored until one full year's data demonstrate that *performance targets* have been met and the implementation did not result in an increase in ~~either the building's EUI or GHGI~~.

9.2.2 Verification of Implemented Energy Efficiency Measures and Emissions Reduction Measures for Buildings without Performance Targets. Upon implementation of ~~EEMs and ERMs~~, the affected end use systems shall be monitored for one year to verify ~~EEM and ERM~~ energy savings ~~and GHG emissions reduction~~. The *qualified energy auditor* or *qualified person* shall review the results of the ~~EEM and ERM~~ energy monitoring and certify that the energy savings ~~and GHG emissions reduction~~ projected in the energy audit with decarbonization assessment and the implementation did not result in an increase in ~~either the building's EUI or GHGI~~.

9.3 Compliance. The *qualified person* shall complete the compliance documentation as required in Section 4.

10. RESIDENTIAL BUILDINGS AND DWELLING UNITS: Not adopted.

~~10.1 Compliance Requirements~~

~~10.1.1 Compliance Process.~~ Residential *buildings* and dwelling units shall comply with the requirements of Section 10.4. Figure 10-1 illustrates the compliance process for residential *buildings* and dwelling units.

~~10.1.2~~ This section applies to individual dwelling and housing units that are covered under the Residential Energy Consumption Survey (RECS)-4 administered by the EIA and identified by activities numbered 51 through 55 in Table 7-1.

~~10.1.3~~ This section includes the following.

~~10.1.3.1~~ Attached/detached single family houses.

~~10.1.3.2~~ Manufactured and modular housing units and mobile homes.

~~10.1.3.3~~ Individual dwelling units, such as apartments or condominiums, within multifamily housing *buildings* (when addressed separately from common areas), provided that all energy used in a dwelling unit is metered separately for that dwelling unit.

~~10.1.4~~ All other residential *buildings*, including multifamily housing unit common areas as well as those units without separate dwelling unit metering, are covered by the commercial sections of this standard in Sections 4 and 7 as *building* type 53. Barracks and dormitories are covered in Sections 4 and 7 as *building*

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Commented [A79]: Delete section related to residential buildings

type 35.

10.1.5 A multifamily residential building or an individual dwelling unit can be granted conditional compliance for up to 15 months following completion of Sections 10.2, 10.3, 10.4, 10.5, and 10.6. Within 15 months, the building or dwelling unit is reevaluated for its energy use intensity (EUI), and the conditional compliance either becomes full compliance or is revoked and the building does not comply with the standard.

10.1.6 The timeline for compliance is shown in Informative Appendix D.

10.1.7 Compliance forms for reporting compliance to the authority having jurisdiction (AHJ) are found in Normative Appendix A.

10.2 Energy Use Intensity

10.2.1 Compliance with this section requires the reporting of annual EUI for a building or individual dwelling unit. The building or dwelling unit owner shall report the EUI and EUI target on Form A.

10.2.2 Collect building energy use data, and report this information using Form B. Annual gross energy use is building energy use data for 12 consecutive months within the last 18 months. Refer to Section 5.2 for details of the collection and recording of building energy use data.

Residential buildings' EUI shall be calculated as follows:

$$EUI = \text{annual gross energy use, Btu/gross floor area for residential buildings, ft}^2 \text{ (I-P)}$$

$$EUI = \text{annual gross energy use, MJ/gross floor area for residential buildings, m}^2 \text{ (SI)}$$

10.3 Operations and Maintenance (O&M)

10.3.1 Operations and Maintenance Program. The building systems shall be operated and maintained in order to ensure that the building or dwelling unit and its energy using systems achieve their intended energy efficiency throughout their service life.

10.3.1.1 When applied to this standard, Sections 4, 5, and 6 of ANSI/ACCA Standard 4-7 shall apply to all building systems. References to Section 7 and Appendix A of ACCA Standard 4 shall not apply.

10.3.1.2 All O&M activities shall conform to the manufacturers' requirements.

10.3.2 The O&M requirements shall be reevaluated when building use changes or other changes are made that affect the building's operations.

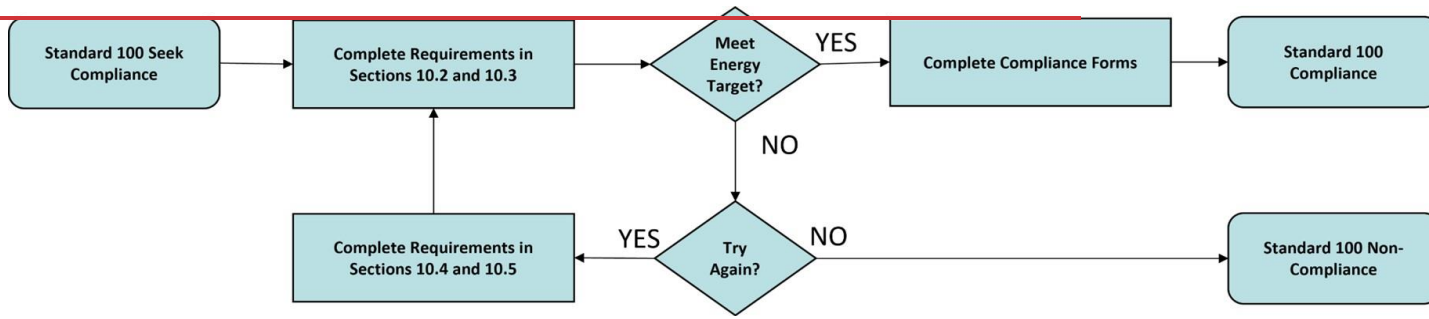


Figure 10-1 Flowchart for residential buildings.

10.3.3 Equipment and Component Replacement

10.3.3.1 When HVAC, domestic hot water heating, and refrigeration equipment and appliances are replaced, the replacement equipment shall meet the most stringent energy efficiency requirements in the federal equipment standards, the applicable *building code*, or ASHRAE Standard 90.2-0.

Exception to 10.3.3.1: For multiunit *residential buildings* that are higher than three stories, replacement equipment shall meet the applicable *building code* or ASHRAE/IES Standard 90.1-0 requirements.

10.3.3.2 Lighting Replacement

10.3.3.2.1 When lighting equipment is replaced, the replacement equipment shall meet the most stringent energy efficiency requirements in both the federal equipment standards and in the applicable *building code*.

10.3.3.2.2 The replacement of any lighting equipment shall not increase the existing installed lighting power unless the current light levels do not meet IES recommendations¹⁰.

10.3.4 Report Building Characteristics. The following basic characteristics shall be reported on Form B.

10.3.4.1 A *building identifier* (optional) and *building address*, including city, state, country, and mail and postal code.

10.3.4.2 The ASHRAE climate zone as found on the map in Informative Appendix E.

10.3.4.3 The start and end dates of the 12-month data measurement period.

10.3.4.4 The gross floor area of the *building* in square feet (square metres) as defined in Section 3.

10.3.4.5 The number of conditioned floors, with subtotals of above-grade and below-grade floors.

10.3.4.6 *Building type*, which relates to the occupancy carried out in the *building*.

10.3.4.7 Select *building types* from among the types of *residential buildings* listed in Table 7-1.

10.3.5 The *EUI* and *EUI target* shall be reported on Form A. Compliance with this standard requires that the *building annual gross energy consumption* be less than or equal to the intensity value for the *building types* and *building climate zone* as calculated per Section 7.2.

Exception to 10.3.5: The *AHJ* may adopt alternate *EUI targets*, such as those in Normative Appendix B, as desired.

Informative Note: Residential *EUI targets* listed in Tables 7-2, 7-3, 7-5, and 7-6 were derived from RECS 2015 data and represent the 25th bottom (low energy) percentile of energy use by each *building category*. The median numbers for each *building category* from RECS data representing all *buildings* in the *building type* across all climatic conditions were extrapolated to 20 DOE climate zones using multipliers generated through simulation of a representative *building* for each group of *building categories*. Refer to Informative Appendix G for more information.

10.3.6 Comparing Performance. Compare *building EUI* using the data from Form A with the *EUI targets* listed in Tables 7-2 and 7-3 for single-use *buildings*.

10.3.7 If the *building EUI* meets the *EUI target*, complete the compliance forms for *buildings with EUI targets* (Section 4).

10.3.8 If the *building EUI* exceeds the *EUI target*, the operational settings shall be reviewed and the *building* shall undergo an energy audit as described in Section 10.4. The *building* will then need to be retrofitted and *energy efficiency measures (EEMs)* implemented to improve energy performance in order to be in compliance with this standard.

10.4 Energy Audit Requirements

10.4.1 Buildings that Meet Energy Use Intensity Targets. *Residential buildings* and *dwelling units* that meet their *EUI targets* under Section 10 comply with Standard 100. Compliance shall be reported according to Section 10.1.7.

10.4.2 Buildings that Do Not Meet Their Energy Use Intensity Targets. A Level 1 or Level 2 energy audit shall be conducted for all *buildings* that do not meet their *EUI target*. The energy audit shall be completed by the *building owner* or *qualified person* and be at an audit level sufficient to identify and evaluate the *EEMs* that, if implemented, would result in the *building* meeting its *EUI target*. The *building owner* or *qualified person* may refer to the list of *EEMs* in Informative Appendix H.

Exception to 10.4.2: *Buildings* that have completed an energy audit within the previous three years may use the previous energy audit to identify *EEMs* for implementation. After the completion of the audit and the selection of *EEMs* to be implemented, the applicant must calculate an adjusted *EUI* for the *building*

~~based on the estimated energy savings from the selected EEMs and the historical energy use of the building. This adjusted EUI is then compared to the EUI target for the building. If the adjusted EUI is less than the EUI target, the applicant shall proceed with implementation (see Section 10.5).~~

10.4.3 If the adjusted *EUI* is greater than the *EUI target*, a more rigorous energy audit is required to identify additional *EEMs*. This process is repeated until the adjusted *EUI* is less than the *EUI target*.

10.4.4 Calculation of the adjusted *EUI* is shown in Equation 10-1:

$$EUI_{adj.} = (Energy_{hist.} - Energy_{saved}) / GFA \quad (10-1)$$

where

$Energy_{hist.}$ = historical annual energy use, kBtu (MJ)

$Energy_{saved}$ = annual energy savings, kBtu (MJ)

GFA = gross floor area for residential buildings, ft² (m²)

Following the completion of an energy audit that has identified *EEMs* sufficient to meet the *building's EUI target*, the applicant shall implement those *EEMs* per the requirements of Section 10.5.

10.4.5 Energy Audit Levels. This section outlines the requirements for Level 1 and Level 2 energy audits.

10.4.5.1 Level 1 Audit. Residential buildings shall complete either of the following.

10.4.5.1.1 An online home energy audit using the Department of Energy's Home Energy Saver Pro website.

10.4.5.1.2 An in-home energy survey audit per the Residential Energy Services Network (RESNET) National Standard for Home Energy Audits.

10.4.5.2 Level 2 Audit. Residential buildings shall perform a home energy audit comparable to the level of effort defined by either of the following.

10.4.5.2.1 Comprehensive home energy audit according to the RESNET National Standard for Home Energy Audits.

10.4.5.2.2 The Building Performance Institute's *Home Energy Auditing Standard*¹³.

10.4.6 Building Audit Report. This section prescribes the overall approaches and methods to be used in the energy audit report for audits completed under Section 10.4.5.1 or 10.4.5.2.

10.4.6.1 Audit Results

10.4.6.1.1 The energy audit report shall define the actions necessary for the *building owner* to achieve the energy and cost savings that are recommended.

10.4.6.1.2 Energy audit results shall be presented in a summary table that includes, at a minimum, an estimate of each of the following:

- a. A list of recommended operational setting adjustments and *EEMs* that, if implemented, shall meet the *EUI target* for the building.
- b. The energy savings associated with each recommended *EEM* expressed in the cost units used on the *building owner's* energy bills, and the units used for comparison with the *EUI target*.

10.4.6.1.3 The estimated (or modeled) utility cost savings associated with each recommended *EEM*.

10.4.6.1.4 The estimated cost of implementation for each recommended *EEM*. The costs of implementation shall include the required monitoring of energy savings per the requirements of Section 10.6.

10.4.6.1.5 The *simple payback* for each recommended *EEM* or bundle of *EEMs*.

10.4.6.2 Measure Order. When considering multiple *EEMs* with *interactive effects*, the order of analysis shall start with load reduction measures and proceed through distribution systems and then plant and heat rejection systems.

10.4.6.3 Financial Analysis. Financial analysis shall be made using current utility rate charges for the site. For customers who are charged based on time of use or peak demand (kW), cost analysis of those *EEMs* shall include appropriate treatment of the costs savings associated with the measures and reflect peak demand or time of use cost savings, if applicable.

10.4.6.3.1 The minimum financial criteria required for reporting include the following:

- a. *EEM* implementation cost
- b. *Energy cost* savings based on current utility rates
- c. O&M cost savings (or penalties)
- d. *EEM simple payback*
- e. *EEM measure life*

~~10.4.7 End-Use Analysis.~~ The energy audit shall include an end-use analysis that compares the estimated energy use of the *building* or individual dwelling unit after implementation of all selected *EEMs* to

historical utility consumption. The intent of this requirement is to ensure that estimates of the base case end-use energy estimates and potential energy savings estimates in the energy audit report are reasonable.

10.4.7.1 Level 1 Requirements. The analysis shall demonstrate that the sum of base case end-use energy estimates total no more than the historical energy consumption for the end use at the site. This shall be done by completing the following.

10.4.7.1.1 The historic energy use shall be apportioned into each of the end uses, such as HVAC, lighting, domestic hot water, and plug loads.

The *building owner* or *qualified person* shall verify that each *EEM* savings estimate is reasonable as compared to the energy consumption of that end use based on energy consumption survey data or experience with similar sites.

10.4.7.1.2 End use analysis shall be conducted for all fuel types at the site, such as electricity, natural gas, or fuel oil, for which *EEMs* are identified.

Informative Note. For example, if the audit identifies lighting retrofit opportunities, the *building owner* or *qualified person* shall compare the identified energy savings for those opportunities with the base case energy use of the facility and demonstrate that they make up a reasonable fraction of the historical electricity consumption at the site.

10.4.7.2 Level 2 Requirements. If a Level 2 audit is necessary, the *building owner* or *qualified person* shall estimate the energy use of all end uses that individually comprise more than 5% of total historical *building* energy use. The energy estimates for these end uses shall be summed and compared to historical energy consumption for the facility. The sum of the base case end-use energy estimates must be between 90% and 100% of the historical energy use at the site.

10.4.7.3 This comparison shall be conducted separately for each fuel type, such as electricity, natural gas, or fuel oil, for which *EEMs* are identified. On-site energy sources such as solar, photovoltaic, geothermal, and wind, shall be included.

10.4.7.4 The same energy use estimates that comprise the end use analysis shall also be used as the basis for energy savings calculations. The *building owner* or *qualified person* shall verify that each *EEM* savings estimate is reasonable as compared to the historical energy consumption of that end use based on energy consumption survey data or experience with similar sites.

10.4.7.5 The *building owner* or *qualified person* shall verify that the combined savings from multiple *EEMs* shall take into account *interactive effects* among measures.

10.4.7.6 Miscellaneous plug loads may be estimated on average equipment power density and *building* area.

10.4.7.7 Baseline. The *baseline* for energy and cost savings estimates shall be taken to be the condition of the existing *building* at the time of the initial comparison with the *building's EUI target* or at the time of the initial required audit. The energy savings estimates shall be calculated as the difference between the energy use of proposed systems and the *baseline* energy use estimates of those systems.

10.5 Implementation and Verification Requirements

10.5.1 Implementation

10.5.1.1 Requirements. *Buildings* shall comply with the requirements of Sections 10.5.1.2 and 10.5.1.3 and shall include, at a minimum, the following.

10.5.1.1.1 An O&M program as defined in Section 10.3.

10.5.1.1.2 Implementation plan for *EEMs*.

10.5.1.2 *EEMs* identified from the energy audit shall be implemented in order to meet the *building's EUI target*. Develop a written plan for maintaining the *building's EUI* at or below the *EUI target*.

10.5.1.3 Monitoring of *EUI*, including all implemented *EEMs*.

10.6 Monitoring. Upon implementation of *EEMs*, the *building's EUI* shall be monitored until 12 consecutive months of energy use data demonstrate that the *EUI target* has been met and Form A is submitted to the
AHL.

10.6.1 If the *building's* postimplementation measured *EUI* is less than or equal to the *EUI target*, the *building* complies with the standard.

10.6.2 If the *building's* postimplementation measured *EUI* is greater than the *EUI target*, the *building* does not comply with the standard and the *conditional compliance* is suspended until either

- a. ~~Additional EEMs are implemented that reduce the subsequently measured EUI to below the EUI target~~
- or
- b. ~~The AHJ revokes conditional compliance~~

