

STANDARD

**ANSI/ASHRAE/IES Addendum k to
ANSI/ASHRAE/IES Standard 100-2018**

Energy Efficiency in Existing Buildings

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FOREWORD

Addendum k aligns the body of Standard 100 with the new title, purpose, and scope (TPS) set by Addendum i to Standard 100-2018. Standard 100 will require a building to meet both a gross energy use intensity (EUI) target and a greenhouse gas intensity (GHGI) target in order to achieve compliance.

Major revisions include the following:

- Buildings now required to meet both EUI and GHGI targets (Section 4)
- Establishes GHG monitoring methodology, including calculations for GHG using regional and custom GHG emissions factors (Section 5)
- Changes EUI definition from net to gross (Section 5)
- Establishes GHGI targets, including calculations for GHGI targets using regional and custom GHG emissions factors (Section 7)
- Adjusts energy audit to “energy audit with decarbonization assessment,” defined by the “building carbonization assessment” in ANSI/ASHRAE/ACCA Standard 211-2018 (RA2023), Informative Appendix H (Section 8)
- For buildings without targets, an optimized bundle of emission reduction measures is defined by cost-effectiveness criteria of a ten-year payback, including carbon costs (Section 9)

Informative Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striking through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum k to Standard 100-2018

Modify Section 3 as shown. The remainder of Section 3 remains unchanged.

3. DEFINITIONS

3.1 General [. . .]

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 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 and distribution to the building site.

[. . .]

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

[. . .]

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.

[. . .]

emissions reduction measure (ERM): an action taken in the operation or 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 and emissions accounting system: a system for measuring, collecting, and documenting the building's energy use and its calculated GHG emissions.

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

[...]

energy use intensity (EUI): an expression of *building* energy use per year in terms of ~~net~~gross energy divided by gross floor area.

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

[...]

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. See also *carbon emissions*.

greenhouse gas intensity (GHGI): an expression of *building* GHG emissions per year measured as *building* GHG emissions divided by gross floor area.

greenhouse gas intensity (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 the equation in Section 5.2.2.1.

[...]

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 GHGI target for a *building* that has been established for compliance with this standard.

[...]

3.2 Abbreviations and Acronyms

AHJ	authority having jurisdiction
CO ₂ e	carbon dioxide equivalent
DDC	direct digital control
EEM	energy efficiency measure
ERM	emissions reduction measure
EM	energy manager
EUI	energy use intensity
EUI _t	energy use intensity target
GHG	greenhouse gas
GHGI	greenhouse gas intensity
GHGI _t	greenhouse gas intensity target
GWP	global warming potential
IRR	internal rate of return
O&M	operations and maintenance

Modify Section 4 as shown. The remainder of Section 4 remains unchanged.

4. COMPLIANCE REQUIREMENTS

4.1 Building Type Requirements

4.1.1 Nonresidential Building

4.1.1.1 A *building* or *complex* of *buildings* whose majority of gross floor area has activities Number 1 through 48 and/or 53 in Table 7-1 has *performance targets* and shall comply with the requirements of Sections 4.2, 4.3.1, and 4.3.2, and 4.3.

4.1.1.2 The *qualified person* determining compliance shall

- determine whether or not the *building* seeking compliance has ~~an *energy target (EUI)*~~ *performance targets* according to Section 7,
- if applicable, establish the *energy target (EUI)* *performance targets* according to Section 7,

[...]

4.2 Energy and Emissions Management Plan and Operations and Maintenance Program

[...]

4.2.2 Energy and Emissions Management Plan. The *building manager* shall comply with the energy management 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 Building ~~Energy Use~~ Performance

4.3.1 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 ~~Form C~~ Forms C-1, C-2, and C-3 (see Normative Appendix C) according to Section 5.2.

4.3.2 Buildings with ~~Energy Performance~~ Targets

4.3.2.1 Compliance Process. *Buildings* with ~~*energy performance targets*~~ shall comply with the requirements of Sections 4.3.2.2 and 4.3.2.3. Figure 4-1 illustrates the compliance process for *buildings* with ~~*energy performance targets*~~.

4.3.2.2 Building Meets the ~~Energy Target (EUI)~~ Performance Targets. If the *building's* measured *EUI* is less than or equal to its ~~*energy EUI target*~~, and the *building's* measured *GHGI* is less than or equal to its *GHGI target*, then the *building* complies.

Informative Note: The *AHJ* has the authority to remove either the *EUI* or *GHGI* requirement above and to specify whether the *EUI target* is based on site *EUI* or source *EUI*.

[...]

4.3.2.3 Building Does not Meet the ~~Energy Target (EUI)~~ 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 with decarbonization assessment according to Section 8. ~~and EEMs and ERM~~s that will reduce energy use and GHG emissions to meet the ~~*energy EUI target*~~ and *GHGI target* shall be implemented according to Section 9. Upon completion of the implementation of all required *EEMs* and *ERMs*, a *building* shall be granted *conditional compliance*.

[...]

4.3.2.4 Verification of Compliance. Within fifteen months after the completion of Section 4.3.2.3 ~~4.3.2.2~~, the *EUI* and *GHGI* shall be recalculated by the *energy manager (EM)* from 12 consecutive months of measured energy use, and Form A shall be resubmitted to the *AHJ*. If the *building's* postimplementation ~~measured *EUI*~~ is less than or equal to the ~~*energy 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 ~~*energy 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 *energy EUI target* and *GHGI target*, respectively, and a new Form A is submitted to the *AHJ* or
- the *AHJ* revokes *conditional compliance*.

4.3.3 Buildings without ~~Energy Performance~~ Targets

4.3.3.1 Compliance Process. ~~Buildings without energy performance targets~~ shall comply with the requirements of Sections 4.3.3.2 and 4.3.3.3. Figure 4-2 illustrates the compliance process for ~~buildings with energy performance targets~~.

4.3.3.2 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.

4.3.3.3 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.

[...]

4.3.3.4 Verification of Compliance. If the *building* complies with Section 4.2, 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~~ package of 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

- 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~~ package of 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
- the *AHJ* revokes *conditional compliance*.

Modify Section 5 as shown. The remainder of Section 5 remains unchanged.

5. ENERGY AND EMISSIONS MANAGEMENT PLAN

5.1 Establish the Energy and Emissions Management Plan

5.1.1 The *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.

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.

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

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

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

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

5.1.2.4 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. Annual comparison of the net EUI to the energy target.

5.1.2.5 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.)

~~5.1.2.5~~ **5.1.2.6** Documentation of original, current, and changes in number of occupants, weekly operating hours, or time of day scheduled for occupancy, production rates, energy-using equipment that would have caused change in the measured *EUI* or GHGI.

~~5.1.2.6~~ **5.1.2.7** Energy audit with decarbonization assessment reports and recommended *energy efficiency measures (EEMs)* and emission reduction measures (ERMs). (Refer to Section 8).

~~5.1.2.7~~ **5.1.2.8** A list of *EEMs* and ~~ERMs~~ that have been implemented and dates of implementation, including the following:

- An operations and maintenance (*O&M*) program as defined in Section 6 for the *EEMs* and ~~ERMs~~

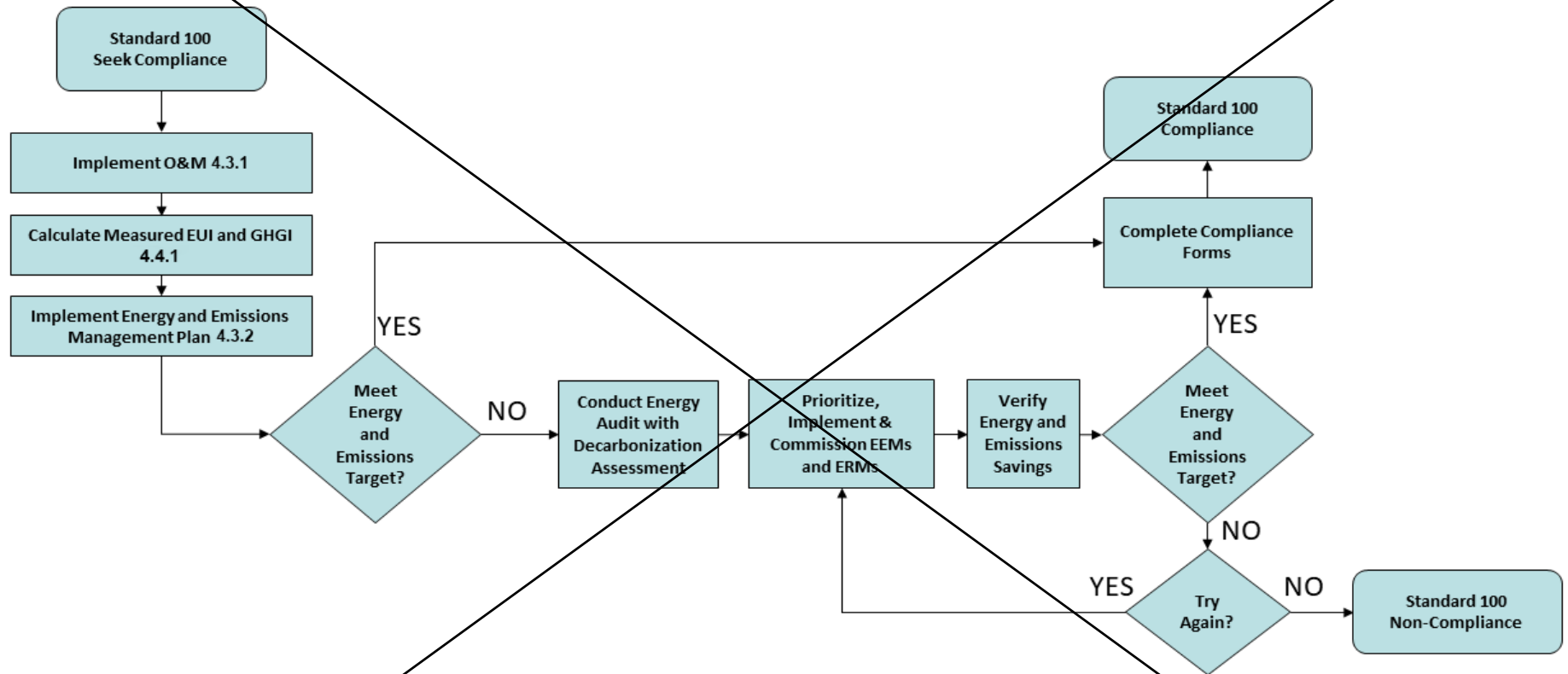


Figure 4-1 Flowchart for buildings with energy targets.

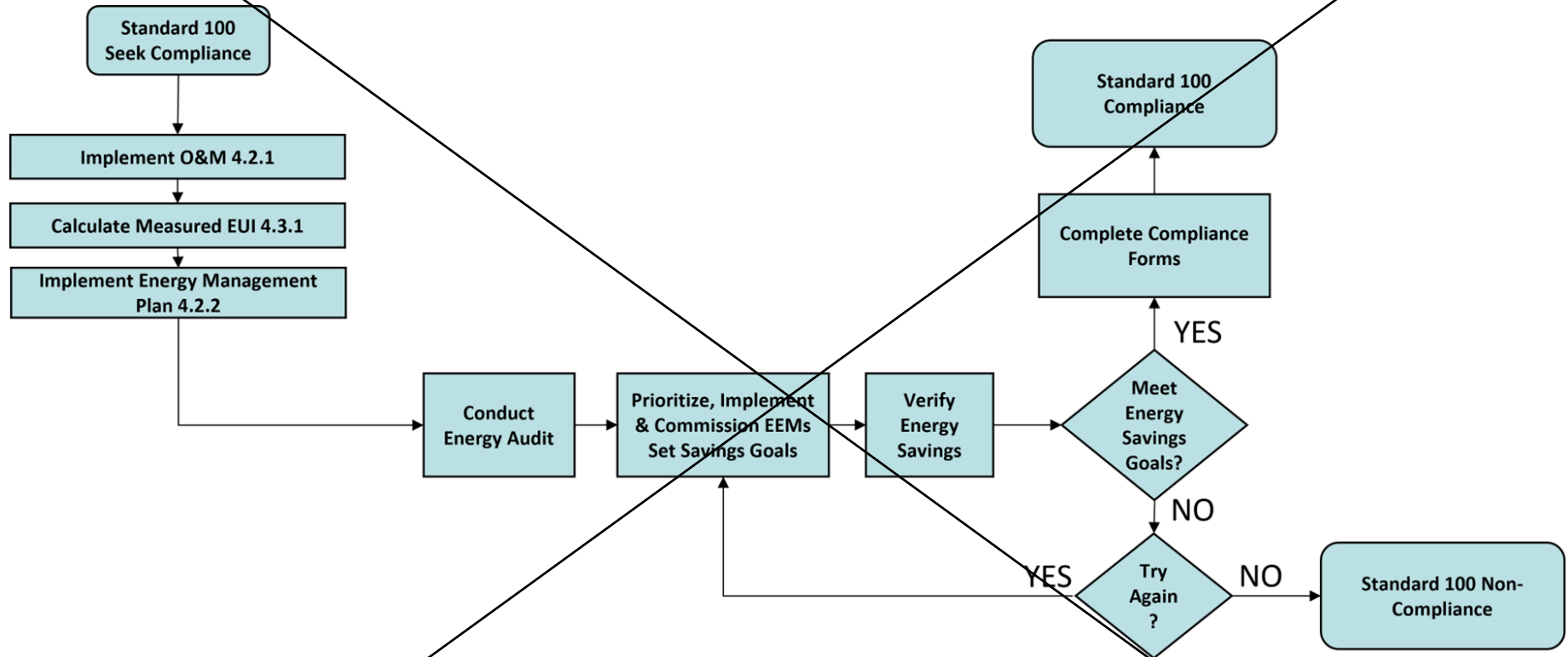


Figure 4-2 Flowchart for buildings without energy targets.

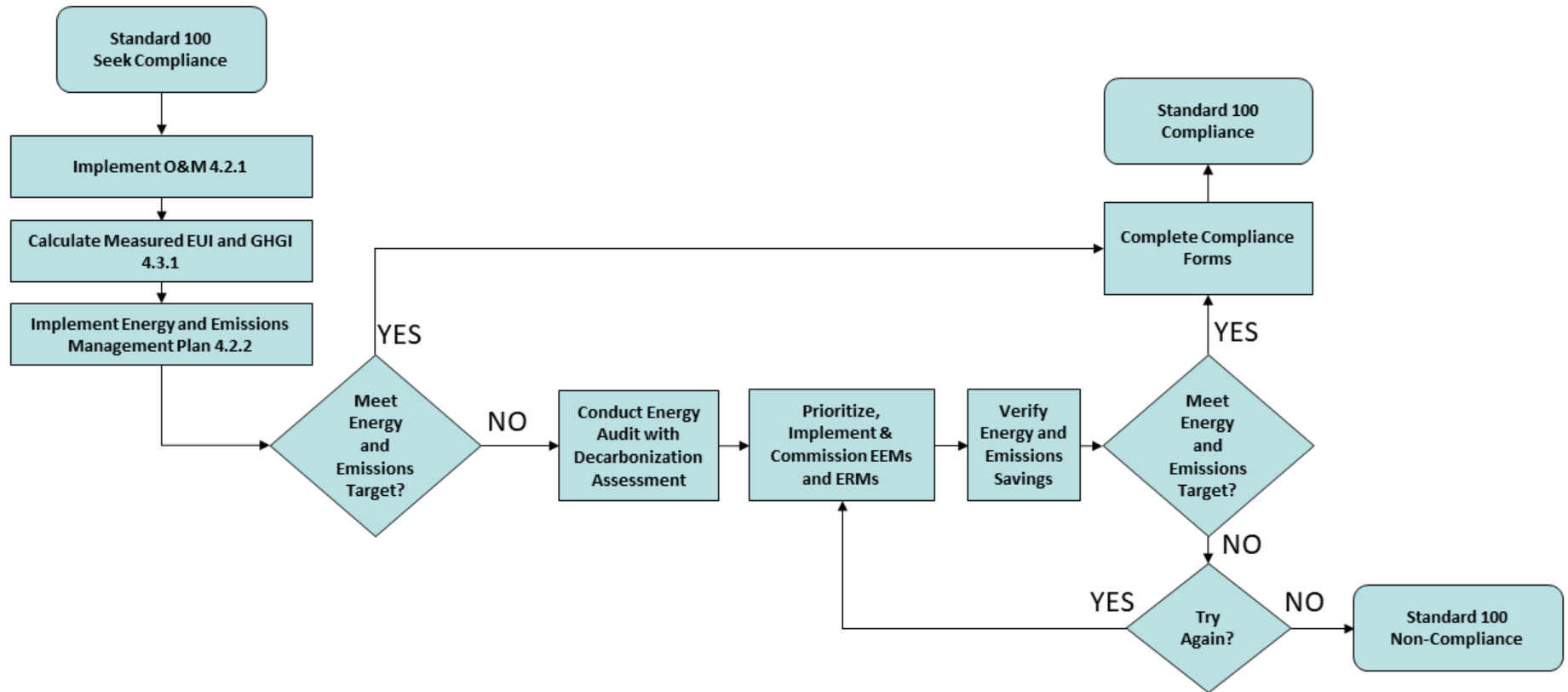


Figure 4-1 Flowchart for buildings with performance targets.

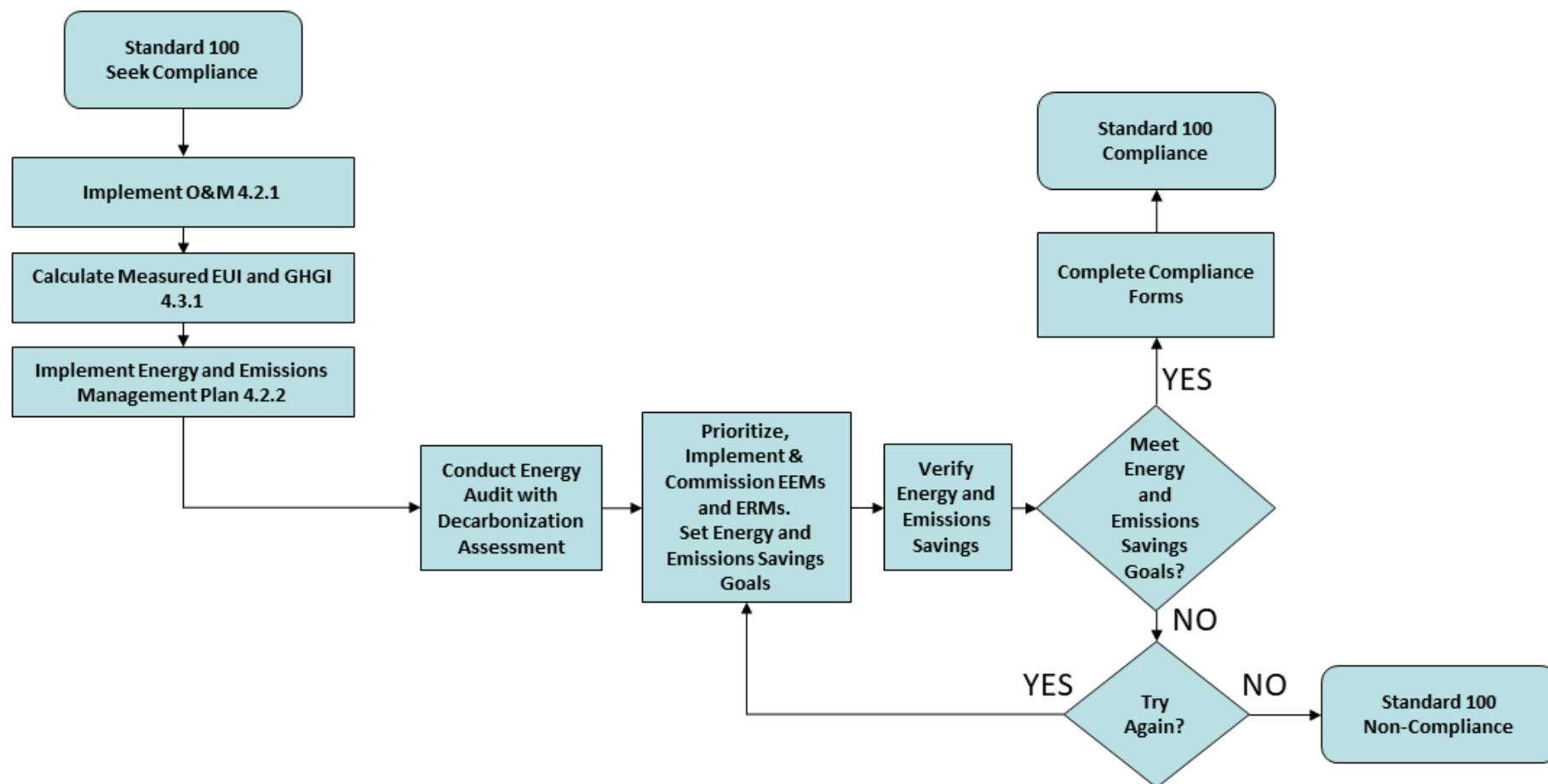


Figure 4-2 Flowchart for buildings without performance targets.

- b. An implementation plan for *EEMs* and *ERMs*, including *EEM*-commissioning
- c. Staff training plan for *EEMs* and *ERMs*
- d. Ongoing commissioning plans for the *EEMs* and *ERMs*

[...]

~~5.1.2.10~~ **5.1.2.11** A capital management plan identifying equipment for replacement with energy efficient and ENERGY STAR[®] rated equipment in case of failure, 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 5.2.1.7
- 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

~~5.1.2.11~~ **5.1.2.12** 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 The EM shall provide a copy of the energy and emissions management plan to the building occupants and other stakeholders annually.

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

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

5.2.1 Provide measured ~~net-gross~~ energy consumption 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 AHJ. ~~efficiency audit.~~ The ~~net-gross~~ energy concept is illustrated in Figure 5-1 and is calculated in accordance with Section 5.2.4. A building's ~~net-gross~~ energy use shall be calculated using Equation 5-1:

$$\begin{aligned} \text{Net-Gross energy use} = \\ \text{Energy delivered to the building} + \text{On-site renewable energy produced and delivered to the building} - \\ \text{Excess energy exported from building for beneficial use} \end{aligned} \quad (5-1)$$

Informative Notes:

1. As shown in Figure 5-1, a building's ~~total-gross~~ energy use is the sum of on-site "building renewable energy production" provided to the building (if there is any) plus purchased "energy delivered to the building" minus any "excess energy exported from building for beneficial use." ~~However, a building's net energy use does not include any energy that might be provided to the building from on-site "building renewable energy production." Therefore, the net energy use equation above does not mention "building renewable energy production."~~
2. Examples of excess energy exported from building for beneficial use are
 - a. Energy used for recharging battery 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

[...]

5.2.2.1 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:

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

[...]

Figure 5-1 Net-Gross energy concept.

5.2.2.2 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.

5.2.3 Energy Conversion Factors. ~~Site energy and source energy shall be calculated according to the following methods.~~

5.2.3 Site Energy, Source Energy, and GHG Emissions Calculation. *Gross energy* shall be converted to *site energy*, *source energy*, and *GHG emissions* according to Sections 5.2.3.1 through 5.2.3.3.

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

5.2.3.1 Site Energy Conversion Factors. ~~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. The site energy content of different forms of purchased energy shall be converted from the purchased unit to the standard site energy unit.~~ If *site energy* conversion factors are not provided by the utility or fuel supplier, the conversion factors in Table 5-2a shall be used. (See also Informative Annex K).

Informative Note: Form C can be used to calculate *site energy*.

5.2.3.2 Source Energy Conversion Factors. *Source energy* shall be calculated using per Equation 5-3: the following equation:

$$\text{Source Energy} = (\text{Site Energy} \times \text{SEF})_1 + (\text{Site Energy} \times \text{SEF})_2 + \dots + (\text{Site Energy} \times \text{SEF})_n$$

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*)

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

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*

[...]

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

$$\text{GHG emissions} = \text{Site energy}_1 \times \text{GEF}_1 + \dots + \text{Site energy}_i \times \text{GEF}_i + \dots + \text{Site energy}_n \times \text{GEF}_n \quad (5-4)$$

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 5-2b

The authority having jurisdiction shall be permitted to

- Substitute the national grid electricity *GHG emissions* conversion factor in Table 5-2b with the appropriate regional factor in Table 5-2d application to the building location
- Substitute other *GHG emissions* conversion factors for electricity and other energy forms following the processes and procedures incorporated in ANSI/ASHRAE Standard 105¹¹
- Specify *GHG emissions* conversion factors for energy sources not listed in Table 5-2d
- Allow buildings to use *GHG emissions* conversion factors for any or all energy forms procured from specific energy providers

5.2.4 The *energy accounting system* shall perform the following.

5.2.4.1 Record annual ~~net-gross energy~~ consumption data for each *building*, including all forms of purchased energy from at least 12 consecutive months of data.

5.2.4.2 Record total ~~gross net~~ energy use expressed as Btu/year (MJ/year).

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

- Annual ~~net-gross energy~~ use, MJ/gross floor area for *nonresidential buildings*, m²
- Annual ~~net-gross energy~~ use, kBtu/gross floor area for *nonresidential buildings*, ft²

Table 5-2b 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 liquified petroleum gas (LPG) or propane		1.15	0.169	0.073
Coal		1.10	0.104	0.242
Other		1.10 <i>Note a</i>	<i>Note a</i>	<i>Note a</i>
Purchased district energy	Hot water	1.35	0.234	0.234
	Steam	1.45	0.247	0.247
	Chilled Water	1.04	0.083	0.083
On-site renewable thermal energy production		<i>Note b</i>	<i>Note b</i>	<i>Note b</i>
On-site renewable electricity production		<i>Note b</i>	<i>Note b</i>	<i>Note b</i>

Notes:

a. To be approved by the AHJ. Default values are 1.10 for *source energy* conversion factor and 0.242 lb CO₂e/kBtu (I-P) or 0.104 kg CO₂e/MJ (SI) 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 (I-P) or 0.000 kg CO₂e/MJ (SI) for *GHG emissions* factor.

Informative Note: Energy accounting and conversion factors shown in Tables 5-2b and 5-2c are based on *site energy* using conversion factors in Table 5-2a converted to *source energy* for buildings in the United States. Section 4.4.2 of this standard allows alternative *energy 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. For further information about these approaches, please see Appendix J and Appendix K of ANSI/ASHRAE Standard 105-2021. 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.

Table 5-2d U.S. Regional Electricity Greenhouse Gas Emissions Factors

eGrid 2018 Subregion 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
NYUP	NPCC Upstate NY	0.101	0.044
RFCE	RFC East	0.258	0.111
RFCM	RFC Michigan	0.441	0.189
RFCW	RFC West	0.395	0.170
SRMW	SERC Midwest	0.534	0.229
SRMV	SERC Mississippi Valley	0.312	0.134

Table 5-2d U.S. Regional Electricity Greenhouse Gas Emissions Factors (Continued)

eGrid 2018 Subregion Acronym	eGrid 2018 Subregion Name	Greenhouse Gas Emissions Factor, lb CO₂e/kBtu	Greenhouse Gas Emissions Factor, kg CO₂e/MJ
<u>SRSO</u>	<u>SERC South</u>	<u>0.359</u>	<u>0.154</u>
<u>SRTV</u>	<u>SERC Tennessee Valley</u>	<u>0.351</u>	<u>0.151</u>
<u>SRVC</u>	<u>SERC Virginia/Carolina</u>	<u>0.263</u>	<u>0.113</u>
<u>SPNO</u>	<u>SPP North</u>	<u>0.388</u>	<u>0.167</u>
<u>SPSO</u>	<u>SPP South</u>	<u>0.399</u>	<u>0.172</u>
<u>CAMX</u>	<u>WECC California</u>	<u>0.178</u>	<u>0.077</u>
<u>NWPP</u>	<u>WECC Northwest</u>	<u>0.215</u>	<u>0.093</u>
<u>RMPA</u>	<u>WECC Rockies</u>	<u>0.424</u>	<u>0.183</u>
<u>AZNM</u>	<u>WECC Southwest</u>	<u>0.355</u>	<u>0.153</u>

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

- Annual ~~net-gross~~ energy use, MJ/gross floor area for residential buildings, m²
- Annual ~~net-gross~~ energy use, kBtu/gross floor area for residential buildings, ft²

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

- Annual *GHG emissions*, kg CO₂e/gross floor area for nonresidential buildings, m²
- Annual *GHG emissions*, lb CO₂e/gross floor area for nonresidential buildings, ft²

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

- Annual *GHG emissions*, kg CO₂e/gross floor area for residential buildings, m²
- Annual *GHG emissions*, lb CO₂e/gross floor area for residential buildings, ft²

[...]

Modify Section 6 as shown. The remainder of Section 6 remains unchanged.

6. OPERATIONS AND MAINTENANCE REQUIREMENTS

[...]

6.4 Operations and Maintenance Tasks

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

[...]

6.5 Tenant Improvements. The *energy manager (EM)* 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 ~~net~~-energy use or *GHG emissions* except to the extent that the annual ~~net~~ energy use or *GHG emissions* change (increase or decrease) is consistent with any change in the *building's performance targets*. ~~energy targets.~~

6.6 Equipment and Component Replacement

6.6.1 When HVAC, domestic hot water heating, or refrigeration equipment or appliances are replaced, the replacement equipment shall meet the most stringent energy efficiency requirements in the federal equipment standards, in the applicable *building code*, in ASHRAE/IES Standard 90.1-², or in ASHRAE/IES Standard 90.2-³. ~~Equipment and component replacement shall be performed in accordance with the capital management plan described in Section 5.1.2.11.~~

Modify Section 7 as shown. The remainder of Section 7 remains unchanged.

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

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

[...]

7.1.2 Energy Use Intensity Targets. ~~Site-based energy~~ Energy use intensity (EUI) targets based on site energy are shown in Tables 7-2a in both I-P and SI units, ~~while source-based energy EUI targets based on source energy~~ are shown in Tables 7-2b in both I-P and SI units. *Site energy* electricity use and fossil fuel use targets listed in Tables 7-2c and 7-2d are for use in target calculations by *authorities having jurisdiction*.

All EUI targets and GHGI targets were derived from Commercial Building Energy Consumption Survey (CBECS) 2012 and Residential Energy Consumption Survey (RECS) 2015 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 USDOE climate zones using multipliers generated through simulation of a representative *building* for each group of *building* categories. Informative Annex J gives a detailed explanation of 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 5-2b), it shall use Tables 7-2c and 7-2d to generate *source energy* targets in conjunction with the *source energy* conversion factors used to calculate *source energy* in Section 5.2. *Performance targets* shall be calculated using the following equation Equation 7-1:

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

where

$ELUI_{t1}$ = electricity use target *EUI* from Table 7-2d7-2e

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

$FEUI_{t1}$ = fossil fuel *energy use target EUI* from Table 7-2c7-2d

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

Informative Note: Tables 7-2d and 7-2c 7-2e and 7-2d should not be applied separately for individual energy sources.

7.1.3 Greenhouse Gas Intensity Targets. Greenhouse gas intensity (GHGI) targets are shown in Table 7-2c 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 5-2b.

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 5-2b for calculating *GHG emissions*, Tables 7-2d and 7-2e 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:

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

where

$ELUI_{t1}$ = electricity use target *EUI* from Table 7-2d

GEF_{el} = greenhouse gas conversion factor for electricity

$FEUI_{t1}$ = fossil fuel *energy use target EUI* from Table 7-2e

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

[...]

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

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

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

7.2.3 Energy EUI targets for buildings with multiple activities shall be determined using weighted averages of *building activity energy EUI target* for each area with a single activity, per the following equation using Equation 7-4, and reported on Normative Annex C, Form B:

$$EUI_t = (A \times S \times EUI_{t1})_1 + (A \times S \times EUI_{t1})_2 + \dots + (A \times S \times EUI_{t1})_i + \dots + (A \times S \times EUI_{t1})_n$$

where-

- $(A)_i$ = percentage of the gross floor area with single *building* activity *i*
 $(EUI_{t1})_i$ = *building* activity target from Table 7-2a or 7-2b for space *i*
 $(S)_i$ = operating shifts normalization factor from Table 7-3 for space *i*
 $(A \times S \times EUI_{t1})_i$ = the weighted space EUI target for space *i*

$$EUI_t = A_1 \times S_1 \times (EUI_{t1})_1 + \dots + A_i \times S_i \times (EUI_{t1})_i + \dots + A_n \times S_n \times (EUI_{t1})_n \quad (7-4)$$

where

- A_i = percentage of the gross floor area with single building activity *i*
 $(EUI_{t1})_i$ = *building* activity target from Table 7-2a or 7-2b for space *i*
 S_i = operating shifts normalization factor from Table 7-3 for space *i*
 [...]

7.3 Determining Greenhouse Gas Intensity Target

7.3.1 The *energy manager (EM)* or *qualified person* shall determine the *GHGI target (GHGI_t)* 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 (see Normative Annex C).

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

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

where

- $GHGI_{t1}$ = *building* activity *GHGI target* value in Table 7-2c for the appropriate *building* activity/type and climate
 S = *building* operating shifts normalization factor in Table 7-3

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 reported on Form B (see Normative Annex C):

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

where

- A_i = percentage of the gross floor area with single building activity *i*
 $(GHGI_{t1})_i$ = *building* activity target from Table 7-2a or 7-2b for space *i*
 S_i = operating shifts normalization factor from Table 7-3 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 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, $\Sigma A_{nontarget}$ comprising less than 10% of the *building* gross floor area A_{gross} can 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 ($A_{gross} - \Sigma A_{nontarget}$).
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 4.1, 4.2, 4.3.1, and 4.3.3.

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 smaller 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.

[. . .]

Update Table 7-2c as shown (I-P and SI). Existing Tables 7-2c and 7-2d are redesignated as Table 7-2d and Table 7-2e, respectively.

Table 7-2c Building Activity Greenhouse Gas Intensity (GHGI) Targets (I-P)

No.	Commercial Building Type	GHG Intensity by Building Type by Climate Zone (lb CO ₂ e/ft ² -yr)																			
		ASHRAE Climate Zone																			
		0A	0B	1A	1B	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
1	Admin/professional office	12.7	12.9	10.9	11.9	10.8	10.2	10.3	9.8	7.8	8.8	10.2	9.6	9.1	10.0	9.7	8.8	10.8	10.1	11.4	12.8
2	Bank/other financial	23.3	23.7	20.1	21.9	19.9	18.8	18.9	17.9	14.3	16.3	18.8	17.7	16.7	18.3	17.9	16.2	19.8	18.6	21.0	23.5
3	Government office	15.7	16.0	13.5	14.7	13.4	12.6	12.7	12.1	9.6	10.9	12.6	11.9	11.2	12.3	12.0	10.9	13.3	12.5	14.1	15.8
4	Medical office (nondiagnostic)	13.0	13.2	11.2	12.2	11.1	10.5	10.6	10.0	8.0	9.1	10.5	9.9	9.3	10.2	10.0	9.0	11.1	10.4	11.7	13.1
5	Mixed-use office	11.8	12.0	10.2	11.1	10.1	9.5	9.6	9.1	7.2	8.2	9.5	9.0	8.5	9.3	9.1	8.2	10.1	9.4	10.6	11.9
6	Other office	9.7	9.8	8.3	9.1	8.3	7.8	7.9	7.4	5.9	6.7	7.8	7.3	6.9	7.6	7.4	6.7	8.2	7.7	8.7	9.7
7	Laboratory	34.5	34.0	29.4	31.9	28.9	27.1	27.5	26.2	21.2	23.6	27.4	26.1	24.6	27.4	26.6	24.3	29.8	28.0	31.6	35.6
8	Distribution/shipping center	3.6	4.9	3.4	4.6	4.2	4.7	5.7	5.2	2.5	4.1	7.2	6.3	5.9	8.9	8.0	6.4	11.4	9.8	13.9	17.9
9	Nonrefrigerated warehouse	2.3	3.1	2.2	2.9	2.7	3.0	3.6	3.3	1.6	2.6	4.6	4.0	3.8	5.7	5.1	4.1	7.3	6.2	8.8	11.4
10	Convenience store	53.3	52.8	48.2	51.1	50.0	46.5	50.2	47.9	41.5	45.1	51.4	48.2	48.4	52.8	50.6	49.3	56.5	53.4	59.5	65.0
11	Convenience store with gas	62.0	61.4	56.1	59.4	58.1	54.1	58.4	55.7	48.3	52.4	59.8	56.1	56.3	61.4	58.8	57.3	65.7	62.1	69.2	75.6
12	Grocery store/food market	41.8	41.4	37.8	40.1	39.2	36.5	39.4	37.6	32.6	35.4	40.3	37.8	37.9	41.4	39.7	38.7	44.3	41.9	46.7	51.0
13	Other food sales	44.7	44.2	40.4	42.8	41.9	39.0	42.1	40.2	34.8	37.8	43.1	40.4	40.6	44.3	42.4	41.3	47.4	44.7	49.9	54.5
14	Fire station/police station	13.1	12.9	11.1	12.1	10.9	10.3	10.4	9.9	8.0	8.9	10.4	9.9	9.3	10.4	10.1	9.2	11.3	10.6	12.0	13.5
15	Other public order and safety	35.1	34.7	30.0	32.5	29.4	27.7	28.0	26.7	21.6	24.1	28.0	26.5	25.1	28.0	27.1	24.8	30.4	28.6	32.2	36.3
16	Medical office (diagnostic)	12.2	11.8	11.2	11.4	10.7	10.8	10.5	10.5	8.6	9.0	10.3	10.4	9.1	10.0	10.3	8.7	10.6	10.6	10.8	11.5
17	Clinic/other outpatient health	14.7	14.2	13.5	13.8	12.9	13.0	12.7	12.7	10.4	10.8	12.4	12.5	11.0	12.1	12.5	10.5	12.8	12.8	13.1	13.9
18	Refrigerated warehouse	25.4	25.1	21.6	23.5	21.3	20.0	20.2	19.3	15.6	17.4	20.2	19.2	18.1	20.2	19.6	17.9	22.0	20.6	23.3	26.2
19	Religious worship	6.1	6.1	5.2	5.7	5.1	4.8	4.9	4.7	3.8	4.2	4.9	4.6	4.4	4.9	4.7	4.3	5.3	5.0	5.6	6.4
20	Entertainment/culture	9.2	9.1	7.9	8.5	7.7	7.3	7.4	7.0	5.7	6.3	7.3	7.0	6.6	7.3	7.1	6.5	8.0	7.5	8.5	9.5
21	Library	15.7	15.5	13.4	14.5	13.2	12.4	12.5	11.9	9.6	10.8	12.5	11.9	11.2	12.5	12.1	11.1	13.6	12.8	14.4	16.2
22	Recreation	12.4	12.2	10.6	11.5	10.4	9.8	9.9	9.4	7.6	8.5	9.9	9.4	8.8	9.9	9.6	8.7	10.7	10.1	11.4	12.8
23	Social/meeting	10.5	10.4	9.0	9.7	8.8	8.3	8.4	8.0	6.5	7.2	8.4	7.9	7.5	8.4	8.1	7.4	9.1	8.5	9.6	10.9
24	Other public assembly	11.6	11.5	9.9	10.8	9.7	9.2	9.3	8.8	7.2	8.0	9.3	8.8	8.3	9.3	9.0	8.2	10.1	9.5	10.7	12.0
25	College/university	28.2	26.3	21.0	24.6	20.3	18.6	18.4	17.4	11.6	14.6	18.7	17.2	16.3	19.1	17.8	16.4	21.4	19.3	23.3	27.9

Table 7-2c Building Activity Greenhouse Gas Intensity (GHGI) Targets (I-P) (Continued)

No.	Commercial Building Type	GHG Intensity by Building Type by Climate Zone (lb CO ₂ e/ft ² -yr)																			
		ASHRAE Climate Zone																			
		0A	0B	1A	1B	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
26	Elementary/middle school	11.9	11.6	9.8	10.9	9.4	9.0	8.8	8.5	7.0	7.7	8.8	8.4	7.9	8.8	8.5	7.8	9.5	8.9	10.2	11.9
27	High school	18.8	17.6	14.0	16.4	13.6	12.5	12.3	11.6	7.7	9.8	12.5	11.5	10.9	12.8	11.9	10.9	14.3	12.9	15.6	18.7
28	Preschool/daycare	15.9	15.5	13.1	14.6	12.7	12.1	11.9	11.3	9.4	10.3	11.9	11.3	10.7	11.8	11.4	10.5	12.7	11.9	13.6	16.0
29	Other classroom education	9.6	9.4	7.9	8.8	7.6	7.3	7.2	6.8	5.7	6.2	7.1	6.8	6.4	7.1	6.9	6.3	7.7	7.2	8.2	9.6
30	Fast food	87.5	85.8	78.4	83.2	78.7	78.0	78.6	77.0	64.2	71.8	81.7	78.3	77.3	85.1	81.8	79.0	91.1	86.4	96.8	107.7
31	Restaurant/cafeteria	56.1	54.2	48.5	52.4	48.0	47.0	47.7	46.4	37.9	42.6	49.6	48.4	46.8	51.3	49.5	48.0	54.1	52.1	57.4	64.4
32	Other food service	23.8	23.0	20.6	22.3	20.4	19.9	20.3	19.7	16.1	18.1	21.0	20.5	19.9	21.8	21.0	20.4	23.0	22.1	24.4	27.3
33	Hospital/inpatient health	48.2	48.2	43.8	45.7	45.3	40.5	43.0	40.4	39.6	39.9	42.3	39.7	38.8	40.1	38.7	36.9	41.2	39.5	41.3	42.0
34	Nursing home/assisted living	26.4	26.4	20.0	23.8	19.3	18.7	19.1	18.1	10.7	14.4	21.1	18.7	18.7	22.6	20.4	19.7	25.5	22.9	28.2	33.1
35	Dormitory/fraternity/sorority	13.3	13.2	10.0	11.9	9.7	9.4	9.6	9.1	5.4	7.2	10.6	9.4	9.4	11.3	10.2	9.9	12.8	11.5	14.1	16.6
36	Hotel	16.8	15.9	14.3	14.9	14.4	13.0	13.5	12.8	11.5	12.0	13.7	12.9	12.5	13.8	13.4	12.7	14.7	13.9	15.4	16.7
37	Motel or inn	15.9	15.6	14.1	14.6	13.4	12.8	12.4	12.2	10.8	11.5	12.2	11.9	11.2	12.2	11.9	11.1	13.0	12.2	13.5	14.7
38	Other lodging	17.1	16.8	15.1	15.7	14.4	13.7	13.3	13.1	11.6	12.4	13.0	12.7	12.0	13.1	12.8	11.9	14.0	13.1	14.5	15.7
39	Vehicle dealership/showroom	13.0	13.1	11.0	12.2	11.0	10.3	10.9	10.2	7.1	8.8	11.1	10.5	9.9	11.8	11.3	10.2	13.5	12.6	14.8	17.4
40	Retail store	12.4	12.4	10.5	11.6	10.5	9.8	10.4	9.7	6.8	8.3	10.6	9.9	9.4	11.2	10.7	9.7	12.8	11.9	14.1	16.6
41	Other retail	17.4	17.5	14.7	16.3	14.7	13.8	14.6	13.6	9.5	11.7	14.9	14.0	13.2	15.8	15.1	13.7	18.0	16.8	19.9	23.3
42	Post office/postal center	16.6	16.6	12.6	15.0	12.1	11.7	12.0	11.4	6.7	9.1	13.3	11.8	11.8	14.2	12.8	12.4	16.0	14.4	17.7	20.8
43	Repair shop	4.3	5.9	4.1	5.6	5.1	5.7	6.9	6.3	3.1	4.9	8.7	7.6	7.1	10.8	9.6	7.7	13.8	11.9	16.8	21.6
44	Vehicle service/repair shop	5.5	7.6	5.2	7.1	6.5	7.2	8.8	8.0	3.9	6.2	11.0	9.6	9.1	13.7	12.2	9.8	17.6	15.1	21.4	27.5
45	Vehicle storage/maintenance	3.8	5.3	3.7	5.0	4.6	5.1	6.2	5.7	2.7	4.4	7.8	6.8	6.4	9.6	8.6	6.9	12.4	10.6	15.0	19.4
46	Other service	5.6	7.7	5.3	7.3	6.6	7.4	9.0	8.2	4.0	6.4	11.3	9.8	9.3	14.0	12.5	10.0	18.0	15.4	21.9	28.2
47	Strip shopping mall	25.7	25.9	21.9	24.2	21.0	19.9	20.7	19.5	14.3	17.1	21.2	19.9	19.2	22.5	21.3	19.7	25.3	23.5	27.8	33.1
48	Enclosed mall	17.8	18.0	15.2	16.8	14.5	13.8	14.4	13.5	9.9	11.9	14.7	13.8	13.3	15.6	14.8	13.6	17.6	16.3	19.3	22.9
49	Bar/pub/lounge	27.7	26.8	24.0	25.9	23.7	23.2	23.6	22.9	18.7	21.0	24.5	23.9	23.1	25.4	24.5	23.7	26.7	25.8	28.4	31.8
50	Courthouse/probation office	23.1	22.5	20.0	21.0	20.2	17.7	19.0	17.2	15.5	16.8	19.0	16.8	16.5	17.6	16.7	15.7	18.6	17.2	19.2	20.7

Table 7-2c Building Activity Greenhouse Gas Intensity (GHGI) Targets (I-P) (Continued)

No.	Residential Building Type	GHG Intensity by Building Type by Climate Zone (lb CO ₂ e/ft ² ·yr)																			
		ASHRAE Climate Zone																			
		0A	0B	1A	1B	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C*	6A	6B	7	8
51	Mobile home	14.1	14.1	10.7	12.7	10.3	9.9	10.2	9.6	5.7	7.7	11.2	9.9	10.0	12.0	10.8	49.0	13.6	12.2	15.0	17.6
52	Single-family detached	10.2	10.2	7.7	9.2	7.4	7.2	7.4	7.0	4.1	5.6	8.1	7.2	7.2	8.7	7.9	36.0	9.8	8.8	10.8	12.8
53	Single-family attached	10.1	10.1	7.7	9.1	7.4	7.1	7.3	6.9	4.1	5.5	8.1	7.2	7.2	8.6	7.8	42.0	9.8	8.8	10.8	12.7
54	Apartment (in 2 to 4 unit building)	11.3	11.3	8.5	10.1	8.2	8.0	8.2	7.7	4.6	6.2	9.0	8.0	8.0	9.6	8.7	61.0	10.9	9.8	12.0	14.1
55	Apartment (in 5+ unit building)	9.8	9.8	7.4	8.8	7.2	6.9	7.1	6.7	4.0	5.4	7.8	6.9	6.9	8.4	7.6	42.0	9.5	8.5	10.5	12.3

* **Informative Note:** Values in Table 7-2c for all Residential Building Types in Climate Zone 5C include an error in calculation and are approximately four times higher than they should be. An addendum will be issued to correct these values.

Table 7-2c Building Activity Greenhouse Gas Intensity (GHGI) Targets (SI)

No.	Commercial Building Type	GHG Intensity by Building Type by Climate Zone (kg CO ₂ e/m ² ·yr)																			
		ASHRAE Climate Zone																			
		0A	0B	1A	1B	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
1	Admin/professional office	62	63	53	58	53	50	50	48	38	43	50	47	44	49	48	43	53	49	56	62
2	Bank/other financial	114	116	98	107	98	92	93	88	70	80	92	87	82	90	88	79	97	91	103	115
3	Government office	77	78	66	72	66	62	62	59	47	53	62	58	55	60	59	53	65	61	69	77
4	Medical office (nondiagnostic)	64	65	55	60	54	51	52	49	39	44	51	48	45	50	49	44	54	51	57	64
5	Mixed-use office	58	59	50	54	49	47	47	44	35	40	47	44	41	45	44	40	49	46	52	58
6	Other office	47	48	41	45	40	38	38	36	29	33	38	36	34	37	36	33	40	38	43	48
7	Laboratory	169	166	144	156	141	133	134	128	104	116	134	127	120	134	130	119	146	137	155	174
8	Distribution/shipping center	17	24	17	23	21	23	28	26	12	20	35	31	29	44	39	31	56	48	68	88
9	Nonrefrigerated warehouse	11	15	11	14	13	15	18	16	8	13	22	19	18	28	25	20	36	31	43	56
10	Convenience store	261	258	236	250	245	228	246	234	203	221	252	236	237	258	247	241	276	261	291	318
11	Convenience store with gas	303	300	274	291	284	265	286	273	236	257	292	274	275	300	288	281	321	304	339	370
12	Grocery store/food market	205	202	185	196	192	179	193	184	159	173	197	185	186	203	194	189	217	205	229	250
13	Other food sales	219	216	198	210	205	191	206	197	170	185	211	198	198	217	207	202	232	219	244	267
14	Fire station/police station	64	63	54	59	53	50	51	48	39	44	51	48	46	51	49	45	55	52	59	66
15	Other public order and safety	172	170	147	159	144	135	137	131	106	118	137	130	123	137	133	121	149	140	158	178
16	Medical office (diagnostic)	60	58	55	56	52	53	51	51	42	44	50	51	45	49	51	43	52	52	53	56
17	Clinic/other outpatient health	72	70	66	67	63	63	62	62	51	53	61	61	54	59	61	51	62	63	64	68
18	Refrigerated warehouse	124	123	106	115	104	98	99	94	76	85	99	94	89	99	96	88	107	101	114	128
19	Religious worship	30	30	26	28	25	24	24	23	18	21	24	23	21	24	23	21	26	24	28	31
20	Entertainment/culture	45	45	38	42	38	36	36	34	28	31	36	34	32	36	35	32	39	37	41	47
21	Library	77	76	66	71	64	60	61	58	47	53	61	58	55	61	59	54	66	62	70	79
22	Recreation	61	60	52	56	51	48	48	46	37	42	48	46	43	48	47	43	52	49	56	63
23	Social/meeting	51	51	44	48	43	40	41	39	32	35	41	39	37	41	40	36	45	42	47	53
24	Other public assembly	57	56	49	53	48	45	45	43	35	39	45	43	41	45	44	40	49	46	52	59
25	College/university	138	129	103	120	99	91	90	85	57	71	92	84	80	94	87	80	105	94	114	136

Table 7-2c Building Activity Greenhouse Gas Intensity (GHGI) Targets (SI) (Continued)

No.	Commercial Building Type	GHG Intensity by Building Type by Climate Zone (kg CO ₂ e/m ² ·yr)																			
		ASHRAE Climate Zone																			
		0A	0B	1A	1B	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
26	Elementary/middle school	58	57	48	53	46	44	43	41	34	38	43	41	39	43	42	38	47	44	50	58
27	High school	92	86	69	80	66	61	60	57	38	48	61	56	53	63	58	54	70	63	76	91
28	Preschool/daycare	78	76	64	72	62	59	58	56	46	50	58	55	52	58	56	51	62	58	67	78
29	Other classroom education	47	46	39	43	37	36	35	33	28	30	35	33	31	35	34	31	38	35	40	47
30	Fast food	428	420	383	407	385	382	385	377	314	351	400	383	378	416	400	387	446	423	474	527
31	Restaurant/cafeteria	274	265	238	257	235	230	234	227	186	208	243	237	229	251	242	235	265	255	281	315
32	Other food service	116	112	101	109	100	98	99	96	79	88	103	100	97	107	103	100	112	108	119	134
33	Hospital/inpatient health	236	236	215	224	221	198	210	198	194	195	207	194	190	196	189	180	202	193	202	205
34	Nursing home/assisted living	129	129	98	116	94	91	94	89	52	71	103	92	92	110	100	96	125	112	138	162
35	Dormitory/fraternity/sorority	65	65	49	58	47	46	47	44	26	35	52	46	46	55	50	48	62	56	69	81
36	Hotel	82	78	70	73	70	64	66	63	56	59	67	63	61	68	65	62	72	68	76	82
37	Motel or inn	78	76	69	72	66	63	61	60	53	56	59	58	55	60	58	54	64	60	66	72
38	Other lodging	83	82	74	77	70	67	65	64	57	61	64	62	59	64	63	58	68	64	71	77
39	Vehicle dealership/ showroom	64	64	54	60	54	50	53	50	35	43	54	51	48	58	55	50	66	61	73	85
40	Retail store	61	61	51	57	51	48	51	47	33	41	52	49	46	55	52	48	63	58	69	81
41	Other retail	85	86	72	80	72	68	72	67	47	57	73	69	65	77	74	67	88	82	97	114
42	Post office/postal center	81	81	62	73	59	57	59	56	33	44	65	58	58	69	63	61	78	70	87	102
43	Repair shop	21	29	20	27	25	28	34	31	15	24	42	37	35	53	47	38	68	58	82	106
44	Vehicle service/repair shop	27	37	25	35	32	35	43	39	19	30	54	47	44	67	60	48	86	74	105	135
45	Vehicle storage/maintenance	19	26	18	24	22	25	30	28	13	21	38	33	31	47	42	34	61	52	74	95
46	Other service	27	38	26	35	32	36	44	40	19	31	55	48	45	69	61	49	88	76	107	138
47	Strip shopping mall	126	127	107	119	103	97	101	95	70	84	104	97	94	110	104	96	124	115	136	162
48	Enclosed mall	87	88	74	82	71	68	70	66	49	58	72	68	65	76	72	67	86	80	94	112
49	Bar/pub/lounge	136	131	117	127	116	114	115	112	92	103	120	117	113	124	120	116	131	126	139	156
50	Courthouse/probation office	113	110	98	103	99	87	93	84	76	82	93	82	81	86	82	77	91	84	94	101

Table 7-2c Building Activity Greenhouse Gas Intensity (GHGI) (SI) (Continued)

No.	Residential Building Type	GHG Intensity by Building Type by Climate Zone (kg CO ₂ e/m ² ·yr)																			
		ASHRAE Climate Zone																			
		0A	0B	1A	1B	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C*	6A	6B	7	8
51	Mobile home	69	69	52	62	50	49	50	47	28	38	55	49	49	59	53	240	66	60	73	86
52	Single-family detached	50	50	38	45	36	35	36	34	20	27	40	35	35	43	38	176	48	43	53	62
53	Single-family attached	50	50	38	45	36	35	36	34	20	27	40	35	35	42	38	205	48	43	53	62
54	Apartment (in 2 to 4 unit building)	55	55	42	50	40	39	40	38	22	30	44	39	39	47	43	298	53	48	59	69
55	Apartment (in 5+ unit building)	48	48	36	43	35	34	35	33	19	26	38	34	34	41	37	205	46	42	51	60

* **Informative Note:** Values in Table 7-2c for all Residential Building Types in Climate Zone 5C include an error in calculation and are approximately four times higher than they should be. An addendum will be issued to correct these values.

Modify Section 8 as shown. The remainder of Section 8 remains unchanged.

8. ENERGY AUDIT WITH DECARBONIZATION ASSESSMENT REQUIREMENTS

8.1 The *qualified energy auditor* shall complete Forms D and/or E and submit to the *authority having jurisdiction (AHJ)*. If an energy audit with decarbonization assessment is required ~~within this section~~ (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 ~~will~~ reduce annual *building* energy use and by adopting *emission reduction measures (ERMs)* that reduce annual *building greenhouse gas (GHG) emissions*. ~~Fuel switching shall not be permitted for this purpose unless the fuel switching saves annual energy costs.~~

8.1.1 Decarbonization Assessment. The energy audit with decarbonization assessment determines achievable levels of *GHG emissions* reductions at 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* 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 ~~Energy Performance~~ Targets

8.2.1 Overall Process. An energy audit with decarbonization assessment shall be conducted for all *buildings* not having ~~an energy performance target~~. The energy audit with decarbonization assessment and the associated ~~energy audit~~ 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~~ defined in Section ~~8.4.4.2~~ 8.4.2). For a *building* having a gross floor area 10,000 ft² (1000 m²) or less, either a Level 1 audit (as ~~defined in Section 8.4.1~~) or a Level 2 audit (as ~~described~~ defined in Section ~~8.4.4.2~~ 8.4.2) shall be conducted.

Exception to 8.2.1: *Buildings* that have completed an energy audit with decarbonization assessment within the previous three 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.

8.2.2 ~~The scope of the energy audit shall include the following required end uses as applicable to the building:~~

- Envelope
- Lighting
- Cooling
- Heating
- Ventilation and exhaust systems
- Air distribution systems
- Heating, chilled, condenser, and domestic water systems
- Refrigeration except for food processing refrigeration
- Power generation equipment
- Uninterruptible power supplies and power distribution units
- People-moving systems

8.2.3 ~~The following end uses are not included in this standard:~~

- ~~Industrial processes~~
- ~~Agricultural processes~~
- ~~Irrigation~~

8.2.4 ~~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 ~~Energy Performance~~ Targets

8.3.1 Buildings that Meet Their ~~Energy Performance~~ Targets. *Buildings* that meet their *performance energy 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 Performance~~ Targets Overall Process. An energy audit with decarbonization assessment shall be conducted, and an associated ~~energy audit~~ report shall be

provided, for all *buildings* that do not meet their *energy 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 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 *energy target performance targets*. The *qualified energy auditor* may refer to the list of potential *EEMs* in Informative Annex E.

After the completion of the ~~audit~~ energy audit with decarbonization assessment and the selection of *EEMs* and *ERMs* to be implemented, the applicant must calculate an adjusted ~~energy use intensity (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*. ~~This~~ The adjusted *EUI* is ~~then~~ compared to the *energy 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 ~~energy 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 *energy 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 additional *EEMs* and *ERMs*. This process is repeated until the *building's* adjusted *EUI* is less than its ~~energy 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 years may use the previous energy audit with decarbonization assessment to identify *EEMs* and *ERMs* 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 ~~energy EUI target~~ and *GHGI* to *GHGI target* shall be made by the applicant. If the *EEMs* and *ERMs* identified in the audit are still applicable, have not been implemented, and if implemented would result in the *building* meeting its ~~energy EUI target~~ and *GHGI target*, these measures shall be implemented by the *building-facility*, and the project shall follow the procedures in Section 9. If the identified *EEMs* and *ERMs* do not result in an adjusted *EUI* less than the ~~energy EUI target~~ and a *GHGI* less than the *GHGI target*, a new energy audit with decarbonization assessment shall be conducted as described in Section 8.3.2.

8.3.2.1 Calculation of the adjusted *EUI* is shown in the following equation. 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 (MJ)
 $Energy_{saved}$ = estimated annual gross energy savings, kBtu (MJ)
 GFA = gross floor area, ft² (m²)

Following the completion of an energy audit that has identified *EEMs* sufficient to meet the *building's* ~~energy target~~, the applicant shall implement those *EEMs* per the requirements of Section 9.

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 (MJ)
 GHG_{saved} = estimated annual *GHG savings*, kBtu (MJ)
 GFA = gross floor area, ft² (m²)

8.4 Energy Audit with Decarbonization Assessment Levels. This section outlines the requirements for Level 1 and Level 2 energy audits for *buildings*. If required, 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 211-2018 (RA2023), including Informative Appendix H, "Building Decarbonization Assessment." ¹² *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 Level 1 Audit. ~~Buildings shall perform a Level 1 audit (walk-through analysis) as defined in ASHRAE's Procedures for Commercial Building Energy Audits, 2nd Edition⁵.~~

8.4.2 Level 2 Audit. ~~Buildings shall perform a Level 2 audit (walk-through analysis) as defined in ASHRAE's Procedures for Commercial Building Energy Audits, 2nd Edition⁵.~~

Delete Section 8.5 and its subsections as shown.

8.5 Energy Audit Report. This section prescribes the overall approaches and methods to be used in the energy audit report for audits completed under Sections 8.4.1 or 8.4.2.

8.5.1 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 *simple payback* or return on investment (ROI) for each recommended *EEM* or bundle of *EEMs*.
- The *simple payback* of the *optimized bundle* of *EEMs* that will achieve the *energy target* for *buildings* with *energy targets* or meet the financial criteria set out in the standard for *buildings* that do not have *energy targets*.

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.

8.5.2 Interactive Effects. Energy savings analysis shall include *interactive effects* of all selected *EEMs*.

8.5.3 Optimized Bundling. The *EEMs* recommended in the energy audit report shall consist of an *optimized bundle* of *EEMs*.

8.5.4 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.

8.5.4.1 Nonfederal Facilities. The minimum financial criteria required for reporting include the following:

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

8.5.4.2 U.S. Federal Facilities. Federal facilities shall follow the National Institute of Standards and Technology (NIST) Building Life-Cycle Cost (BLCC) Program.

8.5.5 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.

8.5.5.1 Requirements for Level 1 Audits. 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:

- a. The historic energy use shall be apportioned into each of the end uses, such as HVAC, lighting, domestic hot water, and plug loads.
- b. The *qualified energy auditor* shall verify that each *EEM* savings estimate is reasonable in comparison to the energy consumption of that end use based on energy consumption survey data or experience with similar sites.

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 *energy auditor* 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. (See Form D in Normative Annex C.)

8.5.5.2 Requirements for Level 2 Audits. The *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 E in Normative Annex C.)

8.5.6 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.

Modify Section 9 as shown. The remainder of Section 8 remains unchanged.

9. IMPLEMENTATION AND VERIFICATION REQUIREMENTS

9.1 Developing and Implementing an Energy and Emissions Management Plan

9.1.1 Requirements. Buildings that have ~~an energy performance targets~~ shall comply with the requirements of Section 9.1.1.1. Buildings that do not have ~~an energy performance targets~~ shall comply with the requirements of Section 9.1.1.2. All 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 management plan shall include the elements listed in Section 5.

9.1.1.1 Building with Energy-Performance Targets. For buildings having ~~energy 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 ~~energy 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.

9.1.1.2 Building without Energy-Performance Targets. Buildings that do not have ~~an energy performance targets~~ shall implement the *EEMs* and ERMs identified from the energy audit with decarbonization assessment within four years from the application of compliance. Implementation of the EEMs and ERMs shall not result in an increase in either the building's EUI or GHGI.

9.1.1.2.1 For nonfederal buildings, the qualified energy auditor shall first determine the optimized bundle of EEMs and then determine the optimized bundle of ERMs.

9.1.1.2.2 ~~the~~ 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:

1. A life-cycle approach may be used with the *optimized bundle* consisting of *EEMs* with an *internal rate of return (IRR)* greater than or equal to 20% using BLCC5 with the current BLCC5 defaults. BLCC5 is a free market 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*.
3. *EEMs* that are no longer appropriate due to deeper retrofits specified for the same equipment in the *optimized bundle of ERM*s 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 ERM*s included an *ERM* 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 ERM*s shall use all *EEM*s identified in Section 9.1.1.2.2 and *ERM*s with a combined *simple payback* less than or equal to ten years. For the purposes of this combined *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* consisting of *ERM*s with an *internal rate of return (IRR)* greater than or equal to 15% using BLCC5 with the current BLCC5 defaults. BLCC5 is a free-market tool and can be found online.
2. *ERM*s that have *simple payback* greater than the effective useful life of the equipment shall be excluded from the *optimized bundle*.
3. *ERM*s 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 *ERM* is not implemented, a specific plan for replacement of equipment at the end of its useful life shall be filed with the *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 *ERM* 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 EEM*s shall use all *EEM*s with a savings to investment ratio (SIR) to meet federal requirements.

9.1.1.2.5 Identified *EEM*s and *ERM*s that are not selected for implementation and have *simple 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 *EEM*s and *ERM*s take into account the impact of previously implemented *EEM*s and *ERM*s and do not result in an increase in either the *building's EUI* or *GHGI*.

[...]

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. *EEM*s and *ERM*s shall be implemented and commissioned. The *qualified energy auditor* or *qualified person* shall review the commissioning report and certify that the *EEM*s and *ERM*s are functioning as intended.

Informative Note: For guidance on commissioning protocols, refer to ASHRAE Guideline 0, *The Commissioning Process*, and ASHRAE Guideline 1.1, *HVAC&R Technical Requirements for the Commissioning Process*.

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

9.2 Verification of Implemented Energy Efficiency Measures and Emissions Reduction Measures

9.2.1 Verification of Implemented Energy Efficiency Measures and Emissions Reduction Measures for Buildings with Energy Performance Targets. Upon implementation of *EEM*s and *ERM*s, the *building's EUI* and *GHGI* shall be monitored until one full year's data demonstrate that *energy-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 Energy Performance Targets. Upon implementation of *EEM*s and *ERM*s, 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 as required and the implementation did not result in an increase in either the *building's EUI* or *GHGI*.

[...]

Modify Section 11 as shown. The remainder of Section 11 remains unchanged.

11. REFERENCES

[...]

11. ASHRAE. 2023. ANSI/ASHRAE/ACCA Standard 211-2018 (RA2023), *Standard for Commercial Building Energy Audits*. Atlanta: ASHRAE.

Modify Normative Annex C as shown. The remainder of Section 11 remains unchanged. (Note: Form C—Energy Use Intensity Calculations is deleted in its entirety and replaced by the new Forms C-1, C-2, and C-3.)

NORMATIVE ANNEX C FORMS

Form C-1—Site Energy Use Intensity Calculation

	Energy Form^a	Source of Energy Data^b	Energy Use Numerical Value	Units	Conversion Factor^c to kBtu (MJ)	Annual Site Energy, kBtu/yr (MJ/yr)
1a.	Imported grid electricity					
1b.	Imported specific renewable electricity ^d					
2a.	Imported grid natural gas					
2b.	Imported specific renewable natural gas ^d					
3.	Imported steam					
4.	Imported hot water					
5.	Imported chilled water					
6a.	Imported grid fuel oil					
6b.	Imported specific renewable fuel oil ^d					
7a.	Imported grid propane					
7b.	Imported specific renewal propane ^d					
8.	Imported coal or other ^e					
9.	Imported biofuels					
10.	On-site nonrenewable energy					
11.	Imported transportation vehicle energy					
12.	Thermal—on-site production					
13.	Electricity—on-site production					
14.	Renewable—on-site production ^e					
15.	Imported energy for on-site production					
16.	Net change in energy stored on-site					
17.	Exported electricity					
18.	Exported steam					
19.	Exported hot water					
20.	Exported chilled water					
21.	Exported other ^e					
22.	Exported transportation vehicle energy					
	Annual Gross Energy^f (Sum of 1 to 14 minus Sum of 15 to 22), kBtu (MJ)					
	Site Energy Use Intensity (<i>gross energy</i> /gross floor area [from Form B]), kBtu/ft ² (MJ/ft ²)					

Notes:

- Grid energy forms are from the electric grid, fuel utility, or distribution system. Specific renewable energy forms are from a specific provider meeting the requirements of the adopting authority.
- See Table 5-2a.
- Documentation of specific off-site renewable energy ownership or procurement shall be submitted to the adopting authority. For procurement, the purchase contract shall have a duration of not less than 15 years.
- If there is more than one "other" energy form, the entry shall be split, or additional notations made to so indicate.
- When the imported energy meter records the imported energy minus the exported energy under a net metering agreement, exported energy shall not be double counted.

Form C-2—Source Energy Use Intensity Calculation Table

	<u>Energy Form^a</u>	<u>Annual Site Energy (Form C-1, Column 6), kBtu/vr (MJ/vr)</u>	<u>Source Energy Conversion Factor^b</u>	<u>Annual Source Energy, kBtu/vr (MJ/vr)</u>
1a.	Imported grid electricity			
1b.	Imported specific renewable electricity ^c			
2a.	Imported grid natural gas			
2b.	Imported specific renewable natural gas ^c			
3.	Imported steam			
4.	Imported hot water			
5.	Imported chilled water			
6a.	Imported grid fuel oil			
6b.	Imported specific renewable fuel oil ^c			
7a.	Imported grid propane			
7b.	Imported specific renewable propane ^c			
8.	Imported coal or other ^d			
9.	Imported biofuels			
10.	On-site <i>nonrenewable energy</i>			
11.	Imported transportation vehicle energy			
12.	Exported electricity			
13.	Exported steam			
14.	Exported hot water			
15.	Exported chilled water			
16.	Exported other ^d			
17.	Exported transportation vehicle energy			
	<u>Annual Source Energy^e</u> (Sum of 1 to 11 minus Sum of 12 to 17), kBtu (MJ)			
	<u>Source Energy Use Intensity</u> (<i>gross energy</i> /gross floor area [from Form B]), kBtu/ft ² (MJ/ft ²)			

Notes:

a. Grid energy forms are from the electric grid, fuel utility, or distribution system. Specific renewable energy forms are from a specific provider meeting the requirements of the adopting authority.

b. See Section 5.2.3.2.

c. Documentation of specific off-site renewable energy ownership or procurement shall be submitted to the adopting authority. For procurement, the purchase contract shall have a duration of not less than 15 years.

d. If there is more than one "other" energy form, the entry shall be split, or additional notations made to so indicate.

e. When the imported energy meter records the imported energy minus the exported energy under a net metering agreement, exported energy shall not be double counted.

Table C-3—Greenhouse Gas Intensity Calculation

	Energy Form^a	Annual Site Energy (Form C-1 Column 6) kBtu/yr (MJ/yr)	Greenhouse Gas Emission Factor^b lb CO₂e/kBtu (kg CO₂e/MJ)	Annual Greenhouse Gas Emissions, lb CO₂e/yr (kg CO₂e/yr)
1a.	Imported grid electricity			
1b.	Imported specific renewable electricity ^c			
2a.	Imported grid natural gas			
2b.	Imported specific renewable natural gas ^c			
3.	Imported steam			
4.	Imported hot water			
5.	Imported chilled water			
6a.	Imported grid fuel oil			
6b.	Imported specific renewable fuel oil ^c			
7a.	Imported grid propane			
7b.	Imported specific renewal propane ^c			
8.	Imported coal or other ^d			
9.	Imported biofuels			
10.	On-site <i>nonrenewable energy</i>			
11.	Imported transportation vehicle energy			
12.	Exported electricity			
13.	Exported steam			
14.	Exported hot water			
15.	Exported chilled water			
16.	Exported other ^d			
17.	Exported transportation vehicle energy			
	Greenhouse Gas Emissions^e (Sum of 1 to 11 minus Sum of 12 to 17), lb CO ₂ e (kg CO ₂ e)			
	Greenhouse Gas Intensity (<i>greenhouse gas emissions/gross floor area</i>), lb CO ₂ e/ft ² (kg CO ₂ e/m ²)			
Notes:				
a. Grid energy forms are from the electric grid, fuel utility, or distribution system. Specific renewable energy forms are from a specific provider meeting the requirements of the adopting authority.				
b. See Section 5.2.3.3.				
c. Documentation of specific off-site renewable energy ownership or procurement shall be submitted to the adopting authority. For procurement, the purchase contract shall have a duration of not less than 15 years.				
d. If there is more than one “other” energy form, the entry shall be split, or additional notations made to so indicate.				
e. When the imported energy meter records the imported energy minus the exported energy under a net metering agreement, exported energy shall not be double counted.				

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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