

**NORMATIVE ANNEX APPENDIX X**  
**INVESTMENT CRITERIA**

This is a normative appendix and is part of the Tier 1 covered building requirements of this standard.

**Commented [A1]:** Note: this appendix uses Washington state appendix X as a basis, and modifications compared to this reference are noted for clarity.

**X1. DEMONSTRATING COMPLIANCE WITH THE INVESTMENT CRITERIA**

*Buildings* seeking compliance using the exception to Section 9.1.1.1 or 9.1.1.2 shall demonstrate compliance with the financial investment criteria of this annex. The investment criteria shall be documented using a Level 2 energy audit and by performing the life-cycle cost analysis (LCCA) as per Section X2.2.

**X1.1 General Guidance on Cost and Benefits for the Base Case and Alternative Case.** The LCCA is a process that compares the base case of the existing *building* to the alternative case that implements *EEMs* proposed by the energy audit. Total life-cycle cost of each case is produced by the analysis, but the resulting cost and benefit of interest is the incremental life-cycle cost difference between each case. Measures and bundles of measures demonstrating positive life-cycle cost compared to the base case are to be implemented in accordance with Section 9.

The base case in the energy audit and LCCA will include all costs for energy, operations and maintenance, and other related costs scheduled in the analysis period. This may include replacement of existing equipment upon failure with code compliant equipment, in the analysis period of measure life of the alternative. All these costs are captured in the base case.

The alternate case captures all costs and benefits associated with implementing additional efficiency features beyond in-kind or code minimum replacement. All costs and all benefits of implementing *EEMs* required by Section 9 should be captured by the analysis. All documented costs may be considered.

Extended implementation periods are allowed by this standard. This allows more *EEMs* to be considered at time of failure, resulting in much of the cost of implementation being attributed to the base case. This requires including the implementation timing of the measure in the extended compliance period. Ultimately, this reduces the cost of the alternative case and will likely make *EEMs* that are not cost-effective as an early replacement be cost-effective as replacement upgrades.

**X2. ENERGY AUDITS AND INVESTMENT CRITERIA PATHWAY**

**X2.1** *Buildings* qualifying under the investment criteria must complete a LCCA and implement an *optimized bundle of energy efficiency measures* that provide maximum energy savings without resulting in a *savings-to-investment ratio* of less than one.

**Exception to X2.1:** *Building owners* may demonstrate compliance with this section by completing the Level 2 energy audit and implementing all *EEMs* ~~determined to have a simple payback that is less than the *EEMs'* expected useful life~~ estimated to achieve a simple payback in less time than the *EEMs* expected useful life.

**X2.2** The procedures for developing the investment criteria shall be based on ANSI/ASHRAE/ ACCA Standard 211, Section 5.5.2, and Section 5.5.3, "Life-Cycle Cost Analysis (LCCA)," as modified by Section X2 of this standard. The LCCA shall also follow and consider the findings of the Level 2 audit as defined by ANSI/ASHRAE/ACCA Standard 211, Section 5.4.

**X2.3 Investment Criteria Chronological Process**

**X2.3.1 Level 2 Audit.** Evaluate a comprehensive list of individual *EEMs* using *simple payback* as a screening criteria. Individual *EEMs* ~~determined to have a simple payback that is greater than estimated to not achieve a simple payback during~~ the *EEMs* useful life may be excluded from further consideration.

**Note:** The simple payback calculation shall be in accordance with NIST Handbook 135, Section 6.4.4, Equation 6-13.

**X2.3.2 Life-Cycle Cost Assessment.** Identify an *optimized bundle* of EEMs that provides maximum energy savings without resulting in a *savings-to-investment ratio* of less than one. The *optimized bundle* of measures shall be implemented based on the schedule established within the energy management plan.

**X2.3.2.1 Life-Cycle Cost Assessment on Individual Measures.** Individual measures that do not meet the life-cycle cost test may be excluded from the implementation plan if they are not integral to the implementation of other cost-effective measures in the bundle.

**X2.3.2.2 Phased Implementation.** The LCCA and energy management plan may include phased implementation such that the *building owner* is not required to replace a system or equipment before the end of the system or equipment's *useful life*.

### **X3. INCLUDED LCCA COSTS AND SAVINGS.**

**X3.1** The costs and savings to be included within the LCCA shall be based on ANSI/ASHRAE/ACCA Standard 211, Sections 5.4.8.1, 5.5.2, and 5.5.3 as modified by the following subsections.

#### **X3.1.1 Cost for Implementation of EEM as Required by Section 9**

1. **Estimate EEM Costs** (based on Standard 211, Sections 5.4.8).
2. **Estimate the total expected cost of implementation for each practical measure.** Cost estimates shall include the following factors, as applicable:
  - a. Material costs
  - b. Labor costs, contracted or executed by employees
  - c. Design fees
  - d. Construction management, contracted or executed by employees
  - e. Site-specific installation factors
  - f. Permits
  - g. Temporary services
  - h. Testing, adjusting, and balancing
  - i. Utility service upgrades
  - j. Verification as required in Section 9.2.2 only
  - k. Commissioning
  - l. Taxes
  - m. Profit
  - n. [Utility or government grants and incentives](#)
  - o. Any additional adjustments that significantly impact the cost estimate of the EEM

**Informative Note:** Multiple measures affecting the same *building* systems or end uses may be combined and their costs estimated as a group. Combining costs may improve the cost-effectiveness of combined measures.

3. **Hazardous material abatement (based on Standard 211, Section 5.4.8.2).** Estimation of hazardous material abatement costs is not required. If the possible presence of hazardous materials is apparent at the site, either through observation or as reported by others, the possible presence of the hazardous material shall be included in the report (see Standard 211, Section 6.2.5) as potentially affecting health and safety and installation costs.
4. **Cost and cost savings of recommended EEMs (based on Standard 211, Section 5.5.2).** Estimate the initial and recurring costs, *energy cost* savings, and nonenergy cost savings of each measure and each integrated group of measures. Cost estimates shall either be
  - a. obtained from a vendor at the quoted price, or

- b. based on quotations of similar projects within the last year, or
  - c. based on labor cost estimates for employee labor.
5. **Life-cycle cost analysis (LCCA) (based on Standard 211, Section 5.5.2).** LCCA 7,8,9,10 of each recommended *EEM* shall be conducted for a time frame that spans, at a minimum, the life of the measure with the longest service *useful life*. The LCCA may include estimates for costs and savings associated with the social cost of carbon dioxide and greenhouse gas emissions. The LCCA and shall include the following:
- a. Initial costs (per Standard 211, Section 5.4.8.1)
  - b. Financing costs
  - c. Annual *energy costs*
  - d. Escalation rates as published by the *AHJ* citing the source within the energy audit report
  - e. Discount rates as published by the *AHJ* citing the source within the energy audit report
  - f. Tax credits and deductions
  - g. Cash incentives, grants, and rebates
  - h. Expected periodic replacements
  - i. Estimated recurring nonenergy costs (maintenance, etc.) of each measure or set of measures. Such costs include annual maintenance and service labor costs, routine replacement of worn parts, or annual warranty fees from manufacturers.
  - j. Contingency funds not to exceed 5% of estimated *EEM* implementation cost
  - k. Water and sewer savings from *EEM*. *EEMs* that provide water and/or wastewater savings shall include the operations and maintenance savings resulting from implementation of the *EEM*.

**Commented [A2]:** Clarification that the social cost of carbon may be incorporated voluntarily into cost and savings calculations as part of LCCA

**Table X-1 Life-Cycle Cost Analysis Variables Independent of NIST Handbook 135 Methodology**

Public owner discount rate	A fixed annual rate as published by the AHJ
Private owner discount rate	Shall be the published Wall Street Journal Prime Rate for based on the average of the previous twelve months.
Financing	Applicants with documented costs of borrowing assuming one hundred percent of the <i>EEM</i> implementation costs are financed at an actual cost of borrowing and stated terms when the property being improved is listed as loan collateral.
Rate of inflation	A fixed annual rate as published by the AHJ
Fuel escalation rate	Based on the most recent edition of NIST Handbook—135 Annual Supplement fuel escalation rates.
Study period	Equal to the <i>useful life</i> of the longest-lived <i>EEM</i> within an <i>optimized bundle</i> (Standard 211, Section 5.5.3).

**X4. LIFE-CYCLE COST ANALYSIS METHODOLOGY, FORM, AND KEY VARIABLES**

**X4.1** Life-cycle cost analysis completed for *buildings* qualifying under the investment criteria shall follow National Institute of Standards and Technology (NIST) Handbook 135, *Life-Cycle Costing Manual for the Federal Energy Management Program* except as specified in this standard in Table X-1.

**X4.2** Publication of analysis variables. The *AHJ* shall on an annual basis publish the public owner discount rate, private owner discount rate, rate of inflation and fuel escalation rates on the agency website.}

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