

# IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays

## Amendment 1: Editorial and Technical Corrections and Clarifications

IEEE Computer Society

Developed by the  
Standards Activities Board

**IEEE Std 1680.1a™-2020**  
(Amendment to IEEE Std 1680.1™-2018)

# **IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays**

## **Amendment 1: Editorial and Technical Corrections and Clarifications**

Developed by the

**Standards Activities Board**  
of the  
**IEEE Computer Society**

Approved 30 January 2020

**IEEE SA Standards Board**

**Abstract:** IEEE Std 1680.1 was published in March 2018 with a number of editorial and technical errors. This amendment addresses, and is limited to, editorial and technical corrections and clarifications in IEEE Std 1680.1-2018. This amendment does not include deletion of any criteria, addition of any criteria, or any substantive revisions to criteria.

**Keywords:** amendment, computer, desktop, display, electronic product, electronic product design, environment, environmental impact, environmental leadership, environmental performance, IEEE 1680.1™, IEEE 1680.1a™, integrated desktop computer, monitor, notebook, portable all-in-one computer, slate/tablet, small-scale server, social responsibility, sustainability, thin client, workstation

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## Introduction

This introduction is not part of IEEE Std 1680.1a-2020, IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays—Amendment 1: Editorial and Technical Corrections and Clarifications.

This amendment addresses a number of editorial and technical errors that were discovered following the publication of IEEE Std 1680.1 in March 2018. This amendment addresses, and is limited to, editorial and technical corrections and clarifications and does not include deletion of any criteria, addition of any criteria, or any substantive revisions to criteria.

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# IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays

## Amendment 1: Editorial and Technical Corrections and Clarifications

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in *bold italic*. Four editing instructions are used: change, delete, insert, and replace. *Change* is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underscore (to add new material). *Delete* removes existing material. *Insert* adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. *Replace* is used to make changes in figures, equations, or subclauses by removing the existing figure, equation, or subclause and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.<sup>1</sup>

### 1. Overview

#### 1.1 Scope

IEEE Std 1680.1-2018 defines environmental and social responsibility performance criteria for computers (i.e., desktop computers, notebook computers, integrated desktop computers, portable all-in-one computers, slates/tablets, small-scale servers, thin clients, and workstations) and displays (i.e., monitors and signage displays). The environmental and social responsibility performance criteria relate to substance management, materials selection, design for end of life, product longevity/life-cycle extension, energy conservation, end-of-life management, packaging, life cycle assessment and carbon footprint, corporate environmental performance, and corporate social responsibility.

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<sup>1</sup> Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

## 1.2 Purpose

IEEE Std 1680.1 was published in March 2018 with a number of editorial and technical errors. This amendment addresses, and is limited to, editorial and technical corrections and clarifications in the standard. This amendment does not include deletion of any criteria, addition of any criteria, or any substantive revisions to criteria.

## 1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).<sup>2,3</sup>

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

## 2. Normative references

*Delete the following reference from Clause 2:*

~~Electronics Industry Citizenship Coalition (EICC), Validated Audit Process~~

*Insert the following reference into Clause 2 in alphanumeric order:*

Responsible Business Alliance (RBA), Validated Audit Process<sup>4</sup>

*Change the following reference in Clause 2 as shown:*

U.S. DOE Superior Energy Performance 50001™ (SEP 50001™)

## 3. Definitions, acronyms, and abbreviations

### 3.1 Definitions

*Change the location of the definition of “conformance assurance process” to be correctly located alphabetically between “conflict minerals” and “connector” in 3.1.*

---

<sup>2</sup> The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

<sup>3</sup> The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is used only in statements of fact.

<sup>4</sup> Available at <http://www.responsiblebusiness.org/standards/vap/>.

## 3.2 Acronyms and abbreviations

*Change the following acronym in 3.2 as shown:*

SEP 50001<sup>TM</sup> Superior Energy Performance 50001<sup>TM</sup>

## 4. Environmental and social responsibility performance criteria

### 4.1 Substance management

#### 4.1.5 Bromine and chlorine

##### 4.1.5.1 Required—Reduction of bromine and chlorine content in plastic parts >25 g

*Replace the text of 4.1.5.1 with the following:*

**Product criterion:** Each plastic part in the product exceeding 25 g shall not contain greater than 1000 ppm chlorine or greater than 1000 ppm bromine at the homogeneous level, with the following exceptions:

- a) For parts that exceed the specified concentrations of bromine and chlorine, the manufacturer shall perform a hazard assessment in accordance with criterion 4.1.8.1 on the substance(s) responsible for exceeding the bromine and chlorine levels and the viable alternative substance(s) being considered. The manufacturer shall demonstrate either:
  - 1) The brominated and chlorinated compounds used in the product received a GreenScreen® for Safer Chemicals Benchmark score of 2, 3, and/or 4 or
  - 2) No viable alternatives to the brominated or chlorinated compounds can achieve a GreenScreen Benchmark score of 2, 3, and/or 4.All assessments shall consider the health and environmental impacts of transformation products associated with combustion. These assessments shall be verified by an independent third party.<sup>5</sup>
- b) Parts which exceed 25% post-consumer recycled content may contain a maximum of 5000 ppm chlorine and a maximum of 5000 ppm bromine.<sup>6</sup>
- c) Printed circuit boards, cables and wiring, fans, and electronic components are excluded.

If the product does not contain plastic parts > 25 g, the manufacturer may declare “Not Applicable.”

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All covered products.

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<sup>5</sup> At the time of this publication, verification by Clean Production Action is an example of a third-party verification process. This information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of this verification process. Equivalent verification processes may be used.

<sup>6</sup> Regulation (EU) 2019/1021 on persistent organic pollutants has entered into force in all EU Member States on 5 August 2019. Annex I has a new limit value for some bromodiphenylethers (BDEs) at 500 ppm. Manufacturers claiming conformity to this criterion using recycled plastics with a maximum Br limit of 5000 ppm will need to assess if their product can be placed in the European market.

**Verification requirements:**

- a) A list of each plastic part in the product exceeding 25 g
- b) Documentation that each applicable plastic part exceeding 25 g meets one of the following options:
  - 1) Test data showing that the part contains less than 1000 ppm chlorine and less than 1000 ppm bromine (e.g., using test method such as IEC 62321-3-1 [B11] and IEC 62321-3-2) [B12],<sup>7</sup> or
  - 2) Documentation of a CAP that demonstrates conformity to this criterion.
  - 3) If using exception a), documentation as specified in the verification requirements of 4.1.8.1.
  - 4) If the part contains greater than 25% post-consumer recycled content and contains either greater than 1000 ppm chlorine or greater than 1000 ppm bromine:
    - i) Documentation from the supplier that demonstrates greater than 25% post-consumer recycled content (e.g., supplier letter, analytical test results, etc.), and
    - ii) Test data demonstrating conformance to the criterion

**Additional details:** See 4.1.8.1 regarding chemical assessment and selection.

The 25 g threshold applies only to the portion of the part composed of plastic. Coatings are not considered plastic parts.

#### 4.1.10 Manufacturing chemicals

##### 4.1.10.1 Optional—Reduce fluorinated gas emissions from flat panel display manufacturing

*Replace the text, table, and equation of 4.1.10.1 with the following:*

**Corporate criterion:** The manufacturer shall annually demonstrate that processes have been implemented at supplier flat panel display manufacturing facilities (fabs) that achieve a reduction of at least 90% of fluorinated greenhouse gas (F-GHG) emissions resulting from the production of flat panel displays, in accordance with the performance reflected in Table 4.

This criterion shall be achieved by at least 75% of flat panel display suppliers by annual spend (fiscal or calendar) that produce flat panel displays in products declared to conform to this standard. Scope may be at the supplier level, fab level, or for the portion of the fab used in products declared to conform to this standard for the manufacturer. Other flat panel displays may be included.

Performance results can be achieved through a calculation demonstrating that F-GHG emissions have been reduced by at least 90% across all fabs (or portions of fabs) in scope, based on an uncontrolled baseline using Equation (2) and other example equations in Appendix B.

$$\begin{aligned} \text{Total reduced emissions (\%)} = & \\ & 100 \times \left[ \frac{\text{Uncontrolled emissions prior to implementation of reduction processes} - \text{Emissions after implementation of reduction processes}}{\text{Uncontrolled emissions prior to implementation of reduction processes}} \right] \end{aligned} \quad (2)$$

---

<sup>7</sup> The numbers in brackets correspond to the numbers of the bibliography in Annex H.

Tools that are utilizing reduction approaches a), b), or c) (described below) may be excluded from the calculation, given that these approaches are known to result in a 90% or better F-GHG reduction. If all manufacturing and ancillary operations tools for all fabs in scope utilize reduction options a), b), or c), then no F-GHG reduction calculation is necessary.

**Reduction Approaches:**

- a) Installation (new or retrofitted), operation and maintenance of emission control technology designed specifically to recycle, remove or destroy F-GHG emissions used in the production of flat panel displays,
- b) Utilization of a gas(es) with global warming potential (GWP) of 2300 or less,
- c) Use of NF<sub>3</sub> remote plasma clean for cleaning chemical vapor deposition (CVD) chambers (only in combination with methods a) and/or b) above),
- d) Other reduction approaches that can be demonstrated to sufficiently reduce F-GHG emissions in accordance with this criterion. These may include, but are not limited to, process optimization, process change(s), use of gases that results in lower emissions, on a CO<sub>2</sub>e basis, than the gases replaced, for example due to a higher utilization rate (after consideration of by-product generation), etc.

**Table 4—Performance based on reduction in F-GHG emissions optional points**

Performance	Total points
The reduction requirement of this criterion has been met for all fabs or portions of fabs in scope, excluding those in operation prior to 2007.	1
The reduction requirement of this criterion has been met for all fabs or portions of fabs in scope.	2

A maximum of two optional points may be claimed for this criterion. If all products declared by the manufacturer to conform to this standard do not contain flat panel displays, manufacturers shall declare “Not Applicable.”

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products declared to conform to this standard.

**Verification requirements:**

- a) Declaration that manufacturer met the requirements of this criterion for 75% of suppliers of flat panel displays in products declared to conform to this standard, by annual spend (fiscal or calendar).
- b) Supplier letter(s) or documentation that indicates the following:
  - 1) Which of the two performance results in Table 4 are being demonstrated, and
  - 2) The extent to which each fab is covered (e.g., at the supplier level, fab level, or for the portion of the fab used in products declared to conform to this standard for the manufacturer), and
  - 3) If performance is demonstrated for a portion of fab operations, the supplier shall provide the manufacturer with an explanation of how the relevant portions of the impacted fab(s) have been accounted for and/or calculated in order to demonstrate that the 90% emission reduction was achieved without including the non-relevant portions (e.g., allocation of F-GHGs used in manufacturing the flat panel displays for the product or product type vs. other products).

- c) Supplier letter(s) indicating which reduction approach(es) was used to achieve the performance in Table 4. Supplier letter(s) shall also include one or more of the following (based on which reduction approach(es) is used):
- 1) If calculating the 90% F-GHG emission reduction, the supplier letter(s) shall include all of the following:
    - i) A description of the procedures or processes used to achieve the results from the most recent calendar or fiscal year, including how tools using reduction approaches a), b), or c) were excluded from the calculation, if applicable,
    - ii) The percentage of F-GHG emissions avoided,
    - iii) The calculation used to achieve 90% reduction; baseline emissions shall be calculated based on the most recent fab, industry average, or company records (e.g., gas purchase records) available prior to when the alternative gas, equipment, and/or process was employed (see Annex B for example equations).
  - 2) If excluding manufacturing tools and ancillary equipment from the calculation by using one or more reduction approaches a), b), or c), supplier shall demonstrate that all excluded tools and equipment are equipped as defined below, based on the reduction approach(es) used:
    - i) If abatement equipment is used to achieve this criterion, a statement certifying that the abatement equipment meets the following requirements:
      - For U.S. EPA Greenhouse Gas Reporting Rule, Subpart I, the abatement equipment has been installed, maintained, and operated in accordance with the site maintenance plan for abatement systems that is developed and maintained in records as specified in 98.97(d)(9).
      - For IPCC Tier 2a, 2b, or 3 methodology, the abatement equipment is any combination of electrically heated, fuelled-combustion, plasma, and/or catalytic devices that are specifically designed to abate F-GHGs and are used within the manufacturer's specified process window and in accordance with specified maintenance schedules. Also, the DREs of these abatement devices have been measured and confirmed under actual process conditions, using a technically sound protocol, which accounts for known measurement errors including, for example, CF<sub>4</sub> by-product formation during C<sub>2</sub>F<sub>6</sub> abatement as well as the effect of dilution, the use of oxygen, or both, in combustion abatement systems.
    - ii) If gases with a GWP of 2300 or less are used toward the achievement of this criterion, the supplier letter(s) shall include the following information:
      - The percentage of the impacted manufacturing and ancillary operation tools that are using gases with a GWP of 2300 or less.
      - Demonstration that the GWP of the gas(es) is less than 2300 (e.g., in peer reviewed literature, IPCC assessment report).
      - Demonstration that when accounting for byproduct emissions and gas utilization rate, the total emissions on a CO<sub>2</sub>e basis, from using a gas with a GWP of 2300 or less, are 90% less compared to total emissions (accounting for byproduct emissions and gas utilization rate) when using SF<sub>6</sub> for the same production. This may be demonstrated through, for example, measured and documented emission factors and by product formation factors.
    - iii) If supplier utilizes NF<sub>3</sub> remote plasma for CVD chamber clean toward the achievement of this criterion (in combination with other reduction methods), the supplier letter(s) shall include the following information:
      - The percentage of impacted CVD chamber cleaning process tools that are using NF<sub>3</sub> remote plasma clean. If not all chamber clean process tools are using NF<sub>3</sub>

remote plasma clean, demonstration that all other chamber clean process tools are using another reduction method (i.e., have emission reduction technology installed or are using gases with a GWP of 2300 or less).

- Declaration that  $\text{NF}_3$  remote plasma clean processes are being used in accordance with manufacturer specifications (e.g., flow rates). If deviations occur from specifications, the declaration should include an indication as to why.

**Additional details:**

F-GHGs are  $\text{SF}_6$ ,  $\text{NF}_3$ , perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Examples of PFCs and HFCs include, but are not limited to,  $\text{CF}_4$ ,  $\text{C}_2\text{F}_6$ ,  $\text{C}_3\text{F}_8$ ,  $\text{c-C}_4\text{F}_8$ ,  $\text{C}_4\text{F}_8\text{O}$ ,  $\text{CHF}_3$ , and  $\text{CH}_2\text{F}_2$ .

Process Optimization is adjusting a process so as to improve a specified set of parameters (e.g., when flat panel display suppliers use less F-GHGs or use F-GHGs more efficiently in the manufacturing process).

Equations for emission reduction with abatement calculation and alternative gas calculation are provided in Annex B.

**4.1.10.2 Optional—Reduce fluorinated greenhouse gas emissions from semiconductor production**

*Replace the text, table, and equations of 4.1.10.2 with the following:*

**Corporate criterion:** Manufacturer shall meet the requirements of Part A for one point, and both Part A and Part B for two points total. The scope of Part A and Part B of this criterion shall include all 300 mm process semiconductor manufacturing facilities (fabs) that produce semiconductor components (e.g., CPUs, DRAM, accelerators) in products declared to conform to this standard for the manufacturer, from 75% of all the manufacturer's semiconductor component suppliers, by annual spend (fiscal or calendar) for those products. Supplier may include other semiconductor components; requirements may be met at the supplier level, fab level, or for the portion of the fab used in products declared to conform to this standard for the manufacturer.

**Part A:** The manufacturer shall demonstrate that both requirements a) and b) below are met by all impacted suppliers for each fab in scope.

- a) Develops a fluorinated greenhouse gas (F-GHG) emissions inventory using one of the following methods:
  - 1) The methods included in the US EPA Greenhouse Gas Reporting Rule, Subpart I
  - 2) The most recent IPCC Tier 2a, 2b, or 3 methodology. If using the IPCC 2006 Tier 2a or 2b methodology, multiply the IPCC 2006 Tier 2a or 2b emissions by a factor of 1.13<sup>8</sup> to obtain adjusted IPCC 2006 Tier 2a or 2b emissions from etching and chamber cleaning processes:

For either 1) or 2), where a F-GHG is used in a process type or subtype for which it has no default emission factor in either the current IPCC guidance or in US EPA Greenhouse Gas Reporting Rule, Subpart I, the supplier may either:

- Assume that 100% of the F-GHG is emitted from the process type or subtype before accounting for abatement, or

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<sup>8</sup> The calibration factor is based on the following ratio: Emissions calculated based on the GHGRP default emission factors (EFs) for 300 mm fabs and the F-GHG consumption by the Semiconductor Industry Association's "sample set" of 300 mm fabs/Emissions calculated based on the Tier 2b IPCC default EFs and the F-GHG consumption by SIA's "sample set" of 300 mm fabs.

- Apply the utilization rate and by-product formation rates of the F-GHG that have been measured for the process using the latest version of the International SEMATECH Manufacturing Initiative (ISMI) Guideline for Environmental Characterization of Semiconductor Process Equipment.

The supplier shall calculate emissions in carbon-dioxide-equivalents (CO<sub>2</sub>e) by applying the set of chemical-specific, 100-year global warming potentials (GWPs) from the IPCC Fourth Assessment Report (IPCC AR4), Table A-1 of Subpart A of 40 CFR Part 98, or the IPCC Fifth Assessment Report (IPCC AR5). For F-GHGs that do not have chemical-specific 100-year GWPs in either IPCC AR4 or IPCC AR5, the supplier shall apply the default GWP in Table A-1 of Subpart A of 40 CFR Part 98 for the F-GHG group of which the F-GHG is a member.

- b) Annually reports inventory results publicly, including (at a minimum) emissions of fluorinated GHGs used in the following:
  - 1) Plasma etching/wafer cleaning,
  - 2) Chamber cleaning processes,
  - 3) Heat transfer fluid use (e.g., those used for temperature control, device testing, cleaning substrate surfaces and other parts, soldering).

This inventory shall be compiled and reported once annually by the supplier.

**Part B (additional 1 point):** The manufacturer shall demonstrate that F-GHG emissions have been reduced across all fabs, (or portions of the fabs) in scope, by the applicable percentage in Table 5 from the uncontrolled baseline emissions calculated as per the Equation (3) and Equation (4). Fluorinated heat transfer fluids (F-HTFs) may be included in or excluded from the reduction assessment.

This percentage shall be calculated and demonstrated once annually and either publicly reported or reported to the manufacturer (see Table 5).

**Table 5—Percent reduction in F-GHG emissions**

	If F-HTF emissions are included in the reduction assessment	If F-HTF emissions are excluded in the reduction assessment
<b>Percentage reduced</b>	≥ 70%	≥ 75%

**Overall equation:** To calculate the percent of F-GHG reduced emissions for the 300 mm fabs, the supplier shall use the following Equations [(3) and (4)]:

$$\text{Percent of Total Reduced Emissions} = 100\% \times \left( 1 - \left( \frac{\sum TE_{Fab}}{\sum BE_{Fab}} \right) \right) \quad (3)$$

where:

*TE<sub>Fab</sub>* is the Total Emissions per fab in scope calculated using the methodologies in Part A (metric tons CO<sub>2</sub>e). Fab data may or may not include F-HTFs, depending on reduction target selected from Table 5. If using Tier 2a, apportioning consumption between etch wafer clean and chamber clean is required for Equation (4).

*BE<sub>Fab</sub>* is Baseline Emissions per fab calculated using the following equation, either including or excluding F-HTFs depending on option selected in Table 5 (metric tons CO<sub>2</sub>e).

**$BE_{Fab}$  equation per fab:**

$$BE_{Fab} = 1.15 \times ((C_{EW} \times WF_{EW}) + (C_{CC} \times WF_{CC})) \quad (4)$$

where:

- 1.15 is the factor to account for fluorinated heat transfer fluid emissions<sup>9</sup> (omit if excluding HTFs)
- $C_{EW}$  is the total consumption of all F-GHGs by all etching and wafer cleaning processes within the fab (metric ton)
- $WF_{EW}$  is the weighting factor for etching and wafer cleaning (CO<sub>2</sub>e / metric ton)<sup>10</sup>
- $WF_{EW}$  is 5940 (if using AR4 GWPs for Part A)
- $WF_{EW}$  is 5330 (if using AR5 GWPs for Part A)
- $C_{CC}$  is the total consumption of all F-GHGs by all chamber cleaning processes within the fab (metric ton)
- $WF_{CC}$  is the weighting factor for chamber cleaning (CO<sub>2</sub>e / metric ton)<sup>11</sup>
- $WF_{CC}$  is 8260 (if using AR4 GWPs for Part A)
- $WF_{CC}$  is 7495 (if using AR5 GWPs for Part A)

Details for calculating  $C_{EW}$  and  $C_{CC}$  for each fab:

- To calculate the total consumption for all etching and wafer cleaning processes within the fab ( $C_{EW}$ ), sum the masses of all fluorinated GHGs fed into etching and wafer cleaning processes in the fab during the year for which the F-GHG Inventory in Part A was prepared.
- To calculate the total consumption for all chamber cleaning processes within the fab ( $C_{CC}$ ), sum the masses of all fluorinated GHGs fed into CVD chamber cleaning processes (in-situ plasma, remote plasma, and in-situ thermal) in the fab during the year for which the F-GHG Inventory in Part A was prepared.

If all the products declared by the manufacturer to conform to this standard do not contain a component covered by this criterion, the manufacturers shall declare “Not Applicable.” This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

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<sup>9</sup> 1.15 = Factor to account for fluorinated heat transfer fluid emissions (omit if excluding HTFs).

<sup>10</sup> The AR4 and AR5 coefficients for calculating baseline emissions from the etch/wafer clean process type are based on the following procedures:

- CF<sub>4</sub> is used as the baseline F-GHG.
- The subpart I emission and by-product formation factors for CF<sub>4</sub> used in etching processes in 300 mm fabs (see Table I-4 to subpart I of 40 CFR Part 98) are each multiplied by the corresponding AR4 or AR5 GWP for CF<sub>4</sub> and each by-product gas. The resulting products (GWPs × EFs) are then summed to derive the two coefficients. One coefficient is based on AR4 GWPs; the other is based on AR5 GWPs.

<sup>11</sup> The AR4 and AR5 coefficients for calculating baseline emissions from the chamber clean process type are based on the following procedures:

- C<sub>2</sub>F<sub>6</sub> is used as the baseline F-GHG.
- The subpart I emission and by-product formation factors for C<sub>2</sub>F<sub>6</sub> used in in-situ plasma clean in 200 mm fabs (see Table I-3 to subpart I of 40 CFR Part 98) are each multiplied by the corresponding AR4 or AR5 GWP for C<sub>2</sub>F<sub>6</sub> and each by-product gas. The resulting products (GWPs × EFs) are then summed to derive the two coefficients. One coefficient is based on AR4 GWPs; the other is based on AR5 GWPs.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) Requirements for Part A:
  - 1) Declaration that manufacturer met the requirements of this criterion for 75% of suppliers of semiconductors in products declared to conform to this standard, by annual spend (fiscal or calendar).
  - 2) Supplier letter(s) or declaration with the following information:
    - i) Whether performance is demonstrated at the supplier-level, fab-level, or portion of the fab associated with the manufacturer.
    - ii) If any portion of the fab operations is excluded (i.e., performance is demonstrated for a portion of fab operations), the manufacturer shall provide information from the semiconductor supplier(s) that explains how the portions of the impacted fab(s) have been accounted for and included in the calculation in order to demonstrate conformance.
    - iii) Which methods were used to develop the F-GHG emissions inventory.
    - iv) Which of the GWPs allowed in Part A were used (IPCC AR4 or IPCC AR5).
    - v) Method used to estimate DREs of abatement equipment, if abatement is used (i.e., default or fab-specific).
  - 3) URL(s) where the inventory reporting is posted by the covered suppliers.
- b) Requirements for Part B:
  - 1) Supplier letter(s) or declaration including the following:
    - i) Demonstration of the equation used to calculate the percentage of F-GHG emissions reduced and whether F-HTFs were included or excluded from the reduction calculation (i.e., reference Equation (3): uncontrolled emissions used for etching/wafer cleaning and chamber cleaning, and emissions after implementation of reduction processes for etching/wafer cleaning and chamber cleaning.)
    - ii) The reduction approach(s) used to demonstrate conformance with this criterion.
    - iii) If abatement equipment is used to achieve this criterion, a statement certifying that the abatement equipment meets the following requirements:
      - For U.S. EPA Greenhouse Gas Reporting Rule, Subpart I, the abatement equipment has been installed, maintained, and operated in accordance with the site maintenance plan for abatement systems that is developed and maintained in records as specified in 98.97(d)(9).
      - For IPCC Tier 2a, 2b, or 3 methodology the abatement equipment is any combination of electrically heated, fuelled-combustion, plasma, and/or catalytic devices that are specifically designed to abate F-GHGs and are used within the manufacturer's specified process window and in accordance with specified maintenance schedules. Also, the DREs of these abatement devices have been measured and confirmed under actual process conditions, using a technically sound protocol, which accounts for known measurement errors including, for example, CF<sub>4</sub> by-product formation during C<sub>2</sub>F<sub>6</sub> abatement as well as the effect of dilution, the use of oxygen or both in combustion abatement systems.
    - iv) If performance is demonstrated for a portion of fab operations, a supplier declaration that all portions of the fab(s) in scope were included.

- 2) Demonstration that the total percent of F-GHG reduced emissions for each supplier included in scope was either reported to the manufacturer or reported publicly [e.g., supplier letter(s), URL(s)].

**Additional details:** Examples of reduction methods for F-GHG emissions are provided in Annex C.

## 4.2 Materials selection

### 4.2.1 Post-consumer recycled plastic content

#### 4.2.1.1 Required—Minimum post-consumer recycled plastic, ITE-derived post-consumer recycled plastic or bio-based plastic content

*Replace the text of 4.2.1.1 with the following:*

**Product criterion:** Product shall contain, on average, a minimum of 2% of any combination of post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, or bio-based plastic, measured as a percentage of total amount of plastic (by weight) in the product.

The following may be excluded from the calculation of percentage:

- a) Printed circuit boards, labels, cables, connectors, electronic components, optical components, ESD components, EMI components, adhesives, and coatings
- b) For ruggedized devices
  - External enclosure and
  - Specialized parts, such as swivels and hinges
- c) External components sold with the product

If an allowable exclusion is used, the plastic content of the component or part must be excluded from both the numerator and the denominator of the calculation of percentage.

This criterion is “Not Applicable” if the product contains a total combined weight of plastic < 100 g after exclusions are removed.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All covered products.

#### **Verification requirements:**

- a) Supplier letter(s) stating percentage of applicable content(s) in plastic(s) supplied to manufacturer or to manufacturer’s part supplier.
- b) Documentation of calculation, including plastic part name(s) or other part identifiers and the total weight of their plastic content, as well as the weight of plastic content that is post-consumer, ITE-derived post-consumer, or bio-based.
- c) If excluding parts, list of excluded parts and reason for exclusion.

**Additional details:** If carbon fiber, filler materials or additives are used in post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, or bio-based plastic, the percentage calculation is made by dividing the weight of the post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, and bio-based plastic by the full weight of the plastic material, including additives and fillers, in the part or product. Additives and fillers are not considered recycled plastic, except in the case where the, additives or fillers are derived from a recycled feedstock.

NOTE—If a continuous carbon fiber material is bound by a resin such as epoxy or acrylic, the continuous carbon fiber material is not considered a plastic but the resin binder would be considered a plastic. If, however, a molded part includes glass or carbon fiber in the flowed resin, the glass or carbon fiber would be included in the weight of the plastic.

**4.2.1.2 Optional—Higher post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, or bio-based plastic content**

*Replace the text, table, and equations of 4.2.1.2 with the following:*

**Product criterion:** Product shall contain, on average, a minimum total percentage of any combination of post-consumer recycled plastic content, ITE-derived post-consumer recycled plastic content, or bio-based plastic content as defined in Table 6. The portion of ITE-derived post-consumer recycled plastic content applied toward Criterion 4.2.1.3 shall not be applied toward this criterion (i.e., shall not be included in the numerator, and shall be included in the denominator for the calculation). Total percentage content is measured as a percentage of total included plastic (by weight) in the product.

**Table 6—Optional points for minimum percent content by product type**

Product type	Minimum % content for 1 optional point	Minimum % content for 2 optional points
Desktop computer, <sup>a</sup> workstation, thin client, portable all-in-one computer, and small-scale server	10	35
Integrated desktop computer	15	40
Notebook computer	5	10
Tablet/slate	3	5
Monitor	15	50
NOTE—Optional points are not additive (maximum of two optional points)		

<sup>a</sup> Not including integrated desktop computer

The following may be excluded from the calculation of percentage:

- Printed circuit boards, labels, cables, connectors, electronic components, optical components, ESD components, EMI components, adhesives and coatings.
- Specialized plastic parts such as swivels and hinges for ruggedized devices.
- External components sold with the product.

If an allowable exclusion is used, the plastic content of the component or part must be excluded from both the numerator and the denominator of the calculation of percentage.

If the sum of included plastic after exclusions are removed weighs less than 100 g, the manufacturer may declare “Not Applicable” for this criterion.

If conformance to this criterion is interrupted by temporary circumstances limited to natural disasters (i.e., fire, flood, earthquakes, typhoons, hurricanes, etc.), acts of war or terrorism, significant labor strikes, or devastating accidents to a supplier facility (i.e., explosion, structural collapse, fire, etc.), conformance to the criterion may be retained if the manufacturer demonstrates the intent to reinstate the supply. This criterion cannot be initially claimed during such a supply interruption.

This criterion may be declared differently in each country or region for which the product is declared to conform to this standard.

**Applies to:** All covered products.

**Verification requirements:**

- a) Supplier letter(s) stating percentage of applicable content(s) in plastic(s) supplied to manufacturer or to manufacturer's part supplier.
- b) Documentation of calculation, including plastic part name(s) or other part identifiers and the total weight of their plastic content, as well as the weight of plastic content that is post-consumer, ITE-derived post-consumer, or bio-based.
- c) If excluding parts, list of excluded parts and reason for exclusion.
- d) If supply is temporarily disrupted, manufacturer shall provide information regarding the disruption, including the dates in which the impacted supply was disrupted and reinstated, the reason for the disruption, and information or attestations from suppliers, and steps the manufacturer is taking to reinstate supply, as relevant.

**Additional details:**

If filler materials or additives are used in post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, and bio-based plastic, the percentage calculation is made by dividing the weight of the post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, and bio-based plastic by the full weight of the plastic material, including additives and fillers, in the part or product. Additives and fillers are not considered recycled plastic, except in the case where the additives or fillers are derived from a recycled feedstock.

NOTE—If a continuous carbon fiber material is bound by a resin such as epoxy or acrylic, the continuous carbon fiber material is not considered a plastic but the resin binder would be considered a plastic. If, however, a molded part includes glass or carbon fiber in the flowed resin, the glass or carbon fiber would be included in the weight of the plastic.

Equation (5) and Equation (6) shall be used to calculate whether the product meets this criterion:

- For products that are not claiming conformance to Criterion 4.2.1.3

$$\frac{(PCB_T)}{P_T} \times 100 \geq \text{applicable \% in Table 6} \quad (5)$$

where

$PCB_T$  is the total amount of bio-based, PCR, and/or ITE-derived PCR plastic content in the product (by weight)

$P_T$  is the total amount of included plastic content in the product (by weight)

— For products that are claiming conformance to Criterion 4.2.1.3

$$\frac{(PCB_T - CL_T)}{P_T} \times 100 \geq \text{applicable \% in Table 6} \quad (6)$$

where

$PCB_T$  is the total amount of bio-based, PCR, and/or ITE-derived PCR plastic content in the product (by weight)

$P_T$  is the total amount of included plastic content in the product (by weight)

$CL_T$  is the total amount of ITE-derived PCR plastic content being used to claim conformance to Criterion 4.2.1.3 (by weight); this may not be equal to the total ITE-derived PCR plastic in the product

#### 4.2.1.3 Optional—ITE derived post-consumer recycled plastic content

*Replace the text of 4.2.1.3 with the following:*

**Product criterion:** Product shall contain, on average, a minimum of ITE-derived post-consumer recycled plastic per either following methods:

- a) Product external enclosure shall contain, on average, a minimum of 10% ITE-derived post-consumer recycled plastic, measured as a percentage of total plastic (by weight) in the enclosure. The following may be excluded from the calculation of percentage if applicable to the enclosure: printed circuit boards, labels, cables, connectors, electronic components, optical components, ESD components, and EMI components.
- b) Product shall contain, on average, a minimum of 10% ITE-derived post-consumer recycled plastic, measured as a percentage of total amount of plastic (by weight) in the product. The following may be excluded from the calculation of percentage:
  - 1) Printed circuit boards, labels, cables, connectors, electronic components, optical components, ESD components, EMI components, adhesives and coatings
  - 2) Specialized parts such as swivels and hinges for ruggedized devices
  - 3) External components sold with the product

For external enclosures for which the sum of plastic parts in the enclosure weighs less than 10% by weight of the enclosure and the sum of included plastic after exclusions are removed weighs less than 100 g the manufacturer may declare “Not Applicable” for this criterion.

This criterion may be declared differently in each country or region for which the product is declared to conform to this standard.

**Applies to:** All covered products.

**Verification requirements:**

- a) Statement of whether calculation method a) or b) was used.
- b) Supplier letter(s) stating percentage ITE-derived post-consumer recycled plastic(s) supplied to manufacturer or to manufacturer’s part supplier.

- c) Documentation of calculation, including plastic part name(s) or other part identifiers and the total weight of their plastic, as well as the weight of plastic content that is ITE-derived post-consumer recycled plastic.
- d) Certification attesting that the average minimum content of the resin is made from ITE-derived post-consumer recycled plastics as defined in this criterion and in accordance with either UL ECVP 2809 (3<sup>rd</sup> edition), BS/EN 15343:2007, SCS Services Recycled Content Standard V7.0, or equivalent standard. Certification shall be obtained from a certification body for which the specific standard is in the scope of their accreditation.

**Additional details:** If filler materials or additives are used in post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, and bio-based plastic, the percentage calculation is made by dividing the weight of the post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, and bio-based plastic by the full weight of the plastic material, including additives and fillers, in the part or product. Additives and fillers are not considered recycled plastic, except in the case where the additives or fillers are derived from a recycled feedstock.

NOTE—If a continuous carbon fiber material is bound by a resin such as epoxy or acrylic, the continuous carbon fiber material is not considered a plastic but the resin binder would be considered a plastic. If, however, a molded part includes glass or carbon fiber in the flowed resin, the glass or carbon fiber would be included in the weight of the plastic.

Requirements for an equivalent recycled content standard:

- Developed through a government process, or open stakeholder consultation process, and adopted by a voluntary national or international standards body or organization, or by a government organization;
- Defines requirements for tracking the source and type of recycled material from generation to fabrication of parts, validating and record-keeping of suppliers, and defines post-consumer content in alignment with 3.1;
- Applicable within the country(s)/region(s) being declared to, and is applicable to the product(s) for which conformity with this criterion is being claimed;
- Publicly available.

## 4.3 Design for end of life

### 4.3.2 Plastics recyclability

#### 4.3.2.1 Required—Plastic parts compatible with recycling

*Replace the text of 4.3.2.1 with the following:*

**Product criterion:** All discrete plastic parts shall meet the following requirements:

For discrete plastic parts > 25 g:

- a) Clearly marked with material type in accordance with ISO 11469/1043, excluding optical parts.
- b) Do not contain a metal insert or fastener that is (1) molded in, (2) heat or ultrasonically inserted, or (3) glued in, unless the metal component is either separable by breaking off from the plastic part, or is separable with commonly available tools. Fan impellers are excluded from this requirement.

For discrete plastic parts > 100 g:

- c) Do not have an adhesive, coating, paint, or finish that is not compatible with recycling. Plastic parts with > 25% post-consumer recycled content are exempt from this requirement.

The following are excluded from this requirement:

- Printed circuit boards assemblies for items b) and c), printed circuit boards for item a)
- Wires and cables, connectors, electronic components, optical components, acoustic components, ESD components, and EMI components
- An adhesive, coating, paint, and finish for item c), or a metal insert/fastener for item b), required for safety, legal, or technical requirements

If the product does not contain a discrete plastic part weighing > 25 g, the manufacturer may declare “Not Applicable.”

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All covered products.

**Verification requirements:**

- a) List of discrete plastic parts > 25 g and > 100 g as per the requirements of the criterion, including as applicable:
  - 1) Plastic part description and if available, unique part number
  - 2) Resin type(s)
  - 3) Instances where the part contains an adhesive, coating, paint, or finish or a statement where there is none
  - 4) Instances where the part contains a covered metal insert or fastener, or a statement where there is none
  - 5) Basis for safety, legal, or technical requirement exemption(s) of non-compatible adhesives, coatings, paints, and finishes or a metal insert/fastener, if claimed
- b) For criterion requirement a), a drawing, part specification or photo of the plastic part marking(s)
- c) For criterion requirement b) provide either:
  - 1) Documentation that the product does not contain a metal insert or fastener that is molded in, heat or ultrasonically inserted, or glued in; or
  - 2) For instances where metal inserts or fasteners are molded; heat or ultrasonically inserted; or glued into plastic parts, documentation showing how it is separable by way of breaking off from the plastic part or with the use of commonly available tools
- d) For criterion requirement c), compatibility of a surface coating(s) (adhesives, coatings, paints, or finishes) with recycling shall be demonstrated through either:
  - 1) Test results showing that the surface coating(s) does not lead to more than a 25% reduction in the notched Izod or Charpy impact at room temperature, as measured using ASTM D256, ASTM E23, ISO 180, or ISO 179-1; one test result can be representative for multiple parts in the event that the same material is used in the parts and that the worst-case application is tested; or

- 2) A statement from a minimum of three plastics recyclers individually, or at least one plastics recycler processing plastics from electronics and working under an independent entity (e.g., not contracted/associated with the manufacturer or contracted with a trade organization), confirming these surface coatings do not negatively impact the recyclability of the plastic; or
- 3) Supplier letter(s) stating that the percentage of post-consumer recycled content in the plastic part is > 25%

**Additional details:** A discrete plastic part refers to a piece that is originally formed (e.g., molded) as an individual plastic piece. The 25 g and 100 g thresholds apply only to the portion of the part composed of plastic.

#### 4.3.2.2 Required—Plastic parts separable for recycling

*Replace the text of 4.3.2.2 with the following:*

**Product criterion:** All discrete plastic parts > 25 g shall be:

- Composed of a single resin, or a combination of resins (e.g., a blend), that are compatible for recycling, and
- Separable by hand or with commonly available tools from other plastic parts that are > 25 g and not compatible together for recycling.

Printed circuit boards, wires and cables, connectors, electronic components, optical components, acoustic components, ESD components, and EMI components are excluded from this requirement.

If the product does not contain discrete plastic parts weighing > 25 g, the manufacturer may declare “Not Applicable.”

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All covered products.

**Verification requirements:**

- a) List of discrete plastic parts > 25 g including:
  - 1) Plastic part description and if available, unique part number
  - 2) Resin type(s)
- b) Demonstration that plastic parts covered by this criterion are separable from other plastic parts > 25 g by hand or with commonly available tools, such that plastic parts are compatible for recycling
- c) If the plastic part > 25 g is made from a blend or combination of resins, provide one of the following:
  - 1) Demonstration that the resins have “good compatibility” or “limited compatibility” using Annex C in ECMA-341 Environmental Design Considerations for ICT and CE Products, 4th Edition / December 2010.<sup>12</sup> If a plastic part is made up of more than one resin, and “good compatibility” or “limited compatibility” cannot be determined because one or more of the

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<sup>12</sup> Available at <https://www.ecma-international.org/publications/standards/Ecma-341.htm>.

resins is not reflected in ECMA-341 Annex C, the manufacturer shall demonstrate that the resin blend is compatible with recycling using c)2) or c)3) below; or

- 2) Test results showing that there is not more than a 25% reduction in the notched Izod or Charpy impact at room temperature, as measured using ASTM D256, ASTM E23, ISO 180, or ISO 179-1; one test result can be representative for multiple parts in the event that the same material is used in the parts and that the worst-case application is tested; or
- 3) A statement from a minimum of three plastics recyclers individually, or at least one plastics recycler processing plastics from electronics and working under an independent entity (e.g., not contracted/associated with the manufacturer or contracted with a trade organization), confirming the resin blend does not negatively impact the recyclability of the plastic.

**Additional details:** A discrete plastic part refers to a piece that is originally formed (e.g., molded) as an individual plastic piece. The 25 g threshold applies only to the portion of the part composed of plastic.

## 4.4 Product longevity/life-cycle extension

### 4.4.1 Increasing product longevity

#### 4.4.1.2 Optional—Long-life rechargeable battery

*Replace the text of 4.4.1.2 with the following:*

**Product criterion:** The product shall contain a long-life rechargeable battery.

A long-life rechargeable battery is a battery pack, including the battery cell(s), an enclosure and control circuitry, that is capable of providing primary power to the product, and when tested in accordance with IEC 61960 and as modified by this criterion, is chargeable to > 65% of its original design capacity after 1000 cycles. A battery that is tested to a shorter cycle count with a greater capacity, e.g., 80% capacity after 300 cycles, does not meet the requirements of this criterion.

The IEC 61960 test parameters and definitions (for cycle, C, and ambient temperature) shall be modified as below when demonstrating that the performance of a rechargeable battery meets the requirements of this criterion:

- a) Charge battery from a fully discharged condition to charge completion, either:
  - 1) At a rate of not less than 0.5C using constant current (CC) and constant voltage (CV), or CC/CV mode, as follows:
    - i) Initial charge shall be CC, from a fully discharged state to the charge voltage limit defined by the product manufacturer to be either:
      - The maximum single cell charge voltage for single cells, or
      - The maximum pack charge voltage for the battery pack.
    - ii) Subsequent CV charge shall be no more than the voltage applicable to a)1) above, and shall be terminated when the current drops below a rate of C/40.
  - 2) Using an alternate charging profile that is representative of the charging profile of the product.

- b) Discharge battery with a constant current of  $> 0.2C$ , to the voltage cutoff limit defined by the manufacturer to be 100% depth of discharge.
- c) Rest periods after charge and discharge are allowed.

This criterion may be declared differently in each country or region for which the product is declared to conform to this standard.

If the product does not contain a rechargeable lithium ion or lithium polymer battery that can provide primary power, the manufacturer may declare “Not Applicable.”

**Applies to:** All covered products.

**Verification requirements:**

- a) Demonstration that a long-life rechargeable battery is included with the product.
- b) Test report(s) that demonstrate that the battery pack or cells meets or exceeds the requirements of this criterion, using the test parameters of a)1) or a)2) above. The test report must include the charge and discharge parameters used.
- c) If option a)2) is used, a manufacturer declaration that the battery test was conducted using a charge profile that matches that of the product.

**Additional details:**

This criterion does not apply to separate batteries that provide power to external components.

The following test parameters and definitions apply to this criterion:

- Cycle: Completion of one or more discharges equal to the current capacity of the battery. Recharge and discharge shall be in accordance with parts a) and b) of the criterion, accordingly.
- C: The theoretical charge or discharge rate of a battery in one hour. Example: A 1000 mAh battery provides 1000 mA for one hour if discharged at a rate of 1C.
- Ambient temperature =  $20 \pm 5C$ .

See Part 3 of IEC 61960.<sup>13</sup>

#### 4.4.2 Increasing reparability and recyclability

##### 4.4.2.2 Optional—Publicly available service information

*Replace the text of 4.4.2.2 with the following:*

**Product criterion:** The manufacturer shall provide service and repair information for the product, excluding external components, on a publicly accessible website, as follows:

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<sup>13</sup> IEC 61960-3:2017, Secondary cells and batteries containing alkaline or other non-acid electrolytes—Secondary lithium cells and batteries for portable applications—Part 3: Prismatic and cylindrical lithium secondary cells and batteries made from them.

- Disassembly instructions including identifying the required tools.
- Exploded diagram of parts.
- List of spare parts including manufacturer-approved spare parts and how to obtain them.
- Maintenance procedures or guidance on where to obtain the procedures.
- Troubleshooting instructions, software diagnostic tools, troubleshooting videos or other troubleshooting guidance.
- Instructions on how to obtain software updates (not applicable to display products).
- Instructions on how the user can remove personal data. If the instructions require destruction of the storage, instructions to replace the storage shall be provided (not applicable to display products).

It is acceptable for service instructions to exclude information that, as determined by the manufacturer:

- a) May expose the user to risk of injury, or
- b) Breaches intellectual property rights, or
- c) Compromises user privacy or security, or
- d) Involves the disassembly of a battery pack or power supply.

If claiming any of the four exclusions above, the manufacturer shall demonstrate how the product is restored to normal operating condition after being repaired. Repair may include replacement of the component(s) associated with the exclusion.

This information shall be available as PDF, HTML (including video available online), and/or IEEE Std 1874. Information shall be provided, at a minimum, in the dominant language(s) local to the region(s) or country(ies) in which the product is declared to conform to this criterion.

This criterion may be declared differently in each country or region for which the product is declared to conform to this standard.

**Applies to:** All covered products.

**Verification requirements:**

- a) Evidence the information listed in the criterion is:
  - 1) Available on a publicly accessible website (provide URL)
  - 2) Available in PDF, HTML, and/or IEEE Std 1874 formats
  - 3) Provided in the dominant language local to the region(s) or country(ies) in which the product is declared to conform to this criterion
- b) List of categories of service instructions excluded for reasons as listed above

**Additional details:** The manufacturer may provide the above information with the use of varying terminology (e.g., service or repair).

## 4.5 Energy conservation

### 4.5.1 Power management system

#### 4.5.1.3 Optional—Energy efficiency for internal power supplies

*Replace the text and table of 4.5.1.3 with the following:*

**Product criterion:** The internal power supply(ies) used by the product shall meet 80 Plus efficiency levels greater than the minimum efficiency requirements as specified in the U.S. ENERGY STAR specification in effect at the time of declaration to this standard, and as per Table 8. Testing of the internal power supply shall be done at 115 V or 230 V using the EPRI/ecova Generalized Internal Power Supply Efficiency Test Protocol, or a test method with identical testing requirements. Test results shall be validated or the internal power supply shall be tested by an entity whose scope of accreditation includes the standard or test method for which it is supplying data, and that is accredited to ISO/IEC 17025 or witnessed or supervised by a certification body accredited to ISO/IEC 17065. The manufacturer shall determine which of the three voltage/frequency level combinations the internal power supply shall be tested at based on product type (reference Additional details).

**Table 8—Efficiency limit levels and associated points**

Efficiency limits	Points
One full 80 Plus efficiency level above the minimum efficiency level requirement as specified in the U.S. ENERGY STAR specification	1
Two full 80 Plus efficiency levels above the required equivalent efficiency level requirement as specified in the U.S. ENERGY STAR specification	2

If the minimum efficiency requirements of the applicable U.S. ENERGY STAR specification are modified, the internal power supply shall meet the requirements as per this criterion for the new minimum efficiency requirements by the effective date to remain in conformance with this criterion. A maximum of two optional points may be claimed for this criterion. If the product does not ship with an internal power supply or is not in scope of the referenced test protocol, the manufacturer may declare “Not Applicable” for this criterion.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All covered products, excluding displays.

**Verification requirements:**

- a) Test report(s) demonstrating that results were validated or the internal power supply tested by an entity whose scope of accreditation includes the standard or test method for which it is supplying data, and that is one of the following:
  - 1) A testing laboratory accredited to ISO/IEC 17025 or
  - 2) A manufacturer’s testing laboratory in which the testing is witnessed or supervised by a certification body accredited to ISO/IEC 17065
- b) Demonstration that the internal power supply has achieved required performance

**Additional details:**

- Accreditation to ISO/IEC 17025 may be met through accreditation to a country-specific standard having the identical requirements to ISO/IEC 17025 (e.g., EN ISO/IEC 17025).
- EPRI/ecova Generalized Internal Power Supply Efficiency Test Protocol (Rev. 6.7 or later).

## 4.6 End-of-life management

### 4.6.1 Product take-back service

#### 4.6.1.1 Required-Provision of product take-back services

*Replace the text of 4.6.1.1 with the following:*

**Corporate criterion:** The manufacturer shall provide a nationwide product take-back service for reuse, refurbishment, and/or recycling for products in countries within which the product is declared to conform to this standard. Processing of equipment recovered by the product take-back service should support the hierarchy of management of used and end-of-life electronic equipment and components based on reuse, refurbishment, and/or recycling first, before considering energy recovery and/or disposal.

The manufacturer shall make information publicly available describing the product take-back service, including how to utilize the service, or for institutional customers, the manufacturer may provide information directly (e.g., by way of the contract).

Manufacturer shall make information publicly available that identifies any direct costs associated with use of the product take-back service. In addition, any direct costs to the customer shall be made available or disclosed to the customer at the time of sale.

In jurisdictions where there are existing laws and/or regulations, which establish, sanction, or require the establishment of a program for the collection and recycling of registered products, demonstration of compliance with those legal requirements meets the requirements of this criterion.<sup>14</sup>

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) Demonstration that product take-back service is offered nationwide in countries where the product is registered, by any combination of the following to span each region:
  - 1) Demonstration of compliance with laws and/or regulations that establish and/or sanction a regional system for collecting and recycling registered products in countries or regions where the product is registered (if applicable); for example: invoices, registration forms, government-issued letters of compliance; or
  - 2) Demonstration of a takeback program offered by the manufacturer or an agent of the manufacturer.

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<sup>14</sup> For example, product take-back programs established to comply with the EU WEEE Directive conform to this criterion.

- b) Demonstration of the public availability of information describing the product take-back service, including how to utilize the service.
- c) Demonstration of the public availability of information identifying any direct costs associated with use of the product take-back service. If there are no direct costs, disclosure is not required.

**Additional details:** Manufacturer is not obligated to demonstrate utilization of the product take-back service.

*Replace the titles and text of 4.6.2 and 4.6.2.1 with the following:*

## **4.6.2 Rechargeable battery recycling**

### **4.6.2.1 Required—Provision of a rechargeable battery take-back program**

**Corporate criterion:** Manufacturer shall provide a take-back program for user-removable rechargeable batteries in declared products.<sup>15</sup>

The manufacturer shall make information publicly available describing the product take-back service, including how to utilize the service, or for institutional customers, the manufacturer may provide information directly (e.g., by way of the contract). The manufacturer shall identify and make publicly available any direct costs associated with use of the program.

The manufacturer shall demonstrate that the rechargeable battery take-back program (which shall be inclusive of user-removable rechargeable batteries) meets one of the following options:

Option 1: The manufacturer provides an independent rechargeable battery take-back program that meets all of the conditions [a) through e)] listed below with the following two additional requirements for battery return [condition b) below]:

- In jurisdictions where a voluntary collective scheme is also in operation, an independent take-back program shall offer:
  - At least 10% of the number of drop-off locations as compared to the voluntary collective scheme at the time of declaration of conformity to the standard.
  - 50% or more drop-off locations as compared to the voluntary collective scheme within a year from when the product is declared to conform to this criterion, and, 70% within two years.
- In jurisdictions that do not have a voluntary collective scheme at the time of declaration of conformance to this criterion, the program shall offer drop-off locations that are convenient for the consumer and/or a mail-back option.

If a mail-back program is offered, information shall be provided to the customer regarding how to package returns for safe and legal transportation in those countries within which the product is declared conformant.

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<sup>15</sup> External communications regarding the name of the take-back program may or may not specify user-removable rechargeable batteries.

Option 2: The manufacturer participates in a voluntary collective scheme that meets all the conditions [a) through e)] listed below. Participating in the Call2Recycle Program<sup>16</sup> [B4] as a Licensee is an example that meets Option 2 requirements.

Option 3: The manufacturer participates in and complies with legal requirements for a battery take-back program in jurisdictions where there are existing laws and/or regulations, which establish, sanction, or require the establishment of a program for the collection and recycling of rechargeable batteries from declared products. Manufacturer demonstration of participation in and compliance with those legal requirements meets Option 3 requirements.

For Options 1 and 2 above, the following conditions shall be met for a rechargeable battery take-back program:

- a) The program documentation shall require that the collection, transportation, and processing of the batteries be in accordance with all applicable laws, including international trans-boundary shipment regulations.
- b) Battery return: The program shall allow customers to return their rechargeable batteries used in declared products.

Examples of acceptable battery return options: mail-back programs, collection locations at retail stores, small and large businesses, cities, towns and government agencies.

- c) Transportation: The program shall have a contract, specification, or equivalent in effect that requires safe and legal transport of shipments from collection to final disposition to be in accordance with applicable laws and regulations.
- d) Data collection: The manufacturer shall require service providers associated with the program to provide information on the batteries collected, including their chemistry, weight, and type.
- e) Process and recovery: The program requires batteries and processing by-product to be:
  - 1) Processed for extraction and recycling of selected chemicals, metals, and materials.
  - 2) Responsibly and safely managed and disposed of according to recognized and certifiable international environmental and occupational health and safety (OHS) standards from the point of collection to final disposition.

If all products declared by the manufacturer to conform to this standard do not contain user-removable rechargeable batteries, the manufacturer may declare “Not Applicable” to this criterion.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products declared to conform to this standard.

**Verification requirements:**

- a) Documentation of notification to customer of the rechargeable battery take-back program, including how to utilize the service and the identification of any direct costs as specified in the criterion.

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<sup>16</sup> External communications regarding the name of the take-back program may or may not specify user-removable rechargeable batteries.

- b) If fulfilling the requirements of this criterion using Option 1, documentation that:
  - 1) The rechargeable battery take-back program meets the “conditions [a) through e)]” outlined in the criterion.
  - 2) In jurisdictions where a voluntary collective scheme is also in operation, an independent take-back program shall offer proof that at least 10% of the number drop-off locations as compared to the voluntary collective scheme are offered by the time of declaration of conformity to the standard and 50% or more drop-off locations as compared to the voluntary collective scheme within a year from when the product was declared to conform to this criterion and 70% within two years.
- c) If fulfilling the requirements of this criterion using Option 2, documentation demonstrating participation in a voluntary collective scheme, and that the voluntary collective scheme meets the “conditions [a) through e)]” outlined in the criterion. For instance, where a manufacturer participates in Call2Recycle [B4], manufacturer demonstrates licensee status.
- d) If fulfilling the requirements of this criterion using Option 3, demonstration of participation in, and compliance with the program.

**Additional details:** None.

### 4.6.3 Initial service provider standards

#### 4.6.3.1 Required—End-of-life processing

*Replace the text of 4.6.3.1 with the following:*

**Corporate criterion:** The manufacturer shall demonstrate that the following requirements are met for all end-of-life equipment collected by the manufacturer (or their contractual agent) pursuant to 4.6.1.1 Required—Provision of product take-back services, by utilizing:

- a) A government-approved program for end-of-life electronics processing in which the manufacturer does not control the selection of initial service providers for the covered product in the jurisdiction,<sup>17</sup> or
- b) Initial service providers that meet one of the following:
  - 1) Are certified by a certification body to a publicly available Qualified Electronics Recycling Standard (as specified below), such as:
    - i) The Responsible Recycling (R2) Standard for Electronics Recyclers;
    - ii) The e-Stewards Standard for Responsible Recycling and Reuse of Electronic Equipment;
    - iii) EN 50625
    - iv) WEEELABEX V.10

The certification body scope of accreditation shall include the Qualified Electronics Recycling Standard(s).

or

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<sup>17</sup> For example, a take-back schemes established based on the EU WEEE Directive are considered government approved programs that conform to this criterion.

- 2) Demonstrate conformance through annual third-party audits to a Qualified Electronics Recycling Standard. The audit shall be performed by:
  - i) A third-party conformity assessment body accredited to ISO/IEC 17020, ISO/IEC 17021, or ISO/IEC 17065 and with competency to conduct an audit to the Qualified Electronics Recycling Standard; or
  - ii) An auditor demonstrating competency in audits of environmental management systems and to the Qualified Electronics Recycling Standard. See Annex E.

For products declared in the US and Canada, manufacturers shall conform with criterion a) or b)1) above.

For either option b)1) or b)2) above, the manufacturer may use an initial service provider located in a country other than where the end-of-life equipment is collected in compliance with national laws implementing applicable international agreements.

Government-approved programs may only be available in certain states, provinces or other sub-jurisdictions within a given country/region, in which case the manufacturer shall provide documentation that the product being declared is processed by an initial service provider that meets requirements b) in all other states, provinces or other sub-jurisdictions in that country/region. If a government-approved program applies to a limited scope of products (e.g., consumer but not institutional/commercial products), the manufacturer shall provide a program that utilizes initial service providers that meet a Qualified Electronic Recycling Standard for all other end-of-life equipment pursuant to 4.6.1.1 and not covered by the government-approved program.

The following programs operated by the manufacturer (or their contractual agent) are exempt from the requirements of this criterion:

- Management of leased products where the manufacturer (or their contractual agent) retains legal ownership.
- Trade-in/exchange programs where the customer surrenders the product to the manufacturer (or their contractual agent) in return for compensation or replacement product.
- Product servicing and/or warranty programs, operated by the manufacturer, or their contractual agent, where a product (or similar product) is returned to a customer.

For the preceding exempted programs, the manufacturer shall provide documentation that addresses the manufacturer's compliance with the legal requirements of importing, exporting and transit countries for transboundary trade to the point of repair or refurbishment.

In addition, manufacturers shall require that any residual equipment and components (including unrepairable equipment/components or equipment/components with no reuse value or market), scrap, and materials derived from equipment that result from these exempt programs are processed by a recycler meeting a) or b) above. Transboundary trade to the certified recycler shall meet the legal requirements of importing, exporting and transit countries. Such equipment/components returned under the exempt program that are under warranty may instead be returned to the original parts supplier.

Qualified Electronics Recycling Standard:

A Qualified Electronics Recycling Standard shall meet the following minimum technical requirements a) through g) below. A certification body or a registry service providing a registry of products declared to conform to this Standard shall determine whether an electronics recycling standard is qualified.

For the purposes of this criterion, a manufacturer's internal technical performance requirements for initial service providers may qualify, if they meet the requirements below for a Qualified Electronics Recycling Standard.

The minimum technical requirements for a Qualified Electronics Recycling Standard are:

- a) The standard is applicable within the country(s)/region(s) being declared to, and is applicable to the scope of equipment covered by this criterion.
- b) The standard includes:
  - 1) A definition for “materials of concern” (or analogous term identifying materials with hazardous characteristics or materials with special handling needs),
  - 2) Requirements for handling and disposition of those materials to protect human health and the environment, and
  - 3) A requirement that initial service providers have a written management plan that addresses “materials of concern” and applicable legal requirements.
- c) The standard requires that initial service providers shall maintain, review annually, and update as needed, an environmental, health and safety management system, and shall train and document training of their employees regarding the contents of this system.
- d) The standard requires that material intended for reuse, repair, refurbishment, remanufacturing, recycling and/or disposal shall be managed in accordance with applicable trade and transporting laws of the exporting, transit, and importing countries.
- e) The standard requires testing or evaluation of equipment/components to determine if the product is suitable for reuse, refurbishment, or repair (e.g., key functions are working if intended for reuse) prior to export and in conformance with the laws of the importing, exporting, and transit countries.
- f) The standard requires that initial service providers shall control, document and track the material flow of all equipment, components, and materials covered by the standard, that pass through its facilities.
- g) The standard requires initial service providers to track all “materials of concern” to final disposition, and to ensure that the downstream service providers are meeting the requirements of items b) through f).

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

For each of the country(s)/region(s) within which the manufacturer is declaring the product conformant, the following shall be documented:

- a) Government-approved program(s) utilized by the manufacturer, the scope of products covered by the program (e.g., consumer, commercial/institutional, or both), demonstration that the product is covered by the program and evidence of participating in the government-approved program in that country/region;

and/or

- b) For each initial service provider that performs take-back services outside of a government-approved program, in conformance with a Qualified Electronics Recycling Standard:
  - 1) Identification of the Qualified Electronics Recycling Standard (s) used.
  - 2) For initial service providers meeting b)1) above, copy/evidence of a current certification, performed by a certification body, to the Qualified Electronics Recycling Standard (s), and/or

- 3) For initial service providers meeting b)2) above, documentation of:
  - i) The accreditation and competency of the third-party conformity assessment body or competency of auditor as specified in b)2) above.
  - ii) Report of findings (including conformance status and all non-conformances) and planned/implemented resolutions of the most recent third-party audit reports examining the performance of the initial service provider against the Qualified Electronics Recycling Standard.
  - iii) Manufacturer statement that the initial service provider performance is acceptable and either in substantial conformance with the Qualified Electronics Recycling Standard, a corrective action is in place, or actions are being taken to withdraw business from the service provider.
- c) When a contractual agent is being used, demonstration that the manufacturer has a contract with the agent and that the agent has a contract with the initial service providers that are providing the take-back services for the manufacturer.
- d) For programs exempt from the criterion's requirements:
  - 1) A list of exempted programs and demonstration of a legal compliance program that addresses the legal requirements of importing, exporting and transit countries for transboundary trade to the point of repair or refurbishment.
  - 2) Documentation that any residual equipment and components (including unrepairable equipment/components or equipment/components with no reuse value or market), scrap, and materials derived from equipment that result from these exempt programs are processed by a Government-approved program(s) utilized by the manufacturer, or a recycler certified to a Qualified Electronics Recycling Standard and that any transboundary trade to the certified recycler meets the legal requirements of importing, exporting and transit countries.

**Additional details:**

It is acceptable for any party to request from or contract with a certification body or registry service (providing certification or conformity assessment to this standard) to evaluate whether a recycling standard is qualified.

For this criterion, a certification body is a body that is accredited to conduct third-party conformity assessment of organizations in accordance with the requirements of ISO/IEC 17020, ISO/IEC 17021, or ISO/IEC 17065. Accreditation of the certification body shall be issued by an accreditation body that is a signatory to the International Accreditation Forum (IAF) Multilateral Arrangement (MLA) or the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) with the appropriate scope of accreditation.

Examples of Qualified Electronics Recycling Standards at the date of publication of this standard include “*e-Stewards Standard for Responsible Recycling and Reuse of Electronic Equipment*,” “*The Responsible Recycling (R2) Standard for Electronics Recyclers*,” EN50625, and WEEELABEX v10.<sup>18</sup>

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<sup>18</sup> WEEELABEX v10 has been replaced by EN-50625 series.

## 4.9 Corporate environmental performance

### 4.9.1 Environmental management system

#### 4.9.1.2 Optional—Third-party certified environmental management system (EMS) for supplier manufacturing facilities

*Replace the text of 4.9.1.2 with the following:*

**Corporate criterion:** Manufacturer shall demonstrate certification to ISO 14001, EU EMAS, or a nationally adopted version of either standard, for all supplier facilities in scope.

To determine supplier facilities in scope, manufacturer shall:

- a) Assess the suppliers in scope as follows: 80% of suppliers (by number) from 80% of directly contracted suppliers [based on annual spend (fiscal or calendar)] for products declared to conform to this standard.

Example: manufacturer has \$200M of annual direct spend with suppliers that manufacture and assemble the products and materials, components and parts of products declared to conform to this standard. If 80% (\$160M) of that direct spend is from 60 suppliers, then the number of suppliers in scope will be 80% of those 60 suppliers, which equals 48 suppliers.

- b) From this supplier list in a), facilities in scope are all supplier facilities with significant responsibility, as determined by the manufacturer, for the manufacturing and/or assembly of the products and the materials, components and parts contained in the products declared to conform to this standard. Additional supplier facilities may be included.

Certification shall be obtained from a certification body accredited by an accreditation body that is a signatory to the IAF MLA with the appropriate scope of accreditation.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

#### **Verification requirements:**

- a) List of manufacturing and assembly facilities of directly contracted suppliers with significant responsibility as determined by the manufacturer for products declared to conform to this standard.
- b) Demonstration of how the list of suppliers that meet the required percentages as outlined in the criterion text was determined.
- c) Demonstration of how manufacturer defined “significant responsibility” to determine suppliers in scope.
- d) Demonstration of current ISO 14001 certification(s), EU EMAS certification(s), or certification(s) to a nationally adopted version of either standard (e.g., certificate, a URL on the supplier website, or a URL on the accredited third-party certification body website) for supplier facilities in a). A supplier facility will be considered ISO 14001 certified if the facility is certified as a standalone facility or as part of an ISO 14001 multi-site organization (enterprise) certification.
- e) Demonstration that certification was performed by a third-party certification body accredited by an IAF member accreditation body whose scope of accreditation includes the specified standard (e.g.,

logo or other indication on certification document, publicly posted URL by certification body reflecting accreditation from an IAF member accreditation body).

**Additional details:** For guidance on defining a “nationally adopted version,” see ISO/IEC Guide 21-1: 2005 Regional or national adoption of International Standards and other International Deliverables—Part 1: Adoption of International Standards Adoption.

A multi-site organization certification is also known as an enterprise certification. For guidance on multi-site organization certification, see IAF Mandatory Document for the Certification of Multiple Sites Based on Sampling [B10].

## 4.9.2 Corporate reporting and public disclosure

### 4.9.2.2 Optional—Corporate environmental performance reporting by suppliers

*Replace the text of 4.9.2.2 with the following:*

**Corporate criterion:** For suppliers in scope, manufacturer shall annually either disclose a publicly available summary of aggregated supplier data, or demonstrate that the required data is publicly disclosed by each supplier, for the following environmental aspects:

- Water use (i.e., withdrawal) or consumption,
- Energy use, and
- Scope 1 and Scope 2 greenhouse gas emissions.

Suppliers in scope shall be 50% of directly contracted suppliers [based on annual spend (fiscal or calendar)] or at least 50 suppliers.

Supplier data shall include the supplier operations relevant to the products covered by this standard. The supplier may include additional operations in the scope, or report at the enterprise level.

Data collection and aggregation can be provided by internal or external programs that meet the requirements of this criterion (e.g., manufacturer program).

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

#### **Verification requirements:**

- a) Declaration that manufacturer met the requirements of this criterion for 50% of directly contracted suppliers (by annual spend) or at least 50 suppliers.
- b) URL(s) for the public disclosure(s) covering the required environmental aspects by the manufacturer and/or by the suppliers (e.g., link to manufacturer and/or supplier website).

**Additional details:** None.

### 4.9.3 Energy management

#### 4.9.3.1 Optional—Energy management system/energy performance improvement—manufacturers

*Replace the text of 4.9.3.1 with the following:*

**Corporate criterion:** Manufacturer shall demonstrate that it has either:

Part A: Third-party certification to ISO 50001 or a nationally adopted version of ISO 50001. A manufacturing facility is considered ISO 50001 certified if the facility is certified as a standalone facility or as part of an ISO 50001 multi-site organization (enterprise) certification.

Part B: Improved energy performance by at least 5% in the most recent three years (calendar or fiscal) or that it has improved energy performance by at least 1.67% in the most recent year. If any manufacturer facility has demonstrated conformity to this criterion for an uninterrupted duration of six years, the thresholds are instead 3% in the most recent three years, or 1% in the most recent year for that facility. The energy performance improvement results shall be verified through a third-party, accredited, verification body or qualified auditor. The energy performance shall be normalized using key relevant variables within the scope of the program (e.g., production volume, building occupancy, and weather). This percentage shall be calculated and achieved once annually.

The scope of this criterion shall include either:

- All manufacturer's facilities that have significant responsibility (as determined by the manufacturer) for the design and/or manufacture of products declared to conform to this standard, or
- One, or multiple facilities of any type, including office buildings, that add up to a total on-site energy consumption of at least 70 million kilowatt-hours (kWh) per year or account for 50% of the manufacturer's total on-site energy consumption.

Any facility, building, or operation owned or leased by the manufacturer may be included in the scope of this criterion. The manufacturer may include additional products in the scope.

Each year, the manufacturer shall publicly disclose one, or a combination, of the following:

- If claiming Part A, the ISO 50001 certificate(s) for facilities in scope. For manufacturers meeting Part A through a multi-site organization (enterprise) certification, the disclosure can be at the enterprise level.
- If claiming Part B, the percentage energy performance improvement over the most recent three-year period (calendar or fiscal) or most recent year (calendar or fiscal). It is acceptable for the disclosure to be at the enterprise level, including instances where this criterion is achieved only by the manufacturer's design and/or manufacturing facilities.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) List of all facilities that have met the requirements of Part A or Part B above.
- b) URL(s) for public disclosure as per the requirements of the criterion.

- c) If claiming Part A: ISO 50001 certification document(s) or certification document(s) to a nationally adopted version of the standard for all facilities in scope. Certification(s) shall be obtained from a certification body for which the specified standard is in the scope of their accreditation. If certification is achieved by the manufacturer in accordance with a multi-site organization (enterprise) certification, the certificate shall include all facilities identified in the scope of this criterion.
- d) If claiming Part B: Annual verification document(s) of normalized energy performance improvements by 1) or 2):
  - 1) An accredited U.S. DOE Superior Energy Performance 50001 (SEP 50001) Verification Body<sup>19</sup> using the SEP 50001 Program Measurement and Verification Protocol to demonstrate normalized energy performance improvement in the most recent three years (calendar or fiscal) or most recent year, or
  - 2) A qualified third-party auditor (see Annex G) that documents the verification of normalized energy performance improvement in the most recent three years (calendar or fiscal) or most recent year using the guidance of a nationally adopted equivalent measurement and verification protocol that meets the guidelines of the Efficiency Valuation Organization International Performance Measurement and Verification Protocol. The credentials and contact information of qualified third-party auditor shall be included in the summary report.

**Additional details:** A multi-site organization certification is also known as an enterprise certification. For guidance on a multi-site organization certification, see IAF Mandatory Document for the Certification of Multiple Sites Based on Sampling [B10].

#### **4.9.3.2 Optional—Energy management system/energy performance improvement for suppliers**

*Replace the text and table of 4.9.3.2 with the following:*

**Corporate criterion:** The manufacturer shall demonstrate that supplier facilities, as outlined in Table 12, have achieved any one, or a combination, of the following:

Part A: Third-party certification to ISO 50001 or a nationally adopted version of ISO 50001. A supplier facility will be considered ISO 50001 certified if the facility is certified as a standalone facility or as part of an ISO 50001 multi-site organization (enterprise) certification.

Part B: Improved energy performance by at least 5% in the most recent three years (calendar or fiscal) or energy performance improvement of at least 1.67% in the most recent year. If any supplier facility has demonstrated conformity to this criterion for an uninterrupted duration of six years, the thresholds are instead 3% in the most recent three years, or 1% in the most recent year for that facility. The energy performance improvement results shall be verified through a third-party, accredited, verification body or qualified auditor. The energy performance shall be normalized using key relevant variables within the scope of the program (e.g., production volume, building occupancy, and weather). This percentage shall be calculated and achieved once annually.

Part C: Third-party certification to one of the following:

- The U.S. Department of Energy (DOE) Superior Energy Performance 50001 (SEP 50001) program
- Korea Superior Energy Management System
- A nationally equivalent energy performance program that meets the requirements of the U.S. DOE SEP 50001 program.<sup>20</sup>

<sup>19</sup> Requirements for accreditation of SEP 50001 Verification Body are available at <http://www.energy.gov/SEP50001>.

<sup>20</sup> Nationally equivalent program is defined on the U.S. DOE SEP 50001 Program website at <http://www.energy.gov/SEP50001>.

**Table 12—Supplier facilities in scope for optional points  
 (maximum of 2 points available)**

Supplier facilities in scope	Points
<p>Supplier facilities in scope shall be 10 manufacturing or assembly facilities from a minimum of 5 suppliers out of the top 50 suppliers [based on annual spend (fiscal or calendar)] for products declared to conform to this standard. The supplier facilities may include other components and products not covered by this standard.</p> <p>If a manufacturer has fewer than 5 suppliers and/or fewer than 10 supplier manufacturing and assembly facilities, the manufacturer shall include all suppliers and/or supplier facilities.</p>	1
<p>Supplier facilities in scope shall be 20 manufacturing or assembly facilities from a minimum of 10 suppliers out of the top 50 suppliers [based on annual spend (fiscal or calendar)] for products declared to conform to this standard. The supplier facilities may include other components and products not covered by this standard.</p> <p>If a manufacturer has between 5 to 10 suppliers and/or between 10 to 20 manufacturing and assembly facilities, the manufacturer shall include all suppliers and/or supplier facilities.</p>	2

Each year, one, or a combination, of the following actions shall be taken:

- The manufacturer or supplier publicly discloses a listing of the certified facilities by city, state, province/territory, and country; or a copy of the certificate(s) for facilities in scope from Part A and/or Part C.
- The manufacturer makes available upon request the percentage energy performance improvement over the most recent three-year period (calendar or fiscal) or most recent year for the facilities in scope from Part B and Part C.

It is acceptable for the disclosure to be at the enterprise level, including instances where this criterion is achieved for those parts of the company within scope that have significant responsibility for the manufacture and assembly of the product.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) List of all supplier facilities that have met the requirements of Part A, Part B, or Part C above.
- b) URL for public disclosure as per the requirements of the criterion.
- c) If claiming Part A: ISO 50001 certification document(s) or certification document(s) to a nationally adopted version of the standard for all supplier facilities in scope. Certification(s) shall be obtained from a certification body for which the specified standard is in the scope of their accreditation. A supplier facility will be considered ISO 50001 certified if the facility is certified as a standalone facility or as part of an ISO 50001 multi-site organization (enterprise) certification.
- d) If claiming Part B: Annual verification document of normalized energy performance improvement by 1) or 2):
  - 1) An accredited U.S. DOE Superior Energy Performance 50001 (SEP 50001) Verification Body using the SEP 50001 Program Measurement and Verification Protocol to demonstrate normalized energy performance improvement in the most recent three years (calendar or fiscal) or most recent year, or

- 2) A qualified third-party auditor (see Annex G) that documents the verification of demonstration of normalized energy performance improvement in the most recent three years (calendar or fiscal) or most recent year using the guidance of a nationally adopted equivalent measurement and verification protocol that meets the guidelines of the Efficiency Valuation Organization International Performance Measurement and Verification Protocol. The credentials and contact information of qualified third-party auditor shall be included in the summary report.
- e) If claiming Part C: Documents demonstrating U.S. DOE SEP 50001 program certification(s), Korea Superior Energy Management System certification(s), or certification(s) to a nationally equivalent SEP 50001 program. Certification shall have been obtained from a third-party certification body accredited by an International Accreditation Forum member accreditation body whose scope of accreditation includes the specified standard. A supplier facility will be considered certified if the facility is certified as a standalone facility or as part of a multi-site organization (enterprise) certification. If an equivalent US SEP 50001 program is used, the manufacturer shall provide documentation that the national program meets US SEP 50001 program equivalency.

**Additional details:** Requirements of the U.S. DOE SEP 50001 Program, including nationally equivalency, are on the program website (<http://www.energy.gov/SEP50001>).

A multi-site organization certification is also known as an enterprise certification. For guidance on a multi-site organization certification, see IAF Mandatory Document for the Certification of Multiple Sites Based on Sampling [B10].

#### 4.9.4 Renewable energy

##### 4.9.4.1 Optional—Renewable energy use by manufacturer

*Replace the text and tables of 4.9.4.1 with the following:*

**Corporate criterion:** The manufacturer shall demonstrate that it has achieved the percentage of renewable energy use reflected in Table 13 for a 12-month reporting period, utilizing one, or any combination, of the eligible renewable energy supply options listed in Table 14. This percentage shall be calculated and achieved once annually.

Manufacturer shall demonstrate that all of the following are met:

- The renewable energy used comes only from the Eligible Renewable Energy Supply Option(s) shown in Table 14;
- Each manufacturer’s facility using the renewable energy is located in the country or electrical grid where the renewable energy was generated, or meets the market boundary requirements specified in the WRI GHG Protocol Scope 2 Guidance;
- The renewable energy used was generated in the same calendar or fiscal year as the reported year of consumption, the last two quarters of the previous calendar or fiscal year, or the first quarter of the following calendar or fiscal year.

In countries or regions where it is available as of the date of publication of this standard, the manufacturer shall demonstrate that eligible renewable energy supply options are third-party certified to the Green-e National Energy Standard or equivalent qualified renewable energy standard that meet the requirements as specified in Additional details.

In countries or regions where third-party certification is not available as of the date of publication of this standard, manufacturers shall obtain third-party certification (when it becomes available in that country), or demonstrate that each eligible renewable energy supply option meets the requirements in Table 15.

The scope shall be the overall annual enterprise electricity used at facilities with significant responsibility, as determined by the manufacturer, for products declared to conform to this standard. The manufacturer may include additional facilities in the scope.

**Table 13—Percentage of renewable energy use achieved  
 (maximum of 2 points available)**

Percentage of renewable energy use	Total points
50% using one, or any combination of the eligible renewable energy supply options listed in Table 14	1
95% using one, or any combination of the eligible renewable energy supply options listed in Table 14 or 75% using Incremental Renewable Energy Supply Options (requirements listed in Additional details)	2

**Table 14—Eligible renewable energy supply options**

Self-generated renewable energy	
A	Generated and owned by the Manufacturer (on-site or off-site), where the energy attributes are retained by the manufacturer.
Purchased renewable energy	
B	Procurement of energy attribute instrument (e.g., Renewable Energy Certificate (REC) based) renewable electricity from on-site installations not owned by the Manufacturer [i.e., on-site Power Purchase Agreement (PPA)].
C	Procurement of energy attribute instrument (e.g., REC-based) renewable electricity via physical connection (i.e., private line or wire) from an off-site generator not owned by the manufacturer with no grid transfers
D	Procurement of energy attribute instrument (e.g., REC-based) renewable electricity from an off-site grid-connected generator (e.g., PPA or virtual PPA)
E	Procurement of an energy attribute instrument (e.g., REC-based) renewable electricity product from a utility or energy service supplier (e.g., utility green pricing program or green tariff, competitive electricity product, or renewable energy purchasing program).
F	Purchase of unbundled energy attribute certificates from the same region within which the manufacturer facility is located (e.g., U.S. RECs for U.S. facilities, E.U. Guarantees of Origin for EU facilities).

Carbon offset credits are not an eligible renewable energy supply option.

Hydropower generating facilities used to meet this criterion shall be certified to the Low Impact Hydro Institute Standard (LIHI), where available as of the date of publication of this standard.

In the event that energy is generated from a mix of energy sources that includes a non-renewable source (i.e., a source that falls outside the definition for renewable energy in this standard such as a mixed fuel facility); the portion of non-renewable energy shall not be used toward demonstration of conformity with this criterion.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) Demonstration of calculation(s) used to determine how the percentage(s) of renewable energy use was achieved, including the following:
  - 1) Declaration of the 12-month reporting period.
  - 2) A list of all manufacturer owned or leased facilities in scope for each geographic location, including the following information for each facility:
    - i) Demonstration of how “significant responsibility” was defined,
    - ii) A list of the renewable energy supply option(s) used from Table 14,
    - iii) The annual total kWh (renewable plus non-renewable) electricity used, and
    - iv) The annual kWh renewable electricity used.
- b) Documentation of conformance to the requirements of this criterion for each renewable energy supply option (listed in Verification requirement a)2), including the following:
  - 1) In countries where third-party certification is available as of the date of publication of this standard, documentation of third-party certification. Third-party certifiers shall have documentation from and/or a signed attestation by the certification program that the standard meets requirements for an equivalent renewable energy standard (as specified in Additional details).
  - 2) In countries where third-party certification is not available at the time of publication of this standard, documentation that each renewable energy source or project meets the verification requirements listed in Table 15 (based on which one or combination of Renewable Energy Supply Options is used).
  - 3) If Incremental Renewable Energy Supply Options are used to meet the requirements of this criterion, manufacturer shall also provide documentation that each source meets the following:
    - i) Is one, or a combination, of renewable energy supply options A, B, C, D, or E listed in Table 14.
    - ii) Was initiated after January 1, 2007.
    - iii) Manufacturer was contractually involved at the outset (i.e., was the original off taker).
    - iv) For purchased renewable energy, manufacturer has contractually committed to purchase the renewable energy for  $\geq 10$  years.
  - 4) If hydroelectric power is used to meet the requirements of this criterion, manufacturer shall provide documentation that each source has been certified to the Low Impact Hydro Institute Standard, if such certification was available in the country(ies) in which the hydropower was generated, as of the date of publication of the standard.
  - 5) Demonstration that energy:
    - i) Was consumed within the same country or electrical grid as the renewable energy generation, or
    - ii) Meets the market boundary requirements specified in the WRI GHG Protocol Scope 2 Guidance.

**Table 15—Alternative documentation needed by renewable energy supply option**

Renewable energy supply option	Verification requirements
A	Proof of permanent retention of energy attribute certificates or energy generation attributes (e.g., commissioning document, purchasing document, or equipment specification indicating the type of renewable energy in use).
B, D, and E	<p>Proof of exclusive ownership of energy attribute certificates or generation attributes (e.g., contracts for an energy attribute instrument and the electricity from a specified facility where attributes are not transacted in any other way).</p> <p>Example documentation demonstrating direct purchase of the renewable energy (e.g., contract invoices, monthly generation statement from energy generator or utility), and showing that all renewable energy reflected on the bill was attributed only to the manufacturer, and will not be sold or transferred to another party (e.g., tracking system report, and/or declaration from or contractual requirement with the energy generator).</p> <p>Example documentation may also include an attestation from an electricity regulatory or relevant government agency, or reference to legal precedent, law or regulation (or lack thereof) showing that attribute ownership is either only legally enforceable using the instrument for that resource and in that market, or that instruments are not enforceable for that resource in that market and attribute ownership is legally enforceable using the contract provided.</p>
C	<p>Documentation showing proof of physical connection with no grid transfers.</p> <p>Example documentation may include a utility interconnect agreement for the renewable energy project.</p>
F	<p>Proof of exclusive ownership and retirement of energy attribute certificates on behalf of manufacturer.</p> <p>Example documentation may include a statement, invoice, or receipt demonstrating certificates were purchased plus a tracking system report showing retirement by or on behalf of the manufacturer, and/or a declaration from the generator that attributes have not been otherwise conveyed.</p> <p>Example documentation may also include an attestation from an electricity regulator or other relevant government agency, or reference to legal precedent, law or regulation, or other credible source showing that attribute ownership for that resource and in that market is legally enforceable using the certificate and that certificates may be procured separately from electricity.</p>

**Additional details:**

Incremental Renewable Energy Supply Options shall meet all of the following requirements:

- Is one, or a combination, of renewable energy supply options A, B, C, D, or E listed in Table 14.
- Was initiated after January 1, 2007.
- Manufacturer was contractually involved at the outset (i.e., was an original off taker).
- For purchased renewable energy, manufacturer has contractually committed to purchase the renewable energy for  $\geq 10$  years.

Requirements for a qualified renewable energy standard are:

- a) Developed through open stakeholder consultation process
- b) Applicable within the country(s)/region(s) being declared to
- c) Relates directly to renewable energy assessment

- d) Addresses requirements, including state- and/or region-specific requirements, to verify the following for certified transactions, purchases, and/or energy products (as defined in Braslawsky *et al.* (April 2016):
- 1) Full aggregation of environmental benefits;
  - 2) Regulatory surplus (the renewable facility, generation or attributes go beyond a regulatory compliance obligation, and are not counted toward meeting a legal or regulatory mandate);
  - 3) Exclusive, unique ownership of generation attributes and attribute certificates, where applicable;
  - 4) Exclusive claims to generation and generation attributes;
  - 5) Vintage requirements for sales as defined above; and
  - 6) Full and accurate product disclosure by sellers (e.g., fuel mix, location, vintage).

#### 4.9.4.2 Optional-Renewable energy use by manufacturer suppliers

*Replace the text and tables of 4.9.4.2 with the following:*

**Corporate criterion:** The manufacturer shall demonstrate that supplier facilities within the scope of this criterion have each achieved the percentage of renewable energy use reflected in Table 16, utilizing any one, or a combination, of the eligible renewable energy supply options listed in Table 17. This percentage for each facility shall be calculated and achieved once annually for a 12-month reporting period.

Manufacturer shall demonstrate that all of the following are met for suppliers within the scope:

- The renewable energy used comes only from the Eligible Renewable Energy Supply Option(s) shown in Table 17;
- Each supplier facility using the renewable energy is located in the country or electrical grid where the renewable energy was generated, or meets the market boundary requirements specified in the WRI GHG Protocol Scope 2 Guidance;
- The renewable energy used meets vintage requirements (i.e., was generated in the same calendar or fiscal year as the reported year of consumption, the last two quarters of the previous calendar or fiscal year, or the first quarter of the following calendar or fiscal year.)

In countries or regions where it is available as of the date of publication of this standard manufacturer shall demonstrate that eligible renewable energy supply options used by their suppliers are third-party certified to the Green-e National Energy Standard or equivalent qualified renewable energy standard (i.e., as listed in the Additional details section).

In countries or regions where third-party certification is not available as of the date of publication of this standard, manufacturers shall obtain third-party certification (when it becomes available in that country), or demonstrate that each eligible renewable energy supply option meets the requirements in Table 18.

Supplier facilities in scope shall be ten facilities from a minimum of five suppliers out of the top 50 suppliers [based on annual spend (fiscal or calendar)] that manufacture and/or assemble the materials components and parts contained in the products declared to conform to this standard. Scope may be at the facility level, or for the portion of the facility used in products declared to conform to this standard for the manufacturer.

If a manufacturer has fewer than five suppliers and fewer than ten facilities in scope, it shall meet the requirements of this criterion for all of its suppliers and/or facilities. The manufacturer may include additional supplier facilities in the scope.

**Table 16—Points available for percentage of renewable energy use  
 (maximum of 2 points available)**

Percentage of renewable energy use	Total points
50% using one or any combination of the eligible renewable energy supply options listed in Table 17	1
75% using one or any combination of the eligible renewable energy supply options listed in Table 17 or 50% using Incremental Renewable Energy Supply Options (requirements listed in Additional details)	2

**Table 17—Eligible renewable energy supply options**

Self-generated renewable energy	
A	Generated and owned by the supplier (on-site or off-site), where the energy attributes are retained by the supplier.
Purchased renewable energy	
B	Procurement of energy attribute instrument (e.g., REC-based) renewable electricity from on-site installations not owned by the supplier (i.e., on-site PPAs).
C	Procurement of energy attribute instrument (e.g., REC-based) renewable electricity via physical connection (i.e., private line or wire) from an off-site generator not owned by the supplier with no grid transfers
D	Procurement of energy attribute instrument (e.g., REC-based) renewable electricity from an off-site grid-connected generator (e.g., PPA or virtual PPA)
E	Procurement of an energy attribute instrument (e.g., REC-based) renewable electricity product from a utility or energy service supplier (e.g., utility green pricing program or green tariff, competitive electricity product, or renewable energy purchasing program).
F	Purchase of unbundled energy attribute certificates from the same region within which the supplier facility is located (e.g., U.S. RECs for U.S. facilities, E.U. E.U. Guarantees of Origin for EU facilities).

Carbon offset credits are not an eligible renewable energy supply option.

Hydropower generating facilities used to meet this criterion shall be certified to the Low Impact Hydro Institute Standard (LIHI), where available as of the date of publication of this standard.

In the event that energy is generated from a mix of energy sources that include a non-renewable source, i.e., a source that falls outside the definition for renewable energy in this standard (e.g., a mixed fuel facility); the portion of non-renewable energy shall not be used toward demonstration of conformity with this criterion.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) A list of all facilities in scope and for each, the following:
  - 1) Geographic location of the facility.
  - 2) A list of the renewable energy supply option(s) used from Table 17.
  - 3) The annual total kWh (renewable plus non-renewable) electricity used.
  - 4) The annual kWh renewable electricity used.
  - 5) Demonstration of calculation(s) used to determine how the percentage(s) of renewable energy use was achieved.
  - 6) Declaration of the 12-month reporting period.
- b) Documentation of conformance to the requirements of this criterion for each renewable energy supply option (listed in Verification requirement a)2), including the following:
  - 1) In countries where third-party certification is available as of the date of publication of this standard, documentation of third-party certification. Third-party certifiers shall have documentation from and/or a signed attestation by the certification program that the standard meets requirements for an equivalent renewable energy standard.
  - 2) In countries where third-party certification is not available at the time of publication of this standard, documentation that each renewable energy source or project meets the verification requirements listed in Table 18 (based on which one or combination of Renewable Energy Supply Options is used).
  - 3) If Incremental Renewable Energy Supply Options are used to meet the requirements of this criterion, manufacturer shall also provide documentation that each source meets the following:
    - i) Is one, or a combination, of renewable energy supply options A, B, C, D, or E listed in Table 17,
    - ii) Was initiated after January 1, 2007,
    - iii) Manufacturer or supplier was contractually involved at the outset (i.e., was the original off taker),
    - iv) For purchased renewable energy, manufacturer or supplier has contractually committed to purchase the renewable energy for  $\geq 10$  years.
  - 4) If hydroelectric power is used to meet the requirements of this criterion, manufacturer shall provide documentation that each source has been certified to the Low Impact Hydro Institute Standard if such certification was available in the country(ies) in which the hydropower was generated, as of the date of publication of the standard.
  - 5) Demonstration that energy:
    - i) Was consumed within the same country or electrical grid as the renewable energy generation, or
    - ii) Meets the market boundary requirements specified in the WRI GHG Protocol Scope 2 Guidance.

**Table 18—Alternative documentation needed by renewable energy supply option**

Renewable energy supply option	Verification requirements
A	Proof of permanent retention of energy attribute certificates or energy generation attributes (e.g., commissioning document, purchasing document, or equipment specification indicating the type of renewable energy in use).
B, D, and E	<p>Proof of exclusive ownership of energy attribute certificates or generation attributes (e.g., contracts for an energy attribute instrument and the electricity from a specified facility where attributes are not transacted in any other way).</p> <p>Example documentation demonstrating direct purchase of the renewable energy (e.g., contract invoices, monthly generation statement from energy generator or utility) and showing that all renewable energy reflected on the bill was attributed only to the manufacturer, and will not be sold or transferred to another party (e.g., tracking system report, and/or declaration from or contractual requirement with the energy generator).</p> <p>Example documentation may also include an attestation from an electricity regulatory or relevant government agency, or reference to legal precedent, law or regulation (or lack thereof) showing that attribute ownership is either only legally enforceable using the instrument for that resource and in that market, or that instruments are not enforceable for that resource in that market and attribute ownership is legally enforceable using the contract provided.</p>
C	<p>Documentation showing proof of physical connection with no grid transfers.</p> <p>Example documentation may include a utility interconnect agreement for the renewable energy project.</p>
F	<p>Proof of exclusive ownership and retirement of energy attribute certificates on behalf of manufacturer’s supplier.</p> <p>Example documentation may include a statement, invoice, or receipt demonstrating certificates were purchased plus a tracking system report showing retirement by or on behalf of the manufacturer’s supplier, and/or a declaration from the generator that attributes have not been otherwise conveyed.</p> <p>Example documentation may also include an attestation from an electricity regulator or other relevant government agency, or reference to legal precedent, law or regulation, or other credible source showing that attribute ownership for that resource and in that market is legally enforceable using the certificate and that certificates may be procured separately from electricity</p>

**Additional details:**

Incremental Renewable Energy Supply Options shall meet all of the following requirements:

- Is one, or a combination, of renewable energy supply options A, B, C, D, or E listed in Table 17,
- Was initiated after January 1, 2007,
- Manufacturer or supplier was contractually involved at the outset (i.e., was an original off taker),
- For purchased renewable energy, manufacturer has contractually committed to purchase the renewable energy for  $\geq 10$  years.

Requirements for a qualified renewable energy standard are:

- Developed through open stakeholder consultation process
- Applicable within the country(s)/region(s) being declared to
- Relates directly to renewable energy assessment

- Addresses requirements, including state- and/or region-specific requirements, to verify the following for certified transactions, purchases, and/or energy products [as defined in Braslawsky *et al.* (April 2016)]:
  - Full aggregation of environmental benefits;
  - Regulatory surplus (the renewable facility, generation or attributes go beyond a regulatory compliance obligation, and are not counted toward meeting a legal or regulatory mandate);
  - Exclusive, unique ownership of generation attributes and attribute certificates, where applicable;
  - Exclusive claims to generation and generation attributes;
  - Vintage requirements for sales as defined above; and
  - Full and accurate product disclosure by sellers (e.g., fuel mix, location, vintage).

## 4.10 Corporate social responsibility

### 4.10.1 Socially responsible manufacturing

*Replace the title, text, and table of 4.10.1.1 with the following:*

#### 4.10.1.1 Optional—Socially responsible manufacturing: Labor

**Corporate criterion:** Manufacturer shall meet Part A and Part B of this criterion. Points will be awarded for meeting Part A and Part B based on the percentages in Table 19.

Part A: Manufacturer shall have publicly available supplier requirements document(s) (e.g., manufacturer or Responsible Business Alliance Supplier Code of Conduct [B14]) outlining supplier requirements that meet or exceed the following Labor provisions:

- a) The International Labor Standards identified in the ILO Declaration on Fundamental Principles and Rights at Work and defined in the following Conventions:
  - 1) Freedom of association and collective bargaining (C. 87 and C. 98),
  - 2) Forced labor (C. 29 and C. 105),
  - 3) Child labor and the worst forms of child labor (C. 138 and C. 182),
  - 4) Discrimination (employment and occupation) (C. 111).
- b) Domestic law in the legal jurisdiction regulating:
  - 1) Minimum wages,
  - 2) Working hours,
  - 3) Overtime compensation,
  - 4) Employment contractual relationships.
- c) Human trafficking as defined in The Protocol to Prevent, Suppress and Punish Trafficking in Persons Especially Women and Children, supplementing the United Nations Convention against Transnational Organized Crime.

Manufacturer shall demonstrate that the supplier requirements document is incorporated into agreements with directly contracted suppliers for products declared to conform to this standard (e.g., contracts, specifications, purchase order, or other documented requirements), including language requiring suppliers to apply Labor provisions a) through c) to their directly subcontracted suppliers.

Part B: The manufacturer shall demonstrate that all Facilities in Scope meet the requirements outlined in the section below titled “Requirements for Facilities in Scope.”

#### Facilities in Scope

##### — Manufacturer Facilities in Scope

Manufacturer facilities in scope shall include all manufacturer-owned or -leased facilities that produce and assemble the products and the materials, components and parts contained in the products declared to conform to this standard.

##### — Supplier Facilities in Scope

Supplier facilities in scope shall include manufacturing and assembly facilities for the materials, components, and parts contained in or composing the products declared to conform to this standard, and that have been assessed as resulting in a finding other than acceptable risk through either prioritization method a) or b). Supplier facility prioritization shall be performed by the manufacturer annually using either a) or b). Additional supplier facilities may be included.

- a) The manufacturer shall use two out of the three methods below to perform the prioritization assessment. The facility shall be considered a Supplier Facility in Scope if any of the assessment results find the facility as not having an acceptable risk:
  - 1) Risk assessment based on information that was not self-reported by the supplier
  - 2) Self-identification by the supplier of risk
  - 3) Results of the most recent third-party audit that covers all Labor topics listed in Part A contained in one of the following:
    - i) SA 8000, or
    - ii) RBA Validated Audit Process (VAP)
- b) The manufacturer shall assess whether a supplier facility meets any of the following factors; if yes, the facility shall be considered a Supplier Facility in Scope:
  - 1) Is located within a country that is actively listed on the Tier 2 Watchlist or Tier 3 of the Trafficking Victims Protection and Reporting Act, or is ranked “C,” “CC,” or “D” in the Government Response Data list of the Global Slavery Index report.
  - 2) Has received a copy of a written claim made to appropriate authorities, whether to a government office, an international organization such as the ILO, or under a multilateral instrument such as the OECD Guidelines for Multinational Enterprises, that the employer has violated an aspect of Labor requirements.

**Table 19—Facilities in scope optional points**

Facilities in scope	Total points
All manufacturer facilities in scope, and All supplier facilities in scope based on the prioritization assessment of 80% of directly contracted suppliers for products declared to conform to this standard	1
All manufacturer facilities in scope, and All supplier facilities in scope based on the prioritization assessment of 95% of directly contracted suppliers for products declared to conform to this standard	2

Requirements for Facilities in Scope

The manufacturer shall demonstrate that each facility in scope (based on the prioritization assessment of the relevant percentages in Table 19) meets one, or a combination, of the following:

- a) Is RBA Validated Audit Process (VAP) recognized, or
- b) Is included in an audit program<sup>21</sup> that covers topics listed in Part A and that meets both of the following requirements:
  - 1) Requires full audits to be performed every two years by one of the following:
    - i) An SA 8000 Certified Lead Auditor
    - ii) An RBA Lead Auditor
  - 2) Includes corrective action identification and resolution.

The manufacturer shall make an annual public disclosure of a summary of audit results (including those done via certification), including the following:

- The number of facilities audited;
- The aggregate number and total percentage of nonconformities and percentage of completion of corrective actions for each Labor provision [as listed in a) through c) of Part A] by country (if > 5 directly contracted suppliers in a country) or by geographic area (if ≤ 5 directly contracted suppliers in a country).
- The aggregate number and total percentage of repeat nonconformities (as compared to the prior full audit, as applicable) for each Labor provision [as listed in a) through c) of Part A] by country (if > 5 directly contracted suppliers in a country) or by geographic area (if ≤ 5 directly contracted suppliers in a country).

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) URL(s) on the manufacturer website for the supplier requirements document (e.g., manufacturer supplier code of conduct).

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<sup>21</sup> Certification to SA8000 meets this requirement.

- b) Documentation of how each Labor provision defined in Part A maps to the Manufacturer's supplier requirements document(s).
- c) Demonstration that the supplier requirements document(s) is incorporated into agreements with directly contracted suppliers (e.g., contracts, specifications, purchase order, or other documented requirements).
- d) Demonstration of:
  - 1) How the manufacturer determined the percentages in Table 19.
  - 2) How manufacturer defined geographic area.
  - 3) The methodology for evaluating supplier prioritization and how it was validated during the most recent prioritization evaluation.
  - 4) If not using SA 8000 or RBA VAP, demonstration of how the audit maps to each provision listed in Part A.
- e) Demonstration that all facilities in scope have achieved RBA VAP recognition or are included in a supplier audit program described above.
- f) If using a supplier audit program to meet the requirements for Part B, demonstration of the following:
  - 1) The auditing program evaluates Labor topics of this criterion, and incorporates corrective action identification and resolution.
  - 2) Certificate or other credential of the auditor(s).
- g) URL for the annual public disclosure of audit results.

**Additional details:**

- Acceptable risk: risk that has been reduced to a level that can be tolerated by the organization and its workers having regard to the organization's legal obligations and its own Labor provisions
- Risk: the frequency and likelihood of a violation by an organization of its legal obligations and labor provisions and the severity of the impact on the workers and the organization
- Risk assessment: process of evaluating the risk(s) taking into account the adequacy of any existing controls, and deciding whether or not the risk(s) is acceptable

**4.10.1.2 Optional—Socially responsible manufacturing: OHS**

*Replace the text and table of 4.10.1.2 with the following:*

**Corporate criterion:** Manufacturer shall meet Part A and Part B of this criterion. Points will be awarded for meeting Part A and Part B based on the percentages in Table 20.

Part A: Manufacturer shall have publicly available supplier requirements document(s) (e.g., Supplier Code of Conduct) that addresses the following major categories of occupational health and safety (OHS) management systems (as defined in OHSAS 18001 and ISO 45001):

- a) OHS management system describing context of the organization.
- b) Leadership and worker participation including OHS Policy, Roles, Responsibilities, Accountabilities, and Authorities.

- c) Risk and hazard identification and assessment and determination of applicable OHS legal requirements and other OHS requirements and risks, including related actions and objectives to address them.
- d) Provision of resources competence and awareness, information and communication and documented information.
- e) Operational planning and control including operational controls that apply to outsourcing, procurement and contractors, emergency preparedness and response and change management.
- f) Performance evaluation including internal audits, monitoring and measurement, analysis and evaluation and management review.
- g) Incidents, nonconformities and corrective action, continual improvement of objectives and processes.

Manufacturer shall demonstrate that the supplier requirements document is incorporated into agreements with directly contracted suppliers for products declared to conform to this standard (e.g., contracts, specifications, purchase order, or other documented requirements), including language requiring suppliers to apply OHS management systems a) through g) to their directly subcontracted suppliers.

Part B: The manufacturer shall demonstrate that all Facilities in Scope meet the requirements outlined in the sections below titled “Requirements for Facilities in Scope.”

#### Facilities in Scope

##### — Manufacturer Facilities in Scope

Manufacturer facilities in scope shall include all manufacturer-owned or -leased facilities that produce and assemble the products and the materials, components and parts contained in the products declared to conform to this standard.

##### — Supplier Facilities in Scope

Supplier facilities in scope shall include manufacturing and assembly facilities for the materials, components and parts contained in or composing the products declared to conform to this standard, and that have been assessed as resulting in a finding other than acceptable risk through either prioritization method a) or b). Supplier facility prioritization shall be performed by the manufacturer annually using either a) or b). Additional supplier facilities may be included.

- a) The manufacturer shall use two out of the three methods below to perform the prioritization assessment. The facility shall be considered a Supplier Facility in Scope if any of the assessment results find the facility as not having an acceptable risk:
  - 1) Risk-assessment-based information that was not self-reported by the supplier
  - 2) Self-identification by the supplier of risk
  - 3) Results of the most recent third-party audit that covers all topics contained in one of the following:
    - i) OHSAS 18001, or
    - ii) ISO 45001, or
    - iii) RBA Validated Audit Process (VAP)
- b) The manufacturer shall assess whether a supplier facility meets any of the following factors; if yes, the facility shall be considered a Supplier Facility in Scope:
  - 1) Has received a major nonconformance from the certification body, if certified to OHSAS 18001 or ISO 45001.

- 2) Has not maintained and implemented policies for following the hierarchy of controls to protect workers including personnel protection, environmental and engineering controls, fire protection, sanitation, and emergency preparedness and response.
- 3) For supplier facilities using chemicals, the supplier has not:
  - i) Provided comprehensive health and safety training to its workers (including providing all relevant Safety Data Sheets).
  - ii) Maintained an up to date chemical inventory of all chemicals used.
  - iii) Followed the hierarchy of controls to protect workers.
  - iv) Mapped its manufacturing processes and identified the chemicals used potential for harm for each process throughout its facility.
  - v) Conducted comprehensive industrial hygiene monitoring to document exposures and reported the results to the manufacturer and the workers.
  - vi) Conducted ongoing comprehensive health surveillance for all workers to identify and prevent occupational diseases.
- 4) Does not explicitly protect workers’ participation in health and safety activities in the company’s written policy.
- 5) Has received a copy of a written claim made to appropriate authorities, whether to a government office, an international organization such as the ILO, or under a multilateral instrument such as the OECD Guidelines for Multinational Enterprises, that the employer has violated an aspect of OHS requirements.
- 6) Does not have a worker grievance procedure that is implemented and maintained.

**Table 20—Facilities in scope optional points**

Facilities in scope	Total points
All manufacturer facilities in scope and All supplier facilities in scope based on the prioritization assessment of 80% of directly contracted suppliers for products declared to conform to this standard	1
All manufacturer facilities in scope and All supplier facilities in scope based on the prioritization assessment of 95% of directly contracted suppliers for products declared to conform to this standard	2

Achieving this criterion at enterprise level is sufficient to meet the scope requirements of this criterion.

Requirements for Facilities in Scope

The manufacturer shall demonstrate that each facility in scope (based on the prioritization assessment of the relevant percentages in Table 20) meets one, or a combination, of the following:

- a) Has achieved and maintained certification by a third-party-accredited certification body (CB) to either (certification shall be no older than three years):
  - 1) OHSAS 18001, or
  - 2) ISO 45001
- b) Is RBA Validated Audit Process (VAP) recognized addressing all topics defined in Part A, or

- c) Is included in an audit program that covers the major categories listed in Part A and that meets both of the following requirements:
  - 1) Requires full audits to be performed every two years by one of the following:
    - i) An OHSAS 18001 or ISO 45001 Certified Lead Auditor
    - ii) An RBA Lead Auditor
  - 2) Includes corrective action identification and resolution

The manufacturer shall make an annual public disclosure of a summary of audit results (including those done via certification), including the following:

- The number of facilities audited;
- The aggregate number and total percentage of nonconformities and percentage of completion of corrective actions for each major category [as listed in a) through g) of Part A] by country (if > 5 directly contracted suppliers in a country) or by geographic area (if ≤ 5 directly contracted suppliers in a country).
- The aggregate number and total percentage of repeat nonconformities (as compared to the prior full audit, as applicable) for each major category [as listed in a) through g) of Part A] by country (if > 5 directly contracted suppliers in a country) or by geographic area (if ≤ 5 directly contracted suppliers in a country).

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products that are declared to conform to this standard.

**Verification requirements:**

- a) URL(s) on the manufacturer website for the supplier requirements document(s) (e.g., manufacturer supplier code of conduct).
- b) Demonstration of how each of the OHS management system topics maps to the Manufacturer's supplier requirements document(s).
- c) Demonstration that the supplier requirements document(s) is incorporated into agreements with directly contracted suppliers (e.g., contracts, specifications, purchase order, or other documented requirements).
- d) Demonstration of:
  - 1) How the manufacturer determined the percentages in Table 20.
  - 2) How manufacturer defined geographic area.
  - 3) The methodology for evaluating supplier prioritization and how it was validated during the most recent prioritization evaluation.
  - 4) If not using OHSAS 18001, ISO 45001, or RBA VAP, demonstration of how the audit maps to each major category listed in Part A.
- e) Demonstration that all manufacturing facilities in scope hold valid OHSAS 18001 or ISO 45001 certificates, have RBA VAP recognition, or are included in a supplier audit program described above.
- f) If using OHSAS 18001 or ISO 45001 certification to meet the requirements for Part B, demonstration that certification was achieved by an accredited certification body accredited (e.g., UKAS, ANAB) to audit to OHSAS 18001 or ISO 45001 upon its publication.

- g) If using a supplier audit program to meet the requirements for Part B, demonstration of the following:
  - 1) The auditing program evaluates OHS topics of this criterion and incorporates corrective action identification and resolution.
  - 2) Certificate or other credential demonstrating qualification of the auditor(s).
- h) URL for the annual public disclosure of audit results.

**Additional details:**

- Acceptable risk, risk, and risk assessment as defined in OHSAS 18001, def 3.21

**4.10.2 Conflict minerals**

**4.10.2.2 Optional—Participation in an in-region program that advances responsible sourcing of conflict minerals**

*Replace the text of 4.10.2.2 with the following:*

**Corporate criterion:** Manufacturer shall support and/or participate in an in-region conflict minerals responsible sourcing program in a covered country or conflict-affected and high-risk regions. The manufacturer shall provide documentation that the responsible sourcing program includes, at the mine level, one or more of the following objectives: improved governance, capacity building, traceability, and/or conflict and human rights risks. Documentation shall also include a description of the program's commitment to engage local stakeholders, and identify and address risks or gaps according to the program scope.

Manufacturer participation in a smelter audit program is not considered sufficient to demonstrate conformity to this criterion.

This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this standard. The approach used to conform to this criterion may vary by country or region.

**Applies to:** All manufacturers with products declared to conform to this standard.

**Verification requirements:**

- a) Demonstration from the program that the manufacturer is a supporter and/or participant (e.g., manufacturer listed on the program's website, confirmation letter or email from the program)
- b) Description of how the program meets the following requirements (e.g., URL where information is located on the program website, in program materials):
  - 1) Program objectives include increasing the responsible sourcing of conflict minerals through improvements to governance, capacity building, and/or traceability at the mine level in a covered country
  - 2) Program reflects activities to identify and address risks or gaps within its program scope, and to engage local stakeholders

**Additional details:** Responsible sourcing programs address capacity building and/or improve formalization, access to markets, or conditions for miners (e.g., through worker training programs, formation of labor unions, cooperatives, registration of miners).

## Annex A

(informative)

### Criteria and sections

*Replace Table A.1 in Annex A with the following:*

**Table A.1—Criteria and optional points**

Criterion and section	Optional points
<b>4.1 Substance management</b>	
<b>4.1.1 Reduction of use of hazardous substances</b>	
4.1.1.1 Required—Conformance with European Union RoHS Directive substance restrictions	
<b>4.1.2 Cadmium</b>	
4.1.2.1 Optional—Restrictions of the use of cadmium	1
<b>4.1.3 Mercury</b>	
4.1.3.1 Required—Elimination of intentionally added mercury in light sources	
<b>4.1.4 Beryllium</b>	
4.1.4.1 Optional—Restriction of the use of beryllium	1
<b>4.1.5 Bromine and chlorine</b>	
4.1.5.1 Required—Reduction of bromine and chlorine content in plastic parts > 25 grams	
4.1.5.2 Optional—Further reduction of bromine and chlorine content of plastic materials	1 or 2
<b>4.1.6 REACH</b>	
4.1.6.1 Optional—Avoidance or elimination of substances on EU REACH Annex XiV (authorization list)	1
4.1.6.2 Optional—Reduction of substances on the EU REACH Candidate List of SVHCs	1
<b>4.1.7 Batteries</b>	
4.1.7.1 Required—Compliance with provisions of EU Battery Directive	
<b>4.1.8 Chemical assessment and selection</b>	
4.1.8.1 Optional—Chemical assessment and selection	1 or 2
<b>4.1.9 Declarable substances and substance inventory</b>	
4.1.9.1 Optional—IEC 62474 declarable substances	1
4.1.9.2 Optional—Requesting substance inventory	1
4.1.9.3 Optional—Acquiring substance inventory	1 or 2
<b>4.1.10 Manufacturing chemicals</b>	
4.1.10.1 Optional—Reduce fluorinated gas emissions from flat panel display manufacturing	1 or 2
4.1.10.2 Optional—Reduce fluorinated greenhouse emissions from semiconductor production	1 or 2

Criterion and section	Optional points
<b>4.2 Materials selection</b>	
<b>4.2.1 Post-consumer recycled plastic content</b>	
4.2.1.1 Required—Post-consumer recycled, ITE-derived post-consumer recycled plastic or bio-based content	
4.2.1.2 Optional—Higher post-consumer recycled, ITE-derived post-consumer recycled plastic, or bio-based content	1 or 2
4.2.1.3 Optional—Post-consumer recycled, ITE-derived post-consumer recycled plastic	1
<b>4.3 Design for end of life</b>	
<b>4.3.1 End of life processing information</b>	
4.3.1.1 Required—Identification of materials and components requiring selective treatment	
<b>4.3.2 Plastics recyclability</b>	
4.3.2.1 Required—Plastic parts compatible with recycling	
4.3.2.2 Required—Plastic parts separable for recycling	
<b>4.4 Product longevity/life-cycle extension</b>	
<b>4.4.1 Increasing product longevity</b>	
4.4.1.1 Required—Service support	
4.4.1.2 Optional—Long life rechargeable battery	1
<b>4.4.2 Increasing Reparability and serviceability</b>	
4.4.2.1 Required—Removal of external enclosure	
4.4.2.2 Optional—Publicly available service information	1
4.4.2.3 Required—Spare parts	
4.4.2.4 Required—Battery replacement and information	
4.4.2.5 Optional—Product upgradeability and repairability	1
4.4.2.6 Optional—Removal of lithium ion batteries	1
<b>4.5 Energy conservation</b>	
<b>4.5.1 Power management system</b>	
4.5.1.1 Required—Conformance to current ENERGY STAR program requirements	
4.5.1.2 Required—Lowest Power Mode limit	
4.5.1.3 Optional—Energy efficiency for internal power supplies	1 or 2
4.5.1.4 Optional—Energy efficiency for external power supplies exceeding International External Power Supply Efficiency Level VI	1
4.5.1.5 Optional—Product energy consumption less than the ENERGY STAR Maximum Energy Limit	1 or 2
<b>4.6 End-of-life management</b>	
<b>4.6.1 Product take-back service</b>	
4.6.1.1 Required—Provision of product take-back services	

Criterion and section	Optional points
<b>4.6.2 Rechargeable battery recycling</b>	
4.6.2.1 Required—Provision of a rechargeable battery take-back program	
<b>4.6.2 Service provider standards</b>	
4.6.3.1 Required—End-of-life processing	
<b>4.7 Packaging</b>	
<b>4.7.1 Constituents in packaging</b>	
4.7.1.1 Required—Elimination of intentionally added heavy metals in packaging	
4.7.1.2 Required—Elimination of elemental chlorine as a bleaching agent in packaging material	
<b>4.7.2 Recyclable packaging materials</b>	
4.7.2.1 Required—Separable packaging material	
4.7.2.2 Required—Plastics marked in packaging materials	
<b>4.7.3 Recycled and sustainably forested packaging</b>	
4.7.3.1 Required—Recycled content in wood-based fiber packaging	
4.7.3.2 Optional—Packaging composed of recycled, and/or bio-based, and/or sustainably forested content	1
<b>4.7.4 Bulk packaging option for packaging materials</b>	
4.7.4.1 Optional—Offering of a bulk packaging option	1
<b>4.8 Life cycle assessment and carbon footprint</b>	
<b>4.8.1 Life cycle assessment and product carbon footprint</b>	
4.8.1.1 Optional—Product life cycle assessment and public disclosure of analyses	1 or 2
4.8.1.2 Optional—Product specific greenhouse gas emissions—product carbon footprint	1 or 2
<b>4.8.2 Corporate GHG emissions</b>	
4.8.2.1 Optional—Corporate carbon footprint	1
4.8.2.2 Optional—Greenhouse gas emissions from product transport	1
<b>4.9 Corporate environmental performance</b>	
<b>4.9.1 Environmental management system</b>	
4.9.1.1 Required—Third-party certified environmental management system (EMS) for design and manufacturing organizations	
4.9.1.2 Optional—Third-party certified environmental management system (EMS) for supplier manufacturing facilities	1
<b>4.9.2 Corporate reporting and public disclosure</b>	
4.9.2.1 Required—Corporate environmental performance reporting by manufacturer	
4.9.2.2 Optional—Corporate environmental performance reporting by suppliers	1
<b>4.9.3 Energy management</b>	
4.9.3.1 Optional—Energy management system/energy performance improvement—manufacturers	1
4.9.3.2 Optional—Energy management system/energy performance improvement for suppliers	1 or 2

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<b>Criterion and section</b>	<b>Optional points</b>
<b>4.9.4 Renewable energy</b>	
4.9.4.1 Optional—Renewable energy use by manufacturer	1 or 2
4.9.4.2 Optional—Renewable energy use by manufacturer suppliers	1 or 2
<b>4.10 Corporate social responsibility</b>	
<b>4.10.1 Socially responsible manufacturing</b>	
4.10.1.1 Optional—Socially responsible manufacturing: Labor	1 or 2
4.10.1.2 Optional—Socially responsible manufacturing: OHS	1 or 2
<b>4.10.2 Conflict Minerals</b>	
4.10.2.1 Required—Public Disclosure regarding conflict minerals in products	
4.10.2.2 Optional—Participation in an in-region program that advances responsible sourcing of conflict minerals	1
4.10.2.3 Optional—Smelter and refiner participation in OECD-aligned third-party mechanisms	1

## Annex G

(normative)

### **Auditor credentials for energy management system/energy performance criteria (for 4.9.3.1 and 4.9.3.2)**

*Replace the text of Annex G with the following:*

Until December 31, 2019, the auditor shall demonstrate to the manufacturer that he/she meets either a) or b). As of January 1, 2020, the auditor shall demonstrate that he/she meets a) only:

- a) The auditor has one of the following credentials:
  - 1) Efficiency Valuation Organization (EVO), Certified Measurement and Verification Professional (CMVP) Auditor
  - 2) Institute for Energy Management Professionals (IEnMP) Superior Energy Performance 50001 (SEP 50001), Lead Auditor for SEP 50001
  - 3) IEnMP SEP 50001, Performance Verifier
  - 4) IEnMP, 50001 Certified Practitioner in Energy Management System (50001 CP EnMS)

Credentials shall be demonstrated by providing up to date certification documentation for the specific credential in 1) through 4).

- b) The auditor has one of the following credentials:
  - 1) Association of Energy Engineers (AEE), Certified Energy Auditor
  - 2) AEE, Certified Energy Manager (CEM)
  - 3) ASHRAE, Building Energy Assessment Professional
  - 4) Certified ISO 50001 Lead Auditor; certification shall be obtained from an accredited personnel certification body for which the specified standard is in the scope of their accreditation.
  - 5) Energy Institute Chartered Energy Manager
  - 6) ESOS (UK auditing scheme) Lead Assessor, and can demonstrate expertise in performing energy measurement and verification (MandV) auditing in accordance with the IPMVP Protocol, by having successfully performed at 18 on-site complete energy MandV audit-days or in accordance with IPMVP Protocol within the last three years, or six prior MandV audits, as demonstrated by i) or ii):
    - i) Both of the following for b):
      - Attestation from the auditor's manager or other person of authority at the auditor's employer confirming the number of audits or audit-days;
      - A prior redacted energy MandV audit performed by the auditor in accordance with IPMVP Protocol within the last three years, for the required number of audits;

- ii) Transcript or certificate showing successful completion of a technical training on energy MandV techniques according to the IPMVP Protocol; Examples include:
  - AEE Fundamentals of Measurement and Verification: Applying the IPMVP ([https://www.aeeprograms.com/store/detail.cfm?id=757andcategory\\_id=4](https://www.aeeprograms.com/store/detail.cfm?id=757andcategory_id=4))
  - ASHRAE Professional Development Seminar: Energy Modeling Best Practices and Applications (<https://www.ashrae.org/education--certification/instructor-led-courses/energy-modeling-best-practices-and-applications-hvac-thermal>)
  - EVO Introductory MandV Training (<http://evo-world.org/en/introductory-one-day-m-v-training>)
  - U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) Measurement and Verification in ESPCs (<https://www4.eere.energy.gov/femp/training/training/measurement-and-verification-espcs>)

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