

Approved VCS Methodology  
Module VMD0039

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Sectoral Scopes 1 and 3

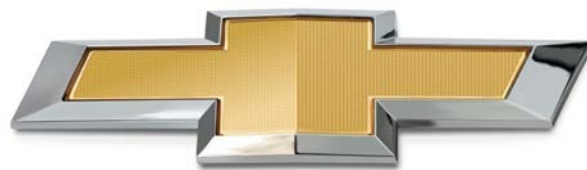
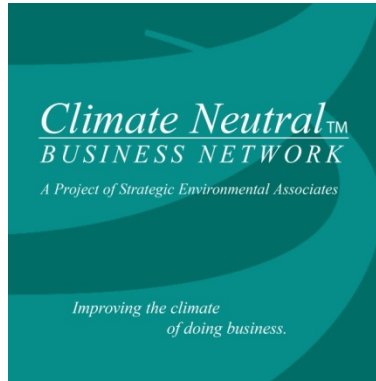
Campus Clean Energy and  
Energy Efficiency:

LEED-Certified Buildings Module

The methodology was developed by Climate Neutral Business Network (CNBN) in collaboration with Bonneville Environmental Foundation based upon generous support from Chevrolet.

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## Table of Contents

|     |   |    |
|-----|---|----|
| 1   | Sources .....   | 4  |
| 2   | Summary Description of the Module .....                                       | 4  |
| 3   | Definitions .....   | 7  |
| 3.1 | Defined Terms .....   | 7  |
| 3.2 | Acronyms.....   | 10 |
| 4   | Applicability Conditions .....  | 10 |
| 5   | Project Boundary .....  | 12 |
| 6   | Baseline Scenario .....   | 14 |
| 7   | Additionality .....   | 15 |
| 7.1 | Additionality Tests.....  | 15 |
| 7.2 | Level of the Additionality Benchmark .....                                    | 15 |
| 7.3 | Additionality Benchmark Calculations .....                                    | 17 |
| 8   | Quantification of GHG Emission Reductions and Removals .....                  | 19 |
| 8.1 | Quantification Procedures for New Construction and Existing Buildings B ..... | 19 |
| 8.2 | Quantification Procedures for Existing Buildings A.....                       | 20 |
| 8.3 | Net GHG Emission Reduction and Removals .....                                 | 21 |
| 9   | Monitoring.....   | 21 |
| 9.1 | Data and Parameters Available at Validation .....                             | 22 |
| 9.2 | Data and Parameters Monitored .....   | 24 |
| 9.3 | Description of the Monitoring Plan .....                                      | 30 |
| 10  | References.....   | 31 |
|     | APPENDIX 1: LEED 2009 Credits.....  | 32 |
|     | APPENDIX 2: Analysis of Performance Benchmarks .....                          | 34 |

## 1 SOURCES

This module uses the latest version of the following tools and guidance:

- US Environmental Protection Agency’s ENERGY STAR Portfolio Manager® program<sup>1</sup>
- US Environmental Protection Agency’s ENERGY STAR Target Finder tool<sup>2</sup>

The module is based on approaches used in the following methodologies:

- VM0008 Weatherization of Single and Multifamily Homes (version 1.1)
- NM0302 Emission reductions in the cement production facilities of Holcim Ecuador S.A. (proposed CDM methodology)

The following have also informed the development of the module:

- USGBC’s LEED certification protocols<sup>3</sup>
- Portfolio Manager supporting documentation<sup>4</sup>

## 2 SUMMARY DESCRIPTION OF THE MODULE

| Additionality and Crediting Method |   |
|------------------------------------|---|
| Additionality                      | Performance Method  |
| Crediting Baseline                 | Performance Method for New Construction and Existing Buildings - B<br>Project Method for Existing Buildings - A |

This module provides the procedures for quantifying reductions in scope 1 stationary combustion emissions and scope 2 emissions from purchase of electricity, heat, cooling or steam in individual Leadership in Energy and Environmental Design- (LEED-) certified buildings on US college and K-12 campuses.

The module is referenced by, and is part of, VCS methodology *VM0025 Campus Clean Energy and Energy Efficiency*.

<sup>1</sup> EPA, 2013: <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>

<sup>2</sup> EPA, 2013: [http://www.energystar.gov/index.cfm?c=new\\_bldg\\_design.bus\\_target\\_finder](http://www.energystar.gov/index.cfm?c=new_bldg_design.bus_target_finder)

<sup>3</sup> USGBC, 2013: <http://new.usgbc.org/leed>

<sup>4</sup> EPA, Nov, 2011. “Methodology for Greenhouse Gas Inventory Calculations”  
[http://www.energystar.gov/ia/business/evaluate\\_performance/Emissions\\_Supporting\\_Doc.pdf?f655-cb13](http://www.energystar.gov/ia/business/evaluate_performance/Emissions_Supporting_Doc.pdf?f655-cb13)  
EPA, Mar, 2011. “ENERGY STAR Performance Ratings – Technical Methodology”  
[http://www.energystar.gov/ia/business/evaluate\\_performance/General\\_Overview\\_tech\\_methodology.pdf?9d9b-0c2d](http://www.energystar.gov/ia/business/evaluate_performance/General_Overview_tech_methodology.pdf?9d9b-0c2d)  
EPA, Jul, 2013. “Portfolio Manager Technical Reference: ENERGY STAR Score”  
<http://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-technical-reference-energy-star-score>  
[http://www.energystar.gov/index.cfm?c=evaluate\\_performance.bus\\_portfoliomanager\\_model\\_tech\\_desc](http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager_model_tech_desc)

The module applies to projects targeting emission reductions in LEED-certified New Construction (NC) and LEED-certified Existing Buildings (EB) located on college campuses or K-12 schools in the United States. LEED certification is required in order to ensure that many key parameters are sustained.

Buildings are segmented by LEED-certified newly constructed buildings (New Construction), existing buildings that would have previously been ineligible for LEED-certification (Existing Buildings - A) and existing buildings that were previously LEED-certified (Existing Buildings - B). Within each LEED certification type buildings are also segmented by LEED-certified building category (higher education, higher education laboratory and K-12 school). To demonstrate additionality these LEED-certified buildings must achieve reductions in scope 1 stationary combustion emissions and scope 2 emissions (see definitions of these terms) that exceed the relevant additionality performance benchmark set out in this module. The project's emissions must be monitored through EPA's Target Finder tool, preferably via LEED's GBIG program.<sup>5</sup>

The module provides criteria and procedures for the following LEED certifications:

### **New Construction**

LEED-certified New Construction must surpass an additionality performance benchmark  $PB_{NC}$  which was developed based on historical USGBC records<sup>6</sup> and is set to ensure the building achieves above average performance for LEED-certified buildings in terms of the building's improvement in energy use intensity (see definition of EUI) over its regulatory code.<sup>7</sup> Buildings that surpass this performance benchmark will likely be beyond an Energy Star score of ES 86.<sup>8</sup> ES 86 represents the average LEED-certified building Energy Star score.<sup>9</sup> The top 50<sup>th</sup> percentile of LEED-certified building designs typically achieve a 21-26 percent EUI improvement versus EUI specified by the relevant regulatory code, based on USGBC's historical analysis by sector.

The additionality performance benchmark metric for New Construction ( $PB_{NC}$ ) is the percent improvement in EUI over the relevant regulatory code specified in the building's LEED certification design documents (eg, ASHRAE Standard including: 90.1-2004 (ASHRAE 2004), 90.1-2007 (ASHRAE 2007), 90.1-2010 (ASHRAE 2010)). The levels of the additionality performance benchmarks segmented by building type and regulatory code are provided in Section 7.1.

The project must achieve a performance level that meets the additionality performance benchmark as specified in each project year  $y$  (after adjusting for any change in campus square footage) in order to be eligible for crediting in that year.

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<sup>5</sup> USGBC is developing a portal within GBIG through which projects can be developed and potentially grouped. The use of the GBIG portal is not required and its use does not impact the certification or eligibility of projects.

<sup>6</sup> USGBC has and will continue to analyze the total population of LEED-certified buildings in each category (higher education, higher education laboratory and K-12 school), segmented by ASHRAE standard (regulatory code) under which they were certified, in order to establish the performance curve for all these buildings based upon the EUI percent improvement over regulatory code that the buildings achieve in their designed performance.

<sup>7</sup> Applicable regulatory code is defined for New Construction during the LEED certification and is found in the LEED certification documents.

<sup>8</sup> On average LEED-certified New Constructions in the US have attained an Energy Star score of ES 86 based on an analysis of USGBC data from 2007 to 2011.

<sup>9</sup> Based on USGBC internal analyses and personal communications. Please see the chart in Appendix 2 which gives all this data, analyzed and published in a transparently reported fashion.

## **Existing Buildings**

LEED-certified existing buildings must qualify as one of the following:

- **Existing Building A (EB-A)**: In order to surpass the additionality performance benchmark  $PB_{EBA}$ , the building must have achieved a 20 percent reduction in EUI in a single year, while starting historically from a baseline performance level that would render the building ineligible for LEED certification.<sup>10</sup> The level of  $PB_{EBA}$  is consistent with LEED's pilot credit 67.<sup>11</sup> The project must surpass the additionality performance benchmark (ie, achieve a 20 percent improvement in EUI relative to the year before the retrofits occurred) in each project year  $y$  in order for emission reductions in that year to be eligible for crediting. The calculation of a 20 percent improvement in performance is based on the project's EUI before and after the retrofits, which is established by entering the pre- and post-retrofit data separately into Target Finder.
- **Existing Building B (EB-B)**: In order to surpass the additionality performance benchmark  $PB_{EBB}$ , the building must surpass the LEED-certified building average Energy Star score of ES 86, which compares the buildings performance to similar buildings on a percentile basis. The project must surpass the additionality performance benchmark in each project year  $y$  in order for emission reductions in that year to be eligible for crediting. The EB-B pathway excludes US higher education campus laboratories.<sup>12</sup>

The module also requires that all projects meet certain criteria and procedures as follows:

- GHG emission reductions and Energy Star scores must be determined and monitored through EPA's Target Finder tool, preferably integrated into LEED's GBIG reporting program.<sup>13</sup> These tools take into account regional, climatic, occupational, computer load, square footage and other salient factors in the determination of GHG emission reductions and Energy Star scores. The applicability conditions for the EPA Portfolio Manager program must also be met as set out in Section 4.
- Campus laboratories applying EB-A must ensure that reasonably comparable research is taking place in the labs before and after retrofits (eg, physical, chemical, biological).
- The activities (ie, technologies and measures) responsible for delivering the required performance level within the building must be identified from the list of qualifying approaches set out in the applicability conditions (set Section 4). These technologies and measures must not have been adopted as a result of regulation.

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<sup>10</sup> LEED's pilot credit 67 examines the existing building's baseline to establish whether it would already meet LEED certification status using a variety of metrics. Attaining pilot credit 67 ensures that assessment has been conducted under LEED. For most buildings this threshold is ES 69 equivalent. With the new version 4 LEED rating system, this may rise to ES 75 in 2014.

<sup>11</sup> LEED's pilot credit 67 is not required for the existing building's LEED certification. However, the performance benchmark is defined in a manner that is comparable to LEED's pilot credit 67 which also helps ensure that the building during its retrofit has not significantly changed its usage or functional characteristics, thus precluding leakage. Particular attention must be given to these aspects for higher education laboratories using this pathway to ensure that comparable research is being conducted before and after retrofits and similar levels of user intensities.

<sup>12</sup> EB-B relies upon ES scores as the additionality performance benchmark. USGBC is not yet confident that the EPA ES tool can be accurately applied to compare laboratories' relative performances. Other applications under this module use the tool to compare laboratories performances to their own prior historical performance or improvements over regulatory code and these applications were considered reliable.

<sup>13</sup> The use of LEED's GBIG reporting program is optional.

- Emissions arising from a campus' third party customer use (eg, if campus on-site energy generation systems provide energy services to neighboring hospitals) must be excluded. Any on-site renewable energy whose services have been sold to other customers either directly as energy or as renewable attributes or carbon reductions (eg, as renewable energy certificates or carbon credits) must also be excluded from the project boundary. Similarly, if RECs have been purchased by the campus to be applied to the LEED-certified building, the RECs must be excluded (ie, project and baseline emissions cannot be reduced via such REC purchases). Additional guidance regarding right of use, ownership and double counting is specified in *VM0025 Campus Clean Energy and Energy Efficiency*.

### 3 DEFINITIONS

#### 3.1 Defined Terms

##### **ASHRAE Standard**

The building energy regulatory code as applied in the United States which LEED stipulates for LEED New Construction certifications

##### **ASHRAE 2004**

The regulatory code provided in ASHRAE Standard 90.1-2004, which is used in LEED version 2.2

##### **ASHRAE 2007**

The regulatory code provided in ASHRAE Standard 90.1-2007, which is used in LEED version 3

##### **ASHRAE 2010**

The regulatory code provided in ASHRAE Standard 90.1-2010, which is used in LEED version 4

##### **Baseline Period**

The historical reference period over which the project's baseline emissions are calculated. Relevant to projects applying a project method (ie, EB-A)

##### **Campus**

A site in the United States at which educational activities take place including a college, university or K-12 school. The LEED buildings on campuses are categorized as *higher education laboratories*, (laboratories on college or university campuses, not those on K-12 campuses); *higher education buildings* (any other building on a college or university campus); and *K-12 schools* (any building on a K-12 campus). Note that *VMD0038 Campus-Wide Module* has a separate definition for campus

##### **Design Building**

A theoretical building that is comparable, with respect to property use details and total annual energy use, to the LEED-certified building included in the project, used by Target Finder to provide performance results (eg, energy use intensity, Energy Star scores or GHG emissions). Target Finder refers to results for the design building in the *Property Estimate at Design* column of the results table

**Energy Star Score (ES score)**

The rating system developed by EPA to evaluate buildings' relative energy performance achievements on a percentile basis (ES 1 through ES 100), adjusting for salient factors such that comparisons can be drawn between buildings in different regions. Target Finder uses ES 50 as the baseline for comparison against which the energy and GHG emission performance are evaluated for design buildings. Target Finder refers to the results for an ES 50 building in the *Median Building* column of the results table

**Energy Use Intensity (EUI)**

The total scope 1 stationary combustion and scope 2 energy use per square foot of building space, as measured in British Thermal Units per square foot (BTU/ft<sup>2</sup>). This is a standard performance benchmark metric used in the energy efficiency sector and by the LEED certification program

**EPA Portfolio Manager (Portfolio Manager)**

An online program developed by EPA under the Energy Star program designed to measure and track energy and water consumption and calculate GHG emissions. The EPA Target Finder tool is incorporated within this program<sup>14</sup>

**EPA Target Finder (Target Finder)**

A tool developed by EPA as part of the Portfolio Manager that estimates the Energy Star score and calculates EUI and GHG emissions for design buildings and comparable ES 50 buildings.<sup>15</sup>

**Green Building Information Gateway (GBIG)**

A reporting portal developed by USGBC through which LEED-certified buildings can optionally report their project's energy and GHG performance results in order to facilitate group certification

**K-12 School (School)**

A site where elementary through high school educational activities take place (ie, kindergarten to 12<sup>th</sup> grade) in the United States

**Labs for the 21<sup>st</sup> Century (LABS 21)**

A program developed by EPA and DoE dedicated to improving the environmental performance of US laboratories. This program includes an energy and GHG reporting tool often used for benchmarking purposes by campus laboratories<sup>16</sup>

**Leadership in Energy and Environmental Design (LEED)**

An internationally recognized green building certification program developed by USGBC<sup>17</sup>

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<sup>14</sup> Portfolio Manager is described at: [http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager?c=evaluate\\_performance.bus\\_portfoliomanager](http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager?c=evaluate_performance.bus_portfoliomanager)

<sup>15</sup> Target Finder is described at: [http://www.energystar.gov/index.cfm?c=new\\_bldg\\_design.bus\\_target\\_finder](http://www.energystar.gov/index.cfm?c=new_bldg_design.bus_target_finder), and the Target Finder and the tool is available at: <https://portfoliomanager.energystar.gov/pm/targetFinder.jsessionid=70FA3987967AB09BFD5E88CB3210A75E?execution=e1s1>

<sup>16</sup> LABS 21 is described at: <http://www.labs21century.gov/>

<sup>17</sup> LEED is described at: <http://www.usgbc.org/leed>



### **LEED-Certified Existing Building (Existing Building)**

An existing building certified under the LEED Existing Building standard for its operation and maintenance. The LEED Existing Building standard includes the following versions: *LEED 2009 for Existing Buildings Operation and Maintenance* and *LEED for Existing Buildings: Operation and Maintenance 2008*

### **LEED-Certified New Construction (New Construction)**

A newly constructed building certified under the LEED New Construction standard for its design and construction. The LEED New Construction standard includes the following versions: *LEED 2012 for New Construction and Major Renovations* (LEED v4), *LEED 2009 for New Construction and Major Renovations* (LEED v3) and *LEED for New Construction and Major Renovations Version 2.2* (LEED v2.2). The version of the LEED New Construction standard used in certification corresponds to the regulatory code of the building

### **LEED Pilot Credit 67**

One of the pilot credits for testing alternative compliance paths within the LEED Existing Building standard which recognizes superior energy efficiency gains that increase EUI by more than 20 percent within a single year<sup>18</sup>

### **Performance Benchmark**

See VCS document *Program Definitions*

### **Project Year 1; Project Year 0**

Project year 1 is the year following the project crediting period start date (ie, the first year of the project crediting period). Project year 1 is denoted as the year where  $p = 1$

Project year 0 is the year prior to project year 1 and is also known as the last baseline year.

Project year 0 is denoted as the year where  $p = 0$ .

Project years may be defined on calendar or fiscal or other periods (although consistency with relevant fiscal reporting to ACUPCC/LEED is strongly preferred)

### **Property Type**

The primary use of the building as established under the EPA Portfolio Manager definitions (eg, office, hospital, K-12 school).<sup>19</sup> The list of property types eligible under this module is set out in Table 1

### **Property Use Details**

The data required by the EPA Target Finder for the respective property type to estimate the Energy Star score, EUI and GHG emissions (eg, gross floor area, weekly operating hours, number of computers, etc.)

### **Scope 1 Stationary Combustion Emissions (Stationary Combustion Emissions)**

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<sup>18</sup> LEED Pilot Credit 67 is described at: <http://www.usgbc.org/node/1733653?return=/pilotcredits>

<sup>19</sup> EPA, 2013: <https://www.energystar.gov/buildings/tools-and-resources/list-portfolio-manager-property-types-definitions-and-use-details>

Scope 1 emissions include all direct energy-based GHG emissions, designated as *scope 1 emissions* under USGBC. Scope 1 Stationary Combustion Emissions include only energy-based GHG emissions from energy generation located on campus sites

### **Scope 2 Emissions**

Scope 2 emissions include all indirect energy-based GHG emissions, designated as *scope 2 emissions* under USGBC, from consumption of purchased electricity, heat, cooling and steam

## **3.2 Acronyms**

|                        |   |
|------------------------|---|
| <b>AASHE</b>           | Association for the Advancement of Sustainability in Higher Education     |
| <b>ACUPCC</b>          | American College & University Presidents' Climate Commitment              |
| <b>ASHRAE</b>          | American Society of Heating, Refrigerating and Air Conditioning Engineers |
| <b>CDM</b>             | Clean Development Mechanism   |
| <b>CH<sub>4</sub></b>  | Methane   |
| <b>CO<sub>2</sub></b>  | Carbon Dioxide  |
| <b>CO<sub>2</sub>e</b> | Carbon Dioxide Equivalent   |
| <b>DoE</b>             | United States Department of Energy  |
| <b>EB-A</b>            | Methodology Path A for LEED Existing Buildings                            |
| <b>EB-B</b>            | Methodology Path B for LEED Existing Buildings                            |
| <b>EPA</b>             | United States Environmental Protection Agency                             |
| <b>GHG</b>             | Greenhouse Gas  |
| <b>N<sub>2</sub>O</b>  | Nitrous Oxide   |
| <b>NGO</b>             | Non-Governmental Organization   |
| <b>REC</b>             | Renewable Energy Certificate  |
| <b>USGBC</b>           | United States Green Building Council                                      |
| <b>UNFCCC</b>          | United Nations Framework Convention on Climate Change                     |
| <b>VCS</b>             | Verified Carbon Standard  |

## **4 APPLICABILITY CONDITIONS**

This methodology applies to LEED-certified buildings that apply renewable energy and/or energy efficiency technologies or measures to achieve substantial performance improvements.

This module is applicable under the following conditions:

- The building must be LEED-certified New Construction or LEED-certified Existing Building
- The building must be located on a campus (see definition) in the United States.
- For existing buildings, the following applies:
  - **EB-A**: To apply the Existing Buildings A (EB-A) option, buildings must have a historical baseline energy performance level that would render the building ineligible for LEED certification. Project year 0 must have delivered an energy performance at or below the

LEED Existing Building minimum energy efficiency performance given in credit EAp2 (currently ES 69).<sup>20</sup>

- **EB-B:** To apply the Existing Buildings B (EB-B) option, buildings must have an historical baseline performance level that would have rendered the building eligible for LEED certification. US higher education campus laboratories are excluded from applying EB-B.<sup>21</sup>
- GHG emission reductions and Energy Star scores must be determined and monitored through EPA Target Finder, preferably integrated into LEED's GBIG reporting program.<sup>22</sup>
- The building must meet the relevant eligibility criteria for an Energy Star score, as specified by the Portfolio Manager program, except for buildings meeting the Portfolio Manager property type definition for *laboratory* and *college/university* which are eligible to apply the tool using the *applicable property type* specified in Table 1 following the procedures within the module. The eligibility criteria for the Energy Star score are specified by EPA and include criteria for the property type, property use details and energy data.<sup>23</sup> Procedures for where to apply energy data in Target Finder calculations are specified within Section 8 and Section 9. Where energy data is required, the eligibility criteria for energy data must be met.
- The building must meet with one of the *eligible Portfolio Manager property types* in Table 1. The building must then apply the corresponding *applicable property type* when using Target Finder to estimate GHG emissions (eg, a building that meets the *laboratory* definition would apply the *office* property type in Target Finder).<sup>24</sup>

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<sup>20</sup> The minimum energy efficiency performance established in EAp2 for LEED v3 can be found at: <http://www.usgbc.org/node/1731052?return=/credits/existing-buildings/v2009/energy-%26-atmosphere>

For most buildings the minimum energy efficiency performance is an Energy Star score of ES 69. With the new LEED v4 LEED rating system, this may rise to ES 75 in 2014.

<sup>21</sup> EB-B relies upon ES scores as the additionality performance benchmark and USGBC is not yet confident that Target Finder can be accurately applied to compare laboratories' relative performances. Other applications under this module use the tool to compare laboratories performances to their own prior historical performance or improvements over regulatory code and these applications are considered reliable.

<sup>22</sup> GBIG reporting is optional and is not an applicability condition or required for calculations. Use of Target Finder is necessary because it takes into account regional, climatic, occupational, computer loads, square footage and other salient performance factors for the applicable building category in the determination of GHG emission reductions and ES scores.

<sup>23</sup> The eligibility criteria for an Energy Star score, as specified by the Portfolio Manager program, can be found at: <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/eligibility>

<sup>24</sup> The applicable Portfolio Manager property types comprise those whose results are based upon the most rigorous set of regression analytics supporting their results. Buildings meeting the *laboratory* property type definition should use the *office* property type in Target Finder since the laboratory property type does not yet have the regression-based supporting analytics. Similarly, buildings that only meet the *college/university* property type definition must use the *office* property type for Target Finder calculations. The list of property types which have the regression analytics can be found here: <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/identify-your-property-type-0>

**Table 1:** Mapping of Eligible Property Types

| Eligible LEED-Certified Building Type | Eligible Portfolio Manager Property Type                              | Applicable Property Type              |
|---------------------------------------|---|---------------------------------------|
| Higher Education Building             | Office  | Office                                |
|                                       | Residence Hall/Dormitory  | Residence Hall/Dormitory              |
|                                       | Medical Office  | Medical Office                        |
|                                       | Hospital (general medical & surgical)                                 | Hospital (general medical & surgical) |
|                                       | Hotel   | Hotel                                 |
|                                       | Worship Facility  | Worship Facility                      |
|                                       | Data Center   | Data Center                           |
|                                       | Other college/university building (ie, where none of the above apply) | Office                                |
| Higher Education Laboratory           | Laboratory  | Office <sup>25</sup>                  |
| K-12 School                           | K-12 School   | K-12 School                           |

- Laboratories qualifying under EB-A must ensure that reasonably comparable research is taking place in the labs before and after retrofits (eg, physical, chemical, biological). Projects may use LAB 21 analysis to demonstrate this by applying EUIs taken from measurements before and after the retrofit from the LAB 21 software package for campus laboratories. However, for the estimation of GHG reductions, Target Finder must be used by labs in order to adjust for other variances (eg, weather variances).
- The building must have implemented activities described under at least two of the Energy and Atmosphere credits in the relevant LEED Standard in order to achieve the project's superior GHG performance. Such credits, for example, for a building applying LEED v3 New Construction and Existing Buildings are set out in Appendix 2.

## 5 PROJECT BOUNDARY

The spatial extent of the project boundary for the buildings included in the project encompasses the same boundary as specified in the LEED New Construction or Existing Building certification. Table 3 sets out the GHG emission sources which are included in the project boundary (which is consistent with LEED energy reporting protocols).

<sup>25</sup> Target Finder draws on Commercial Building's Energy Consumptions Survey data which includes research and development in the operations included within the Office category

**Table 2:** GHG Sources Included In or Excluded from the Project Boundary

| Emissions (Baseline and Project) | Source                          | Gas              | Included/ Excluded | Justification   |
|----------------------------------|---------------------------------|------------------|--------------------|---|
| Scope 1                          | Stationary Combustion           | CO <sub>2</sub>  | Included           | CO <sub>2</sub> emissions from combustion of fossils fuels are significant. CH <sub>4</sub> and N <sub>2</sub> O make up one percent of building emissions and are included in Target Finder calculations of GHG emissions                                  |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |
|                                  | Mobile Combustion               | CO <sub>2</sub>  | Excluded           | Not included in LEED building energy consumption and not impacted by project activities   |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |
|                                  | Fugitive                        | CO <sub>2</sub>  | Excluded           | Not included in LEED building energy consumption and not impacted by project activities   |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |
|                                  | Process                         | CO <sub>2</sub>  | Excluded           | Not included in LEED building energy consumption and not impacted by project activities   |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |
| Scope 2                          | Scope 2 Electricity (Purchased) | CO <sub>2</sub>  | Included           | CO <sub>2</sub> emissions from electricity production are the large source of GHG emissions from buildings. CH <sub>4</sub> and N <sub>2</sub> O make up one percent of building emissions and are included in Target Finder calculations of GHG emissions. |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |
|                                  | Purchased Heating               | CO <sub>2</sub>  | Included           | CO <sub>2</sub> emissions from purchased heating may be significant. CH <sub>4</sub> and N <sub>2</sub> O make up one percent of building emissions and are included in Target Finder calculations of CO <sub>2</sub> e.                                    |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |
|                                  | Purchased Cooling               | CO <sub>2</sub>  | Included           | CO <sub>2</sub> emissions from purchased cooling may be significant. CH <sub>4</sub> and N <sub>2</sub> O make up one percent of building emissions and are included in Target Finder calculations of GHG emissions.  |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |
|                                  | Purchased Steam                 | CO <sub>2</sub>  | Included           | CO <sub>2</sub> emissions from purchased steam may be significant. CH <sub>4</sub> and N <sub>2</sub> O make up one percent of building emissions and are included in Target Finder calculations of GHG emissions.  |
|                                  |                                 | CH <sub>4</sub>  |                    |   |
|                                  |                                 | N <sub>2</sub> O |                    |   |

GHG emission reductions arising from energy generation systems located within the building but which provide services beyond the building (eg, to nearby facilities), must be excluded from the project boundary. Any GHG emission reductions arising from such services delivered beyond the buildings included in the project boundary must be separated and deducted from the net GHG emission reductions.

Where renewable energy certificates have been purchased by the campus to be applied to the LEED building, they must be excluded from the project boundary (ie, project and baseline emissions cannot be reduced via such purchases). Additional guidance regarding RECs is specified in *VM0025 Campus Clean Energy and Energy Efficiency*.

## 6 BASELINE SCENARIO

The baseline scenario is specified for each pathway below.

### **New Construction (NC):**

The baseline scenario comprises the scope 1 stationary combustion emissions and scope 2 emissions for a comparable building with an Energy Star score of ES 50, determined using Target Finder. The GHG emissions are given in the *Median Property* column of the Target Finder results table. The applicable property type must be selected using Table 1 in Section 4 (and inputted as *primary function* in Target Finder).<sup>26</sup>

### **Existing Buildings B (EB-B):**

The baseline scenario comprises the scope 1 stationary combustion emissions and scope 2 emissions for a comparable building with an Energy Star score of ES 50, determined using Target Finder. The GHG emissions are given in the *Median Property* column of the Target Finder results table. The applicable property type must be selected using Table 1 in Section 4 (and inputted as *primary function* in Target Finder).

### **Existing Buildings A (EB-A):**

The baseline scenario comprises the building's average historical scope 1 stationary combustion emissions and scope 2 emissions (as such scopes are defined under this module). The baseline period must include at least three of the five years prior to the project start date, and must include project year 0. The baseline period must comprise the maximum number of baseline years possible given the data available in the LEED certification documents.

The GHG emissions for the baseline period must be determined by inputting the building's historical energy use into Target Finder for each year. The GHG emissions are given for each year in the *Property Estimate at Design* column of the Target Finder results table. This historical energy consumption data is given in the LEED pilot credit 67 documentation. The comparable property type must be selected using the mapping in Table 1 in Section 4.

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<sup>26</sup> Target Finder draws on Commercial Building's Energy Consumptions Survey data which includes research and development in the operations included within the Office category<sup>27</sup>. The benchmark used here is a percent saving based on EUI, taken directly from the LEED New Construction certification documents for pilot credit 67. The percent improvement in EUI can also be calculated using Target Finder by entering the total annual energy use and property use details as found in the LEED certification documents.

## 7 ADDITIONALITY

### 7.1 Additionality Tests

This module uses a performance method for the demonstration of additionality. Appendix 3 provides a full discussion of performance benchmark approach.

#### **Step 1: Regulatory Surplus**

Projects proponents must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the *VCS Standard*.

#### **Step 2: Performance Benchmark**

##### **New Construction:**

The building's percent improvement in energy use intensity (EUI) relative to its regulatory code (as determined during LEED New Construction certification; eg, ASHRAE 2004, 2007) must be equal to or greater than the additionality performance benchmark specified in Section 7.2 below. EUI data must be taken from the building's LEED certification documents.

##### **Existing Building B (EB-B):**

The Energy Star score for the building must be equal to or greater than the additionality performance benchmark specified in Section 7.2 below. The ES score must be determined by entering data from the building's LEED certification documents into Target Finder,

##### **Existing Buildings A (EB-A):**

The building's percent improvement in EUI within a single year must be equal to or greater than the additionality performance benchmark specified in Section 7.2 below.<sup>27</sup> EUI must be taken from the building's LEED certification documents (under LEED's Pilot Credit 67 analysis or separately under the building's EUI).

### 7.2 Level of the Additionality Benchmark

The additionality performance benchmarks are specified as the New Construction additionality benchmark ( $PB_{NC}$ ), Existing Buildings A additionality benchmark ( $PB_{EBA}$ ) and Existing Buildings B additionality benchmark ( $PB_{EBB}$ ), with their respective levels provided in Table 3 below. Note that all decreases in GHG emissions are denoted as positive percentages.

For New Construction, the additionality performance benchmark is specified for each LEED-certified building category as the average percent improvement in energy use intensity relative to the applicable regulatory code. The level of the additionality performance benchmark is set at the

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<sup>27</sup> The benchmark used here is a percent saving based on EUI, taken directly from the LEED New Construction certification documents for pilot credit 67. The percent improvement in EUI can also be calculated using Target Finder by entering the total annual energy use and property use details as found in the LEED certification documents.

EUI percent savings over the regulatory code achieved at the 50<sup>th</sup> percentile performance level relative to the same regulatory code used in the building's LEED certification. The 50<sup>th</sup> percentile performance level was determined based on a published analysis of all LEED-certified buildings in USGBC's database belonging to the same category (ie, higher education, higher education laboratory, K-12 school), as the building.<sup>28</sup> The data set for determining the additionality performance benchmarks was based on USGBC published data available in September 2012 and is provided in Appendix 3. Where the building is LEED-certified against ASHRAE 2010 regulatory code baselines, ASHRAE 2007 performance benchmarks must be used.<sup>29</sup>

For Existing Buildings B, the level of the additionality performance benchmark is specified as the LEED average ES score for all its certified buildings, which is currently an ES score of ES 86. The dataset for developing the additionality performance benchmark was based on a periodically published analysis of all LEED-certified buildings in USGBC's database in September 2012.

For Existing Buildings A, the level of the additionality performance benchmark is the LEED Pilot Credit 67 qualifying percent improvement requirement. As of September 2012, LEED's Credit 67 requires a 20 percent improvement in EUI in a single year.<sup>30</sup>

**Table 3:** Level of Additionality Benchmarks

| LEED Certification | Regulatory Code / Former LEED Status                      | LEED Building Type          | Value                    |
|--------------------|---|-----------------------------|--------------------------|
| New Construction   | ASHRAE 2004   | Higher Education Building   | PB <sub>NC</sub> = 25%   |
|                    |   | Higher Education Laboratory | PB <sub>NC</sub> = 21%   |
|                    |   | K-12 School                 | PB <sub>NC</sub> = 24.5% |
|                    | ASHRAE 2007<br>ASHRAE 2010                                | Higher Education Building   | PB <sub>NC</sub> = 26%   |
|                    |   | Higher Education Laboratory | PB <sub>NC</sub> = 26%   |
|                    |   | K-12 School                 | PB <sub>NC</sub> = 24%   |
| Existing Buildings | Previously Eligible for LEED Existing Building (EB-B)     | Higher Education Building   | PB <sub>EBB</sub> = 86   |
|                    |   | Higher Education Laboratory | Not eligible             |
|                    |   | K-12 School                 | PB <sub>EBB</sub> = 86   |
|                    | Previously Not Eligible for LEED Existing Building (EB-A) | Higher Education Building   | PB <sub>EBA</sub> = 20%  |
|                    |   | Higher Education Laboratory | PB <sub>EBA</sub> = 20%  |
|                    |   | K-12 School                 | PB <sub>EBA</sub> = 20%  |

<sup>28</sup> The benchmark used here is a percent cost saving based on EUI, taken directly from the LEED certification documents

<sup>29</sup> This module could be revised in the future as and when sufficient data for ASHRAE 2010 become available.

<sup>30</sup> In any revisions to this module attention must be paid to ensure that LEED's Credit 67 requirement is at least as stringent as the 85<sup>th</sup> percentile performance level achieved by published EPA Energy Star schools and colleges. The analysis of the 85<sup>th</sup> percentile performance level should be based upon the published EPA ES Partnership Awards, which categorize schools' annual improvements as at least 10 percent, 20 percent or 30percent. If the LEED Credit 67 requirement is lower than the EPA Award recognition level at the 85<sup>th</sup> percentile level, then the latter will form the additionality performance benchmark for the subsequent five year period.



### 7.3 Additionality Benchmark Calculations

The following calculations must be followed to determine additionality for each building included within the project. In years where the building does not meet the relevant additionality performance benchmark that building must be excluded from the quantification of GHG emission reductions for that year. Buildings that qualify for the given pathways must apply the calculations specified below (ie, only LEED-certified existing buildings that meet the applicability conditions for EB-A may apply the calculations for EB-A).

#### **New Construction:**

Each building design must surpass the New Construction additionality benchmark for project year 1 and subsequent project years, as follows:

$$LPCODE \geq PB_{NC} \quad (1)$$

Where:

LPCODE = Percent improvement in EUI relative to the applicable regulatory code (%)  
PB<sub>NC</sub> = New Construction additionality benchmark for the relevant LEED building category and regulatory code (%)

The LPCODE percent improvement metric is already defined and specified in the LEED new construction building's design certification documentation, stated as a percent cost saving.

#### **Existing Buildings B (EB-B):**

Each building must surpass the EB-B additionality benchmark for project year 1 and subsequent project years, as follows:

$$ESP_y \geq PB_{EBB} \quad (2)$$

Where:

ESP<sub>y</sub> = Energy Star score of the building for year y (percentile)  
PB<sub>EBB</sub> = Existing Building B additionality benchmark for relevant LEED building category (percentile)

To calculate the ES score (ESP<sub>y</sub>), each building's relevant input data must be entered into Target Finder. The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. The relevant input data include the building's property use details and total annual energy use. ESP<sub>y</sub> is the Energy Star score found in the *Property Estimate at Design* column as calculated by Target Finder.

The input data must be drawn from the LEED certification documents. Where such data are not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. For example, for the *office* property type, the required property use details include gross floor area, weekly operating hours, number of computers, number of workers on main shift, and percent that can be heated and percent that

can be cooled. Where total annual energy data is not sourced from LEED certification documents it must be calculated using procedures that are consistent with those used for LEED certification.

The same parameters (ie, property used details and total annual energy use) must be used for the quantification of GHG emission reductions in Section 19.

**Existing Buildings A (EB-A):**

Each building must surpass the Existing Buildings A additionality benchmark for project year 1, as follows:

$$LPEUI \geq PB_{EBA} \quad (3)$$

Where:

- LPEUI = Percent improvement in EUI between project year 0 and project year 1 (%)
- PB<sub>EBA</sub> = Existing Building A additionality benchmark for relevant LEED building category (%)

The percent improvement in EUI must either be taken from the LEED certification documents if LEED Pilot Credit 67 has been applied or be calculated using the following equation:

$$LPEUI = \frac{EUI_0 - EUI_1}{EUI_0} \quad (4)$$

Where:

- LPEUI = Percent improvement in EUI between project year 0 and project year 1 (%)
- EUI<sub>1</sub> = Energy use intensity for the building in project year 1 (BTU/ft<sup>2</sup>)
- EUI<sub>0</sub> = Energy use intensity for the building in project year 0 (BTU/ft<sup>2</sup>)

For each subsequent year of the project crediting period, the building must achieve an EUI improvement for that year's emission reductions to be included in the quantification of GHG emission reductions, as follows:

$$EUI_y \leq EUI_0 * (1 - PB_{EBA}) \quad (5)$$

Where:

- EUI<sub>y</sub> = Energy use intensity for the building in year y (BTU/ft<sup>2</sup>)
- EUI<sub>0</sub> = Energy use intensity for the building in project year 0 (BTU/ft<sup>2</sup>)
- PB<sub>EBA</sub> = Existing Building A additionality benchmark for relevant LEED building category (%)

EUI<sub>1</sub>, EUI<sub>0</sub> and EUI<sub>y</sub> must be either specified in the building's LEED certification documents under pilot credit 67 or calculated using Target Finder. The EUIs must be calculated by inputting each building's relevant data for year 0, year 1 and year y separately into Target Finder to yield *Source EUI* results in the *Property Estimate at Design* column. The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. The building's relevant information includes both the building's property use details and total annual energy use.

Input data to Target Finder (ie, property use details and total annual energy use) must be entered in accordance with the procedures described for the EB-B pathway.

## 8 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

The equations below quantify reductions in year  $y$  scope 1 stationary combustion emissions and scope 2 emissions for each building relative to the baseline. GHG emission estimates must be calculated using Target Finder (which adjusts for weather and other factors).

Where the quantification procedures require use of Target Finder the data must be entered as described below. The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. The data for each property use detail and, where relevant, the total annual energy use must be drawn from the LEED certification documents when available (in the energy and water section).

Where such data is not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. Where total annual energy data is not sourced from LEED certification documents it must be calculated using procedures that are consistent with those used for LEED certification. The same parameters (ie, property use details and total annual energy use) must be used for the determination of additionality in Section 7.

Quantification procedures for baseline, project and leakage emissions are given for New Construction and Existing Buildings B in Section 8.1, and separately for Existing Buildings A in Section 8.2. Quantification procedures for net GHG emission reductions are given for NC, EB-B and EB-A together in Section 8.3.

### 8.1 Quantification Procedures for New Construction and Existing Buildings B

#### 8.1.1 Baseline Emissions

Baseline emissions for the building  $b$  in year  $y$  ( $BE_{b,y}$ ) must be calculated using Target Finder to determine the GHG emission for a comparable building with an Energy Star score of ES 50. The GHG emissions for an ES 50 building are calculated by entering each building's relevant information for each year into Target Finder. The relevant information for the building  $b$  includes the property type and property use details. Annual energy use for that year must not be included (which is achieved by checking the "I don't want to enter energy estimates" box in Target Finder under Estimated Design Energy).  $BE_{b,y}$  is *total GHG emissions* for the ES 50 building found in the *Median Property* column calculated by Target Finder.

$BE_{b,y}$  must be calculated each year during the project crediting period and thus represents a dynamic baseline.

#### 8.1.2 Project Emissions

Project emissions for the building  $b$  in year  $y$  ( $PE_{b,y}$ ) must be calculated by entering each building's property type, property use details and total annual energy use into Target Finder.

$PE_{b,y}$  is *total GHG emissions* for the design building found in the *Property Estimate at Design* column calculated by Target Finder.

### 8.1.3 Leakage

Leakage ( $LE_{b,y}$ ) is set at zero. The specification of the project boundary is designed to avoid leakage.

## 8.2 Quantification Procedures for Existing Buildings A

### 8.2.1 Baseline Emissions

Baseline emissions for each building  $b$  ( $BE_b$ ) are calculated using the GHG emissions averaged over each year included in the building's baseline period. Historical GHG emissions for each building must be generated using Target Finder by inputting the building's property type, property use details and total annual energy use for each baseline year  $x$ .  $EPAPMTG_{b,x}$  is *total GHG emissions* for the design building in baseline year  $x$  found in the *Property Estimate at Design* column calculated by Target Finder.  $BE_b$  is calculated using the following equation:

$$BE_b = \frac{\sum_x EPAPMTG_{b,x}}{B_b} \quad (6)$$

Where:

$BE_b$  = Baseline emissions for building  $b$  (tCO<sub>2</sub>e)  
 $EPAPMTG_{b,x}$  = Historical GHG emissions for building  $b$  in baseline year  $x$  (tCO<sub>2</sub>e)  
 $B_b$  = Baseline years for building  $b$  (number)

The baseline emissions are averaged over the years included in the building's baseline period,  $B$ . The baseline period must include at least three of the five years prior to the project start date, and must include project year 0. The baseline period  $B$  must comprise the maximum number of baseline years possible given the data available in the building's LEED certification documentation.

To adjust for business as usual energy efficiency gains,  $BE_b$  is adjusted each year  $y$  to take account of an assumed US average 1.3 percent efficiency improvement factor using the following equation:

$$BE_{b,y} = BE_b * (1 - 0.013)^{(y - 1)} \quad (7)$$

Where:

$BE_{b,y}$  = Baseline emissions for building  $b$  in year  $y$  (tCO<sub>2</sub>e)  
 $y$  = Project year (number)  
 $BE_b$  = Baseline emissions for the building  $b$  (tCO<sub>2</sub>e)

### 8.2.2 Project Emissions

Project emissions for the building  $b$  in year  $y$  ( $PE_{b,y}$ ) are calculated by entering each building's property type, property use details and total annual energy use into Target Finder.  $PE_{b,y}$  is the *total GHG emissions* for the design building found in the *Property Estimate at Design* column calculated by Target Finder.

### 8.2.3 Leakage

Leakage ( $LE_{b,y}$ ) is set at zero. The specification of the project boundary is designed to avoid leakage.

## 8.3 Net GHG Emission Reduction and Removals

For each building  $b$ , the net GHG emissions reductions in year  $y$  ( $ER_{b,y}$ ) must be calculated using the following equation.

$$ER_{b,y} = BE_{b,y} - PE_{b,y} - LE_{b,y} \quad (8)$$

Where:

|            |   |
|------------|---|
| $ER_{b,y}$ | = Net GHG emission reductions for the building $b$ in year $y$ (tCO <sub>2</sub> e) |
| $BE_{b,y}$ | = Baseline emissions for the building $b$ in year $y$ (tCO <sub>2</sub> e)          |
| $PE_{b,y}$ | = Project emissions for the building $b$ in year $y$ (tCO <sub>2</sub> e)           |
| $LE_{b,y}$ | = Leakage for the building $b$ in year $y$ (tCO <sub>2</sub> e)                     |

Net GHG emission reductions are based (only) on the reductions achieved by buildings that meet the relevant additionality benchmark (ie, *eligible* buildings), using the following equation:

$$ER = \sum_b \sum_y ER_{b,y} \quad (9)$$

Where:

|            |  |
|------------|--|
| $ER$       | = Net GHG emission reductions for the project (tCO <sub>2</sub> e)                               |
| $ER_{b,y}$ | = Net GHG emissions reductions for <i>eligible</i> building $b$ in year $y$ (tCO <sub>2</sub> e) |

Where both campus-wide and LEED-certified building emission reductions are sought in combination from the same campus, the building reductions must be subtracted from the campus-wide total, as described in the methodology framework document *VM0025 Campus Clean Energy and Energy Efficiency*.

## 9 MONITORING

The data and parameters available at validation, and monitored, are provided in Sections 9.1 and 9.2 below. Section 9.3 sets out the monitoring plan, as well as additional requirements regarding consistency of data used in LEED and Target Finder reporting, and provision of primary documentation to demonstrate that data entered into Target Finder conforms to Target Finder

guidance when not sourced directly from LEED certification documents. If higher education laboratories apply a LAB 21 analysis, LAB 21 reporting protocols must be conformed to.

## 9.1 Data and Parameters Available at Validation

The data and parameters required at validation include (as relevant for the buildings included in the project) the parameters provided in this section, plus the parameters  $ESP_1$ ,  $EUI_0$ ,  $EUI_1$ ,  $BE_{b,1}$ ,  $EPAPMTG_{b,1}$  and  $y$  provided in Section 9.2 below. The parameters in Section 9.2 must also be monitored annually, which is why they are provided in that section.

|  |  |
|--|--|
| Data Unit / Parameter  | $PB_{NC}$  |
| Data unit  | Percent  |
| Description  | New Construction additionality benchmark for relevant LEED building category and regulatory code. The levels of the benchmarks are set at the percent savings in EUI relative to the regulatory code achieved at the LEED New Construction 50 <sup>th</sup> percentile performance level. The benchmarks are segmented by LEED building category (higher education, higher education laboratory, K-12 school) relative to the applicable regulatory code (eg, ASHRAE 2004, 2007) as used in the building's LEED certification. |
| Equations  | 1  |
| Source of data   | The additionality benchmarks have been calculated based on published analysis of all LEED-certified (v2.2, v3, v4) New Construction buildings (data available at September 2012 from USGBC's database), segmented by regulatory code and LEED building category (higher education building, higher education laboratory, K-12 school).   |
| Value applied  | The levels of the additionality benchmarks are set out in Table 3.   |
| Justification of choice of data or description of measurement methods and procedures applied | Justification for the benchmarks is provided in Appendix 4   |
| Purpose of Data  | Determination of additionality   |
| Comments   |  |

|                       |   |
|-----------------------|---|
| Data Unit / Parameter | $PB_{EBB}$  |
| Data unit             | Percentile  |
| Description           | Existing Building B additionality benchmark for relevant LEED building category. The levels of the benchmarks are set at the LEED average ES score for all LEED-certified buildings. The benchmarks are segmented by LEED building category |

|  |  |
|--|--|
|  | (higher education, higher education laboratory, K-12 school) used in the building's LEED certification.  |
| Equations  | 2  |
| Source of data   | The additionality benchmarks have been calculated based upon a periodically published analysis of all LEED-certified buildings in USGBC's database |
| Value Applied  | The levels of the additionality benchmarks are set out in Table 3.   |
| Justification of choice of data or description of measurement methods and procedures applied | Justification for the benchmarks is provided in Appendix 4   |
| Purpose of Data  | Determination of additionality   |
| Comments   |  |

|  |  |
|--|--|
| Data Unit / Parameter  | $PB_{EBA}$   |
| Data unit  | Percent  |
| Description  | Existing Building A additionality benchmark for relevant LEED building category. The levels of the benchmarks are set at the percent improvement in Energy Use Intensity in a single year required by USGBC for LEED Pilot Credit 67. The benchmarks are segmented by LEED building category (higher education, higher education laboratory, K-12 school) used in the building's LEED certification. |
| Equations  | 3 and 5  |
| Source of data   | The additionality benchmarks have been calculated based on analyses from USGBC's Pilot Credit rating system.   |
| Value Applied  | The levels of the additionality benchmarks are set out in Table 3.   |
| Justification of choice of data or description of measurement methods and procedures applied | Justification for the benchmarks is provided in Appendix 4.  |
| Purpose of Data  | Determination of additionality   |
| Comments   |  |

|                       |   |
|-----------------------|---|
| Data Unit / Parameter | LPCODE  |
| Data unit             | Percent   |
| Description           | Percent improvement in EUI relative to the applicable regulatory code The percent improvement is based on EUI specified in the building's LEED certification documents as a |

|  |  |
|--|--|
|  | percent cost saving.   |
| Equations  | 1  |
| Source of data   | The <i>percent cost savings</i> indicated in the building's LEED certification documents |
| Value Applied  |  |
| Justification of choice of data or description of measurement methods and procedures applied |  |
| Purpose of Data  | Determination of additionality   |
| Comments   |  |

|  |  |
|--|--|
| Data Unit / Parameter  | B  |
| Data unit  | Number   |
| Description  | Baseline years   |
| Equations  | 6  |
| Source of data   |  |
| Value to be applied  | 3, 4 or 5  |
| Justification of choice of data or description of measurement methods and procedures applied | The number of years included in the baseline period, determined in accordance with Section 6.1 |
| Purpose of data  | Calculation of baseline emissions  |
| Comments   |  |

## 9.2 Data and Parameters Monitored

Monitoring data and parameters for New Construction and Existing Building B are provided in Section 9.2.1, and for Existing Building A in Section 9.2.2.

### 9.2.1 New Construction and Existing Buildings B

|                       |  |
|-----------------------|--|
| Data Unit / Parameter | ESP <sub>y</sub>   |
| Data unit             | Percentile   |
| Description           | Energy Star score of the building for year y   |
| Equations             | 2  |
| Source of data        | For project year 1, LEED certification documents if applicable, otherwise Target Finder results. |



|  |  |
|--|--|
|  | For all other years $y$ , Target Finder result.  |
| Value Applied  |  |
| Description of measurement methods and procedures to be applied: | <p>Where the ES score is not provided in the LEED certification documents, the ES score must be calculated using Target Finder by entering the applicable property type, the building's property use details and the building's total annual energy use for each year <math>y</math>.</p> <p>The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. Where available, the total annual energy use and data for each property use detail must be drawn from the LEED certification documents when available (in the energy and water sections).</p> <p>Where such data is not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. Where total annual energy data is not sourced from LEED certification documents it must be calculated using procedures that are consistent with those used for LEED certification. The same parameters (ie, property use details and total annual energy use) must be used for calculating net GHG emissions reductions.</p> <p><math>ESP_y</math> is the <i>ENERGY STAR</i> score for the design building found in the <i>Property Estimate at Design</i> column calculated by Target Finder.</p> |
| Frequency of monitoring/recording                                | Annual   |
| QA/QC procedures to be applied                                   |  |
| Purpose of Data  | Determination of additionality   |
| Comments   |  |

|                            |   |
|----------------------------|---|
| Data Unit / Parameter      | $BE_{b,y}$  |
| Data unit                  | Tonnes CO <sub>2</sub> e  |
| Description                | <p>Baseline emissions for the building <math>b</math> in year <math>y</math></p> <p>Baseline emissions are determined based on the emissions from an ES 50 building equivalent to the design building with respect to property use details using Target Finder.</p> |
| Equations                  | 8   |
| Source of data             | Target Finder results. Property use details must be sourced in accordance with the requirements in Section 9.3.   |
| Description of measurement | GHG emissions must be calculated using Target Finder by   |

|                                      |  |
|--------------------------------------|--|
| methods and procedures to be applied | <p>entering the applicable property type and the building's property use details for each year y. Total annual energy use data must not be entered.</p> <p>The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. Where available, the data for each property use detail must be drawn from the LEED certification documents (in the energy and water sections).</p> <p>Where such data is not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. The same parameters (ie, property use details) must be used for determining additionality.</p> <p><math>BE_{b,y}</math> is the <i>total GHG emissions</i> for the design building found in the <i>Median Property</i> column calculated by Target Finder.</p> |
| Frequency of monitoring/recording    | Annual   |
| QA/QC procedures to be applied       |  |
| Purpose of data                      | Calculation of baseline emissions  |
| Comment                              |  |

|   |   |
|---|---|
| Data Unit / Parameter   | $PE_{b,y}$  |
| Data unit   | Tonnes CO <sub>2</sub> e  |
| Description   | Project emissions for the building b in year y  |
| Equations   | 8   |
| Source of data  | <p>Target Finder results.</p> <p>Property use details and total annual energy data must be sourced in accordance with the requirements in Section 9.3.</p>  |
| Description of measurement methods and procedures to be applied | <p>GHG emissions must be calculated using Target Finder by entering the applicable property type, the building's property use details and the building's total annual energy use data for each year y.</p> <p>The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. Where available, the total annual energy use and data for each property use detail must be drawn from the LEED certification documents (in the energy and water sections).</p> <p>Where such data is not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. Where total annual energy data is not sourced from LEED</p> |

|                                   |  |
|-----------------------------------|--|
|                                   | <p>certification documents it must be calculated using procedures that are consistent with those used for LEED certification. The same parameters (ie, property use details and total annual energy data) must be used for determining additionality.</p> <p><math>PE_{b,y}</math> is the <i>total GHG emissions</i> for the design building found in the <i>Property Estimate at Design</i> column calculated by Target Finder.</p> |
| Frequency of monitoring/recording | Annual   |
| QA/QC procedures to be applied    |  |
| Purpose of data                   | Calculation of project emissions   |
| Comment                           |  |

### 9.2.2 Existing Buildings A

|   |  |
|---|--|
| Data Unit / Parameter   | $EUI_y$ , $EUI_1$ and $EUI_0$  |
| Data unit   | BTU/ft <sup>2</sup>  |
| Description   | Energy use intensity for the building year $y$ ( $EUI_y$ ), project year 1 ( $EUI_1$ ) or project year 0 ( $EUI_0$ )   |
| Equations   | 4 and 5  |
| Source of data  | <p>Data must be sourced in the following order of preference:</p> <ol style="list-style-type: none"> <li>1) Building's LEED certification documents (if pilot credit 67 is used and applicable project year data is available)</li> <li>2) EUI from LEED certification documents (if available for project year)</li> <li>3) Target Finder <i>source EUI</i> rating results using property use details and total annual energy data sourced from LEED certification documents</li> <li>4) Target Finder <i>source EUI</i> rating results using property use details and total annual energy data from metered or estimated sources</li> </ol>  |
| Description of measurement methods and procedures to be applied | <p><math>EUI_1</math> and <math>EUI_0</math> are provided in the LEED certification documents under pilot credit 67 or as provided as EUIs separately.</p> <p>Where EUIs are not provided in the LEED certification documents, <math>EUI_y</math> must be (and <math>EUI_1</math> and <math>EUI_0</math> may be) calculated using Target Finder by entering the applicable property type, the building's property use details and the building's total annual energy use for each year <math>y</math>.</p> <p>The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. Where available, the total annual energy use and data for</p> |

|                                   |   |
|-----------------------------------|---|
|                                   | <p>each property use detail must be drawn from the LEED certification documents (in the energy and water sections). Where such data is not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. Where total annual energy data is not sourced from LEED certification documents it must be calculated using procedures that are consistent with those used for LEED certification. The same parameters (ie, property used details and total annual energy use) must be used for calculating GHG emissions reductions.</p> <p><math>EUI_y</math>, <math>EUI_1</math> and <math>EUI_0</math> are the <i>source EUI</i> for the design building found in the <i>Property Estimate at Design</i> column calculated by Target Finder for the respective year.</p> |
| Frequency of monitoring/recording | Annual  |
| QA/QC procedures to be applied    |   |
| Purpose of Data                   | Determination of additionality  |
| Comments                          |   |

|   |   |
|---|---|
| Data Unit / Parameter   | y   |
| Data unit   | Number  |
| Description   | Project year  |
| Equations   | 7   |
| Source of data  |   |
| Description of measurement methods and procedures to be applied | y is the project year determined by counting the number of years since the project start date (ie, the first project year = 1, the second project year = 2, etc.) |
| Frequency of monitoring/recording                               | Annually  |
| QA/QC procedures to be applied                                  |   |
| Purpose of data   | Calculation of baseline emissions   |
| Comments  |   |

|                       |  |
|-----------------------|--|
| Data Unit / Parameter | $EPAPMTG_{b,y}$  |
| Data unit             | Tonnes CO <sub>2</sub> e                                       |
| Description           | Historical GHG emissions for the building b in baseline year x |

|   |   |
|---|---|
| Equations   | 6   |
| Source of data  | <p>Target Finder results.</p> <p>Property use details and total annual energy data must be sourced in the following order of preference:</p> <ol style="list-style-type: none"> <li>1) Building's LEED certification documents (if pilot credit 67 is used and applicable baseline year data is available)</li> <li>2) LEED certification documents (if available for baseline year)</li> <li>3) Metered or estimated energy data</li> </ol>  |
| Description of measurement methods and procedures to be applied | <p>GHG emission must be calculated using Target Finder by entering the applicable property type, the building's property use details and the building's total annual energy use for each baseline year x.</p> <p>The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. Where available, the total annual energy use and data for each property use detail must be drawn from the LEED certification documents (in the energy and water sections). Where such data is not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. Where total annual energy data is not sourced from LEED certification documents it must be calculated using procedures that are consistent with those used for LEED certification.</p> <p>The same parameters (ie, property used details and total annual energy use) must be used for determining additionality.</p> <p><math>EPAPMTG_{b,y}</math> is the <i>total GHG emissions</i> for the design building found in the <i>Property Estimate at Design</i> column calculated by Target Finder.</p> |
| Frequency of monitoring/recording                               | Annually  |
| QA/QC procedures to be applied                                  |   |
| Purpose of data   | Calculation of baseline emissions   |
| Comments  |   |

|                       |   |
|-----------------------|---|
| Data Unit / Parameter | $PE_{b,y}$  |
| Data unit             | Tonnes CO <sub>2</sub> e  |
| Description           | Project emissions for the building b in year y  |
| Equations             | 8   |
| Source of data        | Target Finder results. Property use details and total annual energy data must be sourced in accordance with the |

|   |   |
|---|---|
|   | requirements in Section 9.3.  |
| Description of measurement methods and procedures to be applied | <p>GHG emissions must be calculated using Target Finder by entering the applicable property type, the building's property use details and the building's total annual energy use data for each year <math>y</math>.</p> <p>The applicable property type used in the Target Finder calculations must be selected using Table 1 in Section 4. Where available, the total annual energy use and data for each property use detail must be drawn from the LEED certification documents (in the energy and water sections). Where such data is not provided in the LEED certification documents, data must be obtained in accordance with the requirements and guidance provided by Target Finder. Where total annual energy data is not sourced from LEED certification documents it must be calculated using procedures that are consistent with those used for LEED certification. The same parameters (ie, property use details and total annual energy data) must be used for determining additionality.</p> <p><math>PE_{b,y}</math> is the <i>total GHG emissions</i> for the design building found in the <i>Property Estimate at Design</i> column calculated by Target Finder.</p> |
| Frequency of monitoring/recording                               | Annual  |
| QA/QC procedures to be applied                                  |   |
| Purpose of data   | Calculation of project emissions  |
| Comments  |   |

### 9.3 Description of the Monitoring Plan

The project proponent must establish, maintain and apply a monitoring plan and GHG information system that includes criteria and procedures for obtaining, recording, compiling and analyzing data, parameters and other information important for quantifying and reporting GHG emissions.

All data collected as part of monitoring should be archived electronically and be kept at least for two years after the end of the last project crediting period. All data must be monitored unless indicated otherwise in the tables above.

Where available, monitoring data must be drawn from the relevant LEED certification documents. Use of any other data must be clearly justified by the project proponent, including justification of any discrepancies with LEED-certified data.

Project proponents do not need to provide supporting documentation and evidence of data collection methods for the primary data used to generate the LEED certification documents and findings, since the data has already been third-party certified via USGBC.

Data quality management procedures must be comparable to those used for reporting to USGBC's LEED program.

Where monitoring data are not sourced from LEED certification documents, project proponents must make available resources to enable validation/verification bodies to:

- 1) Review the project's data entries into Target Finder to ensure that the procedures followed by the project proponent are consistent with those required under Target Finder specifications and guidelines. The same applies to higher education laboratories using LAB 21 to calculate EUIs.
- 2) Review the supporting documentation used to determine the values of the property use details and total annual energy inputs to ensure that the information entered into calculator conforms to the Target Finder definitions and guidance. The same applies to higher education laboratories using LAB 21 to calculate EUIs.

## **10 REFERENCES**

None

## APPENDIX 1: LEED 2009 CREDITS

This appendix provides the list of credits, under the category Energy and Atmosphere, for achieving LEED v3 certification. As set out in the applicability conditions (Section 4), projects must meet implement activities described under at least two of the credit categories as specified under the relevant LEED certification requirements applicable to their building's LEED certification.

**Table 4:** LEED 2009 for Existing Buildings, Credits

| Energy and Atmosphere Credit |   | Intent  |
|------------------------------|---|---|
| Credit 1                     | Optimize Energy Efficiency Performance                      | To achieve increasing levels of operating energy performance relative to typical buildings of similar type to reduce environmental and economic impacts associated with excessive energy use.   |
| Credit 2.1                   | Existing Building Commissioning— Investigation and Analysis | Through a systematic process, to develop an understanding of the operation of the building's major energy-using systems, options for optimizing energy performance and a plan to achieve energy savings.                                      |
| Credit 2.2                   | Existing Building Commissioning— Implementation             | To implement minor improvements and identify planned capital projects to ensure that the building's major energy-using systems are repaired, operated and maintained effectively to optimize energy performance.                              |
| Credit 2.3                   | Existing Building Commissioning— Ongoing Commissioning      | To use commissioning to address changes in facility occupancy, use, maintenance and repair. Make periodic adjustments and reviews of building operating systems and procedures essential for optimal energy efficiency and service provision. |
| Credit 3.1                   | Performance Measurement— Building Automation System         | To provide information to support the ongoing accountability and optimization of building energy performance and identify opportunities for additional energy-saving investments.   |
| Credit 3.2                   | Performance Measurement— System-Level Metering              | To provide accurate energy-use information to support energy management and identify opportunities for additional energy-saving improvements.   |
| Credit 4                     | On-site and Off-site Renewable Energy                       | To encourage and recognize increasing levels of on and off-site renewable energy to reduce environmental and economic impacts associated with fossil fuel energy use.   |
| Credit 6                     | Emissions Reduction Reporting                               | To document the emissions reduction benefits of building efficiency measures.   |



**Table 5:** LEED 2009 for New Construction, Credits

| Energy and Atmosphere Credits |                              | Intent  |
|-------------------------------|------------------------------|---|
| Credit 1                      | Optimize Energy Performance  | To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.    |
| Credit 2                      | On-Site Renewable Energy     | To encourage and recognize increasing levels of on-site renewable energy self-supply to reduce environmental and economic impacts associated with fossil fuel energy use. |
| Credit 3                      | Enhanced Commissioning       | To begin the commissioning process early in the design process and execute additional activities after systems performance verification is completed.                     |
| Credit 5                      | Measurement and Verification | To provide for the ongoing accountability of building energy consumption over time.   |

## APPENDIX 2: ANALYSIS OF PERFORMANCE BENCHMARKS

Performance benchmarks are based upon performance distributions. The performance benchmarks have therefore been calculated by creating a numerically ordered arrangement of the specified database parameters from greatest to least. For example, the 85th percentile value is equal to the value of the data point  $V_{0.85n}$  – that is, the data point whose rank is such that 85 percent of the data points fall below its value. The 50th percentile value is equal to the value of the data point  $V_{0.5n}$  – that is, the data point whose rank is such that 50 percent of the data points fall below its value.

### Performance Benchmark Explanation and Justification

This appendix presents the performance benchmarks for New Construction and Existing Buildings, and the LEED 50<sup>th</sup> percentile cut offs are explained and justified:

- New Construction: The distributions for all LEED-certified New Construction by sub-category (higher education, higher education lab, and K1-12 school) and regulatory baseline (eg, ASHRAE 2004, 2007) based upon EUI improvements over code.
- Existing Building A, EB-A: The analysis of the schools and colleges awarded the EPA Energy Star Partner Award, for achieving at least a 20 percent efficiency improvement in a single year.
- Existing Building B, EB-B: The distributions for all LEED-certified Existing Buildings, as measured by EPA's Energy Star ES ratings.

Based upon analysis of USGBC and EPA Energy Star historical performance data for the college/school segments and stakeholder consultations, it is clear that:

- The performance benchmarks selected are reasonable, conservative and well justified.
- The UNFCCC established in its Marrakech Accords parameters for CDM project additionality as sufficient if the project performance benchmark surpasses the 80<sup>th</sup> percentile of comparable peers. Paragraph 48(c) defines the benchmark as “The average emissions of similar project activities undertaken in the previous five years in similar social, economic, environmental and technological circumstances, and who performance is among the top 20 percent of their category”. This module is more conservative, setting the performance cut off at levels comparable to a more aggressive 86<sup>th</sup> percentile.
- The module's logic is consistent with that of VM008 which justified its 90<sup>th</sup> percentile benchmark against the Marrakesh Accord guidelines. This module's logic is also more conservative than proposed CDM methodology NM0302 (for the cement sector) which is proposing an 80<sup>th</sup> percentile benchmark.
- New Construction: The performance benchmark is set at the 50<sup>th</sup> percentile of LEED-certified buildings. Since LEED-certified buildings achieve an average Energy Star score of 86, this 50<sup>th</sup> percentile design level corresponds to performance expectations within the top 14 percent of buildings nationwide, corresponding to the 86<sup>th</sup> percentile level of performance.
- Existing Building A, EB-A: The performance benchmark requires at least a 20 percent improvement in energy use intensity (BTU/sq ft) within a single year. Analysis of EPA's Energy Star performance Awards confirms that less than 20 percent of schools and colleges (in fact only 3 percent) achieve this level of performance, positioning such a performance

within the 80<sup>th</sup> percentile guidelines (see chart 12 below). Furthermore, USGBC’s extensive stakeholder dialogue regarding Pilot Credit 67, also reached consensus that this performance level was sufficiently demanding to merit distinction.

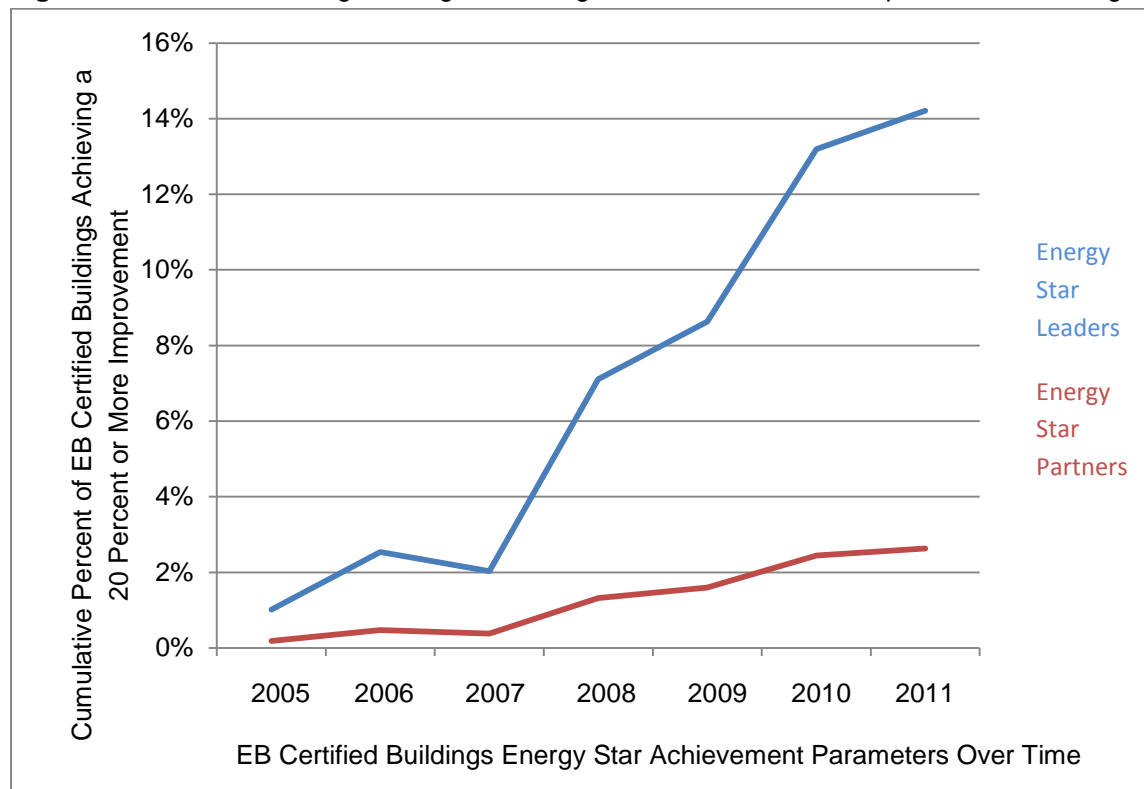
- **Existing Building B, EB-B:** The performance benchmark requires an Energy Star score of 86, which places the building in the top 14 percent of buildings nationwide (see chart 12 below).

**Existing Buildings A and Existing Buildings B, Performance Benchmark Analysis**

Figure 1 shows the percent of campuses with 20 percent or higher energy efficiency improvement in a single year. The percentage of campuses achieving such improvement (in 2005-2011) is given as the percentage of total 2012 Energy Star Leaders<sup>31</sup> as shown in blue. The percentage of campuses achieving such improvement is given as a percentage of total 2012 Energy Star Partners as shown in red.

The figure shows that of the Energy Star reporters, three percent of campuses achieved a 20 percent improvement or more in a single year as a percentage of 2012 Energy Star Partners, which represent the top performing buildings recognized by EPA. Similarly, only 14 percent achieve such improvement as a percentage of 2012 Energy Star Leaders.<sup>32</sup>

**Figure 1:** Percent of Existing Buildings Achieving a 20 Percent or More Improvement in a Single Year

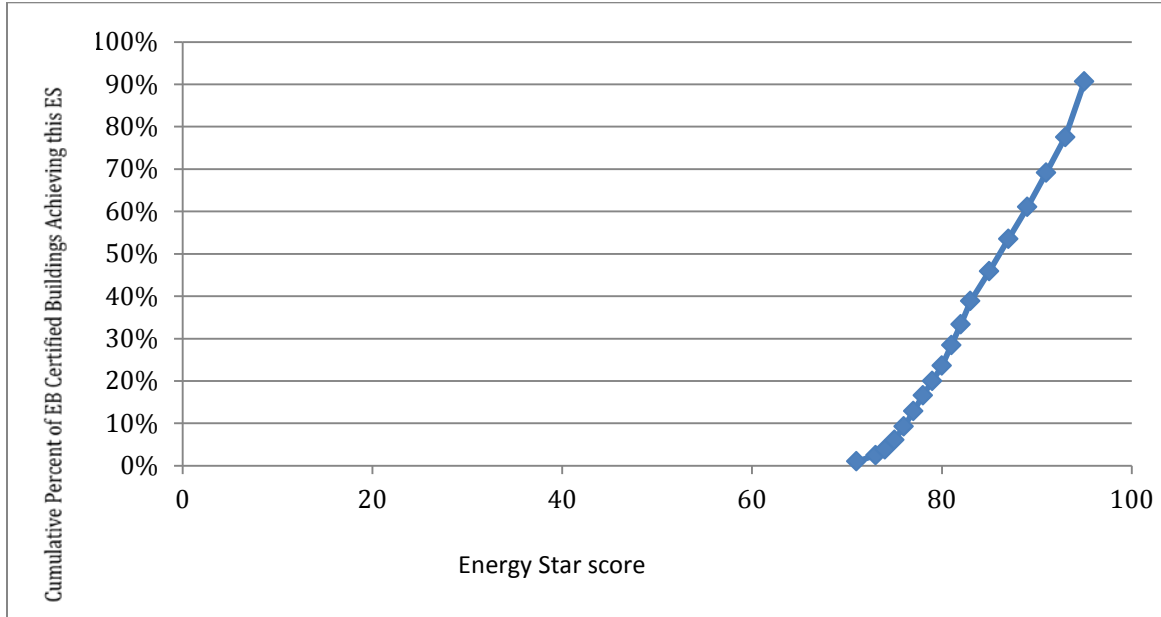


<sup>31</sup> 2012 Energy Star Leaders represent 19 percent of all Energy Star Partners

<sup>32</sup> Based on a Climate Neutral Business Network analysis of the EPA data, sourced from the EPA Energy Star Partners web site

Figure 2 show the cumulative percent of LEED-certified Existing Building that achieve the given Energy Star score. This data demonstrates that the average Energy Star score for LEED-certified Existing Buildings is ES 86.

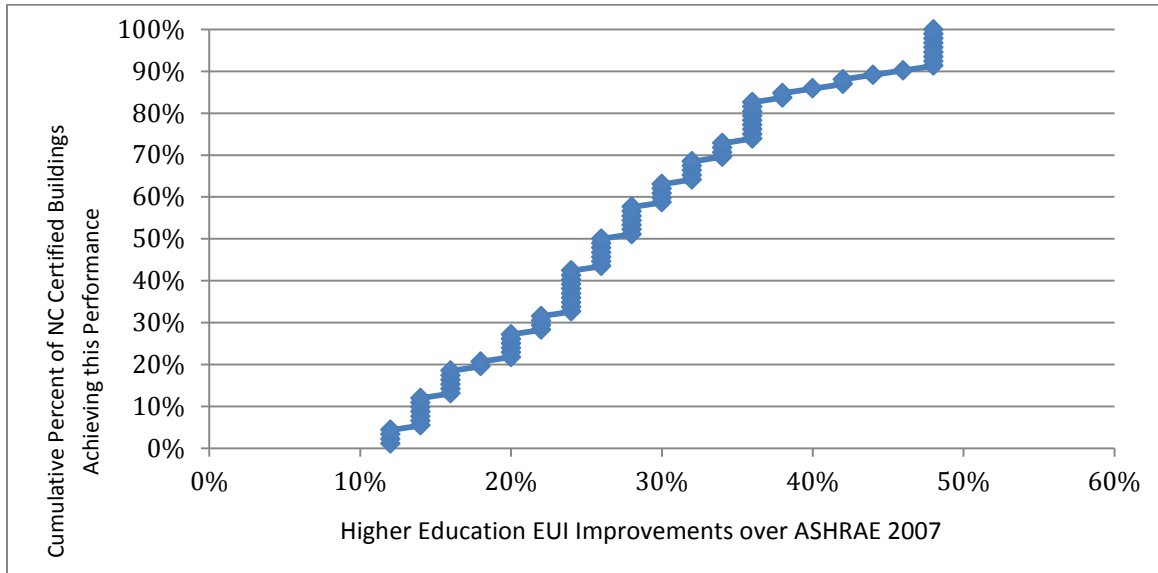
**Figure 2:** Cumulative Energy Star Score for LEED-Certified Existing Buildings



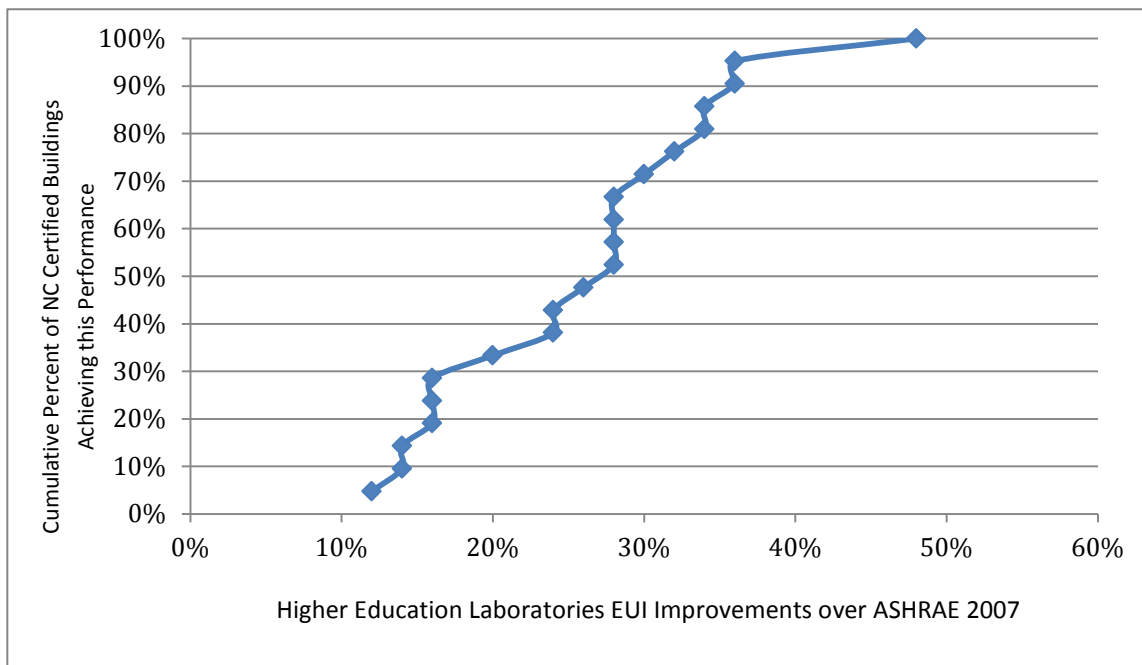
### New Construction Performance Benchmark Analysis

The performance benchmarks for New Construction are set for each sub-category separately (higher education; higher education laboratories; schools), even though performance variances between LEED certification sectors are not extensive. The performance benchmarks also are distinguished separately based on the baseline regulatory code against which the building was certified (where variances are more significant). These benchmarks are based on an analysis of LEED reported data (see figures 3-7 below).

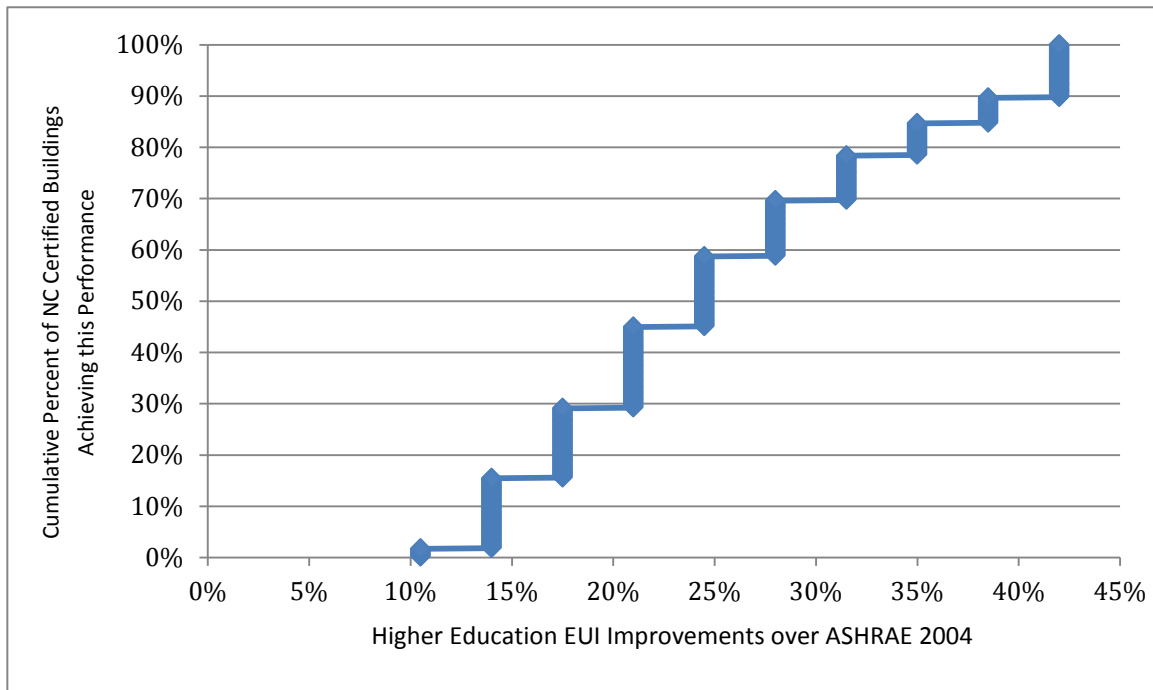
**Figure 3:** New Construction, Higher Education EUI Improvements over ASHRAE 2007



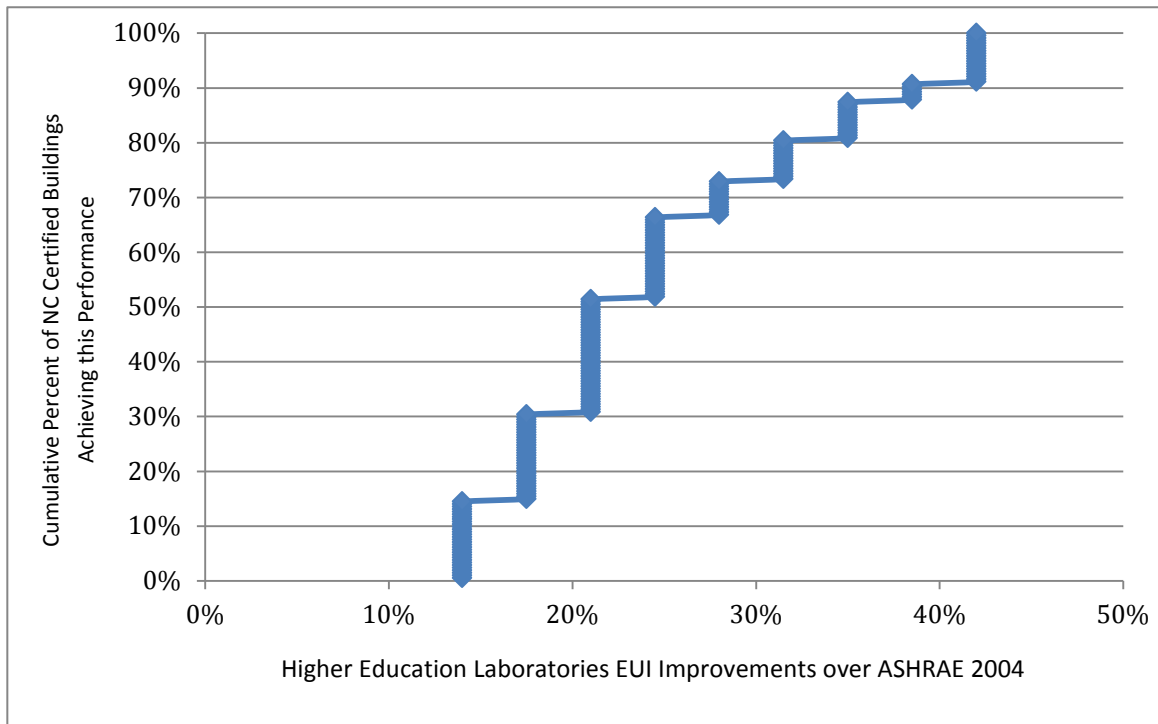
**Figure 4:** New Construction, Higher Education Laboratories EUI Improvements over ASHRAE 2007



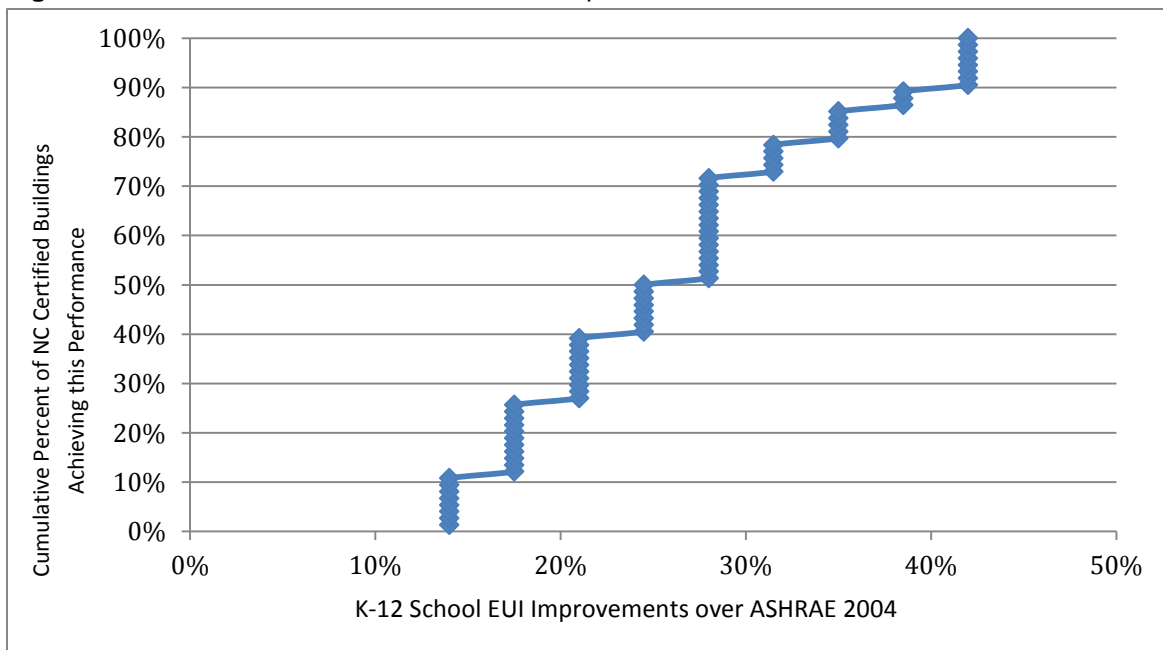
**Figure 5:** New Construction, Higher Education EUI Improvements over ASHRAE 2004



**Figure 6:** New Construction, Higher Education Laboratories EUI Improvements over ASHRAE 2004



**Figure 7:** New Construction, K-12 School EUI Improvements over ASHRAE 2004



The module's performance benchmarks extend beyond the requirements that LEED certification itself would demand. Therefore the performance benchmarks in this module extend beyond business as usual even among LEED-certified buildings, as described below:

- New construction must reach the 50<sup>th</sup> LEED percentile level for their design, and monitor their actual performance over time if GHG credits are to be sold. LEED New Construction has no such

performance monitoring requirements. Since 92 percent of campus LEED certifications (and the vast majority of *all* LEED certifications) are for new construction, the shift into performance monitoring under this methodology represents a significant new departure, beyond existing LEED certification requirements.

- LEED Existing Building certification does not require a 20 percent improvement in energy use intensity in a single year, or an ES 86 level of performance. Thus the methodology is predicated upon a level of performance that goes beyond performance required for LEED existing building certification.
- It should also be noted that LEED-certified buildings comprise just one percent of the total US building market. Since the module's performance benchmarks are anchored to LEED performance data, the performance benchmarks are derived from a data set that is considerably more aggressive than national averages.
- The crediting benchmark for determining baseline emissions is comparable buildings of the same type, size, occupancy levels, etc. in the same region which perform at the EPA Energy Star 50 level – the national average. The national average was selected as the baseline in order to use a consistent approach for setting the level of the performance benchmarks: the crediting benchmark is set at the national 50<sup>th</sup> percentile; the additionality benchmark is set at the LEED 50<sup>th</sup> percentile.

The 50th percentile threshold is also used for both the additionality benchmark (LEED 50<sup>th</sup> percentile) and the crediting benchmark (national 50<sup>th</sup> percentile). The difference here represents the improvement in GHG performance that a project achieves due to the superior measures recognized through LEED certification. This ensures no fundamental change in the percentile threshold required under each performance benchmark.

- The ES 50 baseline adjusts annually and thus will incorporate energy efficiency improvements on a business as usual basis. The 1.3 percent annual business as usual gains in US average energy efficiency will be applied to EB-A's historical baseline in order to be conservative.
- LEED USGBC did not differentiate its Pilot Credit 67 or Existing Building requirements by subclass; performance variations that USGBC also analyzed to date did not justify further segmentation. This can be reviewed again in when the methodology needs to be updated (year 5) if LEED's practices have changed.

Overall, stakeholder feedback and pilot project consultations confirmed that the performance levels set were appropriate:

- Stakeholder feedback, pilot consultation and LEED analysis indicated that more aggressive performance benchmarks were inadvisable. First, setting the additionality benchmark at the 75<sup>th</sup> percentile for LEED-certified existing buildings would be comparable to requiring building performance at the ES 91 level or above. This would be more stringent than any other performance methodology to date and anchored upon performance data already more aggressive than national average. In practice, even campuses which have demonstrated an unusual degree of leadership with their LEED-certified buildings do not have eligible buildings at the 75<sup>th</sup>



percentile level of performance. USGBC also indicated that New Construction certifications have very skewed the distributions at the high end.<sup>33</sup>

- Pilot project discussions confirmed that New Construction certifications can result in qualified buildings whose performance in practice may not live up to design expectations. However, unless the building performs at beyond a US national 50<sup>th</sup> percentile average no credits are issued since emissions will not be below baseline. In such cases, such buildings could only become eligible if further steps are taken on a beyond business as usual basis to increase actual building performance such that the building could be re-certified as Existing Buildings, securing 20 percentage improvements in a single year or an Energy Star score of ES 86, in order to be eligible under EB-A or EB-B. Thus the module provides a route for New Construction buildings whose design performance was superior, but whose performance in practice was below average, to take the extra steps (that currently are very rarely taken, since New Construction buildings' performance in practice is typically not monitored) needed to realize their original design potential through a follow up Existing Building certification.
- Campus higher education laboratory performance data can reflect wider variances, as reflected in LEED databases for New Construction EUI improvements. Although USGBC will use Portfolio Manager for reporting purposes for laboratories (when comparing each individual laboratory's performance over time against itself), at this stage Portfolio Manager is not considered robust enough for this module's reliance upon ES 86 performance levels for pathway EB-B eligibility. An Energy Star score depends upon the ability to benchmark a laboratory's performance against its peers – and here there was not yet a consensus that the Portfolio Manager and Energy Star tools were sufficiently robust. This could be reviewed when the methodology needs to be updated in year 5.
- Campus laboratories were found to often be well suited to the EB-A route. It should note that if the laboratory has used LAB 21 to benchmark its performance and establish EUI's, LAB 21 will ensure that benchmarked laboratories have not significantly changed the focus of its research (eg. from chemical to physical sciences).

Based on an analysis of LEED building achievements, the potential carbon revenues for projects applying this module can be expected to make a meaningful contribution to buildings' ability to achieve this demanding performance level:

- On average, assuming a \$3 per square foot incremental capital investment (which is USGBC's estimate to upgrade buildings to be eligible for LEED certification), a building which achieves a New Construction 50<sup>th</sup> percentile level of EUI improvement (taken at 24 percent), with revenues from a 10 year crediting period, would yield a 5 to 25 percent contribution to incremental capital at \$10-25/tonne carbon revenues (conservatively discounted by 50 percent to reflect losses between design and implementation achievements). Undiscounted contributions to incremental capital would span 10 to 50 percent. Several factors could increase this further such as a higher than average reduction achievements each year.
- This salient financial contribution has been borne out in analysis of candidate pilot projects seeking certification under this module. One set of qualified campus LEED buildings, for example, could secure returns on such incremental capital expenditures of 4 to 21 percent (assuming

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<sup>33</sup> USGBC, 2011 "Geographic and Temporal Patterns in Green Building Practice: a preliminary analysis of data from LEED for New Construction projects in the United States".

carbon prices at \$5-25/tonne). Carbon revenues were also found to be comparable to utility contributions – essentially doubling the available incentive financing for carbon prices beyond \$20/tonne.

The design of the additionality performance benchmark metric is appropriate for the sector to which it applies and meets VCS requirements. All the applicable performance benchmark metrics (EUIs and ES scores) reflect current best practices for individual building designs/performance assessments from across many domains:

For New Construction and Existing Buildings A (percent improvement in Energy Use Intensity):

- Energy use intensity (based on BTU/ft<sup>2</sup>) is a standard intensity metric used widely in the building energy arena. Following VCS rules, BTU/ft<sup>2</sup> can be used as an acceptable proxy for GHG emissions.
- USGBC uses EUI as the core benchmark for its New Construction certification and Existing Building pilot credit 67 certification.
- Building regulations, such as ASHRAE, are defined using EUI.
- The percent improvement in EUI over time has many well recognized precedents, from VCS methodology VM0008 (which uses an energy efficiency gain over time metric for its eligibility metric) to EPA's Energy Star program (which gives Partnership Awards to schools and colleges for improvements of 10 percent, 20 percent and 30 percent gains in EUI).

For Existing Buildings B (Energy Star score):

- EPA Energy Star scores are a US nationally recognized benchmark
- Given their use within USGBC this metric is well suited to the capacity and purposes of this sector and have been incorporated as foundation of LEED's certification based on extensive stakeholder dialogues conducted by USGBC over decades. Furthermore, these metrics reflect the performance monitoring parameters that USGBC would like to encourage and expand on a voluntary basis across all its certifications in order to better track actual energy and GHG performance.
- The EPA Energy Star score is based upon an EUI metric, but has been further modified to adjust for regional, occupancy and weather-based changes.
- The metric also conforms to the requirements for a performance metrics as outlined in the International Performance Measurement & Verification Protocol which VCS methodology VM0018 uses defining performance metrics for energy efficiency projects.
- Stakeholder feedback solicited for this methodology also endorsed these approaches as appropriate, consistent with best practice in the college/school green building domain, and well suited to the USGBC data sources from which the performance criteria were sourced.

## **Beyond Business as Usual Considerations**

### Baseline Setting:

For New Construction and Existing Building B, the ES 50 baseline selection reflects the fact that the beyond business as usual gain in performance that this module secures is a leap to a performance level at the 50<sup>th</sup> percentile of LEED certified buildings from the same 50<sup>th</sup> percentile of all comparable buildings (stratifying by building type, region, etc. using the appropriately segmented property type). The ES 50 baseline therefore reflects the performance that would have been achieved on average had the progressive LEED-certified activities not been undertaken. Since both the additionality benchmark and crediting benchmark are made at the same percentile levels (the 50<sup>th</sup> percentile), the baseline reflects the leap in performance due to LEED-certified activities in comparison to national average practice.

The ES 50 baseline also reflects widely adopted practice by other credible stakeholders as indicative of business as usual practice. EPA itself selects the ES 50 performance level as its benchmark of comparison in Target Finder. All relative performance indicators in Portfolio Manager are given against what EPA considers to be business as usual performance – which they specify as ES 50 for comparable buildings in that same region. This module is therefore consistent with EPA best practices.

For Existing Buildings - B, the ES 50 baseline selection also reflects the fact that, based on USGBC historical data analysis, LEED Existing Buildings are not required to report historical energy/emissions data for LEED certification purposes (unless seeking Pilot Credit 67). Indeed, in most cases, submetering of these parameters will not have even been available in the building historically since Existing Building certifications can apply to subsets of a building. Therefore, if this module required a historical EB-B baseline it will exclude the majority of qualified EB-B projects due simply to a lack of submetering data before the project was implemented. Some Existing Building projects have reported historical data voluntarily but this is not a LEED requirement. Very few LEED buildings pursue the Existing Building pathway (currently around 8 percent of LEED-certified campus building) so the sample set from which to analyze historical baseline trends for this group would currently be unreasonably small and reliant upon an even smaller subset that voluntarily reported historical data. To require buildings to determine a historical baseline would also increase the burden on VCS project validator/verifiers for this LEED EB-B category of projects which, in a group setting, would otherwise be able to rely on the LEED certification data to support all LEED projects. The ES 50 baseline is therefore reasonable.

### Additionality Performance Benchmarks:

The additionality benchmarks have been developed to ensure environmental integrity of the module to avoid undue or unfair crediting of projects relative to their eligibility. The development of the additionality benchmark was founded upon the following:

- The parameters set by the UNFCCC (relative to 80<sup>th</sup> percentile considerations).
- Analysis to determine where average LEED-certified project performance would stand relative to an 80-100<sup>th</sup> percentile range – so that a well justified selection can be made based on LEED average performance achievements to ensure the module's selected percentile requirement is conservative.
- Stakeholder reflections upon the performance benchmarks established (see also below).

- Financial analyses to confirm that financial incentives from carbon revenues, should they become available, would make a meaningful contribution to the incremental capital required to deliver the superior performance that the module requires.
- Careful stratification of the data sets and applicable categories for the performance benchmarks. Without careful stratification, variances are introduced into the module as a result of unduly coarse segmentation when stratifying data sets and applicable categories. As a result, several parameters that could in principle introduce undue variances (which VCS specifies modules should review) are adequately addressed, including such factors as:
  - Socio-economic conditions
  - Electricity grid emission factors
  - Plant age, access to raw materials, and raw material/energy pricing
  - Geography, location considerations – including data applicability to said regions
  - Greenfield versus brownfield sites
  - Larger and smaller scale projects
  - Climatic conditions
- Applicability conditions to further constrain and refine both the additionality and crediting benchmarks.
- Sensible design of performance benchmark metrics to avoid other undue variances within the calculations.
- Stakeholder discussions examining the approaches considered in order to reach a consensus regarding the performance levels selected.
- Pressure testing for the proposed methodology against pilot candidate projects.

Stratification:

Stratification for LEED Certified Individual buildings is achieved by segmenting campuses by three LEED categories, according to the classifications which USGBC has itself developed and uses to track the performance of its certified buildings in the higher education and school categories. These include:

- Higher Education Buildings
- Higher Education Laboratories
- K-12 Schools

Further stratification was then incorporated by the LEED certification category the building used and the appropriate design of metrics for each category:

- For New Construction, each LEED building category has further stratification based on the regulatory code used in the LEED New Construction certification (variances across regulatory codes are still small).
- For Existing Buildings – A, USGBC's own stakeholder consultation for pilot credit 67 determined that no stratification was needed for the applicability of 20 percent improvement in a single year

for EB-A. EPA analysis of the schools attaining a 20 percent improvement in a single year confirms this finding.

- For Existing Buildings – B, variances for EB-B were not deemed by USGBC to be significant.

Sensible stratification is an essential foundation to help preclude false positives and negatives which can arise from overly generalized application of performance criteria in the first instance.

The module follows USGBC's segmentations since USGBC has not adopted performance/certification parameters with any other further or significant sub-segmentations within the college/school domain.

The USGBC stratification already takes into account, as reflected in its extensive stakeholder dialogues, any relevant variations in socioeconomic status. No LEED certification parameters were established in order to adjust for socioeconomic variances in this sector. LEED-certified buildings have become the most commonly accepted benchmark against which individual green building performance is accredited. With more than 6000 LEED certified buildings in the school (2000+) and campus (4000+) arenas, USGBC's penetration of the education sector is far more extensive than other groups (eg, EPA Energy Star with 200+ campuses) have achieved. It therefore represents the most extensive, diverse set of individual green building performance statistics available in the US to date. Thus, using USGBC's adopted stratification classes represents the best stakeholder-endorsed approach in these regards.

These segmentations by LEED building category (ie, higher education, higher education laboratories and K-12 schools) and by certification route (ie, NC, EB-A, EB-B) were developed based upon the available LEED historical data sets in 2012. Performance benchmarks were developed for each segmentation where USGBC deemed the data sets of sufficient size for the results to be meaningful (eg, PB<sub>NC</sub>). Averages across all LEED building types have been used where this was not deemed a credible option (eg, PB<sub>EBB</sub> applying ES 86 for all LEED-certified buildings). Any revision to the performance benchmarks should strive towards all performance benchmarks and other parameters to be set consistent with this stratification where the updated LEED data sets allow.

Relative to geographic variances and access to lower cost/lower carbon fuels, the module takes these variances into account in its design. The USGBC data set, which is national in scope, is well aligned to the US scope of the module. USGBC's data includes all US LEED certified buildings on campuses and schools in its analysis. No extensions of the additionality benchmarks from US campuses to other non-US regions is considered within this module, and application of this module outside the US is precluded under applicability conditions. USGBC, through its extensive stakeholder process, does not set different criteria or award LEED certification points differently by US sub-region, confirming that a US-wide geographic basis is appropriate. Quantification of emission reductions will be against the building's historical baseline for EB-A or against an ES 50 comparable buildings' performance for New Construction and EB-B, using Target Finder which is regionally anchored. In particular, ES 50 baselines are regional since comparable buildings are selected from the same region, reflect that region's weather, occupational and other salient variances, and, for this methodology's purposes, will also use a regional fuel mix as the default in establishing the GHG baseline emissions so that the choice of fuels in the region can also be

reflected. Thus the regional basis for the crediting benchmark is also assured while access within a region to low carbon/low cost fuel inputs is also integrated into the baseline designs.<sup>34</sup>

Relative to greenfield/brownfield and project size criteria, the methodology can only consider greenfield sites under the applicable LEED certification guidelines for New Construction. From an analysis of average LEED campus building characteristics, all projects are expected to be small (around 500 tonnes per year in reductions). Nonetheless, refinements to the project GHG emissions will be made based on actual square footage for each reporting year of GHG reductions, through Target Finder which takes square footage and other occupancy parameters into account in both the project performance and baseline emissions performance. These Target Finder adjustments will also incorporate occupancy changes, changes in computer loadings and weather variations.

From purely a baseline and crediting perspective, the module's mechanics are then implemented through Target Finder which adjusts for other drivers which EPA has identified as salient in these sectors, including climate (HDD/CDD). It should be noted that in EPA's own rigorous and independent regression analyses, which was conducted under extensive public consultation, socioeconomics, energy prices, raw material availability and GHG grid emission factors were not found to be drivers. However, these energy prices, raw material availability and GHG grid emission factors are nonetheless incorporated into the crediting benchmark on a regional basis, including the regional default fuel mix. This benchmarks the design building's GHG reduction performance against those fuels (given their pricing and low/high carbon profile) which are available and typically used in the specific region in which the building is located. For emissions calculations purposes Target Finder allows for even more refined segmentation than the three LEED building categories through the selection of the applicable property type.

#### Applicability Conditions:

Applicability conditions further constrain and refine both eligibility and crediting parameters to address other potential variances. The module sets extensive applicability conditions (see Section 4), including that the building must be located in the US and be LEED-certified New Construction and Existing Building only. This precludes other LEED certification categories (eg, Commercial Interiors, Core and Shell, Innovation and Design) since no performance benchmarks have been developed based on their historical data.

#### Performance Benchmark Metric:

Sensible design of the additionality performance benchmark metric helps constrain other variances that could be intrinsic to the module's algorithms. This module's performance benchmark metrics align closely to best practice adopted for individual green buildings in the campus sector since EUI is the benchmark design parameter used by USGBC, US EPA and ASHRAE.

For New Construction and EB-B, the module does not apply a traditional performance benchmark metric to determine the crediting benchmark (eg, GHG per tonne clinker). Instead, the module uses a more project-oriented performance benchmark metric, crediting only the emission reductions that a project delivers over and above a baseline specific to the project as calculated using Target Finder. Thus there

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<sup>34</sup> Separate analysis of other college GHG performance data (through ACUPCC under I Campus Wide Reductions) also confirms that there is low correlation between geographic location, GHG/kwh (and thus access to low cost or low carbon fuels) and energy efficiency improvement performance.

are no false positives or negatives arising as a result of the use or accuracy of an intensity-based metric (eg, GHG per tonne clinker). This crediting benchmark is consistent with the follow up measurements that USGBC is encouraging for LEED-certified buildings – measuring their actual delivered performance.

#### Expert Consultation:

Expert consultation (see report in *VM0025 Campus Clean Energy and Energy Efficiency*) was conducted to establish the performance benchmarks across a diverse, representative groups of experts including: AASHE, independent environmental experts, college-focused NGO's, EPA ES colleagues and their consultants, college sustainability officers, college business officers, carbon experts, EE experts etc. Experts confirmed this module's approach and performance benchmark metrics. Experts were asked open-ended questions regarding what kinds of project activities would be most impactful on college campuses if stronger energy efficiency and clean energy systems were to be encouraged. As the stakeholder consensus converged towards approaches that were not technology specific but could be applied campus-wide or building wide, the methodology sought out the most comprehensive and credible (third party reported) sources of historical data through which to analyze campuses' GHG performance. Stakeholder dialogue called for the module to focus on stationary combustion emission reductions, since they represent one of the largest segments of campuses' emissions (29 percent), yet have been historically resistant to transformative change, since on-site energy production systems are so capital intensive and thus challenging to address.

#### Pilot Project Design/Discussion:

Discussions with pilot projects further confirmed and refined the validity of the approach. It was found that eligible projects were hard to find, even those which initially were deemed intriguing by USGBC. Some gold level LEED-certified New Construction buildings had not performed in practice close enough to their design level that they would be eligible under NC. As a result these buildings are now considering further improvements, justified through access to carbon revenues, in order to sort out the design/performance difficulties and deliver a 20 percent improvement in a single year under a new EB-A pathway designation. However, it was possible to find eligible projects, which, when identified, were soundly based. Their return on incremental capital contributions from the carbon funding was also salient. Pilot project discussions and analysis therefore supported the effectiveness of the module's additionality benchmarks.

#### Data Selection, Use and Maintenance:

The datasets for this module meet all the criteria set out by VCS Guidance documents. The module expressly set out to identify historical datasets for campuses' GHG performance that would bear serious scrutiny, seeking out those which were either already subject to third party certification (LEED buildings) or were third party, publicly and transparently reported (ACUPCC).

The evaluation of projects' additionality and performance is anchored on the third party LEED certified data, which, given its third party certification status, can be expected to have integrity. The use of Portfolio Manager provides a reporting and computational structure that is also endorsed by leading US government agencies and their stakeholder dialogues. This provides credible secondary data for the analysis and stakeholder consultation.

When analysis has been performed for this module, the USGBC data set for schools and campuses has not been further sampled (that is all data entries from these sectors have been included by USGBC in the analysis of the performance curves in order to establish performance parameters).

Given USGBC's LEED certification system's status as an internationally recognized certification system for individual green buildings, the choice of USGBC LEED data for establishing the performance benchmarks reflects some of the most established and progressive application of available technologies and/or current practices, and trends, within the sector. The tactics and strategies that can deliver such superior performance are also transparent through the LEED certification criteria as set out for their energy efficiency credits (see Appendix 1). Furthermore, the USGBC LEED data can be used to update the performance benchmarks every 5 years. The USGBC LEED data set was selected to support this module because it already has a five year span of historical data, consistent with UNFCCC parameters.



## DOCUMENT HISTORY

| Version | Date        | Comment                  |
|---------|-------------|--------------------------|
| v1.0    | 12 Feb 2014 | Initial version released |