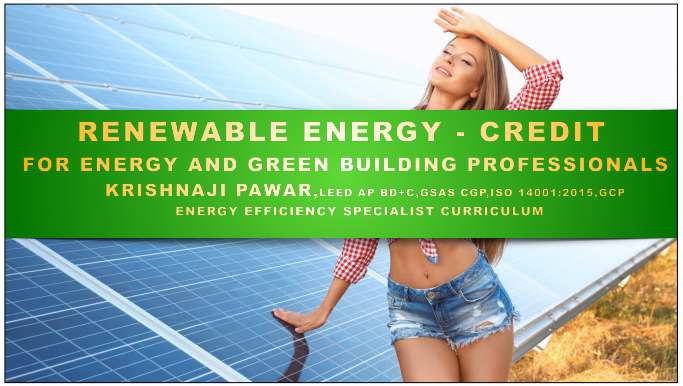
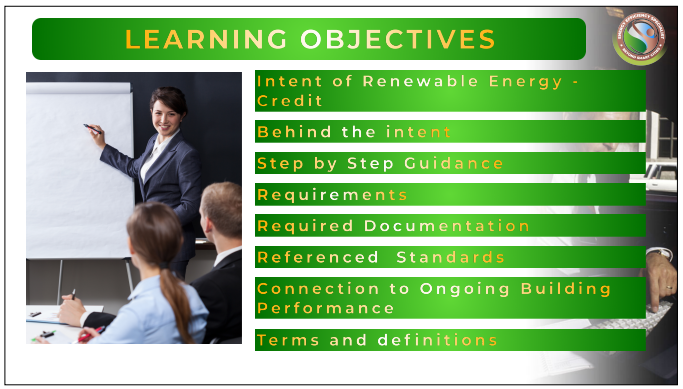

BEYOND
SMART CITIES
ENERGY AND ATMOSPHERE - GREEN BUILDING TECHNOLOGY TRAINING PROGRAM
FOR ENERGY AND GREEN BUILDING SPECIALISTS
KRISHNAJI PAWAR,LEED AP BD+C,GSAS CGP,ISO 14001:2015,GCP
ENERGY SPECIALIST CURRICULUM
DULHA


RENEWABLE ENERGY - CREDIT
FOR ENERGY AND GREEN BUILDING PROFESSIONALS
KRISHNAJI PAWAR,LEED AP BD+C,GSAS CGP,ISO 14001:2015,GCP
ENERGY EFFICIENCY SPECIALIST CURRICULUM


LEARNING OBJECTIVES
Intent of Renewable Energy - Credit
Behind the intent
Step by Step Guidance
Requirements
Required Documentation
Referenced Standards
Connection to Ongoing Building Performance
Terms and definitions

EA- CR(5) - DESIGN

RENEWABLE ENERGY

INTENT

To reduce the environmental and economic harms associated with fossil fuel energy and reduce greenhouse gas emissions by increasing the supply of renewable energy projects and foster a just transition to a green economy.

REQUIREMENTS

Use on-site renewable energy systems or procure renewable energy from offsite sources for all or a portion of the building's annual energy use. Choose one or more strategies for renewable energy procurement from the categories below. Points achieved in each category may be added for a total of 5 points.

POTENTIAL TECHNOLOGIES & STRATEGIES

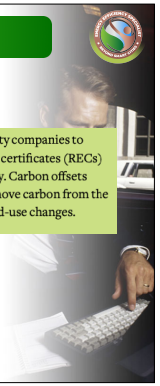
☑ Renewable energy generation can reduce carbon emissions and offer local environmental benefits by reducing air pollution. Some renewable energy systems capture wind or sunlight; others usefully employ materials that might otherwise be wasted. Renewable energy produced on-site protects projects from energy price volatility and reliance on the grid while reducing wasted energy lost in transmission. Ultimately, renewable energy production contributes to reducing a country's demand for imported energy

IMPLEMENTATION

REQUIRED DOCUMENTATION

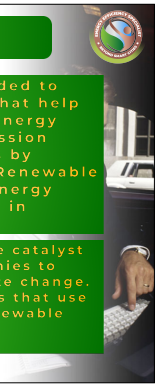
Documentation	On-site system	Third-party system ownership	Community system
Renewable system rated capacity	X	X	X
Calculations to determine energy generated	X	X	X
Equivalent cost of renewable energy produced	X	X	X
Documentation of annual energy costs	X	X	X
Contract indicating duration		X	X
Documentation indicating percentage owned or leased of community system			X

BEHIND THE INTENT



The voluntary market can be an effective catalyst for encouraging energy generators and utility companies to develop clean energy sources and help address climate change. Purchasing renewable energy certificates (RECs) allows buildings that use nonrenewable power to create market demand for renewable energy. Carbon offsets allow buildings or companies to fund activities that seek to decrease carbon emissions or remove carbon from the atmosphere, such as methane abatement, energy efficiency projects, and reforestation or land-use changes.

BEHIND THE INTENT +



Renewable energy criteria in v4.1 has been expanded to recognize the variety of procurement strategies that help to add renewable energy to the grid. Renewable energy generation can contribute to greenhouse gas emission reductions and offer local environmental benefits by reducing air pollution and increasing resilience. Renewable energy produced on-site protects projects from energy price volatility while reducing wasted energy lost in transmission.

Additionally, the voluntary market can be an effective catalyst for encouraging energy generators and utility companies to develop clean energy sources and help address climate change. Purchasing off-site renewable energy allows buildings that use nonrenewable power to create market demand for renewable energy and support the development of renewable infrastructure.

BEHIND THE INTENT +

This new credit combines Green Power and Renewable Energy Production into one credit, recognizing the wide spectrum of renewable energy procurement. The credit adds new categories of renewables and updates performance requirements. The credit structure incentivizes self-supply of renewable energy and development of new renewables, and provides further opportunities for building and portfolio owners to select the renewable procurement strategies that are most appropriate for the project application.



STEP-BY-STEP GUIDANCE

STEP 1. INVESTIGATE AVAILABLE OPTIONS

The possibilities for purchasing green power, RECs, and offsets will vary with the project's location and energy types. Consider the costs of various options (see *Further Explanation, Green Power Purchasing*).

- Green power and RECs must be Green-e Energy certified or the equivalent. Direct or local green power may be available through local utility providers; review their websites for green power cost premiums.
- Green power and RECs can be used only toward the electric energy use portion of the project's annual energy use (Scope 2, electricity). They cannot be applied toward nonelectric energy uses.
- Carbon offsets must be Green-e Climate certified or the equivalent. Unlike RECs and purchased green power, carbon offsets can be used toward both electric and nonelectric energy use.

STEP 2. CONDUCT COST-BENEFIT ANALYSIS

Undertake a cost-benefit analysis to understand the financial and environmental benefits for the available options. All carbon offsets are not the same. Some are associated with land-use development, others with energy efficiency projects. Teams are encouraged to purchase carbon offsets that align with their environmental interests and values.

STEP 3. SET PROJECT GOAL FOR GREEN POWER OR CARBON OFFSETS

Review the credit point thresholds and establish the green power or carbon offset purchase goal for the project. The offset goal is not a one-time purchase—it must be met for multiple consecutive years, as indicated in the credit requirements.

STEP 4. CALCULATE ENERGY USE ASSOCIATED WITH SCOPE 1 AND SCOPE 2 EMISSIONS CATEGORIES

Determine the total grid-generated annual energy use, based on the option selected in EA Prerequisite Minimum Energy Performance.

- Projects that used modeling to comply with EA Prerequisite Minimum Energy Performance (Option 1) must use the whole-building simulation results to determine the total annual electricity and nonelectricity energy use.
  - Exclude any site-generated electricity (e.g., wind turbines, photovoltaics) and fuel (e.g., biogas) from the total consumption amount, provided the project does not sell the on-site energy generated as RECs.
  - Include as nonelectric energy any steam and chilled water purchased from the utility provider or a third party and any fuel purchased for on-site electricity generation in the building (e.g., diesel for gensets).
- Projects that used a prescriptive pathway to achieve EA Prerequisite Minimum Energy Performance (Option 2 or 3) must use the U.S. Department of Energy's Commercial Buildings Energy Consumption Survey (CBECS) database to estimate annual energy use.
  - Exclude any site-generated electricity from the total annual electric energy use.
  - Use the total building area and appropriate energy use intensity (EUI) from the CBECS database to calculate the projected electric and nonelectric annual energy use.



STEP-BY-STEP GUIDANCE

  - If a project contains multiple space types (e.g., an office building with ground-floor retail), use the EUIs associated with each space type to generate the projected annual energy use (see *Further Explanation, Calculating Annual Energy Use Using CBECS Data for Projects with Multiple Space Types*).
- Net-zero buildings—those anticipated to consume zero net energy on an annual basis—are eligible to achieve 2 points under this credit without purchasing any additional renewable energy, RECs, or carbon offsets, provided the project does not sell any RECs associated with the on-site renewable energy production.

STEP 5. CALCULATE REQUIRED GREEN POWER AND CARBON OFFSETS

Use the project's electricity and nonelectricity energy use totals to determine the required amount of green power and/or carbon offsets to be purchased.

- Projects that use green power or RECs must convert their annual grid-generated electricity use to MWh.
- Projects that use carbon offsets must convert their annual grid-generated electricity use to metric tons of CO_2e. For conversion factors and GHG emissions factors, see *Further Explanation, Calculating Greenhouse Gas Emissions*.
- All projects must convert their annual nonelectricity energy use to metric tons of CO_2e.
- Any combination of the above can be used to achieve either the 50% or the 100% threshold. If the project goal is less than the 100% threshold, prorate the required amount accordingly.

STEP 6. OBTAIN PROPOSALS FOR GREEN-E CERTIFIED PRODUCTS OR EQUIVALENT AND MAKE PURCHASE

Solicit proposals for green power, RECs, and/or carbon offsets from providers of Green-e certified products, as specified in the credit requirements and select a vendor.

- The provider must provide confirmation of the date on which the qualified resources came online.
- The contract must specify the purchasing goals and is valid for the duration indicated in the credit requirements.
- For U.S. projects, the offsets must come from greenhouse gas (GHG) emissions reduction projects within the U.S.
- If Green-e certified products are not available, equivalency of other products must be demonstrated (see *Further Explanation, Establishing Green-e Equivalency*). Projects outside the U.S. that cannot find local products that meet the Green-e standard or equivalent can still achieve this credit by purchasing Green-e certified products from the U.S.

STEP-BY-STEP GUIDANCE

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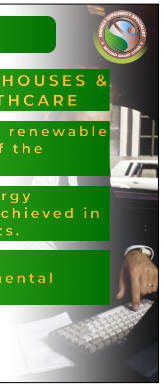
REQUIREMENTS

NC, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Use on-site renewable energy systems or procure renewable energy from offsite sources for all or a portion of the building's annual energy use.

Choose one or more strategies for renewable energy procurement from the categories below. Points achieved in each category may be added for a total of 5 points.

☑ Tier 1: On-site renewable energy generation
o On-site renewable energy generation, environmental attributes (e.g. RECs) retained



REQUIREMENTS

☑ Tier 2: New off-site renewable energy : Off-site renewable electricity that is produced by a generation asset(s) built within the last five years or contracted to be operational within two years of building occupancy. o Green-e Energy certification or equivalent is required for one-time purchase and delivery of EACs of more than 100% of the project's annual electricity use.

☑Tier 3: Off-site renewable energy : Off-site renewable electricity that is Green-e Energy certified or equivalent or captured bio-methane

Ownership of Environmental Attributes: All environmental attributes associated with renewable energy generation must be retired on behalf of the LEED project in order for the renewable energy procurement to contribute to credit achievement.



REQUIREMENTS

The default contract length for renewable energy procurement is 10 years. Contract lengths less than 10 years may be pro-rated.
For Tier 2, the age of the generation asset(s) is assessed at the beginning of the contract, and the generation asset(s) retain this attribute for the duration of the initial contract or lease term.

Off-site renewable energy must be generated by renewable electricity projects located in the same country or region where the LEED project is located. Methane capture in the form of biogas that is both captured and used on-site may qualify as a Tier 1 renewable energy resource.

Points are awarded according to Table 1, based on the percentage of total site energy use. Renewable electricity and EAC procurement can only be applied to project electricity use or district energy use. Captured bio-methane can only be applied to project fuel use.

REQUIREMENTS

Table 1. Points for Renewable Energy Procurement

Points	Tier 1	Tier 2	Tier 3
1	2%	10%	35%
2	5%	20%	70%
3	10%	30%	100%
4	15%	40%	
5	20%	50%	

Tier 1 renewable energy may be accounted for in the cost metric and the GHG emissions metric in EA credit Optimize Energy Performance.

Tier 2 renewable energy may be accounted for in the GHG emissions metric in EA credit Optimize Energy Performance. Calculate avoided GHG emissions by using the renewable energy asset's hourly generation profile and the hourly GHG emissions profile of the renewable energy asset's grid. Where hourly data are not available, calculate avoided GHG emissions using the emissions factors defined in EA prerequisite Minimum Energy Performance.

REQUIRED DOCUMENTATION

Documentation
LEED v4.1 Renewable Energy Calculator
Renewable system rated capacity
Calculations to determine energy generated
Confirmation of renewable attribute ownership (for on-site systems owned by building owner) or contract indicating duration and renewable attribute ownership (for on-site systems owned by a third party)
Contract indicating percentage ownership, lease, or allocation of Tier 2 off-site renewable system
Purchase letter or contract of commitment showing renewable energy for targeted point threshold
Eco-label documentation showing Green-e Energy equivalency if not Green-e certified

REFERENCED STANDARDS

- Green-e Energy and Green-e Climate: green-e.org
- U.S. Department of Energy's Commercial Buildings Energy Consumption Survey (CBECS): eia.gov/consumption/commercial/index.cfm
- Building Owners and Managers Association (BOMA): boma.org
- ENERGY STAR Portfolio Manager: Methodology for Greenhouse Gas Inventory and Tracking Calculations: https://portfoliomanager.energystar.gov/pdf/reference/Emissions.pdf
- Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2010. Annex 2 Methodology and Data for Estimating CO2 Emissions from Fossil Fuel Combustion: epa.gov/climatechange/ghgemissions/usinventoryreport/archive.html
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories: ipc

CONNECTION TO ONGOING BUILDING PERFORMANCE

LEED O+M EA credit Energy Performance: Investments in renewable energy throughout the building life cycle can help reduce building greenhouse gas emissions and improve the building's energy performance score, increase market demand for renewables, and support the growth and financial feasibility of new renewable energy projects.

EXEMPLARY PERFORMANCE

Tier 1: renewable energy generation meets or exceeds 25% of total site energy use.

Tier 2: renewable energy procurement meets or exceeds 60% of total site energy use.

Exemplary performance is not available for Tier 3 renewable energy procurement.

TERMS AND DEFINITIONS

- Carbon offset a unit of carbon dioxide equivalent that is reduced, avoided, or sequestered to compensate for emissions occurring elsewhere (World Resources Institute)
- Green power a subset of renewable energy composed of grid-based electricity produced from renewable energy sources
- Scope 1 emissions direct greenhouse gas emissions from sources owned or controlled by the entity, such as emissions from fossil fuels burned on site. Electricity produced on site through the burning of fossil fuels is measured by the Scope 1 emissions associated with that fossil fuel.
- Scope 2 emissions indirect greenhouse gas emissions associated with the generation of purchased electricity, heating/cooling, or steam of site, through a utility provider for the entity's consumption. Transmission and distribution losses related to hot water, chilled water, and steam are included in Scope 2 emissions, but transmission and distribution losses associated with electricity are not included.



THE WORLD'S 1ST GREEN TECHNOLOGY MARKETPLACE