



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





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ADVANCED ENERGY METERING - CREDIT

FOR ENERGY AND GREEN BUILDING PROFESSIONALS

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LEARNING OBJECTIVES



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



EA- CR(1) - DESIGN

INTENT

To support energy management and identify opportunities for additional energy savings by tracking building-level and system-level energy use.

POTENTIAL TECHNOLOGIES & STRATEGIES

Design and install an advanced metering system.
☑ Refer to the credit requirements for types of equipment, measurement frequency, communication protocols, and data storage requirements (see Further Explanation, Meter Selection).
☑ Locate the meters to capture the usage of major end users (see Further Explanation, Electricity Metering Strategies).
☑ Install and calibrate the meters according to the manufacturers' recommendations

ADVANCED ENERGY METERING

REQUIREMENTS

Install advanced energy metering for the following:
☑ all whole-building energy sources used by the building; and
☑ any individual energy end uses that represent 10% or more of the total annual consumption of the building.

IMPLEMENTATION

REQUIRED DOCUMENTATION

Documentation	All projects
List of all advanced meter to be installed, including type, energy source metered	X
Manufacturer's instructions	X

BEHIND THE INTENT

Whole-building metering lets building operators track energy consumption over time, illustrating variations in usage patterns that can be used to develop energy conservation measures over the lifetime of the building. Once such conservation measures are in place, metering then allows staff to track energy savings and used to justify additional investments with calculable payback periods. Building operators gain detailed feedback, enabling them to precisely calibrate operational parameters, depending on the needs of changing occupancy groups, while continuing to operate building systems efficiently.

Disparities between how buildings are designed to operate and how they actually perform are common. Even green buildings exhibit this gap between projected and actual performance. Numerous factors can explain the incongruity: flaws with energy modeling, inadequate commissioning, inaccurate assumptions regarding occupants' behavior, lack of coordination during the transition from construction to operations, or the everyday operation of the building systems. To reduce such disparities, USGBC collects and analyzes performance data, comparing building performance across the LEED portfolio to identify common traits among high and low performers, then shares the findings to help LEED registrants improve their buildings' performance.

STEP-BY-STEP GUIDANCE

STEP 1. IDENTIFY ENERGY SOURCES THAT SERVE PROJECT BUILDING

Determine all energy sources that serve the project.

- Whole-building energy sources delivered to the building by an external provider, such as a utility company or campus central plant, include sources owned by the building owner that cross an exterior wall between the point of generation and point of use (see EA Prerequisite Building-Level Metering).
- Count both renewable and nonrenewable sources of on-site energy generation.
- Renewable sources include wind turbines, photovoltaic panels, solar thermal panels, and geothermal.
- Nonrenewable sources include fossil fuel-burning generators and microturbines. Both inputs and outputs of nonrenewable sources, including fuel input, electricity output, and recovered heat (if applicable), must be metered.

STEP 2. IDENTIFY ENERGY END USES THAT REQUIRE ADVANCED ENERGY METERING

Determine the type and quantity of advanced meters necessary to capture all individual end uses that represent 10% or more of the building's total annual energy consumption (see Further Explanation, Determining Major End Uses). ➡

- Projects that used modeling to achieve EA Prerequisite Minimum Energy Performance (Option 1) must use the whole-building simulation results to determine which end uses must be metered.
- Projects that followed a prescriptive pathway for EA Prerequisite Minimum Energy Performance (Option 2 or 3) should use historical end-use data from buildings with similar design and operational characteristics.

STEP 3. IMPLEMENT ADVANCED METERING SYSTEM

Design and install an advanced metering system.

- Refer to the credit requirements for types of equipment, measurement frequency, communication protocols, and data storage requirements (see Further Explanation, Meter Selection). ➡
- Locate the meters to capture the usage of major end users (see Further Explanation, Electricity Metering Strategies). ➡
- Install and calibrate the meters according to the manufacturers' recommendations.

REQUIREMENTS

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

Install advanced energy metering for the following:

- ✓All whole-building energy sources used by the building ;and
- ✓Any individual energy end uses that represent 10% or more of the total annual consumption of the building.

The advanced energy metering system must have the following characteristics:

- ✓Meters must be put in place permanently, record every hour or less, and send data to a faraway place.
- ✓Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate.

REQUIREMENTS +

✓The data The data collection system must use a local area network, a building automation system, a wireless network, or comparable communication infrastructure.

✓All meter data must be able to be stored on the system for at least 36 months.

✓The information must be easily accessible: [enr.com/green](#)

✓All meters in the system must be able to report energy on an hourly, daily, monthly, and annual basis.

REQUIREMENTS +

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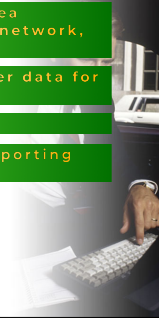
Install meters for future tenant spaces so that tenants will be capable of independently metering energy consumption (electricity, chilled water, etc.) for all systems dedicated to their space. Provide a sufficient number of meters to capture total tenant energy use with a minimum of one meter per energy source per floor.

Install advanced energy metering for all base building energy sources used by the building. The advanced energy metering must have the following characteristics.

- ✓Meters must be put in place permanently, record every hour or less, and send data to a place far away.
- ✓Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate.

REQUIREMENTS +

- ✓The data collection system must use a local area network, building automation system, wireless network, or comparable communication infrastructure.
- ✓The system must be capable of storing all meter data for at least 36 months.
- ✓The data must be remotely accessible.
- ✓All meters in the system must be capable of reporting hourly, daily, monthly, and annual energy use.



REQUIRED DOCUMENTATION

Documentation	All projects
List of all advanced meters to be installed, including type, energy source metered	X
Manufacturers' cutsheets	X



REFERENCED STANDARDS

✓None



CONNECTION TO ONGOING BUILDING PERFORMANCE

LEED O+M EA credit Energy Performance: Sub metering energy subsystems helps facility managers track changes in energy usage over time and provides the performance data necessary to identify opportunities for energy savings by end use. Sub metering is an important component of a successful energy management program; metered data enables monitoring of consumption and costs as well as progress reporting throughout the building life cycle.



TERMS AND DEFINITIONS

✓District energy system (DES) a central energy conversion plant and transmission and distribution system that provides thermal energy to a group of buildings (e.g., a central cooling plant on a university campus). It does not include central energy systems that provide only electricity.

✓Revenue-grade meter a measurement tool designed to meet strict accuracy standards required by code or law. Utility meters are often called revenue grade because their measurement directly results in a charge to the customer.

✓Upstream equipment a heating or cooling system or control associated with the district energy system (DES) but not part of the thermal connection or interface with the DES. Upstream equipment includes the thermal energy conversion plant and all the transmission and distribution equipment associated with transporting the thermal energy to the project building or site.



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THANK YOU

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