



BIOMASS



GEOTHERMAL



HYDROPOWER



SOLAR



WIND

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Schlitz Audubon Nature Center, Bayside, Wisconsin. The 10 kW solar electric thin film BIPV system incorporated into the roofing at left provides 10 percent of the building's electricity needs. This building has earned a LEED-NC 2.0 Gold Certification and received the SE² Award of Excellence in 2004.

A building's energy use contributes significantly to its environmental impact. Incorporating clean, renewable energy sources into the design and construction of new and existing buildings reduces the carbon footprint, provides a hedge against volatile energy costs and makes a visible and positive environmental statement to the community. Installation of on-site renewable energy technologies is a component of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System™.

The U.S. Green Building Council developed LEED to establish an industry standard for environmentally sustainable building practices. Projects seeking LEED certification must incorporate a variety of measures into the design to reduce the environmental impact on the building site, on the surrounding community and on the people who occupy the building itself. LEED promotes an integrated approach to design that

incorporates energy systems into a project from the beginning. This way, renewable energy technologies and energy efficiency strategies can be combined to link aspects of the natural environment like sun, wind and earth mass to designing the build environment.

LEED credits can be earned for both on-site renewable energy systems and for purchasing renewable energy or green power from a certified provider. These credits are available under the Energy and Atmosphere (EA) category in LEED-NC and other LEED certification products (see sidebar on Page 2).

ON-SITE RENEWABLE ENERGY SYSTEMS

Credit 2 in the EA category applies to on-site renewable energy systems. The intent of this credit is to encourage installation of renewable energy technologies to reduce "environmental and economic impacts associated with fossil fuel energy use."

LEED CERTIFICATION POINTS

LEED certification points in this fact sheet refer to LEED for New Commercial and Major Renovation (LEED-NC v2.2). LEED-NC provides a set of performance standards for certifying the design and construction phases of commercial, institutional buildings and high-rise residential buildings. Other LEED products that offer points for renewable energy include LEED for Existing Buildings, v.2.0 (LEED-EB), LEED for Homes Pilot Rating System v.1.11a and the LEED for Neighborhood Development Rating System Pilot version. Check these ratings for specific requirements.



The Wisconsin Energy Conservation Corporation building in Madison, Wisconsin, is a LEED-registered project designed to achieve a LEED-NC Gold Certification. This building uses both solar electric and solar thermal technologies.

Eligible renewable electrical energy generation systems:

Solar: Solar electric or photovoltaic systems (PV) are the most likely to be used in urban settings.

Wind: Current wind turbine technology is occasionally appropriate on larger, typically rural project sites with a satisfactory wind resource, and located at a distance from airports.

Hydro, wave or tidal: Hydro, wave or tidal generation systems require the project to be located near a river or large body of water.

Biomass: There are several types of bio-based generation systems that might be incorporated economically into a LEED-NC project, depending on the local availability of biomass resources. A biodiesel or biomass-fired cogeneration unit is potentially possible, as is methane-fired generation from landfill gas or anaerobic digestion of sewage or process waste.

SOLAR ELECTRICITY

Solar electricity is the most commonly used system, and it has several distinct advantages for use in a LEED project built on an urban or suburban site. The technology is clean and quiet, and the system can be

of any size. Solar electric systems operate wherever there is sunshine. A building can also be designed and built so that future additions to the system can be incorporated at minimal cost. Attractive roofing, awnings, siding materials and glazing are now available that incorporate photovoltaic technologies as part of their structure, so they serve double duty in the design. Referred to as Building Integrated Photovoltaics or BIPV, they have begun to capture the imagination of architects looking for ways to incorporate green energy while maintaining a high level of aesthetic quality. Installation costs tend to be lower for standard panel systems located on sunny roof areas.

LEED EA Credit 2 grants one to three points for generating renewable electricity on site, calculated as a percentage of the annual energy cost supplied by renewable energy. Target levels in LEED-NC are 2.5 percent, 7.5 percent and 12.5 percent. These percentages are based on the proposed building performance of the project calculated through computer simulation for LEED EA Credit 1, **Optimizing Energy Performance**. LEED EA Credit 1 grants one point to ten points based on increasing levels of efficiency above ASHRAE/IESNA Standard 90.1-2004.

Points for generating renewable electricity on site are linked to the energy performance of the building because it will be more economical to incorporate renewable energy generation in an efficient building. In a highly efficient building, a smaller, less expensive renewable energy system can achieve the minimum production requirement of 2.5 percent of the design load than might otherwise be needed. Likewise, a larger system could potentially boost the percentage to earn the project two points or three points instead of one or two. LEED EA Credit 2 encourages all renewable electric generation to be grid connected and to take



The Wisconsin Energy Conservation Corporation's solar system includes four small, attractive and highly visible "solar flags" located in the parking lot and on the grounds. Overall, the roof-mounted solar electric panels and the solar flags produce 19 kW of electricity.

LEED-NC FOR NEW CONSTRUCTION VERSION 2.2: ENERGY AND ATMOSPHERE CATEGORY		
CREDIT	TITLE	DESCRIPTION
Prerequisite 1	Fundamental Commissioning of the Building Energy Systems	Verify proper installation, calibration and performance of HVAC systems
Prerequisite 2	Minimum Energy Performance	Establish minimum level of energy efficiency
Prerequisite 3	Fundamental Refrigerant Management	Zero use or phase-out of CFC-based refrigerants
EA Credit 1 (up to 10 points)	Optimize Energy Performance	Incremental efficiency improvements above required baseline
EA Credit 2 (1 to 3 points)	On-Site Renewable Energy	Use of on-site renewable energy to reduce fossil fuel impacts
EA Credit 3 (1 point)	Enhanced Commissioning	Incorporate commissioning into design phase and perform verification beyond baseline requirements
EA Credit 4 (1 point)	Enhanced Refrigerant Management	Elimination of refrigerants or early compliance with Montreal Protocol
EA Credit 5 (1 point)	Measurement & Verification	Providing ongoing verification of building performance
EA Credit 6 (1 point)	Green Power	Support utility-sited renewable energy by purchasing green power
Shaded background above indicates potential credits for renewable energy		

advantage of available net metering. In Wisconsin, a system of 20 kW or less is eligible for net metering.

THERMAL RENEWABLE ENERGY TECHNOLOGIES

Active solar thermal systems that heat water for domestic use or space heating are eligible under LEED EA Credit 2. In cold climate states like Wisconsin, these systems typically include solar thermal collection panels, pumps or fans to transfer the heat and a heat storage tank with a heat exchanger. Whether reducing gas or electricity use, solar thermal systems are most cost effective in applications that fully use the hot water produced—the larger the required volume of hot water, the greater the savings. Hotels, multifamily housing, nursing homes, health clubs or fire stations are among the most cost effective applications for solar thermal systems in Wisconsin.

GREEN POWER

A project can earn LEED credit for renewable energy even if it's not technically feasible to incorporate a renewable energy system in the building design. LEED EA Credit 6 is awarded for supplying at least 35 percent of a building's electricity with certified green power. The building owner must contract to have green power delivered for a minimum of two years. The intent of this credit is to support renewable energy already available on the grid, and to encourage development of more through customer demand.

OTHER RENEWABLE ENERGY RESOURCES AND LEED

The following design strategies and technologies qualify for LEED points in categories other than renewable energy or green power:



The solar thermal system on the Wisconsin Energy Conservation Corporation building will provide 40 percent to 45 percent of the hot water needed in restrooms, breakroom and fitness room showers.



Daylighting louvered sunscreens direct light far into the interior office spaces at the Wisconsin Energy Conservation Corporation.

Passive solar design and daylighting

Passive solar design and daylighting strategies can contribute to the overall energy performance and energy efficiency of a building. These strategies can help meet LEED EA Prerequisite 2 (Minimum Energy Performance) and earn points in LEED EA Credit 1 (Optimize Energy Performance).

LEED EA Prerequisite 2 establishes the minimum level of energy efficiency for the building and its systems. It is a mandatory provision for earning LEED certification. LEED EA Credit 1 awards points for improving energy performance beyond the minimum requirements by employing additional energy efficient strategies and equipment selections.

Passive solar design is a recommended design practice for achieving basic building envelope efficiency and meeting LEED EA Prerequisite 2. It takes advantage of optimum building orientation to gather both heat and light from the sun. LEED EA Credit 1 awards points for

exceptional levels of building performance attributable to passive solar design techniques.

Daylighting strategies that eliminate or reduce the need for artificial light earn points under LEED EA Credit 1. Energy savings attributable to daylighting are calculated here because they optimize the energy performance of the building. Strategies that employ windows and daylighting to connect building occupants with the outdoors and improve the work environment earn points under LEED Environmental Quality (EQ) Credit 8.1, Daylight and Views.

Ground source or water source (geothermal) heat pumps

Water or ground source heat pumps are technologies that minimize energy use. They are also considered to be energy efficient technologies. Including a heat pump system in a project design could reduce building energy use to achieve the minimum requirement in LEED EA Prerequisite 2, or it could boost efficiency higher and be included in calculations to increase total points under LEED EA Credit 1.

FINANCIAL INCENTIVES FOR RENEWABLE ENERGY TECHNOLOGIES

There are Focus on Energy incentives as well as federal and utility incentives available for installing renewable energy technologies. Go to LEARN MORE for the Focus on Energy Web site and other links. Focus on Energy offers discounts on solar and wind site assessments to eligible Wisconsin customers. A wind site assessment is required for approval of a Focus on Energy installation incentive for a wind power project.

LEARN MORE

focusenergy.com/renewableenergy

Information about Focus on Energy renewable energy financial incentives.

usgbc.org

The U.S. Green Building Council Web site offers further information about LEED certification.

dsireusa.org

The Database of State Incentives for Renewable Energy Web site.

weccusa.org

The Wisconsin Energy Conservation Corporation Web site.

Focus on Energy works with eligible Wisconsin residents and businesses to install cost effective energy efficiency and renewable energy projects. Focus information, resources and financial incentives help to implement projects that otherwise would not get completed, or to complete projects sooner than scheduled. Its efforts help Wisconsin residents and businesses manage rising energy costs, promote in-state economic development, protect our environment and control the state's growing demand for electricity and natural gas. For more information call **800.762.7077** or visit focusenergy.com.