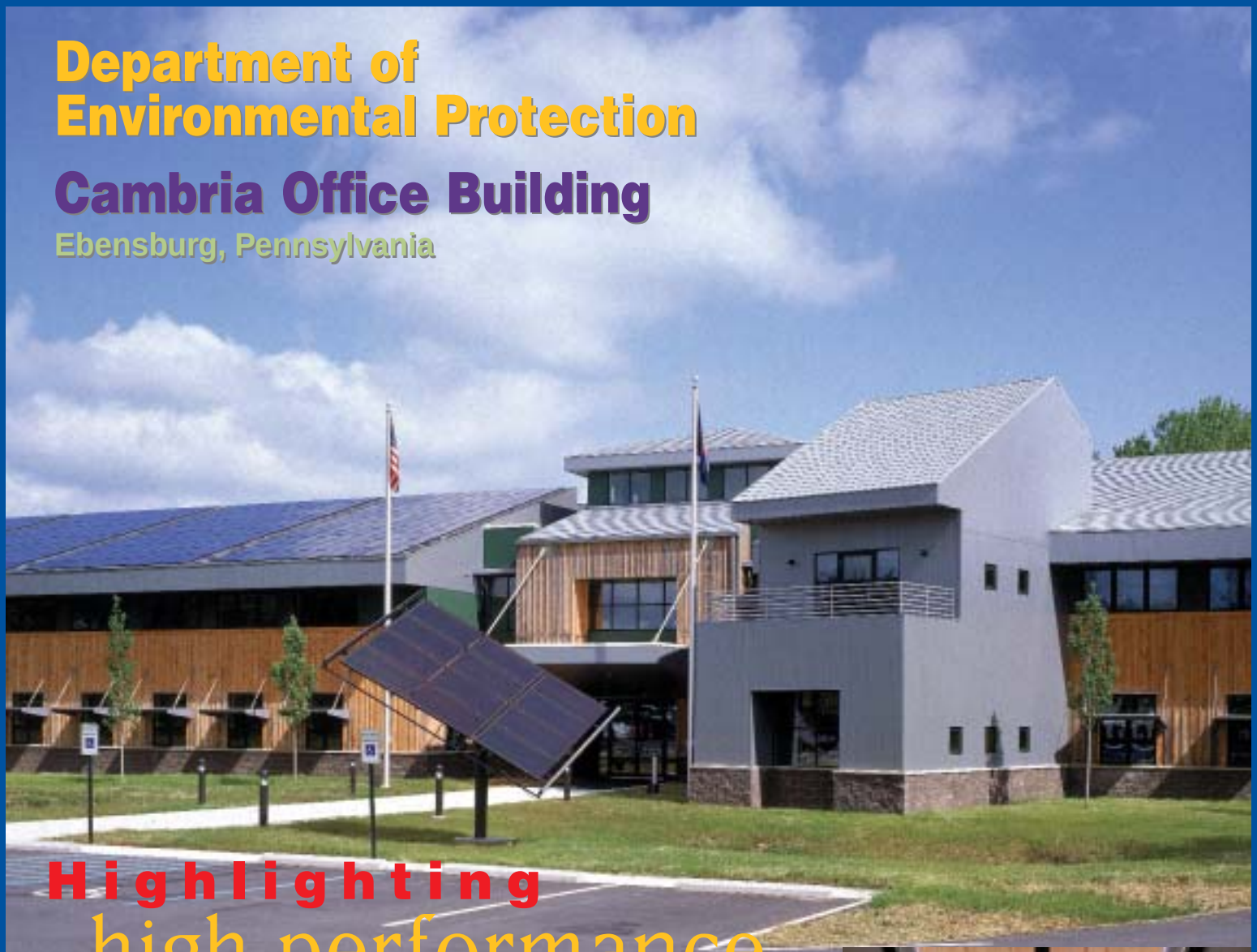
Department of Environmental Protection

Cambria Office Building

Ebensburg, Pennsylvania



Highlighting high performance

The 36,000-square-foot Cambria building in Ebensburg, Pennsylvania backs up against hardwood trees and some small wetlands. The designers of this energy-efficient office building worked to fit the building into this environment with as little impact on the surroundings as possible, and they took the greater environment into consideration in choices they made about building materials and building systems. By applying a concept called integrated design, they were able to evaluate and minimize energy use and pollution created in the production of the materials they used, and reduce the energy use and pollution the Cambria building will create throughout its lifetime.

The Cambria building's design is particularly apt considering its purpose—it currently serves as a district office for the Commonwealth of Pennsylvania's Department of Environmental Protection (DEP). DEP, the lessee for this building, used the Governor's Green Government Council's "Building Green in Pennsylvania" program to create a cooperative funding and leasing agreement with Miller Brothers, the private commercial building owner, to jointly meet U.S. Green Building Council's requirements and standards for a high-performance, environmentally sound, integrated design.

The Cambria building's interior was also a major design consideration. The architects chose paints with low levels of volatile organic compounds and installed air quality monitors to monitor temperature, humidity, and carbon dioxide. All occupants have access to daylighting in their work environment, which also contributes to energy savings. Individuals control lighting and temperature in their work areas. According to the building's principal architect, John Boecker, Cambria is an "energy-efficient building that also provides highly flexible, healthy, daylighted spaces."

Low-energy design and renewable energy at the Cambria Office Building

Site Selection & Orientation

The building is oriented on an east-west axis to take advantage of north-south solar exposures and minimize east-west windows. Small deciduous trees planted along the south side of the building help reduce a potential heat island effect, as heat emanating from the buildings and pavement can change the temperature in the surrounding area. To further protect the surroundings, the design limited the clearing of vegetation to minimal distances from the building perimeter. The designer also used pervious paving, which allows water to permeate it in order to recharge ground water and reduce storm water runoff. Building designers chose cut-off fixtures to cast light downwards and low wattage lamps for parking areas. This reduces power usage and reduces light pollution.

Daylighting & Lighting

Innovative light shelves on south-facing windows reflect natural light deep into interior spaces while at the same time shading lower windows from direct sun, reducing cooling loads and glare. Integral roof overhangs shade second floor south-facing windows. Reflective ceiling tiles—made from mostly recycled material—increase lighting levels. Daylighting is combined with overhead dimming light fixtures for ambient lighting. Occupants have access to task lighting in work areas. The lighting scheme reduces electrical energy use and cooling loads.

Energy

The building's utility bills are predicted to be low in part because it was designed with a highly efficient thermal envelope. Exterior walls are made from R-30 insulated concrete forms. High-density fiberboard roof decking laminated with an interior reflective surface and four inches of rigid insulation provide a composite roof insulation of R-33.

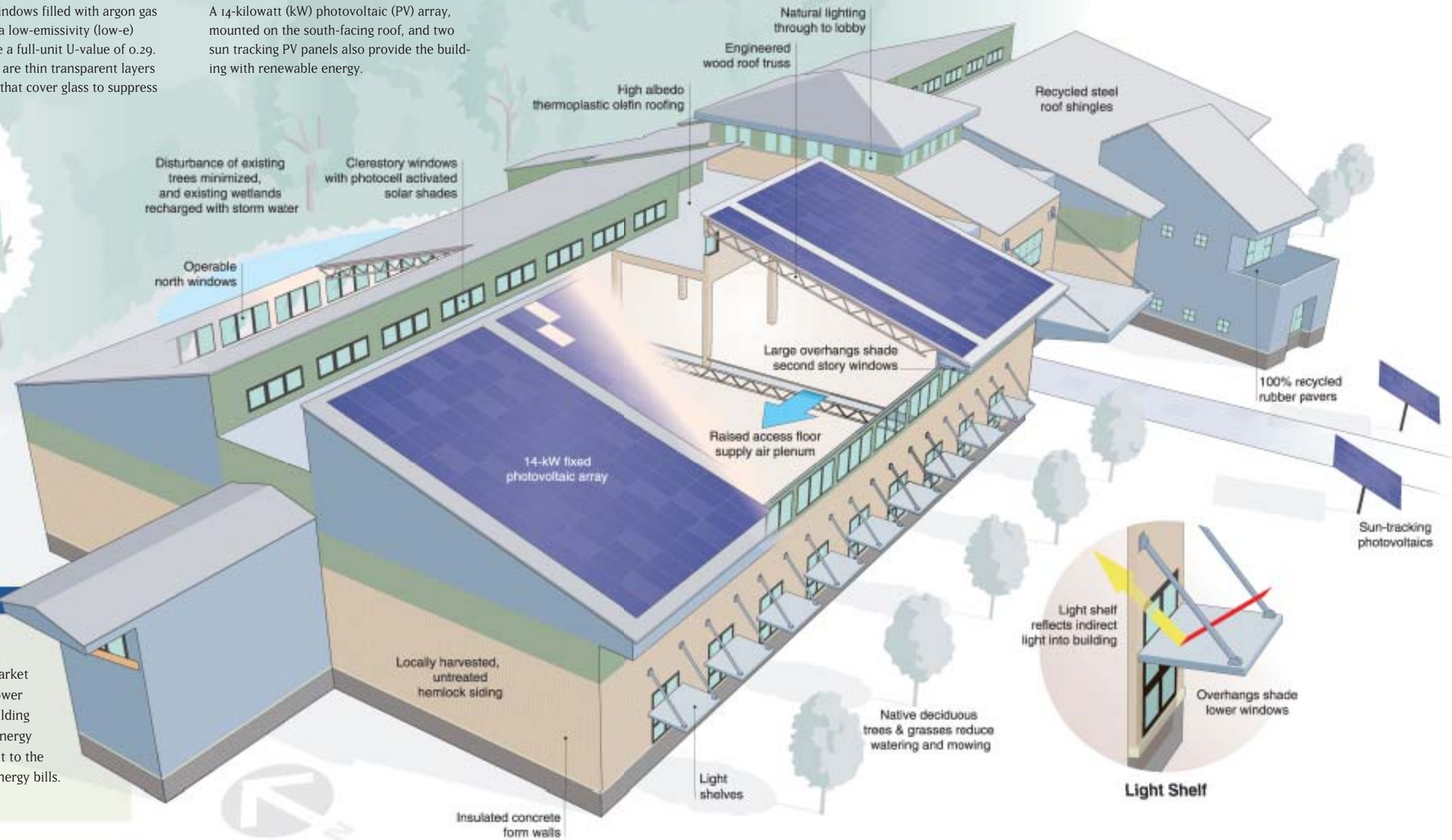
Premanufactured aluminum-clad wood, triple-paned windows filled with argon gas and coated by a low-emissivity (low-e) coating provide a full-unit U-value of 0.29. Low-e coatings are thin transparent layers of metal oxide that cover glass to suppress radiative heat flow. Raised access flooring provides an under-floor supply air plenum for displacement heating and cooling through floor-mounted diffusers.

A ground source heat pump (GSHP) provides heating and cooling as well as domestic hot water. A GSHP was selected based on simulations and evaluating criteria, such as lowest operation cost and net present value.
A 14-kilowatt (kW) photovoltaic (PV) array, mounted on the south-facing roof, and two sun tracking PV panels also provide the building with renewable energy.

Materials

The architects selected building materials based on several criteria: environmental impact and energy consumption of the product's production process; percentage of substantial recycled content or recyclability of material in each product; and whether the product came from a renewable resource.

Material systems use modular dimensioning—standard dimensions for flexibility and variety—which minimized construction waste. Some examples of materials selected for this building include recycled structural steel, fly ash content concrete, high density fiberboard roof decking made from 100% post-consumer recycled waste paper, a heat-welded thermoplastic olefin (TPO) roofing system fastened mechanically to reduce the use of solvent-based adhesives, recyclable nylon carpet tiles, recycled rubber floor tiles, sustainably harvested maple flooring, and solvent free paints. Rough sawn hemlock wood siding on the exterior was harvested sustainably and milled locally. It will be left unpainted and allowed to weather, eventually coming to resemble some of Pennsylvania's century-old barns.



Green Power Arrangement

Green Mountain Energy (GME) purchases all the solar power Cambria produces at a premium price, and then sells DEP back whatever portion of energy the building consumes at GME's market price. In this kind of power brokering arrangement, a green power company not only benefits from selling the excess power a building produces to another customer, but also benefits from selling energy back to its original producer. This arrangement is a cost benefit to the power company, the building owner, and DEP, who pays the energy bills. The building owner receives a tax credit.

Buildings for the 21st Century

Buildings that are more energy efficient, comfortable, and affordable… that's the goal of the U.S. Department of Energy's Office of Building Technology, State and Community Programs (BTS). To accelerate the development and wide application of energy efficiency measures, BTS:

- Conducts R&D on technologies and concepts for energy efficiency, working closely with the building industry and with manufacturers of materials, equipment, and appliances
- Promotes energy/money saving opportunities to both builders and buyers of homes and commercial buildings
- Works with state and local regulatory groups to improve building codes, appliance standards, and guidelines for efficient energy use
- Provides support and grants to states and communities for deployment of energy-efficient technologies and practices.

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Integrated Design Process and the Cambria Building

To reduce redundancies between systems and maximize their efficiency, the architects used an integrated design process. This integration allows system components to combine multiple purposes. For example, the architects combined flooring with underfloor supply air distribution.

Another part of an integrated design process is using a life-cycle analysis in selecting materials and systems. Life-cycle analysis examines the cost and impact of a product or material from its inception to its disposal at the end of its useful life. The architects performed life-cycle analyses with the help of software and computer-generated energy simulation models. At a construction cost of $93 per square foot, this building shows it is possible to pay extra attention to systems and materials to build a "green" office building within the same cost range as building a conventionally constructed office building.

The Cambria building features integrated building systems that minimize energy and materials use.

More Information

The U.S. Department of Energy's High Performance Commercial Building Initiative is monitoring the building described in this brochure to evaluate its performance and advance the technologies used.

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