

Nova Scotia Community College (NSCC)

Dartmouth, NS

The technology

Centre for the Built Environment (CBE): a teaching, learning, and innovation centre focused on the integration and modelling of sustainable-energy building technologies.

The 1100 m² (120,000 sq. ft.) NSCC building – a living building – is a model of environmental design and sustainable development. It incorporates alternative-energy and energy-efficient technologies to power, heat, and light the building, reduce GHG emissions, and monitor its efficacy.

A green roof provides insulation, reducing heating costs in winter and absorbing solar energy in summer, which reduces the need for air conditioning. Plants and soil help to moderate rainwater runoff, which is collected and used for watering the biowalls.

A geothermal well field provides heating and cooling.

Six wind turbines generate emissions-free electricity. They represent four different styles and suitability for different uses. Two are tower mounted, four roof mounted. They are expected to provide approximately 21 MWh of electricity per year and save some \$2,300 in electrical billing.

Two solar thermal systems, using different panel styles, produce domestic hot water and supplement space heating needs. Wastewater heat recovery is in place.

Four solar photovoltaic systems comprise 60 fixed roof-mounted panels and 32 Suntracker-mounted. They are expected to offset approximately 25 MWh of utility-supplied electricity per year and save some \$2,700 in electrical billing.

Water conservation features include rainwater collection in underground cisterns, a bioswale and settling pond, grey-water system, composting toilet, and waterless urinals.

Other green features include solar wall cladding, interior biowalls that filter the air, LED lighting, and natural ventilation. The building functions as an R&D centre for real-world testing of sustainable-energy systems. The CBE is designed to evolve as new technologies are developed, tested, and proven.

Specifications

- Green roof: 745 m² (8000 sq. ft.); extensive portion with soil depth 15 cm, intensive portion with soil depth 60 cm (able to support wider range of plant life); five planting zones host purple coneflowers, brown-eyed Susans, sedums, herbs, common roses, and low-bush blueberries
- Exterior biowall: 24 m wide x 3.7 m high, more than 1000 plants selected for survivability in local conditions (including salt, fog, wind, freezing temperatures).
- Geothermal well field: 36 boreholes, 150 m (500 ft.) deep; meets 100% of building mechanical cooling needs, 50% of annual heating load
- Wind turbines (annual electricity production is estimated):
 - 1 Skystream 2.4 kW tower-mounted (18 m high) horizontal-axis wind turbine; 5000

kWh/a; representative of a small residential-sized turbine

- 1 Endurance 5.0 kW tower-mounted (18 m high) horizontal-axis wind turbine; 8000 kWh/a; representative of a larger residential- or small commercial-sized turbine
- 2 Windspire 1.2 kW roof-mounted vertical-axis wind turbines; 3000 kWh/a; intended for use in urban area with turbulent wind conditions
- 2 Windtronics 2.5 kW roof-mounted horizontal-axis gearless wind turbines; 5000 kWh/a; intended for residential use
- Solar thermal hot water:
 - 6 roof-mounted evacuated-tube panels plus related heat exchangers, pumps, tanks, and controls; 15 700 kWh/a estimated offset of equivalent natural gas requirements
 - 4 roof-mounted flat-plate panels plus related heat exchangers, pumps, tanks, and controls; 6400 kWh/a estimated offset of equivalent natural gas requirements
- Solar photovoltaics (annual electricity production is estimated):
 - 30 roof-mounted standard 200 W PV panels (6 kW total); 8,200 kWh/a
 - 30 roof-mounted bifacial 200 W PV panels (6 kW total); 8,200 kWh/a
 - 16 standard PV panels on ground-mounted Suntracker; 5,600 kWh/a
 - 16 bifacial PV panels on ground-mounted Suntracker; 5,600 kWh/a
- Integrated Building Automation System: allows for integration of HVAC, lighting, security, and CCTV to provide Smart Building technology monitoring of more than 1800 points
- LEED Gold rating

Environmental Benefits

Direct reduction in emissions of 0.85 kg CO₂ per kWh of energy generated; reduction in GHG emissions from greatly reduced heating fuel (natural gas) needs; clean internal air

Applications

Institutional and commercial buildings, either new or under renovation

Advantages

Eliminating emissions of GHGs; reducing operating costs; maintaining a comfortable and healthy work environment

The Centre for Built Environment is designed to educate students in the construction sector and current industry professionals about sustainable development in general and energy sustainability in particular. In its R&D function, it will fill a gap in the market and create commercial opportunities for Nova Scotian companies interested in the energy management and alternate energy fields. It will create a knowledge base on which Nova Scotian businesses and industries can build and operate more efficient and sustainable buildings.

Partners

Construction and building supply industry partners; ecoNova Scotia