Multi-Unit Residential Buildings
Energy and Water Efficiency

RENEWABLE ENERGY

This document has been designed to provide a general understanding of the principles and practical considerations involved in implementing cost-effective energy and water efficiency measures in existing MURBs.

The measures have been organized from the easiest to implement to the more complex.

The simple payback for each measure is fairly broad, given the wide variations in factors affecting costs and savings. Users should complete their own assessment based on actual capital costs and estimated annual energy savings for an individual measure. Where appropriate, other factors specific to individual measures have been identified in their description.

This document is intended as a guideline only and is not intended to replace professional advice. Prior to incorporating any energy or water efficiency measures into existing MURBs, it is recommended that they be reviewed by qualified energy management professionals. All work must be performed in accordance with applicable codes and standards.

Introduction

Renewable energy options, including solar thermal and electrical energy, wind-generated electricity, and biofuels are starting to become more popular in Canada. While their application as a retrofit option in the MURB sector has been limited to date, it can be anticipated that there will be growing interest in the future.

This section introduces some notable renewable energy measures based upon their likely interest to MURB sector owners and managers and the technical feasibility of applying them in MURB installations.

For more information on maintaining your building equipment and systems, refer to cmhc.ca.

Maintenance, repair and retrofit opportunities

Of the various categories of renewable energy, solar energy represents a realistic potential opportunity in the sector. Building-integrated wind generation and biofuel systems are not likely candidates for retrofits. Solar systems—either thermal or photovoltaic—require a certain amount of space for their installation. Flat roofs, parking lots and similar spaces are ideal areas.

This section describes a number of renewable energy measures that have been organized from the easiest to implement to the more complex.

LESS

MORE

1. Install solar thermal system for outdoor swimming pool heating
2. Install solar thermal system for domestic hot water
3. Install solar photovoltaic system for generating electricity
4. Install solar thermal system for makeup air preheating

1 Install solar thermal system for outdoor swimming pool

Measure

Install a solar thermal supplementary pool water heating system to supply heat from a renewable energy source. This measure is applied to partially or fully replace the energy required to maintain an outdoor pool at a more comfortable temperature throughout the season.

Payback

Simple payback: 2 to 5 years.

Final payback will depend on these factors:

- Amount of annual solar radiation available.
- Temperature of water maintained during the season.
- Length of time that the swimming pool is open.

Application

MURBs with an outdoor swimming pool and area of the roof or an area on the ground near the pool generally facing south without obstruction.

Benefits

- Reduced purchased energy consumption and costs.
- More comfortable pool temperatures if previously unheated.

Considerations

- Roof or ground space must be available with a clear view of the sun from the southeast to the southwest.
- Solar panels for swimming pool are a specialized product made of black rubber or plastic, usually in a standard 1.2 m by 3.0 m (4 ft. by 10 ft.) size. The panels are generally fastened to a sloping roof using straps or clamps. Most of the products for solar pool heating are extremely durable and have 15-year warranties.
- Generally, they work by diverting pool water to the solar panels from the pipe delivering water from the pump/filter to the pool.
- The collectors can be located on a sloping roof, on an angled support frame located on a flat roof or on the ground. Consideration must be given to the vertical height the water must be pumped—this is limited by the capability of the swimming pool pump.
- The number of panels required will be dictated by the size of the pool and the direction the panels face.

Implementation

- Implementation requires the services of a knowledgeable and qualified solar swimming pool contractor.
- The system must be arranged to drain down when the pool is closed for the winter.

2 Install solar thermal system for domestic hot water

Measure

Install a solar thermal supplementary domestic hot water system to supply a portion of domestic hot water consumption from a renewable energy source. This measure is applied to partially replace the energy required to heat domestic hot water in a building having a central domestic hot water heating plant.

Application

MURBs with an area of the roof generally facing south without obstruction and with a central hot water heating plant.

Benefits

- Reduced purchased energy consumption and costs.
- Improved reliability of hot water supply.

Considerations

- Implementation requires the services of a knowledgeable and qualified solar thermal contractor. The Canadian Solar Industries Association offers such a qualification. (http://www.cansia.ca)
- The system should meet standards CSA-F383-08, "Installation of packaged solar domestic hot water systems," and CSA-F379, "Packaged solar domestic hot water systems (liquid-to-liquid heat transfer)," as applicable.
- Roof space must be available with a clear view of the sun from the southeast to the southwest.
- The building requires an existing central domestic hot water plant.
- A rooftop penthouse mechanical room containing the domestic hot water plant is more efficient and convenient, and cheaper than a basement location.

Payback

Simple payback: 5 to 12 years.

- From the energy cost savings and the capital cost, an estimate of the simple payback can be prepared: Simple Payback (years) = Capital cost/annual energy cost savings.
- An estimate of daily and monthly hot water consumption should be prepared from site data. In the absence of actual data, an estimate can be prepared from ASHRAE 2007 HVAC Applications Handbook, chapter 49.
- An estimate of the contribution of the solar thermal system to monthly and annual domestic hot water energy consumption should be provided by the contractor. In the absence of other information, this can be estimated by using RETScreen software, available from Natural Resources Canada at this website at no cost. (http://www.retscreen.net/)

Final payback will depend on these factors:

- Amount of annual solar radiation available.
- DHW use.
- DHW system configuration.

Implementation

- Collectors can be flat plate or evacuated tube, non-tracking or tracking. The system can be a drain-down type using domestic water directly in the collector or it can incorporate a heat exchanger near the hot water storage tank and use a thermal fluid (antifreeze) in the collector.
- A permit will usually be required from the municipality to demonstrate that the collectors are properly mounted and that the components and piping comply with the Plumbing Code.

3 Install solar photovoltaic system for generating electricity

Measure

Install a solar photovoltaic (PV) system on the roof of the building to generate electricity and feed it into the building systems or sell it to the electricity grid.

Payback

Simple payback: 8 to 20 years.

Final payback will depend on these factors:

- Amount of annual solar radiation available.
- Available incentives.

Application

MURBs with an area of the roof generally facing south and available for mounting the solar collectors.

Benefits

- Reduced purchased energy consumption and costs.
- Potential electricity generation revenue.

Considerations

- Roof space must be available with a clear view of the sun from the southeast to the southwest.
- The panels are fastened to an angled support frame located on a flat roof and anchored either directly to the roof or by means of sufficient ballast to prevent movement due to wind.
- Additional equipment, including an inverter, transformer and electrical protection, is generally, but not always, mounted inside the building.
- The Canadian Electrical Code makes provision for a building to generate its own electricity and to feed any excess back into the utility's power lines. There are rules that must be met, including agreements with the local electricity distribution company (LDC) that must be signed.
- The number of panels supplied will be dictated by the project budget and available roof space. It is generally not possible or practical to serve the entire electricity needs of a building, but the system can supply a portion of those needs.

Implementation

- Implementation requires the services of a knowledgeable and qualified solar PV contractor experienced with solar PV.
- The contractor should apply for all electrical safety, local distribution utility, municipal and any other permits required to complete and start up the system.

4 Install solar thermal system for makeup air preheating

Measure

Install an aspirating air type solar thermal collector to preheat outdoor air before it is supplied to the building. This measure is applied to replace part of the energy required to heat outdoor air supplied to the corridors or other areas by a makeup air unit.

Payback

Simple payback: 2 to 7 years.

Final payback will depend on these factors:

- Amount of annual solar radiation available.
- Size of solar collector that can be installed.
- Existing configuration of makeup air unit.

Application

Can be applied to MURBs with a central corridor ventilation system and available south-facing area. The system can be located either on a south-facing wall with no windows or on a south-facing roof. In general, the wall-mounted system provides a larger collector area.

Benefits

- Reduced purchased energy consumption and costs during periods when space heating is required.
- Improved reliability of corridor ventilation air supply during winter.

Considerations

- The use of a south-facing wall for the collector requires that there be a significant area of opaque wall, since the collector itself is opaque.
- The collector must be in clear view of the sun during the winter throughout most of the day when the sun is relatively low in the sky.
- Implementation requires the services of a qualified mechanical/HVAC/sheet metal contractor who is experienced with this technology.
- The system must be capable of being bypassed by the incoming air during warmer periods to ensure the building will not be overheated.

Implementation

- Collectors are generally custom-designed and manufactured for the application. They are fixed in position and do not follow the sun.
- A permit may be required from the municipality to demonstrate that the collector is properly mounted and that the installation complies with the building code.

Other modules in the *Multi-Unit Residential Buildings – Energy and Water Efficiency* series

- *Heating and Ventilation Systems* (OPIMS 68752)
- *Lighting Systems* (OPIMS 68754)
- *Building Envelope* (OPIMS 68756)
- *Domestic Hot Water* (OPIMS 68758)
- *Renewable Energy* (OPIMS 68760)
- *Electrical Systems* (OPIMS 68762)
- *Water Conservation* (OPIMS 68764)

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