



RENEWABLE RESOURCE RECOVERY CORP.

@Source-Energy Wall

@Source- Energy Wall System

- is a sustainable green energy system providing clean, safe, dependable heating and cooling of buildings,
- uses photovoltaic panels cast into the surface of the wall providing electricity to the building or for resale to the grid,
- provides domestic hot water to the building,
- uses the principles of geothermal energy and is connected to a heat pump or heat pumps located in the building, which provide heating or cooling energy to the building,
- provides safe, renewable reliable, low cost energy that is not subject to cost fluctuations, and
- is a new technology based on sound engineering principles.

Green Technology

The @Source-Energy wall system is a sustainable energy system that does not emit greenhouse gases, air pollutants or toxic fumes. It is a low cost, safe, dependable, renewable energy source that is not subjected to fluctuating costs.

In many areas electricity generated by the @Source-Energy Walls can be sold to the grid generating a revenue source for the building.



@Source-Energy Wall Heat Recovery

Photovoltaic panels generate considerable heat behind the cells, which reduces the efficiency of the cells and is absorbed by the building materials. The @Source-Energy Wall system extracts the heat energy and returns it to heat residential, institutional, commercial and industrial buildings.

@Source-Energy Wall Heat Recovery Technology

By removing heat energy from the wall and/or roof the @Source-Energy Wall cools the wall and roof, reducing building heat gains.

A heat pump in the building operates and controls the energy system, transferring heat in and out of the building to the @Source-Energy Wall. The heat pump provides year round comfort in the building - heating in the winter and cooling and conditioning the building in the summer.

Building Advantages

While providing an energy source precast concrete @Source-Energy Walls provide a durable building envelope with high fire resistance, lower sound transmission and fast installation, increasing the resale value of the building.

The @Source-Energy Wall is a precast, prestressed concrete wall panel with photovoltaic (PV) cells cast into the face of the wall and a thermal heat recovery system embedded in the concrete.

The @Source-Energy Wall is fabricated as a structural wall or roof panel or as a cladding panel for residential, commercial, industrial and institutional buildings.

The Wall units can be single uninsulated panels or composite insulated panels. They can be fabricated as load bearing or non-bearing units for single- or multi-storey buildings. The Walls are installed in new construction or in retrofits cladding over existing walls.

The @Source-Energy Wall generates electricity which is used in the building or sold to the electrical grid providing a revenue source to the building owners.

A fluid is circulated through the @Source-Energy Wall's thermal energy recovery system collecting heat energy from the wall or roof all summer long. The heat energy is used to heat domestic hot water and/or stored in a Ground Thermal Energy Storage GTES system. Heat from the GTES is transferred to a heat pump in the building. In summer the heat pump transfers heat from the Wall and the building to the GTES.

Precast, prestressed concrete @Source-Energy Walls are custom engineered products providing high strength, durable weather resistant walls.



"E=R³C"

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Photovoltaic Energy Efficiency

The efficiency of photovoltaic (PV) generators is significantly affected by the temperature of the cells. Higher PV cell temperatures reduce the electrical output.

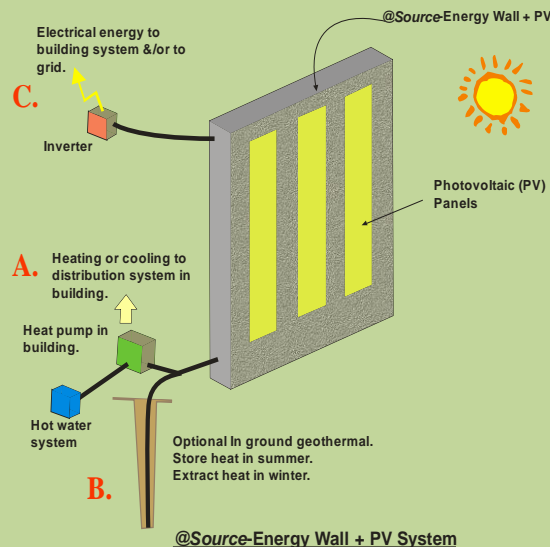
The @Source-Energy wall uses a heat transfer system embedded in the precast concrete in the Wall to reduce the temperature of the PV cell, and to reduce the variation in temperature on the PV panel, improving the PV output by up to 20%.

Photovoltaic Cell Heat Generation

Photovoltaic cells normally have a solar conversion efficiency of 15% to 27%. The balance of the energy (about 73% to 85%) is converted to heat which is usually wasted. The @Source-Energy Wall captures that wasted heat energy and returns it to heat the building, increasing your energy savings.



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@Source-Energy Wall System

An enormous amount of solar heat energy is absorbed by precast concrete building walls. Photovoltaic cells also generate considerable heat energy which is absorbed by the wall. A heat recovery system in the @Source-Energy Wall captures the heat to a heat pump (shown at A. above) to provide heating and cooling through the building heat distribution system and supplementary heating for domestic hot water.

Ground Source Heat Storage and Recovery

The @Source-Energy Wall heating and cooling system can be supplemented with a ground source heat recovery (GSHR) system. The GSHR can be vertical geothermal wells, ground loops or @Source-Energy Pipes to provide ground source heating and cooling to the building.

The @Source-Energy Pipe system is precast concrete pipes installed as the sanitary and/or storm sewer system. Where no sewer system is available @Source-Energy Pipes can be buried in the ground as an excellent GSHR system. (Please refer to R³C's brochure on @Source-Energy Pipe or visit our web site.)

Photovoltaic Generators

The @Source-Energy Wall incorporates photovoltaic panels embedded into the exterior face of the wall to generate electrical energy (shown at C. in the adjacent diagram). The PV characteristics are shown below (each wall section can have 1 to 3 panels). The cooling capacity inherent in the @Source-Energy Wall will increase the PV output by up to 20%.

PV panel Characteristics

- 230 W per panel (or higher)
- Panels have a 25 year manufacturer's warranty on the efficiency, 90% power output for the first 12 years and 80% for the remaining 13.
- Panels are guaranteed for the highest quality workmanship and materials and have a 5 year manufacturer's warranty on construction.

Panel Configurations

Precast concrete wall units are usually fabricated 96 inches wide and to any length. PV panel dimensions are approx. 66 inches by 39 inches. PV panels are fit to the precast concrete wall unit to suit the customer requirements. @Source-Energy Wall units can be fabricated to suit most architectural dimensions and shape requirements.

Performance

Over a 1 year test period in Canada a single 235W PV panel generated 29W/h of electricity (average). Heat recovery from the @Source-Energy Wall averaged 28W/h per PV panel - **increasing the total energy generated by approximately 100%.**