NISTTech

PHOTOVOLTAIC SOLAR WATER HEATING SYSTEM

Energy-saving computerized solar water heaters

Description

This photovoltaic solar water heating system converts solar energy into electrical energy. It uses the direct current supplied by the photovoltaic array and the inherent storage capabilities of a residential water heater. The photovoltaic solar hot water system eliminates the components most often associated with the failures of solar thermal hot water systems. It can be configured as a single-unit or double-unit system. This system uses photovoltaic cells to generate electrical energy that is dissipated in multiple electric resistive heating elements. The photovoltaic solar water heating system does not require an inverter to convert the DC supplied by the photovoltaic array to an alternating current or a battery system for storage.

Images

A single-tank, solar photovoltaic hot water system is being evaluated at the Florida Solar Energy Center (FSEC).

Hot water used for hand washing in the restrooms at the Sugarland's Visitor Center (Great Smokey Mountains NP) is being generated by a photovoltaic solar water heating system.

Applications

- **Remote water heating**
  Useful for vacation homes, agricultural applications or livestock watering troughs.

Advantages

- **Adaptable**
  Works with either single or double-unit systems.
- **Eliminates failure components**
  Uses the direct current supplied by the photovoltaic array and a residential water heater, thus eliminating the components (inverters and heat pipes) most often associated with the failures of solar thermal hot water systems.
- **Efficient**
  Energy efficient; generates power at or near maximum capacity; useful where other energy sources are unavailable or prohibitively expensive.
- **Low Cost**
  Generates DC power thus eliminating inverters or wide arrays of piping.

Abstract

A system for heating water using solar energy comprises a photovoltaic array, a water heater comprising a variable resistive load, and a controller for varying either the load characteristics of the resistive load or the power generating characteristics of the photovoltaic array, or both, to ensure maximum power transfer efficiency.

Inventors

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Citations

1. 1.) NIST's Building and Fire Research Laboratory, Building Environment Division. Solar Photovoltaic System.

   2.) NIST's Building and Fire Research Laboratory, Heat Transfer and Alternative Energy Systems Group. Solar Photovoltaic Hot Water System.

Related Items

- Article: Interest Heats Up for Photovoltaic Water Heater

References

- U.S. Patent # 5,293,447, issued 03-08-1994; expired 06/02/2012
- Docket: 91-023US

Status of Availability

This technology is available in the public domain.

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