FM Journals

Frontiers Journal of Renewable energy

# Alternative energy demonstration system in support of green engineering

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## Abstract

This study explores positive accept of several alternative energy laboratories that have been designed and constructed to support a course entitled Solar Energy Systems here at Western New England University. These laboratories, which give students hands-on experience and a better understanding of basic concepts in wind energy, solar energy, and fuel cell technology, utilize an Alternative Energy Learning Platform, as well as an indoor/outdoor Alternative Energy Laboratory facilities. The alternative energy indoor/outdoor laboratory facility includes six 195 Watt photovoltaic panels, a 30,000 Btu/clear day flat-plate solar collectors, a Thermomax evacuated tubes solar collector, as well as a full scale 1 kW wind turbine, whose scale allows for useful power to be provided to the engineering building. This facility (Figure 1.) has been fully instrumented for the collection of key performance data and allows for large scale demonstration of alternative energy systems to students.

The Alternative Energy Active Learning Platform (Figure 2) which uses wind and solar energy to power an electrolyzer, which disassociates water into hydrogen and oxygen, and then subsequently uses the hydrogen and oxygen produced, within a fuel cell to power a fan, has been automated to allow better visualization of the system in operation and more efficient data collection. This paper also describes the development, operation and capability of the improved Alternative Energy Active Learning Platform, and its utilization within the Green Concentration of the undergraduate mechanical engineering program. The system can also be used to demonstrate the capabilities, safety and benefits of using alternative energy, and demonstrates the essential components of a renewable hydrogen energy system. Using the renewable energy produced from a Sharp NE-80EJE, 80 watts, solar panel, and a Rutland 503, 20-inch diameter, 60 watts, wind turbine, an electrolyzer (15 watts, 2-cell PEM) disassociates water into its components of hydrogen and oxygen. Energy is stored in the form of hydrogen, which is then utilized by the fuel cell. Hydrogen and oxygen are combined into water by the fuel cell (3 watts), which releases energy and heat in the process. The electrical energy supplied by the fuel cell is used to power a set of LED lights installed on the cabinet of the demonstration system.

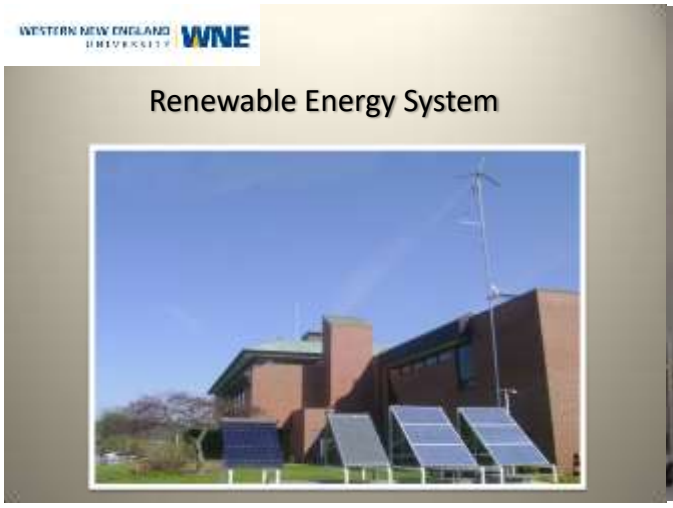


Figure 1. The alternative energy indoor/outdoor laboratory facility  Figure 2. Learning Platform

**Biography:**

Said Dini is the chair and professor of mechanical engineering at Western New England University. His research interests are Heat transfer, Thermodynamics, Fluid mechanics, solar energy, HVAC systems.