

UNIVERSITY OF CENTRAL FLORIDA
Solar Water Heating Systems Facility
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Description: The objective of the task was to construct a solar systems test facility by adding walls, windows, doors and A/C to an existing Florida Solar Energy Center roof facility. The enclosing of this existing space was done for the purpose of increasing laboratory space and to allow for conducting tests on solar water heating systems and PV modules and inverters. The action was taken following a study which determined this project was the most cost effective means of adding indoor laboratory space.

Budget: \$600,609

Universities: UCF/FSEC

Progress Summary

Over the past two years, the Florida Solar Energy Center (FSEC) has received a significant increase in demand for solar and PV systems testing and certification. This occurrence has resulted in requiring the Center to correspondingly amplify its capabilities to respond to the increased demand. Thus, the objective of this project was to add walls, windows, doors and A/C to an existing roof only facility for the purpose of increasing conditioned laboratory space and to allow for conducting tests on solar water heating systems and PV modules and inverters.

In 2005, FSEC constructed a slab and roof only facility on the west side of its Cocoa site. Due to the increase in testing and certification requirements, the need for conditioned laboratory space has become a critical requirement. Following a study, the most cost-effective method to add laboratory space was to enclose the existing roof facility. This facility is now called the Solar Systems Test Facility (Bldg. #1940). The following photograph shows this existing facility before any renovation was begun (Figure 1) and the exterior and interior views after renovation (Figures 2 to 4).



Figure 1: Ground Level Front View



Figure 2: Exterior View After Completion



Figures 3 and 4: Interior Views – Ready for Laboratory Installation

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Results

The building renovation has been completed and the design-build contractor's work has been accepted. Presently, work is underway inside the building to install the laboratory equipment for testing and certification of solar systems, installation of a PV simulator and work stations for five technical personnel.

A timeline of the renovation results is as follows:

- The enclosing of the FSEC roof facility began in September 2008.
- A design build firm* was hired on April 1, 2009.
- Construction drawings were completed July 2009.
- State Fire Marshal approval was requested and received on September 15, 2009.
- A meeting was held to discuss cost and timing with the design build firm on September 8, 2009.
- Following the meeting, a purchase order for construction was issued on September 19, 2009.
- The facility renovation was completed in April 2010.

*PPI Construction Management of Orlando, FL.

Background

The Florida Solar Energy Center (FSEC) is one of the nation's leading testing and certification organizations for solar products and equipment. The center's expertise is based on nearly 30 years experience conducting accredited solar energy testing and certification programs. FSEC believes that independent, third-party testing and certification has extensive value in the marketplace, especially for products that are not widely "proven" with consumers such as solar water heating systems and solar electrical (photovoltaic) systems. Independent, third-party certification provides not only protection for consumers, but also much needed consumer confidence. Even more important, third-party certification provides protection to reputable manufacturers, ensuring that lower quality products, often from foreign markets, do not compete head-to-head with Florida and U.S. products unless they meet the same standards.

In addition, to be eligible for the 2005 EPAct federal tax credits for solar thermal systems, the consumer must purchase a solar thermal system certified by the Solar Rating and Certification Corporation (SRCC) or FSEC. Since this federal tax credit has been extended through 2016, solar thermal testing and certification will continue to be required.

Due to the resurgence of the solar industry, FSEC has received a significant increase in demand for solar collector and solar system testing and certification. This occurrence has resulted in requiring the Center to correspondingly amplify its capabilities to respond to the increased demand.

Thus, the objective of this project was to add walls, windows, doors and A/C to an existing FSEC roof only facility for the purpose of increasing indoor and air-conditioned laboratory space and to allow for conducting tests on solar water heating systems and PV modules and inverters.

Existing Facility

In 2005, FSEC constructed a slab and roof only facility. The purpose of this facility was to allow for PV module and inverter testing and for hydrogen research. Due to the increase in testing and certification requirements, the need for conditioned laboratory space has become a critical requirement. Thus, the most cost-effective program that could be done to add laboratory space was to design an enclosure for an existing roof facility.

Although not a direct part of this program, the following sections describe the FSEC solar thermal system test development and PV module and inverter testing.

Solar Thermal Systems and Certification

FSEC is responsible for approving all solar water and pool heating systems that are sold or manufactured in Florida. The FSEC standards program has been designed to meet the intent of the legislation while also helping the Florida solar industry to develop quality products, aiding building departments in product approval, and instilling confidence in the consumer who chooses to use solar energy in their residence or business.

The solar water heating systems that are certified by FSEC are done in accordance with the Florida System Standards Program for Solar Thermal Systems. These systems have been found to meet the minimum standards established by FSEC. The certification also provides FSEC-developed system ratings.

FSEC provides three annual ratings for certified solar systems. These are:

- Energy Factor
- Energy Output
- Solar Fraction

Ratings are based on the estimated annual performance of the system as modeled using the TRNSYS system simulation program and typical meteorological year weather data (TMY2). The ratings are based on TMY2 weather data for the three regions defined by the Florida Building Code. These are North (Jacksonville), Central (Tampa), and South (Miami).

The old solar system test apparatus was located in the FSEC low bay laboratories. This lab space is critical to the development of fuel cell and PV cell research, thus, the systems lab is being moved to the new test facility. Figure 5 shows the newly designed solar thermal system test apparatus.

PV Module Testing

PV modules from various manufacturers are being tested and certified using the new Spire PV simulator (see Figure 6).



Figure 5. Solar Thermal Test Stand and Storage Tank (on left).



Figure 6. PV Simulator

Power Conditioning Equipment

A critical component in the power conditioning package of a PV system is the PV inverter which transforms DC electrical current from the PV array to AC electrical current for the power application. The testing of PV inverters is shown in Figure 7.



Figure 7. PV Inverter Testing

Industry Support:

This task will be strongly supported by the solar thermal manufacturers, who must have certification (FSEC within Florida, and FSEC-contracted SRCC nationwide) to effectively sell their products and qualify those products for various state and federal incentives and rebates. The Solar Rating and Certification Corporation (SRCC) currently contracts with FSEC for \$500,000 of annual work in test and certification. Further, FSEC expects the US Department of Energy to fund test work at an annual rate of \$200,000 during through 2011. However, this support is directed to labor and other operating expenses, and will not provide for the capital expansion and enhancements proposed under this task.