

University of Central Florida *Enhanced and Expanded Solar Thermal Test Capabilities*

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Description: 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. In addition, 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. This project has the objective of increasing FSEC’s solar thermal testing and certification activities by the following actions: test and analysis equipment and software upgrades and expansion, integration of the solar collector and system laboratories, enhancing documentation and reporting methods and streamlining and devising more comprehensive client test and certification application documents. Additional test facilities have come on-line internationally in the last two years and the increased testing capacity resulting from the additional tests labs has reduced the industry demand for FSEC’s thermal test services. FSEC however, remains the only test facility in the U.S. capable of testing certain types of solar thermal energy equipment and the current testing demand at FSEC still significantly exceeds the demand prior to 2008.

Budget: \$809,295

Universities: UCF/FSE

External Collaborators: US Department of Energy, SRCC

Executive Summary

This project has the objective of increasing the Florida Solar Energy Center (FSEC) solar thermal testing and certification processes and capabilities. Increased testing and certification capabilities were needed to meet the demand of the solar thermal industry and eliminate a “backlog” of collectors needing testing. This objective was met by the following actions:

- Implemented an Interim Certification category in order to give temporary product certification and speed product to market
- Upgraded and expanded the test and analysis equipment and software
- Implemented an information control system which begins with on-line application and payment and follows the complete testing process all the way through to the final test report and the certification notification.
- Moved and upgraded the thermal systems testing facility.

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. Equally 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.

FSEC's test capabilities were quite adequate to test and certify 3-5 new collectors introduced each year prior to 2005. However, in 2005, the demand for testing jumped dramatically, and is now projected at 20-40 new collectors annually. This increase is driven both by the recent "boom" in green energy awareness and the globalization of the solar industry, resulting in many requests from overseas manufacturers wanting to enter the US market and, thus the need for this project.

This project through its development of improved equipment, computer software and administrative processes has allowed FSEC to meet the new demand for testing and certification of solar thermal collectors and systems. As of the Fall of 2012, there is no longer any "backlog" for collector testing at FSEC. Additionally, the testing capabilities at FSEC are now sufficient to meet current and expanding demand in the solar thermal industry.

The following sections describe the upgraded testing and certification programs.

A. Interim Certification

The interim certification category was introduced in June 2009 to allow quality products to market quickly. Collectors are exposed to outdoor conditions as required by the standard to determine general quality. If they pass these tests, the products are allowed to market for a limited time until the performance testing is completed.

B. Testing Instrumentation

Over the years, the instrumentation used in testing aged to the extent that an unacceptable level of failures occur causing negative impacts in the time period required to complete a thermal performance test. Thus, FSEC implemented a modern instrumentation and testing system using advanced, but proven hardware and software.

Specifically, the Compact Field Point (CFP) data loggers, processors and controllers were purchased for these instrumentation upgrades. The advanced hardware and software configuration were beta tested and then used for production testing on three test stands. The collector test software application used LabVIEW® software which resulted in more flexibility and autonomy in running the tests. Features such as automatically adjusting the inlet temperature to compensate for changing air temperature and automatically deciding the orientation of the tracking platform when testing off-angle were introduced to maximize the data collection rate while minimizing user intervention. A Test Application Data Analysis (Ta Da) application was written and released which allows more flexibility and efficiency in reviewing the data and developing the equations, tables and graphs required for the test report. The same automation principles just described were also applied to the temperature sensor calibrations, flow calibrations and pressure tests. These improvements have reduced the test time significantly while improving the data capture integrity.

A parallel equipment and software upgrade has been underway for thermal system component testing at FSEC. System component testing includes testing of solar thermal collector "systems" that include hot water storage in the design. Other components such as heat exchangers, storage tanks, and certain pumps can also be tested in the FSEC thermal system components lab. In 2011, significant progress was made in the systems component test lab, and in 2012, the construction was completed. New equipment was purchased and installed in an on-site lab building, and the old, existing component test facility was decommissioned and dismantled. As of the fall of 2012, the new facility is approximately 98% complete with some final verification and validation activities now underway.

C.Information Control System

Due to the increased demand, a more efficient, traceable information control system and a more efficient document control process were needed. Work has been ongoing on a system that encompasses all the aspects required from beginning to end for a competent provider of testing and certification services. The new system is designed so that the customer can readily apply and pay on-line for services requested. Additionally they will be able to track the progress of their test from beginning to end and the test report will be automatically generated and much of the certification process will be automated. Additionally the system will meet the requirements that an ISO 17025 accredited test facility must meet with respect to document control.

Work has begun on the system. The conceptual design is complete with the database design is nearly complete. A separate contract was entered into between FSEC and the National Renewable Energy Laboratory (NREL), which leveraged work already accomplished to further pursue information control upgrades.

D.Key Results

The enhanced and expanded solar thermal test capabilities project has generated impressive results. The following is summary of the key measurable results of the project.

<u>Year</u>		<u>Test Rate</u>	<u>Report Rate</u>	<u>Certification Rate</u>
2008	(before project)	4 collectors/year	4 reports/year	4 per year
2009		14 collectors/year	22 reports/year	-
2010		27 collectors/year	20 reports/year	195
2011		15 collectors/year	12 collectors/year	180
2012		14 collectors/year	15 collectors/year	216

E.Industry Support:

These tasks were strongly supported by the solar thermal manufacturers, who must have certification to effectively sell their products and qualify those products for various state and federal incentives and rebates. The DOE has also supported this work through the Solar Rating and Certification Corporation (SRCC) that has operated from the FSEC.

This report has been completed. [Final report found here.](#)