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**NREL** ENERGY SYSTEMS  
INTEGRATION FACILITY  
NATIONAL RENEWABLE ENERGY LABORATORY

U.S. DEPARTMENT OF ENERGY

6



# Thermal Systems Process and Components Laboratory

The focus of the Thermal Systems Process and Components Laboratory at NREL's Energy Systems Integration Facility (ESIF) is to research, develop, test, and evaluate new techniques for thermal energy storage systems that are relevant to utility-scale concentrating solar power plants. The laboratory holds test systems that can provide heat transfer fluids for the evaluation of heat exchangers and thermal energy storage devices. The existing system provides molten salt at temperatures up to 800°C. This unit is charged with nitrate salt rated to 600°C, but is capable of handling other heat transfer fluid compositions. Three additional test bays are available for future deployment of alternative heat transfer fluids such as hot air, carbon dioxide, or steam systems.

## Laboratory Specifications

The 950 sq. ft. laboratory features four test bays, each capable of supporting a 30kW test system. One bay resides inside in a HEPA-rated enclosure so articles containing nanofluids can be tested. Outside cooling air is available from a roof-mounted blower and hot air can be exhausted through the ceiling.

The laboratory contains 30kW test systems designed to provide hot heat transfer fluid to pilot-scale thermal energy storage systems. Storage systems can be cycled through multiple charge and discharge cycles to evaluate performance and storage efficiency.

## Application Scenarios

The Thermal Systems Process and Components Laboratory performs pilot-scale thermal energy storage system testing through multiple charge and discharge cycles to evaluate heat exchanger performance and storage efficiency. The laboratory equipment can also be utilized to test instrument and sensor compatibility with hot heat transfer fluids.

Future applications in the laboratory may include the evaluation of thermal energy storage systems designed to operate with supercritical heat transfer fluids such as steam or carbon dioxide. These tests will require the installation of test systems capable of providing supercritical fluids at temperatures up to 700°C.

## Partner with Us

Work with NREL experts and take advantage of the state-of-the-art capabilities at the ESIF to make progress on your projects, which may range from fundamental research to applications engineering. Partners at the ESIF's Thermal Systems Process and Components Laboratory may include:

- CSP technology developers
- Utilities
- Certification laboratories
- Government agencies
- Universities
- Other National laboratories

## Contact Us

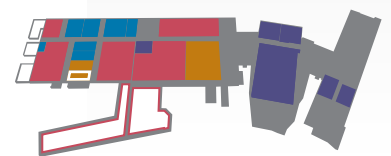
If you are interested in working with NREL's Thermal Systems Process and Components Laboratory, please contact:

### ESIF Manager

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## Major Laboratory Equipment

- Four 10 ft. X 10 ft. test bays for evaluation of 30kW thermal systems
- Custom test system to provide hot salt or molten metal heat transfer fluid to the test device
- LabView computer interface for unit control and data acquisition
- Thermal energy storage process test loops
- Outdoor air feed and exhaust for system cooling
- HEPA-rated enclosure for testing systems containing nanomaterials



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