NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Thermal Scout Pinpoints Hard-to-Find Problems in CSP Fields

Highlights in Research & Development

Updated receiver survey system uses an infrared camera, GPS technology, and computer software to rapidly analyze concentrating solar power fields and locate defective receivers.

In a parabolic trough concentrating solar power (CSP) system, collectors reflect the sun's rays onto long, tubular receivers that convert the sunlight into heat that is used to generate electricity. The long-term performance of these receivers—designed to minimize heat loss to the environment while absorbing as much sunlight as possible—is critical for high efficiency and sustained performance.

Traditionally, locating problems with receivers has been a costly, time-consuming, and labor-intensive effort, often requiring manual inspection of tens of thousands of receiver tubes. In most cases, operators must assess the entire output of a plant and roughly estimate the number of receiver tubes with leaks or other damage.

The National Renewable Energy Laboratory (NREL) has developed Thermal Scout, a sophisticated survey system to rapidly inspect receivers for performance issues using an infrared (IR) camera, global positioning system (GPS) technology, and computer software. The portable system attaches to a standard vehicle that is driven down each row of a parabolic trough plant, using the GPS data to automate IR imaging and analyze temperatures of all receivers in the field. Previous methods required collectors to be defocused so that teams of two operators could get close enough to the receivers to take measurements using handheld IR temperature measurement devices, and a two-person team could typically measure the glass temperature on only about 200 receivers per day. The fully automated Thermal Scout allows operators to safely and more accurately evaluate over 6,000 receivers per day—without impacting normal plant operation.

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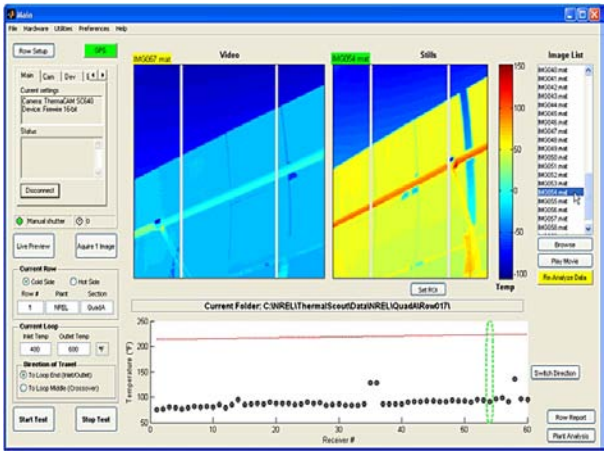

Thermal Scout's user-friendly data acquisition interface allows users to read data in real time or save it for later analysis. The left screen shows a video image with the mirrors in blue and the tube in lighter blue. The right side shows a still shot with the tube in orange. In the space below, a series of dots shows which tubes have elevated temperatures.

Key Research Results

Achievement

NREL has created a receiver survey system that integrates an IR camera, GPS technology, and computer software to rapidly assess the thermal properties of receivers and pinpoint which receivers are not functioning properly.

Key Result

The Thermal Scout system enables operators to more accurately locate problems, reducing the time, cost, and effort required to monitor the performance of parabolic trough systems.

Potential Impact

By more easily locating defective receivers for replacement, Thermal Scout will increase the overall efficiency of CSP systems, thereby reducing the cost of solar energy.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

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