Summary of the 10 MW Solar Two Tests and Evaluations

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Abstract

The Solar Two project is a collaborative, cost-shared project between eleven United States industry and utility partners and the U.S. Department of Energy to validate molten-salt power tower technology. The Solar Two plant, located east of Barstow, California, comprises 1926 heliostats, a receiver, a thermal storage system and a steam generator system that uses molten nitrate salt as the heat transfer fluid and storage media. The steam generator powers a 10 MWe, conventional Rankine cycle turbine. The thermal storage system was sized to provide 3 hours of full turbine operation after sunset.

The objectives of the Solar Two Test and Evaluation (T&E) program were to gather data and information, and perform analyses to:
1. Validate the technical characteristics of the nitrate salt receiver, storage system, and steam generator technologies.
2. Improve the accuracy of economic projections for commercial projects by increasing the database of capital, operating, and maintenance costs.
3. Distribute information to U.S. utilities and the solar industry to foster wider interest in the first commercial plants.

Originally, the T&E program was planned to run for a period of one year after final plant acceptance. During this period, the entire plant and the operations and maintenance (O&M) crew were to be devoted exclusively to T&E with no emphasis on power production goals. However, the startup and acceptance phase of the project took much longer than expected. Consequently, the T&E phase was integrated into the power production phase and reorganized. Special tests that required the plant to be in a non-standard configuration were accommodated during power production, then the plant was returned to normal operation. Because of the compressed project schedule, the test plan was revised. Some tests were eliminated, others combined and re-scoped to fit into the new objectives. This paper describes results from tests on the receiver efficiency, steam generator and electric-power-generation system characterization, thermal losses of major equipment, dispatchability, and overall plant performance. The primary objectives of these tests were to characterize each major subsystem relative to design performance and to characterize the overall plant performance relative to predicted performance.