

Path 3

Advanced Systems and Components

Overview

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Concentrating Solar Power (CSP) Peer Review

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CONCENTRATING SOLAR POWER

Sun♦Lab

Sandia National Laboratories, Albuquerque, NM
National Renewable Energy Laboratory, Golden CO

Path Objectives

- Address longer-range R&D needs
 - Goal is achieve energy costs in the 4-6¢/kWh range
 - Broader penetration of domestic and international markets
 - Innovation should lead to breakthroughs
- Current areas of interest
 - High efficiency system designs
 - Advanced converter concepts
 - Materials and components
 - Supporting activities
 - Systems analyses
 - Resource assessment
 - University R&D



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Benefits

- High efficiency system designs
 - 20% increases in annual energy delivered by both trough and power tower systems possible
 - troughs already have made 20% performance improvement
 - receiver improvements offer major increase in power produced for dish systems
 - Heat pipe receivers can improve performance by 20%
 - Hybrid receivers can extend performance past sunlight hours
- Advanced converters
 - new converters can increase efficiency, reduce costs and improve reliability
 - provides program with new options
 - takes advantage of core capabilities within SunLab



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Examples of Promising ‘New’ Converters

- Concentrating photovoltaics
 - replace existing Stirling in dishes
- Free-piston Stirling engine
 - STC developing small engines for gas-fired, cogeneration applications
 - demonstrated reliability, potential for high efficiency and scale-up
 - Successfully tested 1 kW unit at NREL HFSF

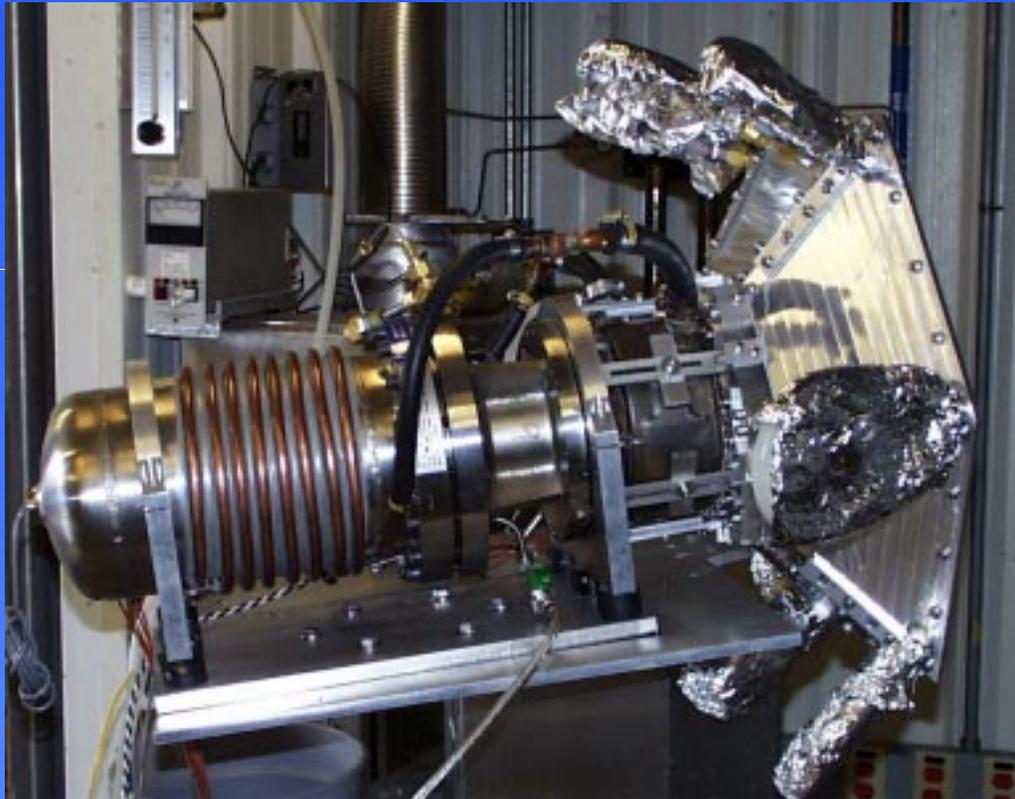


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STC Engine Tests at HFSF



1 kW engine on test stand



On sun



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Benefits (cont'd)

- Materials and components
 - at 40 to 50% of the cost of the typical CSP power plant, concentrator improvements can be significant
 - Optical materials
 - 50-75% cost reduction possible in terms of reflector cost, structure cost, drive/control cost (weight issue), and manufacturing cost (25-40% assembly cost saving)
 - Industry desperately wants/needs less expensive, longer lived mirrors
 - Components
 - structures, drives, controls each contribute to concentrator cost
 - Tools
 - measurement tools allow for accurate characterization and assessment of improvements



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Benefits (cont'd)

- Supporting activities
 - Systems analysis
 - Evaluate the status of R&D efforts, identify promising new directions for technology development (e.g. troughs and small systems), conduct system modeling and optimization, maintain and update CSP technology characterizations, respond to short-term industry requests
 - Resource assessment
 - Develop and apply tools and methodologies for producing high quality solar resource data and related products
 - Optimize the siting process in given regions
 - University R&D
 - Another path for introducing new ideas, expertise



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Summary

- New ideas are critical for the future of the technology (and the program)
- Following discussions
 - Don't cover all remaining program activities
 - Cover wide range of ongoing technology areas
 - Dish Receiver Development, Chuck Andraka
 - Hybrid Receiver Development, Jim Moreno
 - Resource Assessment, Dave Renné
 - Systems Analysis Support, Scott Jones
 - Break –
 - Concentrating PV R&D, Allan Lewandowski
 - CPV Development, Raed Sherif, Spectrolab
 - Optical Materials R&D, Gary Jorgensen
 - Analysis Tools and Components, Tim Wendelin
 - UNLV Dish Test Site, Bob Boehm, UNLV
 - University Subcontracts, Lizana Pierce, DOE/GFO



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