SOLAR DISH / STIRLING TECHNOLOGY. A WORLD STATUS REPORT AND COMPARISON

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Solar electric generation systems using a parabolic dish concentrator with a Stirling engine at the focus are approaching commercialization. Studies both in the United States and Germany indicate that there are large worldwide markets for these systems. Based on the information gathered for a 2-year technology survey for the International Energy Agency (Stine & Diver, 1993), this presentation describes experience with early dish / Stirling systems, systems that are currently in operation, and development activities that support bringing these systems to the marketplace rapidly.

The foundation for these market projections lies in the testing and evaluation of dish / Stirling systems developed in the 1980's in both the United States and Germany, using Stirling engines manufactured in Sweden. It was the performance data produced by these systems that proved the high efficiency potential of dish / Stirling systems, higher than any of the other solar-to-electric conversion systems. Also demonstrated was the ability of these systems to restart and produce net power immediately following cloud-induced transients, permitting them to produce more energy during a cloudy day than competing solar technologies. A comparison of these systems is presented with important conclusions about their performance drawn.

Currently, three different dish / Stirling designs are operating gaining information on performance and longevity. Three Cummins Power Generation 5-kWe systems are currently under test at three sites within the United States. The German firm of Schlaich, Bergermann und Partner is currently life-testing three of their 9-kWe at the Plataforma Solar in Almeria Spain. Aisin Seiki is also currently testing dish / Stirling systems at a site on Miyako Island, Japan. Current updates of these tests will be presented and recent data presented. These systems will be compared with the early systems described above to indicate trends in system development.

A discussion of current technology development activities follows. These include programs for technologies critical to the design of concentrators, receivers and engines in both government laboratories and private industry. Trends are identified that predict the future directions of dish / Stirling development.

The paper concludes with a comparative assessment of technologies for dish / Stirling concentrators, receivers, engines and systems. Dish / Stirling systems are then compared with other solar electric technologies in order to describe the market 'niche' into which they fit.

References