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Design of a Supercritical Carbon Dioxide Brayton Cycle for Solar Dish Concentrator Energy Production

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As evidenced by solar flux mapping, a solar dish concentrator with a parabolic arrangement mirror system is used to generate 100 kW of solar flux. The solar flux concentrated by this dish is used to replace fossil fuels as the heat source for a clean power generation cycle. Component design and configuration for a Brayton cycle using supercritical carbon dioxide as the working fluid is paramount for achievability and efficiency in this study. Computer modeling has provided benchmarks for system component design, while material and machining constraints provide upper and lower limits. Testing has shown that the solar concentrator dish is achieving solar concentration ratios of over 220 suns, providing experimental receiver temperatures over 950 C in less than five minutes. It is found that the receiver is able to withstand these temperatures without negative effects. Development of a turbo-compressor with modularity is in the final design stages. This new modular design allows for optimization redesign of each section in the turbo-compressor without the need to re-machine the entire unit.

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