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# Turbine Drive Gas Generator for Zero Emission Power Plants

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### Abstract

The Vision 21 Program seeks technology development that can reduce energy costs, reduce or eliminate atmospheric pollutants from power plants, provide choices of alternative fuels, and increase the efficiency of generating systems. Clean Energy Systems is developing a gas generator to replace the traditional boiler in steam driven power systems. The gas generator offers the prospects of lower electrical costs, pollution free plant operations, choices of alternative fuels, and eventual net plant efficiencies in excess of 60% with sequestration of carbon dioxide.

The technology underlying the gas generator has been developed in the aerospace industry over the past 30 years and is mature in aerospace applications, but it is as yet unused in the power industry. This project modifies and repackages aerospace gas generator technology for power generation applications. The purposes of this project are: (1) design a 10 MW gas generator and ancillary hardware, (2) fabricate the gas generator and supporting equipment, (3) test the gas generator using methane as fuel, (4) submit a final report describing the project and test results.

The principal test objectives are: (1) define start-up, shut down and post shutdown control sequences for safe, efficient operation; (2) demonstrate the production of turbine drive gas comprising steam and carbon dioxide in the temperature range 1500 °F to 3000 °F, at a nominal pressure of 1500 psia; (3) measure and verify the constituents of the drive gas; and (4) examine the critical hardware components for indications of life limitations.

The 21 month program is in its 13<sup>th</sup> month. Design work is completed and fabrication is in process. The gas generator igniter is a torch igniter with sparkplug, which is currently under-going hot fire testing. Fabrication of the injector and body of the gas generator is expected to be completed by year-end, and testing of the full gas generator will begin in early 2002. Several months of testing are anticipated.

When demonstrated, this gas generator will be the prototype for use in demonstration power plants planned to be built in Antioch, California and in southern California during 2002. In these plants the gas generator will demonstrate durability and its operational RAM characteristics. In 2003, it is expected that the gas generator will be employed in new operating plants primarily in clean air non-attainment areas, and in possible locations to provide large quantities of high quality carbon dioxide for use in enhanced oil recovery or coal bed methane recovery. Coupled with an emission free coal gasification system, the CES gas generator would enable the operation of high efficiency, non-polluting coal-fueled power plants.