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Development and Demonstration of a Solid Fuel-Fired Gas Turbine System

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DISCLAIMER

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CONTRACT INFORMATION

Cooperative Agreement	DE-FC21-93MC30127
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ABSTRACT

Western Research Institute (WRI) and Power Generating Incorporated (PGI) are developing a solid fuel-fired gas turbine system for specialized cogeneration applications. The system is based on a patented pressurized combustor designed and tested by PGI in conjunction with McConnell Industries. The other components of the system are (a) fuel receiving, preparation, storage and feeding system, (b) gas clean-up equipment, and (c) a gas turbine generator.

A demonstration of the technical and economic viability of the integrated system is being funded by the U.S. DOE through METC and the National Renewable Energy Laboratory, and PGI. An approximately 400 kW prototype system is under construction at the WRI facilities in Laramie, Wyoming. As a part of this demonstration the integrated system, following a short shakedown period, will be operated on white wood. White wood was selected as the fuel for early tests because of its low ash (0.5 - 1.0 %), silica, and sulfur contents. The system will then be operated on coal. It is expected that the design of the coal-based system will evolve as the wood testing proceeds.

In previous similar wood-fired system development attempts, albeit at lower turbine inlet temperatures, a major technical hindrance to long-term operation of a gas turbine power system has been the degradation of the hot section of the gas turbine. Deposition, erosion, and corrosion are main issues that need to be addressed. In the wood-fired PGI system, erosion is not likely to be of concern because of the low silica and low overall ash content of the fuel and the fact that the wood ash particle size is expected to be in the range where little or no erosion would be

expected. However, because of the high alkali content of the fuel, deposition and corrosion can become major issues.

This paper will deal with the issues pertaining to the design of the prototype being constructed at the WRI premises. Preliminary thoughts on the design aspects of the plant modifications required for coal testing will also be presented.