

EVALUATION OF ALTERNATE POWER CONVERSION UNIT DESIGNS FOR THE GT-MHR*

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ABSTRACT

General Atomics in the USA and Experimental Design Bureau of Machine Building (OKBM) in the Russian Federation have jointly developed a nuclear power plant design, the gas turbine modular helium reactor (GT-MHR). There have been some considerable improvements during the last 10 years, which resulted in a more effective, efficient and safe design. The existing design is based on a 600 MW(t) reactor cooled by helium at a pressure of about 7 MPa. The power conversion unit (PCU) uses reactor outlet helium with a temperature of 850°C in a direct Brayton cycle to achieve the cycle efficiency of about 48%. The PCU consists of a gas turbine, a recuperator, a precooler, low-pressure and high-pressure compressors, an intercooler, and a generator. The turbomachine (TM) includes the turbine, compressors and generator mounted on a single vertical shaft. TM shaft rotation speed is 4400 rpm. The shaft of generator is connected to the turbine shaft by a flexible coupling. The required grid frequency of generated electricity is achieved by a converter. All PCU components are enclosed in a single vessel. TM uses radial and axial electromagnetic bearings (EMB) for support. Catcher bearings (CB) are provided as redundant support for the TM rotor in case of EMBs failure. Several alternative PCU designs were analyzed on the basis of current progress in technologies, new world experience, and experience accumulated in the process of GT-MHR design development. Results of these analyses will be taken into account when a final PCU design is selected.

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