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***Current status and future  
development of modular  
high temperature gas cooled  
reactor technology***



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## FOREWORD

During the 1980s, the modular high temperature gas cooled reactor (HTGR) concept was developed, primarily in Germany and the United States of America. This concept utilized characteristics of HTGR technology to arrive at a design wherein safety issues were addressed through the inherent response characteristics of the system. These initial modular HTGR designs were primarily directed toward electricity generation using a steam turbine (Rankine cycle).

Substantial developments have occurred over the past decade in the modular HTGR programmes of Member States of the IAEA's International Working Group on Gas Cooled Reactors (IWG-GCR). The 1990s were witness to the initiation of plant designs that incorporate this advanced nuclear reactor coupled to a gas turbine power conversion system for the production of electricity (Brayton cycle). This design replaces the steam cycle components with fewer gas turbine cycle components, and with an attendant benefit of increasing net plant electrical efficiency from approximately 40% into the range of 45 to 50%. The resulting plant simplification and increased thermal efficiency provides the promise of competitive capital and O&M costs at relatively low unit ratings (100–300 MW(e)).

Significant programmatic changes are also taking place in the investigation of the modular HTGR as the high temperature heat source for industrial co-generation and non-electric applications to realize products including hydrogen and synthesis fuels as well as the production of electricity.

This report was developed by IAEA for the purpose of providing Member States with a detailed reference on the current status and future plans for utilization of the modular HTGR as an energy source for industrial applications and the generation of electricity. The international HTGR programmes described herein involve substantial international collaborative efforts of IWG-GCR Member States including technical personnel and research facilities.

This report was developed by H.L. Brey from materials obtained from Member States participating in the IWG-GCR. It has received an international review by experts in HTGR development from China, Japan, South Africa and the USA, as indicated in the Contributors to Drafting and Review section. The IAEA officers responsible for this publication were J. Kupitz and J.M. Kendall of the Division of Nuclear Power.

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