

IAEA TECDOC 1249 (advance electronic version)

Critical Experiments and Reactor Physics Calculations for Low-Enriched High Temperature Gas Cooled Reactors

The originating Section of this publication in the IAEA was:

Nuclear Power Technology Development Section
International Atomic Energy Agency
Wagramer Strasse 5
P.O.Box 100
A-1400 Vienna, Austria

Critical Experiments and Reactor Physics Calculations for
Low-Enriched High Temperature Gas Cooled Reactors
IAEA, Vienna, 2001
IAEA-TECDOC--1249
advance electronic copy
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FOREWORD

An important function of the International Atomic Energy Agency is to "foster the exchange of scientific and technical information" and to "encourage and assist research on, and development and practical application of, atomic energy for peaceful uses throughout the world". For innovative advanced nuclear reactor concepts, IAEA Member States in many cases find it attractive to cooperate internationally in technology development. The IAEA's gas-cooled reactor technology development activities, which are conducted within its Nuclear Power Program, encourage international cooperation through technical information exchange and cooperative research.

Advanced gas cooled reactor designs currently under development are predicted to achieve a high degree of safety through reliance on innovative features and passive systems. The IAEA's activities in this field during the 1990's focused on three technical areas that are essential to providing this high degree of safety, but which must be proven. These technical areas are:

- (a) the neutron physics behavior of the reactor core
- (b) the ability of ceramic coated fuel particles to retain the fission products, even under extreme accident conditions
- (c) the ability of the designs to dissipate decay heat by natural transport mechanisms

To enhance confidence in predictions of neutron physics behavior, the IAEA established a Coordinated Research Project (CRP) on Validation of Safety Related Physics Calculations for Low Enriched HTGRs. Countries participating in this CRP include China, France, Japan, Switzerland, Germany, the Netherlands, the USA and the Russian Federation. Its objective was to fill gaps in validation data for physics methods used for core design of gas-cooled reactors fueled with low enriched uranium. Within this CRP, an international team of researchers was assembled at the PROTEUS critical experiment facility of the Paul Scherrer Institute, Villigen, Switzerland, to plan, conduct and analyze a new series of critical experiments focused on the needs of participating countries. In this CRP, experience from critical experiment programs in the Russian Federation and Japan was also utilized.

The following institutes participated in this CRP:

Paul Scherrer Institute (PSI), Villigen, Switzerland
Institute for Nuclear Energy Technology (INET), Tsinghua University, Beijing, China
Forschungszentrum Jülich (FZJ), Jülich, Germany
Japan Atomic Energy Research Institute (JAERI), Tokai-mura, Japan
Interfaculty Reactor Institute, Delft University, Delft, the Netherlands
Centre d'Etudes de Cadarache (CEA), St. Paul les Durance-Cedex, France
Oak Ridge National Laboratory (ORNL), Oak Ridge, USA
Russian Research Center Kurchatov Institute (RRC-KI), Moscow, Russia
Energy Research Center, Petten, the Netherlands
General Atomics (GA), San Diego, USA
Experimental Machine Building Design Bureau (OKBM), Nizhny Novgorod, Russia

This report was edited by T. Williams and M. Rosselet (formerly PSI), and W. Scherer (FZJ). The IAEA project officers for the CRP were J. Cleveland and H. Brey, and the officer responsible for this publication was J. Kendall. Additional CRPs addressing technical areas (b) and (c) were conducted in parallel, with results documented in IAEA TECDOCs 978 and 1163.

EDITORIAL NOTE

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