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***Considerations in the
development of safety requirements
for innovative reactors:
Application to modular high
temperature gas cooled reactors***



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CONSIDERATIONS IN THE DEVELOPMENT OF SAFETY REQUIREMENTS FOR
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FOREWORD

Member States of the IAEA have frequently requested this organization to assess, at the conceptual stage, the safety of the design of nuclear reactors that rely on a variety of technologies and are of a high degree of innovation. However, to date, for advanced and innovative reactors and for reactors with characteristics that are different from those of existing light water reactors, widely accepted design standards and rules do not exist.

This TECDOC is an outcome of the efforts deployed by the IAEA to develop a general approach for assessing the safety of the design of advanced and innovative reactors, and of all reactors in general including research reactors, with characteristics that differ from those of light water reactors. This publication puts forward a method for safety assessment that is based on the well established and accepted principle of defence in depth.

The need to develop a general approach for assessing the safety of the design of reactors that applies to all kinds of advanced reactors was emphasized by the request to the IAEA by South Africa to review the safety of the South African pebble bed modular reactor. This reactor, as other modular high temperature gas cooled reactors (MHTGRs), adopts very specific design features such as the use of coated particle fuel. The characteristics of the fuel deeply affect the design and the safety of the plant, thereby posing several challenges to traditional safety assessment methods and to the application of existing safety requirements that have been developed primarily for water reactors.

In this TECDOC, the MHTGR has been selected as a case study to demonstrate the viability of the method proposed. The approach presented is based on an extended interpretation of the concept of defence in depth and its link with the general safety objectives and fundamental safety functions as set out in “Safety of Nuclear Power Plants: Design”, IAEA Safety Standards No. NS-R.1, issued by the IAEA in 2000. The present TECDOC is not intended to be exhaustive, but rather suggests a systematic approach to be used in the development of detailed safety requirements.

The IAEA is grateful to the experts who contributed to this publication. The IAEA officer responsible for this publication was M. Gasparini of the Division of Nuclear Installation Safety.

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