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***Emerging nuclear energy and  
transmutation systems:  
Core physics and  
engineering aspects***



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CORE PHYSICS AND ENGINEERING ASPECTS

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## FOREWORD

The recycling of plutonium, minor actinides and long-lived fission products in various types of fission reactors, accelerator driven systems (ADS) and molten salt reactors is under investigation in several Member States. The surmised advantages of some of these concepts, e.g. ADS, are intrinsic low waste production, high transmutation capability, enhanced safety characteristics and better long-term resources utilization (e.g. with thorium fuels). Important R&D programmes are being undertaken by various institutions in many Member States to substantiate these claims and advance the basic knowledge in this innovative area of nuclear energy development. For these groups there is the clearly perceived need for coordinating their efforts and also for getting access to information from nationally and internationally coordinated activities.

While long term objectives for developing novel nuclear systems for energy production and transmutation may not be unanimously agreed upon by the different groups participating in this effort, it is clear that the short-term goals are similar. Thus, it is useful to exchange technical information developed in the different approaches and to identify areas of co-operation.

Indications as to the needs of the Member States for co-operation and information exchange in this area emerged from various Agency meetings, and are documented in meeting reports and other publications (e.g., Special Scientific Programme on “Use of High Energy Accelerators for Transmutation of Actinides and Power Production”, in conjunction with the 38<sup>th</sup> IAEA General Conference; Vienna, September 1994; the “Second International Conference on Accelerator-Driven Transmutation Technologies and Applications”, Kalmar, Sweden, 1996; The “Eighth International Conference on Emerging Nuclear Energy Systems (ICENES '96)”, Obninsk, Russia, June 1996; the “Ninth International Conference on Emerging Nuclear Energy Systems (ICENES '98)”, Tel-Aviv, Israel, June-July 1998; and the “Third International Conference on Accelerator-Driven Transmutation Technologies and Applications, Prague, Czech Republic, June 1999.

The Technical Committee Meeting (TCM) on “Core Physics and Engineering Aspects of Emerging Nuclear Energy Systems for Energy Generation and Transmutation” was held from 28 November to 1 December 2000 at Argonne, Illinois, U.S.A. The meeting was hosted by the Argonne National Laboratory, and was convened by the IAEA on the recommendation of its Technical Working Group on Fast Reactors (TWG-FR).

The objectives of this TCM were threefold: to review the status of R&D activities in the area of hybrid systems for energy generation and transmutation, to discuss specific scientific and technical issues covering the different R&D topics of these systems; and to recommend to the IAEA activities that would be specifically targeted to the needs of the Member States performing R&D in this field.

The IAEA would like to express its appreciation to all the participants in the TCM, the chairpersons, and the hosts at Argonne National Laboratory.

The IAEA officer responsible for this publication was A. Stanculescu of the Division of Nuclear Power.

## *EDITORIAL NOTE*

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