The ADS programme in Belgium – MYRRHA and the associated fuel cycle research*

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Abstract

SCK•CEN has offered in 2005 to the partners of the EUROTRANS project to use the then-available version of MYRRHA as a starting basis for the XT-ADS design. The EUROTRANS project is an Integrated Project in the 6th European Framework Programme in the context of partitioning and transmutation. It aims to deliver an advanced design of a small-scale short-term facility, XT-ADS, and the conceptual design of a medium-scale, longer-term facility called EFIT. Several detailed communications in this workshop are dedicated to the EUROTRANS project. The EUROTRANS partners have accepted the proposal and the existing MYRRHA design has been deeply reviewed.

MYRRHA today is conceived as a flexible irradiation facility, able to work as an accelerator-driven (subcritical mode) and in critical mode. In this way, MYRRHA will allow fuel developments for innovative reactor systems, material developments for Gen-IV systems, material developments for fusion reactors, radioisotope production for medical and industrial applications and industrial applications, such as Si-doping. MYRRHA will also demonstrate the ADS full concept by coupling the three components (accelerator, spallation target and subcritical reactor) at a reasonable power level to allow operation feedback, scalable to an industrial demonstrator and allow the study of efficient transmutation of high-level nuclear waste. MYRRHA is foreseen to be in full operation by 2022 and it will be operated in the first years as an ADS. The present communication focuses on the further steps that are required, since the end of the EUROTRANS project until this target date of 2022.

In line with the development of MYRRHA, SCK•CEN continues to study the impact ADS can have on innovative fuel cycles. In the FP7 programme ARCAS, which should start in June 2010, SCK•CEN together with 11 European partners will perform an economic comparison of minor actinide transmutation in fast reactors and ADS. A key parameter in this study is the maximum minor actinide content in the innovative fuels. It is well known that with increasing minor actinide content, safety parameters, like the Doppler coefficient, are reduced. It is the aim of this project to define both a representative fast reactor system and ADS that can operate within common day safety limits. Together with a selection of a fuel reprocessing/innovative fuel production plant, these systems will be analysed on investment cost and operating cost. This study answers one of the key questions posed in the Strategic Research Agenda (SRA) issued by the Sustainable Nuclear Energy-Technology Platform (SNE-TP).

SCK•CEN is also involved in the INPRO/GAINS initiative in which a working group is analysing a Global Architecture for Innovative Nuclear Systems. This working group has defined reference scenarios in both a homogeneous and heterogeneous world. As a part of the study, ADS systems will be introduced in these analyses and the impact on the fuel cycle studied. As reference ADS system, the EFIT core has been selected.

This paper wishes to give an overview of fuel cycle related activities at SCK•CEN in the research domain of accelerator-driven systems and Generation IV systems.

* The full paper being unavailable at the time of publication, only the abstract is included.