Progress of the MYRRHA ADS Project in Belgium.

Gert Van den Eynde, Hamid Aït Abderrahim
Belgian Nuclear Research Centre (SCK•CEN)
Boeretang 200, BE-2400 Mol – Belgium
gert.van.den.eynde@sckcen.be

Abstract

The MYRRHA project started in 1998 by SCK•CEN in collaboration with Ion Beam Applications (IBA, Louvain-la-Neuve), as an upgrade of the ADONIS project. MYRRHA is designed as a multi-purpose irradiation facility in order to support research programs on fission and fusion reactor structural materials and nuclear fuel development. Applications of these are found in Accelerator Driven Systems (ADS) and in present generation as well as in next generation critical reactors. The first objective of MYRRHA however, will be to demonstrate on one hand the ADS concept at a reasonable power level and on the other hand the technological feasibility of transmutation of Minor Actinides (MA) and Long-Lived Fission Products (LLFP) arising from the reprocessing of radioactive waste. MYRRHA will also help the development of the Pb-alloys technology needed for the LFR (Lead Fast Reactor) Gen.IV concept.

Transmutation of minor actinides can be completed in an efficient way in fast neutron spectrum facilities. Both critical reactors and sub-critical ADS are potential candidates as dedicated transmutation systems. However, critical reactors, heavily loaded with fuel containing large amounts of MA, pose reactivity control problems, hence safety problems, caused by unfavourable reactivity coefficients and small delayed neutron fraction. A sub-critical ADS operates in a flexible and safe manner even with a core loading containing a high amount of MA leading to a high transmutation rate. Thus, the sub-criticality is not a virtue but rather a necessity for an efficient and economical burning of the MA. Besides these reactor and core physics considerations, there are other parameters to consider for deciding on the most appropriate technology suitable for the large scale deployment of partitioning and transmutation (P&T) technology for the reduction of the HLW burden.

The implementation of P&T needs the demonstration of the feasibility of several installations at an “engineering” level. The respective research and development activities could be arranged in four so called “building blocks” aiming to:

A. demonstrate the capability to process a “sizable” amount of spent fuel from commercial power plants (i.e. LWR) in order to separate Pu and MA,

B. demonstrate the capability to fabricate at semi-industrial level the dedicated fuel needed to load a dedicated transmuter,

C. make available one or more dedicated transmuters,

D. provide an installation for processing of the fuel unloaded from the transmuter which can be of a different type of the one used to process initially the original spent fuel unloaded from the commercial power plants (i.e. LWR).

In this paper we will report on the progress of the MYRRHA project and its perspective of implementation in Belgium.