

Realisation of a New Research Infrastructure in Belgium: MYRRHA

20 years of Ideas, 20 years of Design and R&D summarized in 20 & 20 minutes

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Abstract

SCK•CEN is at the forefront of Heavy Liquid Metal (HLM) nuclear technology worldwide with the development of the MYRRHA accelerator driven system (ADS). MYRRHA is serving since the FP5 EURATOM framework as the backbone of the P&T strategy of the European Commission based on the "4 building Blocks at Engineering level" and fostering the R&D activities in EU related to the ADS and the associated HLM technology developments.

At the same time MYRRHA is conceived as a flexible fast-spectrum pool-type research irradiation facility cooled by Lead Bismuth Eutectic (LBE), and was identified by SNETP (www.snetp.eu) as the European Technology Pilot Plant for the Lead-cooled Fast Reactor. MYRRHA is proposed to the international community of nuclear energy and nuclear physics as a pan-European large research infrastructure to serve as a multipurpose fast spectrum irradiation facility for various fields of research such as; transmutation of High Level Waste (HLW), material and fuel research for Gen.IV reactors, material for fusion energy, innovative radioisotopes development and production and for fundamental physics. As such MYRRHA is since 2010 on the high priority list of the ESFRI roadmap (<http://www.esfri.eu/roadmap-2016>).

Since 1998 SCK•CEN is developing the MYRRHA project as an accelerator driven system based on the lead-bismuth eutectic as a coolant of the reactor and a material for its spallation target. The nominal design power of the MYRRHA reactor is 100 MWth. It is driven in sub-critical mode ($k_{eff} = 0.95$) by a high power proton accelerator based on LINAC technology delivering a proton beam in Continuous Wave (CW) mode of 600 MeV proton energy and 4 mA intensity. The choice of LINAC technology is dictated by the unprecedented reliability level required by the ADS application. In the MYRRHA requirements the proton beam delivery should be guaranteed with a number of beam trips lasting more than 3 seconds limited to maximum 10 for a period of 3 months corresponding to the operating cycle of the MYRRHA facility. Since 2015, SCK•CEN and Belgium government decided to implement the MYRRHA facility in three phases to minimize the technical risks associated to the needed accelerator reliability.

On September 7, 2018 the Belgian federal government decided to build this large research infrastructure. In this lecture we will summarize 20 years of Ideas turned in Design in 20 minutes and 20 years of R&D in another 20 minutes.