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Issues and Challenges in Research Reactors based Radioisotope Production

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Research reactors play a key role in the production of radioisotopes for various applications in nuclear medicine (Mo-99/Tc-99m, I-131, Xe-133, Lu-177, Ir-192, Ho-166, P-32, Y-90, Sm-153, Re-186, W-188/Re-188, Sr-89, Sn-117m, Ac-227/Ra-223, ⋯), industry (Ir-192, Se-75, Hg-203, ⋯) and research. While the number of accelerators –mainly cyclotrons –is increasing specially for the production of medical radioisotopes, the supply of reactor-produced medical radioisotopes relies on a limited number of research reactors. This is the case for the production of Mo-99, a very crucial radioisotope as it decays into Tc-99m which is used in 80% of the 30 million radiodiagnostic nuclear medicine procedures carried out worldwide annually. The current situation is a major concern in the Mo-99/Tc-99m supply chain, especially after the decisions taken recently to shut down definitively the OSIRIS reactor (France) in December 2015 and to cease routine Mo-99 production at the NRU reactor (Canada) from November 2016. Current research reactors are ageing, expensive to replace and due to safety and financial issues, it is a continuing source of public and political debate. Their availability with appropriate neutron fluxes, significant operating time and economic viability are important issues to ensure a secure and reliable supply of radioisotopes in future. Successful conversion of High Enriched Uranium (HEU) into Low Enriched Uranium (LEU) for reactor fuel and targets for Mo-99/Tc-99m production are also important challenges in the coming years in the frame of the National Nuclear Security Administration Global Threat Reduction Initiative.

In this context, the Belgian Nuclear Research Centre (SCK•CEN) made a strategic decision to refurbish the BR2 reactor, which is considered as a major facility worldwide for the routine supply of Mo-99/Tc-99m, I-131, Xe-133, Lu-177, Ir-192, Re-186, Sm-153, Er-169, Y-90, P-32, W-188/Re-188, I-125, Sr-89, Sn-117m, ⋯and for the development of new medical radioisotopes as Ac-227/Ra-223, ... The BR2 reactor is currently in temporary shutdown for a scheduled period of 16 months from February 2015 until June 2016 to replace mainly its beryllium matrix. The refurbishment will allow a safe and reliable operation of the reactor for another period of at least 10 years with an upgraded annual operating regime of up to 8 cycles, i.e. up to 180-200 operating days per year, subject to the economics.

Organization

SCK.CEN - BR2 Reactor

Country

Belgium

Primary author: Dr PONSARD, Bernard (SCK.CEN - BR2 REACTOR)

Presenter: Dr PONSARD, Bernard (SCK.CEN - BR2 REACTOR)

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