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#4-276 News of the European Spallation Neutron Source, ESS, Radioactive Waste Management

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The European Spallation Source ESS is under construction and located at Lund, Sweden. ESS is funded and supported by currently 13 European Countries from in- and outside the EU.
ESS has a 700m long linear accelerator for a 14Hz / 62mA pulsed proton beam heading on a spinning wheel solid state elementary Tungsten target which is directly He-gas cooled in a closed circuit. ESS is designed for 5 MW average beam power on target, albeit ESS shall run at a 2MW power level after a 3 years ramp-up period and subsequent 10 years long period of gathering experience.
As a long-pulse (3ms) neutron source ESS utilizes an unprecedented versatility of neutron wave-length tuning and pulse frame multiplexing from its specific multi-wavelength and wide-angle moderator design that serve the total of 42 individually time-tuned beamlines for neutron scattering instruments all dedicated to specific and supplementary tasks if condensed matter research in physics, chemistry, life-science, soft matter and material research, spanning from cosmology and fundamental particle physics to pharmacological and engineering development, from fundamental and applied magnetic properties research and even exploring into geoscience and archeology.
As an accelerator based subcritical facility, ESS will not produce long-lived fissile or actinoid radioactive waste. Almost all radioactive waste is fairly short-lived and most of it can be free-classified after some manageable period of time. ESS comprises state-of-the art radioactive waste characterization and conditioning methods, following the Swedish national regulations and good practice.
As a novel example, the gentle and fairly low-temperature thermolysis of spent ion exchange resins shall be employed for the safe and gentle disintegration of these resins, collected in 200L standard steel drums. This method has been recently invented by Studsvik Nuclear AB, and a test facility at Studsvik site is under commissioning. This inDRUM © technique is also suitable for the controlled disintegration of oily/organic liquids and for contaminated plastic materials. The residual ash can be compacted reducing the low-level disposable volumes to ca. 20% while the volatile off-gases are scrubbed and quenched in a commonplace off-gas treatment before sea-based and air-borne discharge.
Another cutting-edge option for ESS will be the advanced tritiated water treatment AWD offered by Laker Ltd from Oakville, ON, Canada. The same company is installing such an HTO clean-up facility at ITER. ESS has an option for such an installation, if needed. Major advantages are the very flexible and versatile controlled detritiation of tritiated radioactive water residues. HTO vs. H2O separation factors on the applied throughput vs. the pushed volumes of radwater, i.e. the operational capacity of the facility. The technical dimensioning of the AWD device can be tuned to the individual needs and budget.
With this lecture I shall present an overview of the ESS research facility, its unique technical features and scientific prospects and shall emphasize some topics of of radiation monitoring and radioactive waste characterization and management.

Primary author: TIETZE-JAENSCH, Holger (European Spallation Source ESS)

Co-authors: Dr MARKOVIC, Nikola (European Spallation Source ESS); Dr LIDAR, Per (Studsvik Waste Management Technology AB); Dr ROOS, Per (European Spallation Source ESS)

Presenter: TIETZE-JAENSCH, Holger (European Spallation Source ESS)

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