The Safety Related Functions of The Engineered Barriers of the IAEA Borehole Disposal System: The Ghana Pilot Project

Authors : Paul Essel, Eric T. Glover, Gustav Gbeddy, Yaw Adjei-Kyereme, Abdallah M. A. Dawood, Evans M. Ameho, Emmanuel A. Aberikae

Abstract : Radioactive materials mainly in the form of Sealed Radioactive Sources are being used in various sectors (medicine, agriculture, industry, research, and teaching) for the socio-economic development of Ghana. The use of these beneficial radioactive materials has resulted in an inventory of Disused Sealed Radioactive Sources (DSRS) in storage. Most of the DSRS are legacy/historic sources which cannot be returned to their manufacturer or country of origin. Though small in volume, DSRS can be intensively radioactive and create a significant safety and security liability. They need to be managed in a safe and secure manner in accordance with the fundamental safety objective. The Radioactive Waste Management Center (RWMC) of the Ghana Atomic Energy Commission (GAEC) is currently storing a significant volume of DSRS. The initial activities of the DSRS range from 7.4E+5 Bq to 6.85E+14 Bq. If not managed properly, such DSRS can represent a potential hazard to human health and the environment. Storage is an important interim step, especially for DSRS containing very short-lived radionuclides, which can decay to exemption levels within a few years. Long-term storage, however, is considered an unsustainable option for DSRS with long half-lives hence the need for a disposal facility. The GAEC intends to use the International Atomic Energy Agency's (IAEA's) Borehole Disposal System (BDS) to provide a safe, secure, and cost-effective disposal option to dispose of its DSRS in storage. The proposed site for implementation of the BDS is on the GAEC premises at Kwabenya. The site has been characterized to gain a general understanding in terms of its regional setting, its past evolution and likely future natural evolution over the assessment time frame. Due to the long half-lives of some of the radionuclides to be disposed of (Ra-226 with half-life of 1600 years), the engineered barriers of the system must be robust to contain these radionuclides for this long period before they decay to harmless levels. There is the need to assess the safety related functions of the engineered barriers of this disposal system.

Keywords : radionuclides, disposal, radioactive waste, engineered barrier
Conference Title : ICNST 2024 : International Conference on Nuclear Science and Technology
Conference Location : Toronto, Canada
Conference Dates : September 19-20, 2024

Open Science Index, Nuclear and Quantum Engineering Vol:18, No:09, 2024 publications.waset.org/abstracts/180713.pdf