Building Future Safeguards Capabilities
SYMPOSIUM
ON INTERNATIONAL SAFEGUARDS

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Wet Solid Radioactive Waste and Shielding as Alternate Detective Measures

Research reactors with thermal power of 25 MW or less are assumed not able to produce 1 SQ of Pu or U-233 per annum. Binford's correlation is a rough estimate for the capability of any Uranium-fueled thermal reactor to produce Pu. The quality of Pu-239 varies with fresh fuel type, neutron flux and irradiation time. An increase in irradiation time results in the build-up of Pu-240.

IAEA uses Technical Objectives and Measures to confirm that neither the reactor was not shut-down or operate for sufficient period or power to produce 1 SQ of Pu or U-233, nor unrecorded irradiation of fertile materials took place.

The objective of this research is to suggest a new approach that correlate radioactive waste and shielding with reactor's power. The inventory of the radioactive waste accumulated in the Ion-Exchangers and Filters, and shielding materials and thickness are indicators about the actual operational power over certain period of time.

Radiation source terms were evaluated for: the main reactor core, the spent fuel, the primary cooling system and radioactive waste generated from the connected systems of the reactor pool.
Based on the design, neutron and gamma ray source terms of the main core were evaluated. Then the spent fuel gamma ray source term was generated using specific codes related to the fuel cycle calculations. The source terms in the primary coolant system are evaluated based on the calculations of the activation products from various sources. From this data, the source term in the medium level wet solid wastes relating to cooling systems such as the hot water layer system Ion-Exchanger is derived and generated. These are the radiation sources that occur during normal operation. Discrete ordinates codes ANSIN and DORT were used for the shielding analysis of the core. QAD-CGGP, the point-kernel codes, were implemented in the shielding analysis of the spent fuel in the service pool. MCNP5 was used in the Ion-Exchangers and Filters of radioactive waste.

Benchmark analysis was conducted to show the bias defect between the actual and calculated quantities.

Which "Key Question" does your Abstract address?

TEC1.4

Topics

TEC1

Which alternative "Key Question" does your Abstract address? (if any)

Primary author: Ms ALJILANI, Duaa (Jordan Atomic energy Commission)

Co-author: Mr RAWASHDEH, Qasim (Jordan Atomic Energy Commission)

Presenter: Ms ALJILANI, Duaa (Jordan Atomic energy Commission)

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