



Contribution ID: 121

Type: Poster

## SAFEGUARDS APPROACHES OF THE SPENT NUCLEAR FUEL: THE ROUTE TO DETECT PARTIAL AND GROSS DEFECTS

*Wednesday, 26 June 2019 16:15 (15 minutes)*

Operations that extend from the process of uranium ore mining to the step of reprocessing are well known as nuclear fuel cycle (NFC). NFC consists of two ultimate parts the first part is called “front end” while the other is named “back end”. The back end of the NFC involves managing the spent fuel after irradiation. IAEA executes safeguards system on states under the non proliferation umbrella. This system ensures not only nuclear material (NM) but also the activities within facilities are subject to supervised criteria accredited internationally and supported by states acceptance. Safeguards approaches and the application of safeguards is facility specific. Implementation of safeguards includes inspection on facilities that contain spent fuel. The paper highlights the SNF signatures such as physical signature, gamma radiation, Cerenkov radiation, neutron radiation, and combined radiation. Each signature gives safeguards inspector a piece of information concerning the nuclear fuel and the process it passes through. Discussions on spent fuel safeguards and verification objectives are presented also. NMA verification objectives are to detect gross defects like missing a spent fuel assembly also to verify the identity of SNF to ensure that a spent fuel assembly is the assembly that declared by the facility operator another verification objective is to detect partial defects like verification of the integrity of SNF object. The Containment and surveillance (C/S) verification objectives are to verify continuity of knowledge over SNF assemblies and to verify no use or production of undeclared nuclear material. Design Verification objectives are to verify facility design (no new unsafeguarded SNF transfer paths). Eventually, nuclear abuse scenarios are suggested and the role of any robust accounting system in safeguarding SNF was discussed to stand up to these concealment tricks.

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Yes

### Country or International Organization

Egypt

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**Session Classification:** Track 6 Poster Session

**Track Classification:** Track 6: Disposal