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High Temperature Gas Cooled Reactor with Pebble Fuel -Its Accountancy and Verification

The HTR with pebble fuel is a typical reactor of generation IV nuclear energy system and a module facility in China will be commissioning in the coming years. China had offered the facility to implement safeguard by the agency. This paper will discuss an approach for the accountancy system based on the module facility and, also, develop some of the verification scenery to support the domestic nuclear material control and the international safeguards inspection.

Different from the PWRs' items characteristic and convention and enrichment facilities' bulk feature, HTGRs' fuel appears as dualistic: bulk state when receipt, in storage and shipment, but item state inside the reactor. In general, the accountancy should be based on the number accountancy of pebbles, but with the interpretation of the weights of the elements and isotopes for each batch for transfer and storage. As there are extremely low probability of the damaged pebbles and the malfunction of the pebbles counting equipment, an unbalance in the HTGRs' accounting data maybe arise after a period of operation and an appropriate updating criteria, including the MUF evaluation criteria, if applied, have to be developed to meet the requirement of material balance. Another important consideration is on-site inspection, as a facility with dual-appearance nuclear fuel characteristic, the fresh fuel will received in cylinders as a batch, but the amount of the nuclear material is not just the total of the cylinders', because for each cylinder the amount of the nuclear material is calculated based on the pebbles, not as a whole but as individual item, inside it. So the sampling method should be based on the cylinders in a batch together with the number of the pebbles inside the cylinder. About the graphite balls, the facility maybe does not intend to include them on the list of nuclear material records, but there is a transfer risk, in the nuclear safeguards perspectives as well, when possibilities of the radiation monitor failure existing. As to spent fuel, the qualified measurement system is required but the accountancy issues should be same as that in the PWRs.

Which "Key Question" does your Abstract address?

NEW1.1

Topics

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