



Contribution ID: 19

Type: **Wedge Participant**

Features of statistical tests adopted in the Near Real Time Accountancy system

Generally, uncertainty of material balance (σ MUF) of large bulk-handling nuclear facilities will be consequently large according to the throughput of nuclear materials. In order to establish and to apply an effective and accurate material accountancy system to such facilities, the Safeguards by Design (SBD) concept should be introduced prior to construction of the facilities. As a part of it, several studies based on computer simulation is useful for designing the material accountancy system. Nuclear Material Control Center (NMCC) developed a computer simulator for nuclear facility process, including calculation of material flows and inventories in each process and also calculation of measurement data with error propagation for a model large scale MOX fuel fabrication plant.

As safeguards measures of Pu handling facility should achieve not only quantity goal but also timeliness goal of Pu, Near Real Time Accountancy (NRTA) system has been developed to achieve both goals with closing material balance frequently without a clean out of the process and evaluating dynamic MUF (MUFd) frequently, which includes residents of material as a holdup unlike traditional MUF. NMCC has conducted various studies of NRTA application and identification of features of detection capabilities regarding statistical tests adopted in the NRTA system using the developed simulator, e.g., availability on selection of sectors as unit process of accountancy area under consideration of σ MUF, confirmation of detection capabilities regarding various sequential statistical tests for nuclear material loss.

From these studies, it is expected that MUF residual (MUFR), which is eliminated unknown bias from MUFd, will be relatively sensitive indicator for detection of nuclear material loss.

In this paper, features of detection capabilities regarding sequential statistical tests e.g., MUFR Test, CUMUFR Test, Truncated Sequential CUMUFR Test and Page's test in comparison with the detection capabilities of traditional statistical tests using MUF will be reported.

Topics

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Session Classification: [SGI] Improvements in the Field: Enhancements to Measurement Techniques

Track Classification: Shaping the future of safeguards implementation (SGI)