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Near Real Time Accountancy at JNC-1

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The JNC-1 site in Japan includes four large Pu/MOX bulk handling facilities for which standard plutonium accountancy would not be sufficient to give high confidence in the timely detection of diversion. Other safeguards measures are needed to strengthen the ability for early detection, and Near Real Time Accountancy (NRTA) provides the capability of performing a short-term evaluation of material accountancy in the field as well as at Headquarters.

NRTA was introduced at the main JNC-1 facilities on a facility-by-facility basis, starting at the MOX fuel fabrication plant (Plutonium Fuel Production Facility, PFPF) in 1999, followed by the reprocessing plant (Tokai Reprocessing Plant, TRP) in 2000, the MOX fuel fabrication and R&D facility (Plutonium fuel center, Plutonium Fuel Facility, PPFF) in 2007, and finally at the conversion facility (Plutonium Conversion and Development Facility, PCDF) in 2014. In all four facilities, the main process areas are covered.

This paper summarizes the experience gained with NRTA in PFPF, TRP, and PPFF since it was introduced in the respective facilities and describes the development work performed in implementing it in the last facility, PCDF. The key NRTA signatures which help guide the analysts'decisions on possible follow-up activities, i.e. the early detection of changes in parameters toward which NRTA is geared, are described based on the experience gained over the years.

Furthermore, the paper describes the basis of the algorithms used in NRTA and the important relationships and dependencies between vessel calibrations, the determination of calibration curves and the associated uncertainty matrices on one side and the implemented structure and algorithms employed in the software on the other side. These algorithms were developed using Oracle SQL PLUS, MS Excel and Visual Basic, and batch commands.

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