Considerations for the Future Design of On-Site Safeguards Analytical Laboratories

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ABSTRACT

The International Atomic Energy Agency (IAEA) has utilized its Safeguards Analytical Services (SAS) for a wide range of nuclear fuel cycle facilities. The SAS performs, inter alia, analysis of safeguards samples collected by IAEA inspectors and provides analytical results for drawing safeguards conclusions with respect to nuclear material accountancy verification. This presentation focuses on the use of the SAS for the processing of nuclear material samples at future large bulk handling facilities for direct-use material, such as reprocessing plants, MOX fuel conversion plants and MOX fabrication plants. In these types of facilities, IAEA safeguards measures normally require intensive and frequent verification of nuclear material flow and inventory. The IAEA, in cooperation with the designated authority of the State system of accounting for and control of nuclear material (SSAC) and the facility operator, must develop a safeguards approach that includes near real time accountancy (NRTA) verification. In order to meet IAEA's safeguards objectives in terms of significant quantity and timeliness requirements, frequent verification by sampling and analysis of the in-process material is required. Though these facilities usually contain a large amount of nuclear material as in-process material, sampling of in-process material for verification tends to be difficult. In addition, in some facilities human access for verification purposes is restricted by radiation and other safety constraints. Depending on the size and composition of the samples taken for analysis, transport to off site analytical laboratories may be expensive, time consuming, and subject to complex regulatory procedures. The IAEA therefore foresees that future advanced fuel cycle facilities may require dedicated analytical facilities located on site, The On-Site Laboratories (OSLs) are satellites of the Agency’s SAS and are part of the Network Analytical of Laboratories. Design and construction of such OSLs will require advance preparation, including the early provision of design information of the nuclear facilities as required by the safeguards agreement. This early involvement of the IAEA will assure that designers and operators write specifications that are well matched to the analytical requirements in the most cost effective way. The additional challenge of operating OSLs on site must also be addressed, including the quality assurance of analytical results through close cooperation within the SAS and the use of recognized internal and external quality control measures. Additional information regarding sample verification arrangements, unattended sampling of in-process material, and the use of the operator's accountancy and process declarations will be presented. The function of the Rokkasho Reprocessing Plant on-site laboratory, a jointly operated facility between the IAEA and the Nuclear Material Control Center of Japan, will be presented as an example.