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An Unattended Verification Station for UF₆ Cylinders: Development Status

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In recent years, the International Atomic Energy Agency (IAEA) has pursued innovative techniques and an integrated suite of safeguards measures to address the verification challenges posed by advanced centrifuge technologies and the growth in separative work unit capacity at modern centrifuge enrichment plants. These measures would include permanently installed, unattended instruments capable of performing the routine and repetitive measurements previously performed by inspectors. Among the unattended instruments currently being explored by the IAEA is an Unattended Cylinder Verification Stations (UCVS) that could provide independent verification of the declared relative enrichment, U-235 mass and total uranium mass of all declared cylinders moving through the plant, as well as the application and verification of a 'Non-destructive Assay Fingerprint' to preserve verification knowledge on the contents of each cylinder throughout its life in the facility. As IAEA's vision for a UCVS has evolved, Pacific Northwest National Laboratory (PNNL) and Los Alamos National Laboratory have been developing and testing candidate nondestructive assay (NDA) methods for inclusion in a UCVS. Modeling and multiple field campaigns have indicated that these methods are capable of assaying relative cylinder enrichment with a precision comparable to or substantially better than today's high-resolution handheld devices, without the need for manual wall-thickness corrections. In addition, the methods interrogate the full volume of the cylinder, thereby offering the IAEA a new capability to assay the absolute U-235 mass in the cylinder, and much-improved sensitivity to substituted or removed material. Building on this prior work, and under the auspices of the United States Support Program to the IAEA, a UCVS field prototype is being developed and tested. This paper provides an overview of: a) hardware and software design of the prototypes, b) preparation for field trials, and c) status of the UCVS prototype development.

Country or International Organization

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