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Atomic Energy of Canada Limited Prepares for Nuclear Forensic Analyses

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Atomic Energy of Canada Limited (AECL) has focused on developing peaceful and innovative applications from nuclear technology for over 60 years through its expertise in S&T and its more than 50 unique facilities and laboratories, including fuel development, hot cells, gloveboxes, x-ray diffraction, neutron beam, surface science and analytical chemistry laboratories. AECL is leading a national collaboration with other federal government laboratories to establish a Canadian nuclear forensics laboratory network. In preparation for AECL becoming part of this lab network, the Analytical Chemistry Branch (ACB) identified three opportunities for improvement to ensure analytical results could be used as evidence in a court of law. These were accreditation to the international standard ISO/IEC 17025:2005, procurement of a modern Laboratory Information Management System (LIMS), and qualification as part of the IAEA's network of analytical laboratories (NWAL) for nuclear materials.

Accreditation to ISO/IEC 17025 started with a gap analysis between the existing quality management system and the requirements of the standard. The ACB quality assurance plan was restructured to align with the requirements of the standard, and several procedures covering a range of analyses were selected for the initial accreditation. An internal audit provided an opportunity to refine our documentation and records management prior to an accreditation assessment from the Canadian Association for Laboratory Accreditation (CALA), leading to successful accreditation to ISO/IEC 17025:2005. The on-going internal and CALA assessments to maintain accreditation will provide continued opportunities for improvement.

The ACB currently uses a quality assurance database developed in-house to track samples, quality control materials, records and equipment. Many features of this system became difficult to use as the database grew, necessitating a reassessment. A decision was made to utilize a commercially available LIMS, thus capitalizing on industry expertise in this area. Based on the client requirements document, a commercial LIMS was procured from Perkin Elmer. Configuration of the Perkin Elmer Labworks LIMS is underway, and experience gained is shared in this paper.

As the third component of AECL's laboratory capability improvement initiative, becoming qualified as part of the IAEA's Network of Analytical Laboratories (NWAL) for Destructive Analysis of Nuclear Materials represents the advantage of AECL maintaining relevant equipment, procedures, and expertise. This is not only of direct value to the IAEA program of non-proliferation and safeguards, but also of strategic importance to maintain the capability in a ready state in the event it is required for a nuclear forensics incident. As part of the qualification process, AECL participated in a round robin exercise and subsequent technical meeting for isotopic determination of U and Pu. Highlights from the exercise, including major lessons learned, are discussed in the paper.

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