Contribution ID: **292** Type: **Panelist (Panel Session)**

Verification Data Pattern Recognition and Change Detection at the Neutron Instrument Level

Tuesday, 6 November 2018 16:00 (7 minutes)

As the pressure on International Atomic Energy Agency (IAEA) safeguards resources increases, there is a drive to essentially "do more with less."New ways of using current verification instrumentation and visualizing the collected data are needed, coupled with maintaining and sustaining the current safeguards instrumentation fleet. This paper explores how to innovate with current safeguards neutron instrumentation using data-driven algorithms at the instrument level. A concept is described for upgrading current neutron counting systems with modern electronics by leveraging electronics developments in other fields (e.g., high-energy physics) to facilitate full list mode data acquisition and, therefore, expand existing analyses to pattern recognition and change detection at the instrument level. The aim is to advance correlated neutron counting by improving the reliability of detecting nuclear material diversion and, at the same time, to improve the sustainability of those systems. It is likely that upgrading existing systems with new hardware and software is more cost-effective than replacing systems with other novel systems that might meet this need. A specific project example is highlighted in which a system was upgraded by retrofitting the standard uranium neutron collar detector with new electronics; as a result, verification data can be analyzed in new ways. A new neutron analysis method, the "List Mode Response Matrix,"has been developed to analyze every pulse train from the detector array and thus enable the verification of spatial information about the assay item for safeguards inspections. This project has improved the reliability of resolving individual fuel pin locations within a given fresh fuel assembly and the percentage of partial defects detected. Herein, the overall concept of upgrading current neutron counting systems is discussed with respect to the potential increase in analysis capabilities. In addition, the details and results of the list mode collar project are discussed.

Which "Key Question" does your Abstract address?

TEC2.6

Topics

TEC2

Primary author: Dr WORRALL, Louise (Oak Ridge National Laboratory)

Co-authors: Dr NICHOLSON, Andrew (Oak Ridge National Laboratory); Ms SIMONE, Angela (Oak Ridge National Laboratory); Dr BRITTON JR, Charles (Oak Ridge National Laboratory); Dr DAYMAN, Ken (Oak Ridge National Laboratory); Dr ERICSON, Milton (Oak Ridge National Laboratory); Dr MCELROY, Robert (Oak Ridge National Laboratory); Dr CROFT, Stephen (Oak Ridge National Laboratory)

Presenter: Dr WORRALL, Louise (Oak Ridge National Laboratory)

Session Classification: [TEC] Advancements in Instrumentation Data Processing and Analysis

Track Classification: Leveraging technological advancements for safeguards applications (TEC)