

## Extended Abstract submission for: 9th INMM/ESARDA/INMMJ Joint Workshop in Tokyo

### WG-4: Nuclear Knowledge Retention

#### Extended Abstract Title: Data Analytics Repository for International Nuclear Safeguards

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Data analytics is an increasingly visible field across the global nuclear security and non-proliferation domain, with fast-evolving capabilities and applications<sup>1</sup>. Data analytics has a high variability in requirements, stakeholders, data availability across the in international nuclear safeguards research space. A data analytics initiative focusing exclusively on international nuclear safeguards needs to be promoted by Institute of Nuclear Materials Management (INMM) and European Safeguards Research and Development Association (ESARDA) through a repository of real and simulated datasets, accompanied by documentation of current safeguards data analytics challenges or needs.

Specific opportunities and challenges exist in international nuclear safeguards verification requiring multidisciplinary teams being led by international nuclear safeguards experts to focus and provide nuance to data analytic projects. At present, many projects do not have a cohesive strategy or foresight to lead to a coordinated research effort among various research institutions for data analytics within international nuclear safeguards. A piecemeal approach to data analytics in international nuclear safeguards will not lead to great leaps forward in the application of data analytics since each particular effort will face a set of similar barriers without gaining reinforcement from other efforts in the community. This is leading to a general slow down in realized benefits from the potential of cumulative efforts.

The ESARDA and INMM communities hold the capability to organize a new effort in this field that could establish a repository of scenarios and datasets that vary in degree of complexity, but all relate to international nuclear safeguards situations. In general, data analytics research benefits from a vast array of data collected through a number of sensors that are not available to international nuclear safeguards research practitioners.<sup>2</sup>

Furthermore, when data analytics is used in the international nuclear safeguards community, certain sensitivities are often associated with the datasets. This fact leads to vague descriptions of the data analytics procedures and outcomes by researchers to the larger INMM and ESARDA communities. Adding to the complexity of the research field, the implementation of use cases by inspectorates are oftentimes not known to the research community. For example, the IAEA Department of Safeguards describes their Collaborative Analytical Platform (CAP) initiative without providing explanation of the specific models used within the capabilities. While the

<sup>1</sup> Recall Dir Euratom plenary speech at 41<sup>st</sup> annual ESARDA where he clearly asked for much more research in data analytics. Also, the IAEA 2018 Safeguards Symposium included many papers related to data analytics as well as the session [TEC-S2] Automating and Optimizing Data Collection and Processing at HQ.

<sup>2</sup> The ESARDA Verification Technologies and Methodologies working group is attempting to jump-start just such an effort, with plans to develop a data analytics challenge for engagement by the entire ESARDA community. The challenge is expected to be communicated in early 2020.

sensitivity of this information is understandable, the situation poses a conundrum for researchers. How should a researcher simulate IAEA data and produce valuable results that may be used within an inspectorate?

The authors anticipate that this initiative could result in strong matrixed relationships with technical experts across the international nuclear safeguards research community bolstered by the community's connections with academia and international organizations, as well as new interest in the international nuclear safeguards field from data scientists by offering a data repository with evolving use case scenarios that could be accessible by INMM and ESARDA members.

In order to establish and maintain repositories of safeguards-relevant data, use cases, approaches, and lessons learned, data analytics for international nuclear safeguards must be approached not just as a technical research and development question, but as an issue of knowledge retention for the broader safeguards and nonproliferation verification field.

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