

The challenges of integrating multiple safeguards systems in a large nuclear facility

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ABSTRACT

Implementing safeguards in a cost-effective manner in large nuclear facilities such as fuel conditioning, fuel reprocessing, and fuel fabrication plants requires the extensive use of instrumentation that is operated in unattended mode. The collected data is then periodically reviewed by the inspectors either on-site at a central location in the facility or remotely in the IAEA offices. A wide variety of instruments are deployed in large facilities, including video surveillance cameras, electronic sealing devices, non-destructive assay systems based on gamma ray and neutron detection, load cells for mass measurement, ID-readers, and other process-specific monitors. The challenge to integrate these different measurement instruments into an efficient, reliable, and secure system requires implementing standardization at various levels throughout the design process. This standardization includes the data generator behaviour and interface, networking solutions, and data security approaches. This standardization will provide a wide range of savings, including reduced training for inspectors and technicians, reduced periodic technical maintenance, reduced spare parts inventory, increased system robustness, and more predictive system behaviour. The development of standard building blocks will reduce the number of data generators required and allow implementation of simplified architectures that do not require local collection computers but rather utilize transmission of the acquired data directly to a central server via Ethernet connectivity. This approach will result in fewer system components and therefore reduced maintenance efforts and improved reliability. This paper discusses in detail the challenges and the subsequent solutions in the various areas that the IAEA Department of Safeguards has committed to pursue as the best sustainable way of maintaining the ability to implement reliable safeguards systems.