This implies that the human factor and security culture as defined by the International Atomic Energy Agency (IAEA) in the Nuclear Security Series No. 7, plays a crucial role in the entire nuclear security architecture of any organisation or state. Physical Protection Systems for nuclear facilities and radiological sources are designed to protect and/or prevent possible malicious acts.

The dynamic significant threat environment has evolved such that, relying on the perception that certain nuclear materials are self-protecting, can lead to the sabotage and unauthorized removal of facility assets by insiders. These assets are manned by management members and employees who are trained and trusted to maintain procedures and practices required for the routine operation and development of the associated facilities and activities.

The methodological approach utilized in this research as a predictive potential insider model adapts initial data from the threat group table of the hypothetical facility, Anshar Radiation Source Calibration Laboratory and National Repository (RSCL).

The initial state vector values adapted from the threat group table with a high, medium and low potential insider attribute analysis are; 0.42% 0.33% and 0.25% respectively of the employee population at RSCL.

This methodology is designed to quantify the likely outcome of an implemented internationally recommended security culture model to guide management of nuclear and radiological facilities in preventing sabotage and theft at nuclear and radiological facilities.

Over a 20 year period (ie. trials), involving an annual International Atomic Energy Agency (IAEA) recommended self-assessment of the facility security culture, a steady state of 0.38%, 0.35% and 0.27% of the employee population indicating a fairly balanced security system.

The obtained steady state will aid the managers of RSCL to acknowledge and make the necessary changes to the knowledge training development of personnel, the controlled authorized access granted to the employees at various divisions of the facility and control the level of authority granted to the employees.

ENSURING SECURITY WHEN USING RADIOACTIVE MATERIALS IN A RADIOLOGICAL FACILITY

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The number of radioactive materials used in the radiological facilities around the world demands for an effective security to be put in place. Ensuring the safe operation of facilities that uses radioactive materials has always been priority of States, personnel and the general public. The main idea is to keep these operating

radiation installations against growing terrorist threats and possible theft. Physical protection systems, fire safety, radioactive security, accounting and control of radioactive materials are practiced at radiological facilities to prevent any unauthorized actions from an outsider or even a worker of such facility. A Physical Protection System (PPS) is usually designed and implemented into these facilities to protect radioactive materials from adversaries which pose as possible threats. The purpose of the work is to articulate security requirements for handling radioactive materials at a radiological facility.

The evaluation of physical protection system designed for a hypothetical radiological facility against unauthorized actions is presented. In this research an Adversary Sequence Diagram (ASD) is developed and effective of physical protection system is assessed through the use Estimate of Adversary Sequence Interruption (EASI model) for interruption of adversary action on a radiological facility. The estimated value of total probability of interruption P_I is calculated using the relation:

$$P_I = 1 - B_D$$

B_D is the combined non-detection probability which describes the probability that adversaries will not be defeated.

The resulting probability of interruption associated with the facility according to the selected path of the adversary is 0.486. After the improvement in some security measures put in place at the oncological center and running then model again, the probability of interruption for the facility increased to 0.565. The probability of interrupting the activities of an adversary abruptly towards the hypothetical radiological facility was increase by 7.9% indicating that the PPS provided for the hypothetical radiological facility has been improved in terms of reliability. It may be a valuable guiding principle for decision-makers when establishing adequate security requirements for handling radioactive materials for a radiological center.

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НЕЙТРОННО-АКТИВАЦИОННЫЙ КАЧЕСТВЕННЫЙ АНАЛИЗ ГРАФИТОВЫХ РАДИОАКТИВНЫХ ОТХОДОВ

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В настоящее время значительно увеличилось количество выводов из эксплуатации уран-графитовых ядерных реакторов. Важным аспектом является определение радионуклидов для создания эффективной защиты при за-