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Toward Radiation Detection Sustainability : Failure Analysis and Life-cycle Cost Estimation in Burkina Faso

In order to detect nuclear and other radioactive material, mitigate and combat illicit trafficking, illegal transport and any other unauthorized or malicious acts, countries deploy usually detection equipment within and at their borders. Most of the non-advanced countries focuses their detection systems on handheld equipment.
The main issue after deployment of detection equipment is to make this system sustainable and effective.
Indeed, breakdown could occur at inappropriate time leading to the failure or interruption of the detection system and increasing the chances of malicious or unauthorized acts.
The common failures recorded from different countries in particular from Burkina Faso are inter alia damage to cables, break of handle, and probe, loss of cables, short circuit in charging transformer, break or wear of connectors and pins, leakage of batteries, software corruption and outdate, etc.
The failures are due to manufacturing features (robustness, resistance), human factor (negligence, misuse) and drastic environment effect (Temperature, humidity, dust).
Another important issue is calibration of detection instrument, ensuring they are working properly and detecting efficiently. In general, most of manufacturer recommend to calibrate instrument once a year unless the country has its own regulation.
The cost for maintenance of equipment, including repair, calibrating periodically in a referred laboratory or at manufacturer side, replacement and spares, seems too high for non-advanced countries.
This study is from a part of research project under the J02012 Coordinate Research Project (CRP) on Advancing Radiation Detection Equipment for Detecting Nuclear and Other Radioactive Material Outside of Regulatory Control. To achieve ultimate goal of the CRP to improving efficiency of the equipment and sustaining detection systems, it is crucial to understand causes and rates of failures to be able to manage maintenance and calibration plan to sustain the systems. Therefore, this study aims to analyse failure rates, and estimating life –cycle cost of radiation detection systems for Nuclear Security in Burkina Faso. Forecasting the cost of maintenance could help to avoid the inoperability of detection systems due to the lack of funds to repair, calibrate or replace the equipment when needed.
Proceeding by failures analysis and rate calculation, this work allowed to: (i) assess the operability (reliability, maintainability and availability) of the detection system for the country; (ii) assess the life expectancy for a given instrument; (iii) estimate the cost of maintenance based on different scenarios and alternatives.
The benefit of such approach is to master the expenses linked to detections instruments and their lifecycle maintenance.
In the case of Burkina Faso, taking into account different alternative to maintenance, mainly calibration, the initial planned cost of maintenance which was too high, has been reduced by 64%.
But this suggest the validation and approval of some internal calibration procedures using standard sources and determining correction factor. These internal methods may help to reduce resorting systematically to standard laboratory for calibration.

In addition to this alternative, a comprehensive management system for maintenance of the overall detection system as well as human resource development programme based on identified weaknesses and training needs, also contribute a lot to reducing the lifecycle cost.

State

Burkina Faso

Gender

Male

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