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Sustainability Challenges and Evaluation Recommendations for Handheld Radiation Detection Equipment

Sustainability Challenges and Evaluation Recommendations for Handheld Radiation Detection Equipment
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Abstract:
Over the past decade, the US Department of Energy's Office of Nuclear Smuggling Detection and Deterrence (NSDD) has deployed thousands of radiation detection instruments to partner countries for the purpose of detection, location, and identification of radioactive materials at storage facilities, border crossings, seaports, and airports. During this time, challenges have been observed regarding the deployment, operation, sustainability, and repair of these instruments. Specifically, in the areas of sustainability and repair, these challenges have resulted in situations where partner countries lose confidence in the equipment and alter their operations to bypass or discontinue use of the equipment. This presentation will focus on the sustainability challenges encountered, potential solutions, and a method that can be used to evaluate handheld detection instruments prior to making a purchase.
Approximately fifty percent of the maintenance scenarios encountered involve depleted batteries, incorrect settings, or issues that may be easily corrected with a calibration or background measurement. However, with a lack of knowledge or comfort with performing these basic procedures, operators tend to avoid these tasks and, instead, discontinue use of the equipment. To complicate the issue, many sites experience high turnover of operators with minimal succession, no mechanism for the transfer of knowledge, and no budget for continuous training. Additional challenges are introduced due to the international shipping and logistics. Any task ranging from purchasing replacement batteries to a full instrument factory return can become very complex.
Potential solutions to these issues involve participation on the side of both instrument vendors to the partner countries. Instruments should be designed with field serviceability in mind. Vendors should be more forthcoming providing maintenance training, repair manuals, spare parts, and overall better international customer service. Partner countries should development maintenance management programs where instruments receive adequate preventive and corrective maintenance on a scheduled basis and develop plans that survive staff turnovers. For future purchases of radiation detection instruments, an evaluation method is needed to compare instruments based on a wide variety of factors including operability, performance, sustainability and life cycle costs.
New instruments with better technology and design have emerged on the market that advertise better performance and more features. Although not generally publicized, many new instruments are also field serviceable having one or more of the following sustainability features:
• modular, easily-repairable component design
• longer battery life for portable instruments (both operational and lifespan)
• instrument self-diagnostics and state-of-health reports for component failures
• field-upgradable software/firmware
Due to the challenges above, many end users desire field-serviceable instruments, eliminating the need for shipping and logistics back to the vendor. In addition, users need total life cycle cost information to make a more comprehensive comparison between instruments. Unfortunately, sustainability and life cycle cost information is not generally shared prior to procurement and the end user is often burdened with unforeseen maintenance, shipping, and logistics costs to keep the instrument operational. By establishing a method to evaluate instruments for sustainability and estimate life cycle costs prior to procurements, end users can make more informed purchase decisions.
NSDD recognized this gap in information and developed an evaluation method for handheld instruments using an Analysis of Alternatives (AoA) approach. AoA compares several different instrument alternatives based on multiple criteria and provides a final score for each. Although the focus was on sustainability, the evaluation was expanded into three main "pillars"(operability, performance, and sustainability) and life cycle costs. These pillars are further broken down into more focused categories that may be prioritized and scored, resulting in an overall score for each instrument being evaluated. Analysis scores combined with life cycle costs can be used to make more informed decisions on instrument procurements. An initial evaluation was performed on a set of instruments and will be presented without revealing specific manufacturers and models.

Many proposed solutions to these sustainability challenges require manufacturer cooperation. Specifically, manufacturer assistance is highly valuable when creating and implementing basic and advanced maintenance training. Additionally, manufacturers can recommend shipping and logistics processes to minimize down-

time and costs, possibly by using regional distributors or service centers. By enabling partner countries to perform their own maintenance and providing well-defined processes to obtain replacement parts and/or return non-functional instruments for repair, an increase in equipment uptime and longevity may be observed. In addition, enabling member states and partner countries to evaluate instruments will allow them to make future procurements focused on their specific priorities.

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