Report of the
Sixth Regional Review Meeting of the
Radiological Security Partnership

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H.L. Anil Ranjith
Director General
Sri Lanka Atomic Energy Regulatory Council

Kristin Hirsch
Director
Office of Radiological Security
National Nuclear Security Administration
U.S. Department of Energy

Robert Rudich
East Asia Program Officer
Office of Radiological Security
National Nuclear Security Administration
U.S. Department of Energy

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Acronyms and Abbreviations

AERC	Atomic Energy Regulatory Council (Sri Lanka)
ASEANTOM	Association of Southeast Asian Nations Network of Regulatory Bodies on Atomic Energy
BAPETEN	Badan Pengawas Tenaga Nuklir (Nuclear Energy Regulatory Agency of Indonesia)
CNSC	Canadian Nuclear Safety Commission
GCSI	Global Cesium Security Initiative
GMS	Global Material Security (United States)
IAEA	International Atomic Energy Agency
IDD	In-Device Delay
INTERPOL	International Criminal Police Organization
MOH	Ministry of Health (Malaysia)
MSTE	Ministry of Science, Technology, and Environment (Nepal)
NNSA	National Nuclear Security Administration
NRTRC	National Radiological Theft Response Code
NSS	Nuclear Security Series (IAEA)
OAP	Office of Atoms for Peace (Thailand)
ORS	Office of Radiological Security (United States)
PNRI	Philippine Nuclear Research Institute
RDD	radiological dispersal device
RED	radiological exposure device
RSS	radioactive source security
STF	Special Task Force (Sri Lanka)
U.K.	United Kingdom
U.S.	United States
U.S. DOE	United States Department of Energy
WINS	World Institute for Nuclear Security

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1. Introduction

The Sri Lanka Atomic Energy Regulatory Council (AERC) and the United States Department of Energy (U.S. DOE) co-hosted the 6th Regional Review Meeting on Radiological Security involving representatives from 20 countries, the International Atomic Energy Agency (IAEA), the International Criminal Police Organization (INTERPOL), and the World Institute for Nuclear Security (WINS). The purpose of the event was to discuss the implementation of, and plans for, high-activity radioactive source security (RSS). The U.S. DOE's National Nuclear Security Administration (NNSA), Office of Radiological Security (ORS) fully sponsored this review meeting.

Ms. Nirmali Karunarathna, a member of AERC's organizing committee, welcomed participants and delegates to the meeting and invited dignitaries from Sri Lanka and sponsoring countries and institutes to light the traditional oil lamp. Robert Hilton, Deputy Chief of Mission at the U.S. Embassy in Colombo, and Kristin Hirsch of ORS represented the U.S. Government in the lamp lighting ceremony. After the lamp lighting, Dr. Saman Hewamana, AERC Chairman, formally opened the meeting and welcomed all the participants to Colombo, Sri Lanka. Dr. Hewamana emphasized the strong partnerships among the participants and recognized the assistance provided by the U.S. DOE under ORS to help Sri Lanka develop its nuclear security infrastructure. Robert Hilton and Kristin Hirsch gave other opening remarks that highlighted the social benefit from radiological sources in medicine, industry, and agriculture, while stressing the importance of addressing the risks associated with the malicious use of radioactive sources. Emphasis was placed on the importance of partnerships among all the participants to help ensure the success of securing radioactive sources throughout the world and the opportunity to share information and experiences. AERC was acknowledged with special thanks for hosting this event. Mr. Ajith P. Perera, State Minister of Power and Renewable Energy, attended the opening ceremony as the chief guest and delivered a keynote speech emphasizing importance of collaborative work initiated by the U.S. DOE with other governments to improve nuclear security in partner countries. Mr. Anil Ranjith, Director General of AERC, proposed the vote of thanks.

A participant list is included as Attachment A, and the meeting agenda is provided as Attachment B. All presentations were made available to participants. The following sections summarize the meeting's presentations, discussions, issues, suggestions, and recommendations.

2. The Threat of Radiological Terrorism

2.1. Radiological Security Threats

John Buchanan of INTERPOL presented on various radiological security threats, including radiological dispersal devices (RDDs) and radiological exposure devices (REDs). Mr. Buchanan displayed a threat matrix that showed recent attacks, methods, and groups. He noted that recent attacks are not confined to one region of the world. Countries as diverse as Belgium, the U.K., Indonesia, the U.S., and Iraq have all experienced attacks. The methods of delivery in these attacks were varied, ranging from RDDs, REDs, drones, and insiders. Mr. Buchanan noted that the groups perpetrating these attacks were also diverse. They included Jihadist groups, ethnonational/separatist groups, right wing groups, and the lone actor.

Mr. Buchanan's presentation emphasized the need to stay ahead of the individuals who want to perpetrate a radiological attack, understand the methods they plan to use, and identify if they are associated with extremist groups or are operating as lone actors. Although the threat landscape is constantly changing, it is a certainty that international terrorist groups are trying to secure radioactive material and find better ways to deploy those materials if attained. We must be prepared to counter them.

2.2. ORS Economic Impact Study

Mark Ladd of Sandia National Laboratories presented on a study to assess the economic impact of a hypothetical attack on Lower Manhattan, New York, involving three small vials of Cs-137. Before the presentation, Dr. Ladd polled the audience to discover what they felt would be the biggest effect of an improvised explosive device or dirty bomb on an area. Most respondents (over 40%) selected "psychological/social" as the primary effect. Dr. Ladd then continued with the results of the study. The analysis concluded that an RDD can cause significant economic consequences and disrupt an area for a decade or longer.

The scenario-based study analyzed the potential of an RDD to create contamination over a large area and what the economic impact would be based on a set of assumptions, including the area's prevailing weather patterns, architecture (e.g., predominance of tall buildings), and an assumed device design. Three primary impact categories were analyzed, including physical, response, and economic. The net effect of an event like this would be damage to the area's infrastructure, deaths/serious injuries from the dispersion explosion, and significant loss to the gross domestic product over a 10-year period. One of the most damaging economic effects identified was the perception by the public that the area was unsafe, even after clean-up efforts were complete. This negative perception caused a significant, long-term loss of tourism and business in the region. Dr. Ladd noted that the overall risk from radiological attacks can be mitigated with robust radiological security plans, use of alternative technologies (e.g., using x-ray machines

rather than high-activity irradiators), and the prompt removal of disused sources. The study's methodology can be applied to perform risk-based assessments of other cities around the world.

3. Radiological Security Regulations: Progress and Trends

3.1. Update to IAEA Guidance Document NST 048

David Ladsous of the IAEA Nuclear Security Program discussed updates to NST 048, *Security of Radioactive Material in Use and Storage and of Associated Facilities*, which revises the IAEA's Nuclear Security Series (NSS) 11, *Security of Radioactive Sources Implementing Guide*). Mr. Ladsous opened his presentation with some statistics on the theft of radioactive material. From 2011 to 2017, there have been 163 reported thefts of radioactive material, including theft during transportation. In many cases, the stolen source has never been recovered. He then addressed revisions to NST 048, which was updated to better align with the recommendations contained in NSS 14 (*Nuclear Security Recommendations on Radioactive Material and Associated Facilities*), clarify the application to nuclear material, ensure that NST 048 applies to the lifecycle of radioactive material, from manufacture and use to disposal, and to address measures to protect against unauthorized removal. Next, Mr. Ladsous reviewed the status of *Guidance on the Management of Disused Radioactive Sources*. This guidance document was approved at the Guidance Committee in September 2017 and is currently awaiting publication. Mr. Ladsous concluded with a review of IAEA plans for the 2018-2019 South East Asia Regional Project.

3.2. Recent Regulatory Experiences

Regulatory development and approval is one of the largest hurdles countries face associated with securing and managing radioactive materials. This panel discussion focused on some of those challenges. Dr. Carlo Arcilla, Director of the Philippine Nuclear Research Institute (PNRI), discussed the need for a legal framework to secure and manage radioactive materials and outlined the Philippine's legislative and regulatory framework. Dr. Arcilla also identified the assistance the IAEA has provided the Philippines through workshops, scientific visits, and review of draft regulations and law.

Ishak Hasanuddin of the Nuclear Energy Regulatory Agency of Indonesia (BAPETEN) presented on the Indonesian Government's political commitment to the *Code of Conduct on the Safety and Security of Radioactive Sources* and implementation of *Supplementary Guidance on the Import and Export of Radioactive Sources*. Mr. Hasanuddin discussed the structure of Indonesian legislation and regulations associated with security of radioactive sources and the

requirements of both the importers and exporters of those materials. He closed his presentation with a review of the training conducted by BAPETEN in Indonesia.

Suing Hong Nhat of the Vietnam Agency for Radioactive and Nuclear Safety discussed RSS regulations and the challenges associated with developing the associated documents. Mr. Nhat identified the lack of experience in developing security plans and lack of funding to implement the supported activities as barriers to the successful development of RSS regulations. He noted that facilities do not prioritize the development of security plans and have trouble implementing them on site. Other challenges include the lack of experience local police have with radiation. Mr. Nhat also reviewed the process to develop security plans, which starts with adoption of a strong security culture. He emphasized the difficulty of developing a security plan that harmonizes current facility security systems, practical threats, response capabilities, and traditional culture.

The panel concluded with a reminder to integrate safety and security in regulations, continue to have effective coordination and cooperation among relevant institutions, and ensure adoption of a strong security culture.

4. Advances in Physical Protection

4.1. ORS Initiatives in Physical Protection

Kristin Hirsch of ORS introduced the Global Cesium Security Initiative (GCSI) and related In-Device Delay (IDD) Project. GCSI aims to accelerate and expand global efforts to enhance the security of Cs-137 devices and, where possible, replace them with safer alternative technologies such as x-ray devices. The program operates based on the three ORS pillars of Protect, Remove, and Reduce. Specific goals of the initiative include end-of-life management of Cs-137; the reuse and recycle, consolidation, and repatriation of radiological material to U.S.; the replacement of Cs-137 devices with safer alternative technologies, such as x-ray machines; installation of security enhancements for remaining Cs-137 sources; and response engagement, including training. Participation in GCSI is voluntary, and the U.S. offers financial incentives to participate.

Ms. Hirsch described IDD technology, a successful Protect measure in which additional material or mechanical complexity is added to the irradiator shielding as enhanced protection against theft or tampering. IDD uses hardened plates, tamper-resistant fasteners, special materials, and other features to increase the time for local law enforcement to respond to a potential theft. The original manufacturer installs the IDD kit, so the warranty will not be voided. In conclusion, Ms. Hirsch emphasized that ORS is trying to identify industry-wide standards for security associated with Cs-137 sources.

5. Transportation Security Experiences and Training

5.1. Transportation Security

Robert Rudich of ORS facilitated a panel on challenges and successes in transport security in Asia. The panel included David Ladsous of IAEA Nuclear Security, Mike Schultze of ORS, Pennapa Kanchana of Thailand's Office of Atoms for Peace (OAP), and Sumith Kumara of Sri Lanka's AERC.

David Ladsous discussed the IAEA's NSS, which provides States with international consensus guidance on all aspects of nuclear security. One statistic he noted during the presentation was that there have been 479 reported thefts of radiological materials during transport over the past 25 years. The IAEA's NSS offers training and guidance to respond to transportation security needs.

Mike Schultze reviewed transportation security courses offered by ORS, which include training on transport security plans, pre-shipment verification, and tabletop exercises to evaluate or identify gaps in a transport security plan and procedures. Tabletop exercises also help facilitate discussions between law enforcement and operators. Mr. Schultze described the challenges of developing a robust transport security plan, including staff turnover due to retirements or promotions and coordination among the various agencies involved in transporting radiological material.

Sumith Kumara reported that Sri Lanka has developed draft transportation security regulations in partnership with the IAEA, which are under review. Kumara discussed the challenges of getting regulations passed, training security personnel, and securing funding and staff to successfully carry out operations.

Pennapa Kanchana gave a briefing associated with transport security in Thailand. Although current regulations do not require GPS tracking of vehicles transporting radiological materials, Thailand has installed GPS tracking devices on 12 vehicles. Thailand has held various training courses through the IAEA and ORS with plans to raise security awareness of operators, develop training plans for inspectors, and develop in-house train-the-trainer courses.

5.2. Sri Lankan Special Task Force in Action

S.W.A.B. Athula Daulagala of the Sri Lankan Special Task Force (STF) demonstrated Sri Lanka's transportation security and response capabilities. An overview of the STF's capabilities preceded the live demonstration.

6. Session on Alternative Technologies to High-Activity Radioactive Sources

WINS hosted and facilitated this session on alternative technologies to high-activity radioactive sources.

7. Radiological Theft Response Experiences and Training Techniques

7.1. Radiological Theft Response

Raphaël Duguay of the Canadian Nuclear Safety Commission (CNSC) facilitated a panel with Athula Daulagala of the Sri Lanka STF and Prageeth Kadadunna of Sri Lanka's AERC. The discussion focused on partnerships between site staff and local responders, target folder development, and partnerships between regulators and law enforcement.

Prageeth Kadadunna of Sri Lanka's AERC noted that physical protection of high-activity sources began in 2009 during a collaboration with U.S. DOE Global Material Security (GMS) programs. Since then, the physical security of five sites has been assessed.

Strong security requires building partnerships between site staff and local responders. On-site radiation protection officers are responsible for radiation security, notifying the contractors who maintain security systems, conducting inspections of sources, developing documents, and issuing directives related to corrective measures if unsafe, or potentially unsafe, conditions are detected.

The target folder was identified as a tool to facilitate discussion between the site and police to help the police better understand what the adversary is trying to access. Discussion focused on what happens when an alarm is triggered and an officer has never been to the site. The target folder includes maps, radiological material in use, and other information the police may need until specialized teams can reach the site.

Athula Daulagala of the Sri Lanka STF identified other elements of a robust radiological theft response, including:

- Training: Since 2010, GMS has held many training courses. Other trainings include train-the-trainer courses for security inspectors, a national training course on physical protection and security management of radioactive sources, a National Radiological Theft Response Protocol development workshop, and a tabletop exercise on National Radiological Theft Response Code (NRTRC). The Sri Lankan STF has a unit trained to respond to threats based on their level of severity.

- Integrated Partnerships: In 2009, the Sri Lankan STF was invited to partner with GMS. Source search and recovery partnerships have repatriated four high-activity Co-60 sources to India and the U.S. using instruments provided by GMS.

7.2. Introduction to the Facilitated Scenario Discussion

John Duda of Summit and Matt Thompson of Sandia National Laboratories explained the capabilities, benefits, and techniques of tabletop exercises and facilitated scenario discussions as they relate to radiological theft response.

A facilitated discussion is a simulated emergency in which members come together to work through planned scenarios. The purpose of a facilitated discussion is to describe, identify, validate, and train stakeholders to prepare for an emergency. During the event, participants practice safety and security plans, improve interoperability, identify gaps, improve performance, and define roles. These exercises can accommodate as many as several hundred participants or as few as ten. Participants are typically mid-level to senior-level in rank/experience. Facilitated scenarios simulate an emergency event in a stress-free environment, providing participants with a scenario that requires them to develop responses with no prior planning. These events can help stakeholders engage in a team-building environment. They offer a cost-effective tool for identifying gaps and reviewing and practicing response plans. To be successful, objectives must be clearly defined and challenging while remaining possible to complete within the established timeframe.

7.3. Facilitated Scenario Discussion

John Duda of Summit and Matt Thompson of Sandia National Laboratories delivered this scenario-driven event to guide participants through a site-level response to hypothetical radiological material theft.

- Scenario One: Incident involving radiological material in a large city.
  The presenters discussed how information is typically shared, including through formal channels and peer-to-peer communications. Identified responsibilities include the need to validate the threat, notify the licensee that there is a threat, and improve security.

- Scenario Two: Adversary has entered site.
  The presenters asked the participants to identify top priorities to prevent a theft of the radiological material. Top responses were physical security upgrades (68%), site security (15%), and law enforcement (10%). The presenters reviewed the three elements of a robust physical security system: detection, delay, and response

- Scenario Three: Alarm is sent to local law enforcement.
  The presenters asked the participants to identify the primary action their organizations

would take if faced with an alarm in a room housing radioactive material. Top responses were to evacuate facility, review camera feeds, and send security to the room (64%) and to lock down the facility (31%). When asked which organization they would notify first, participants selected law enforcement (77%), the regulator (18 %), and the military (5%). When asked what is the most effective measure to assist with immediate response, participants answered with target folders/site response plans (60%), effective notification (16%), and responder awareness of material (14%).

- Scenario Four: Law enforcement requests special tactical teams.
  The presenters asked the participants to identify the most important aspect of their containment strategy. Responses were adequate delay or deterrence (42%), well-exercised coordination between all responders (36%), access to radiological detection equipment (11%), and having initial responders implement containment of the site (11%).

- Scenario Five: News agencies and social media are reporting conflicting information.
  In this scenario, the presenters asked the participants to identify their most important public messaging priority. Responses were to deliver timely and accurate information to the public (76%), assist law enforcement (15%), control the narrative (5%), and counter false information (2%). The presenters advised the participants to ensure there is only one point of contact who provides information to the media.

7.4. Retrospective and Lessons Learned

Matt Thompson of Sandia National Laboratories delivered a brief presentation on how tabletop exercises have helped identify gaps and improve or revise response plans, standard operating procedures, and interagency agreements. Mr. Thompson identified the following elements of tabletop exercises:

- Evaluation
  - Existing or proposed Physical Protection System
  - Procedure/communication
  - Incident command
  - Current or postulated threats
  - Response plans
  - Response strategy

- Training
  - Interagency rehearsals
  - Coordination

- After Action Review
  - Discussion with stakeholders and participants after the exercise has been completed

Athula Daulagala, STF Superintendent of Police, then discussed what his organization has learned during tabletop exercises. He noted that, as a military organization, planning is the most important aspect. Their organization reviews the potential scenario and, after performing several tabletop exercises, they begin to see results. They structured their tabletop exercises with red, green, and blue teams and used supplemental information (such as the speed someone can run and the odds of shooting and hitting your target) to create their scenarios. Daulagala also discussed the importance of managing the tabletop exercise's timeline. The Sri Lanka Navy is now using the tool to evaluate unauthorized boats.

8. National Radiological Theft Response Introduction and Experiences

8.1. National Radiological Theft Response Code Briefing

Neel Fernando of Sri Lanka's AERC delivered a briefing on Sri Lanka's NRTRC. In his remarks, Fernando noted that high-activity radioactive material is used worldwide, and considerations should be made to establish a plan for responding to theft. Sri Lanka's NRTRC was developed to identify key roles, responsibilities, and actions of identified stakeholders to ensure an effective and practical response to theft is in place. Topics covered in Sri Lanka's NRTRC include possible theft and response, planning and assumptions, and roles and responsibilities.

To prepare the code, officials first defined the document's scope (including identification of key stakeholders, roles, and responsibilities). Next, officials identified high-activity radioactive sources. Category 1 and 2 sources are used in Sri Lanka, to include Co-60 and Cs-137. The group held two meetings between AERC and ORS. These meetings included law enforcement and the Sri Lankan STF. One of the biggest challenges of this effort was that this was the first attempt in Sri Lanka to publish a national code to bridge gaps in radiological security. This is a new field for the stakeholders, and there is a learning curve to understand the need and requirements. Additional updates to the code are required before it will receive final approval; however, the code is expected to have a positive impact on radiological security in the country.

8.2. Provincial Radiological Theft Response Plan Briefing

Kieu Ngoc Dung from Vietnam's National Committee for Incident, Disaster Response, and Search and Rescue discussed Vietnam's Provincial Radiological Theft Response Plan. The primary goal of this committee is to help the government with disaster management. The group organizes exercises for search and rescue and manages radiological monitoring throughout the country. A national radiological theft plan has been approved since 2017. Vietnam has identified 24 facilities with Category 1 radioactive sources. Their plan includes 24-hour security,

detailed program documents, an inventory of sources, and regular training. They maintain on-site security forces and adequate equipment.

9. Security Culture Experiences and Training

9.1. Radiological Site Security Culture Training

Mr. Khairul from the National Nuclear Energy Agency of Indonesia introduced key concepts of radiological site security culture and basic steps for building and evaluating a security culture program. Khairul and Phil Richards of the United Kingdom (U.K.) Department for Business, Energy, and Industrial Strategy facilitated the discussion.

The objective of radiological site security culture training is to prevent the loss of control of radioactive sources. In most organizations, managers delegate security to lower tiered staff and tend to focus on protecting people from the sources and not the sources from the people. Radiological security and culture should be blended into an overall security regime. Organizations should apply a risk-based graded approach to these issues. Those with direct access to the sources need to be the focus. Elements of a strong security culture include:

- Commitment
- Awareness
- Training and education
- Leadership as a driving force

The presenters reviewed IAEA culture indicators for radioactive sources as a supplement not a replacement. Culture indicators need to be developed in the workforce. Culture indicators include:

- Management of sources
- Inventory
- Disposal time
- Recover lost or stolen

Security awareness and culture assessments play a key role in developing and maintaining an awareness of the organization's strengths and weaknesses. The IAEA can provide direct and indirect support for self-assessments (IAEA technical guidance NSS 28-T).

9.2. Update to IAEA Guidance Document NSS 28-T

David Ladsous of IAEA Nuclear Security Information summarized updates to NSS 28-T, *Self-assessment of Nuclear Security Culture in Facilities and Activities*.

9.3. Radiological Site Security Culture

Phil Richards of the U.K. Department for Business, Energy, and Industrial Strategy facilitated a panel with audience participation on major challenges to security culture implementation, examples of success, and ways to improve. Panel participants included Mohd Nathir Bin Mohd Kamari of the Malaysian Ministry of Health (MOH), Dr. Kanchan P. Adhikari from Nepal's Ministry of Science, Technology, and Environment (MSTE), Raphaël Duguay of CNSC, Khairul of the National Nuclear Energy Agency of Indonesia, and David Ladsous of IAEA Nuclear Security.

Mohd Nathir Bin Mohd Kamari of the Malaysian MOH presented on a self-assessment trial to determine if nuclear security is part of an organization's structure, receive feedback on IAEA partnerships, and assess RSS. This involved a review of current regulations, guidance documents, standard operating procedures, and work instructions as well as participation in a national workshop on nuclear security culture self-assessment. The pilot included a hospital and national blood center. A security culture baseline assessment was developed and executed at the pilot sites. A training was held to introduce the self-assessment tool, which included a questionnaire/survey and focus group interviews. Leadership and personnel behavior groups were engaged. Assessment results showed that security systems are in place but that personnel have not fully embraced the security culture. Another round of surveys is planned.

Dr. Kanchan P. Adhikari from Nepal's MSTE discussed radiological site and security culture in Nepal. Nepal has been an IAEA Member State since 2008 and has held Physical Protection and Security Management workshops. They currently have a Co-60 source and one blood irradiation machine. An increase in cancer cases is driving the need for additional radiotherapy machines. Security systems have been installed since 2009. Challenges are the lack of a regulatory body, insufficient rules and regulation on security, lack of leadership, problems with hierarchy/accountability/communication, lack of qualified manpower and excessive workloads, inability to adequately maintain security equipment, inadequate budgets, lack of knowledge and commitment to threat assessments, and an unstable political situation. To mitigate these problems, the MSTE issued a nuclear material regulatory directive in 2015. Since then, security equipment has been installed, the IAEA has held workshops, and regulations are working their way through the approval process.

Raphaël Duguay of CNSC noted that Canada is one of the world's major suppliers of sealed radioactive sources, and they have a broad cradle-to-grave nuclear regime that includes a nuclear safety and control act, general nuclear safety and control regulations, and licensed conditions. Requirements are in place for Category 1, 2, and 3 sources and prudent management for Category 4 and 5 sources.

Security culture is based on procedures and processes. There is no one-size-fits-all approach to achieving a strong security culture, but leaders must place a high value on the role of the individual.

Challenges at the sites include belief, attitude, and adoption of behavior and management systems. It is important to provide transparency through clear security guidance and bulletins.

Safety culture can be driven by awareness. Often, the culture is present but it is not assessed or tracked. Some methods for this include:

- Continuous behavioral observation program
- Security awareness program
- Trustworthiness and reliability verifications

Canada is working to engage law enforcement agencies in site visits and establish response arrangements. They still need to update requirements and guidance to foster and enhance a strong nuclear security culture program. Building culture takes time and is a team effort.

10. Sustainability and Transition

10.1. Sustainability and Transition Discussion

Kristin Hirsch of ORS introduced ORS's approach to sustainability at both the national and site level. ORS seeks to enhance global security by preventing high-activity radioactive materials from use in acts of terrorism. ORS uses the following approaches to carry out its mission: Protect, Remove (and dispose), and Reduce. The goal of sustainable security is to have sites with radioactive sources possess the technical means, infrastructure, personnel, procedures, and funding to ensure the security of those sources without external support. Security regulations should cover both fixed and mobile sites and include detect, delay, and response measures as well as lifecycle management, authorization to conduct security inspections, and source inventory.

ORS collaborates with national- and site-level partners that promote security sustainability. ORS envisions long-term collaborations. Timetables for transition from ORS financial support are based on the unique circumstances of each country. Sites should plan to take full ownership of their security systems through resource plans, system maintenance ant testing plans, knowledge of the system, law enforcement integration for theft response, and maintenance of a strong security culture.

10.2. Site Transition Process

Mike Hazel of ORS delivered an overview of the process for communicating site-level transitions and tools for regulators or other national authorities in support of site-level sustainability and transition. Mr. Hazel noted there is a difference between national- and site-level activities. National-level capabilities are critical to ensure successful site transition. Approved regulations, trained, authorized regulators and inspectors, and effective response capabilities must be in place to protect against a malicious act. ORS supports site security development in five areas: security plan development, site/responder interaction, training/job knowledge, maintenance and testing, and budget/lifecycle planning.

During site visits, ORS teams discuss with partners the steps needed to move toward sustainability. The challenge is that while ORS team visits do not occur regularly at all sites, all sites need to move toward transition. The regulator can help ORS move sites toward transition since they interact with the site much more frequently than ORS teams. Site regulator partnerships with ORS improve site awareness and security culture around radiological materials.

The decision to initiate a site transition is made based on the site's readiness. ORS will provide written notice to the regulator when sites are identified for transition. ORS then will meet with the regulator and the site to address outstanding issues, define final transition dates, and establish a date to end equipment warranty and maintenance support. ORS will provide ongoing assistance to help sites achieve sustainable security.

10.3. ASEANTOM Efforts in Radiological Security

Wee Teck Hoo of Singapore's Radiation Protection and Nuclear Science Department National Environment Agency delivered a briefing on the Association of Southeast Asian Nations Network of Regulatory Bodies on Atomic Energy (ASEANTOM)'s contributions to and hopes for radiological security sustainability.

The Association of Southeast Asian Nations was first established in Thailand's OAP in September 2011 and adopted at the Southeast Asian Nations Joint Preparatory Meeting in September 2013. Activities included initiatives to develop regional capabilities in nuclear and radiological emergency preparedness and response. The agency established a national radiochemistry laboratory and ambient radiation monitoring network and has conducted national security work with local agencies to carry out security audits of licensees with higher risk radioactive material and enhance security measures at storage sites. The agency has also worked to license shipments of nuclear material in transit through Singapore. Singapore has launched a Protective, Analytical, and Assessment Facility at the Immigration and Checkpoint Authority. Future activities are to improve regional cooperation and collaboration in nuclear security through the sharing of good practices to enhance border interactions.

10.4. Site Sustainability and Transition

Julia Gibson of Global Affairs Canada facilitated a panel on stakeholder strategies, thoughts, and questions about site-level transition activities. Sugeng Sumbarjo of BAPETEN joined Dr. Kanchan P. Adhikari of Nepal's MSTE and Bui Thi Thuy Anh of Vietnam's Agency for Radiation and Nuclear Safety on the panel.

Dr. Kanchan P. Adhikari of Nepal's MSTE discussed radiological security site sustainability and transition in Nepal. Nepal's first brachytherapy machine was introduced in 1976. Since that time, the country has continued to address challenges including an incomplete inventory of sources, difficulty in getting regulations approved, and a lack of trained workers. One of the country's biggest hurdles is having a regulatory body in place. However, multiple sites have had security equipment installed and many are shifting from Co-60 to alternative technology.

Bui Thi Thuy Anh of Vietnam's Agency for Radiation and Nuclear Safety discussed the country's regulatory framework under the 2008 Atomic Energy Law, which includes basic measures to ensure security of radioactive sources and outlines responsibilities of facilities and the country's regulatory body. Program documents that include material storage and characterization have been developed. Two sites with security systems in place are ready to transition from ORS support. These sites have developed and implemented robust site security plans. Training has helped move the sites closer to transition. Regulatory inspections will take place at the two sites, which will serve as a model to the other sites for future transition.

Sugeng Sumbarjo noted that Indonesia currently has over 7,000 sources in use and another 16,000 not in use. Sources are distributed throughout the country. Inspection and Law Enforcement ensure licensees meet requirements. Both scheduled and unplanned inspections are periodically performed, and the inspectors are paid by the government. There is an established inspection schedule and noncompliance penalty based on source type. If issues are identified, consequences include everything from suspension to written warnings. Inspection results are identified with a color-coded sticker. The Indonesia program follows a source from cradle to grave.

10.5. Future Challenges to Radiological Source Security

This working lunch explored future challenges to radiological source security.

11. Life Cycle Source Management

11.1. Deep Geological Repositories

Dr. Carlo Arcilla of PNRI presented information on deep geological repositories. Nuclear waste is one of the main reasons people cite for opposing nuclear power. Only one nuclear power plant out of 400 has a license to dispose of nuclear material. The U.S. military uses the Waste Isolation Pilot Plant for its waste. When a nuclear reactor is granted a license, it must also receive a license for a disposal site. Disposal sites must be carefully designed to provide long-term engineered barriers. The design must evaluate if the site is isolated from surface perturbations, has "quiet" geology, and no resource conflicts. Other considerations include the need for low water flux/movement and communities that are receptive to nuclear waste. Deep boreholes are worth consideration.

11.2. Update to IAEA Guidance Document on the Management of Disused Sources

Kate Roughan of the IAEA's Nuclear Fuel Cycle & Waste Technology program spoke on the *Code of Conduct Supplemental Guidance on the Management of Disused Radioactive Sources*. The *Code of Conduct* encourages States to improve the safety and security of their disused sources according to established standards. Supplemental guidance was drafted and approved in 2017. This code applies to all radioactive sources, including orphan sources; however, it does not address how a source becomes labeled as "disused." The code does cover short-term storage and transport, transit and trans-shipment, and options for management of disused sources, including reuse, recycle, and long-term storage. Additional terms and definitions have been added to the code since its original release. While this *Code of Conduct* address both the safety and security of radioactive sources, it is not a legally binding document.

11.3. Lifecycle Management and Final Disposition

Dr. Carlo Arcilla of PNRI facilitated a panel discussion on lifecycle management and final disposition of radioactive sources. The panel included representatives from the Malaysia Atomic Energy Licensing Board (Faeizal Ali), Bangladesh Atomic Energy Commission (Dr. A.K.M. Fazle Kibria), IAEA Nuclear Fuel Cycle & Waste Technology program (Kate Roughan), National Nuclear Energy Agency of Indonesia (Husen Zamroni), and Thailand's OAP (Pennapa Kanchana).

Ms. Pennapa Kanchana discussed nuclear energy organizations in Thailand. In 2014, an expert mission on drafting the national policy and strategy for managing radioactive waste and spent fuel was held. The goal was to ensure radioactive waste is safely managed in a cost-effective manner. The current and future financial arrangements for management of radioactive waste will

be the responsibility of the generator, and they must set aside funding to meet this requirement. The government will take the responsibility when there is no generator. Currently 70% of sites with Category 1 material have been secured by ORS. The rest of the sites will develop their own security upgrade program or plan to remove the radioactive material. Waste treatment, conditioning, and storage have been identified. Some challenges still exist, such as awareness of security and development of security culture, availability of competent security staff, effectiveness and sustainability of a security regime, conducting threat assessments, and transport security.

A.K.M. Fazle Kibria stated that Bangladesh has been using nuclear technology for over six decades. Increased usage of radioactive sources in the health and industrial sectors has resulted in a significant increase in disused sources. The country has experienced difficulties with returning the sources to their countries of origin, and the absence of a national policy for reuse or recycle has contributed to the daily increase in disused sources. A Waste Processing and Storage Facility exists, and the disused radioactive source program includes collection, transport, and storage. A national policy for radioactive waste and spent fuel management is pending government approval. Challenges include getting policies approved, maintaining a qualified workforce, establishing a capability for long-term storage/disposal for Category 1, 2 materials, the need to switch to non-isotopic alternatives, and a lack of hands-on training in the region.

Faeizal Ali noted that since 1984 Malaysia's Atomic Energy Licensing Board has implemented the country's regulations, which have included radioactive waste management since 2010. They are not disposing of sources, but instead focusing on long-term storage. They have identified the definition of a disused source. Challenges and issues include the need to gain control of orphan sources and sources out of regulatory control, transportation security measures, the expense of shipping radioactive materials, and the need to provide for secure and sustainable long-term management solutions. Long-term management involves return to supplier, transfer to an authorized recipient for disposal, decay in storage, interim or long-term storage at licensee facility, and reuse/recycle. The country is working on establishing a national registry of sealed radioactive sources.

Kate Roughan reported on the IAEA Nuclear Fuel Cycle & Waste Technology program. Key components of a national lifecycle management strategy are a detailed regulatory infrastructure, technical infrastructure, and management disposal options. The first step to developing a national strategy is a thorough inventory of sources, including material characterization. The next step is to identify a centralized storage facility. Managing disused sources involves conditioning to reduce volume, reuse/recycle or return to supplier, and/or long-term storage. When a source is purchased, the following should be done: develop an estimate disposal costs, establish funding mechanism, and use decision-aiding documents to determine the best option for disposal. The IAEA has the tools and information to help manage disused sources.

12. Closing of the 6th Regional Review Meeting on Radiological Security

12.1. Future Challenges in Radiological Security

Mr. Pierre Legoux of WINS facilitated a discussion on evolving threats and emerging technologies and how these evolutions may impact radiological security in the future. He opened the discussion by delivering his own perspective on the topic and then requested selected stakeholders in the room (a regulator, a licensee, and a law enforcement representative) to provide complementary perspectives. Mr. Legoux asked participants to reflect on what they just heard at their table and to further discuss the topic. He then asked the participants to plan for radiological security challenges that might occur over the next ten years.

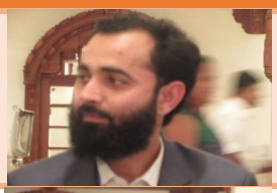
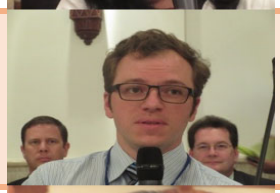
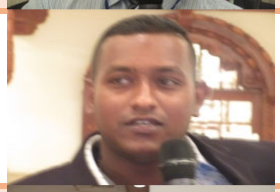
During the reporting discussions, participants highlighted the difficulty of anticipating future adversary intent and attributes. It was agreed that threat levels would remain elevated and licensees should be ready to face adversaries using any available technologies to support their malicious actions. It was also agreed that licensees and regulatory organizations should establish and sustain close cooperation with specialized law enforcement agencies. Licensees and other stakeholders were encouraged to adopt a proactive attitude towards new security technologies and include them in their security arrangements, when cost effective. Participants also highlighted the need to understand the type and number of sources that will be used in their country in the future and to be ready to adapt the security regime to the anticipated need. It was finally mentioned that the adoption of alternative technologies will influence national inventories and may reduce the need for security, but it was also noted that some new devices containing high-activity radioactive sources (e.g., the GammaPod system) may enter the market and require the implementation of high levels of security.

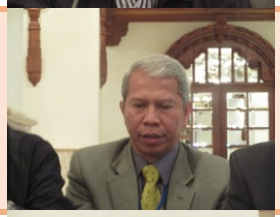
ATTACHMENT A: MEETING PARTICIPANTS

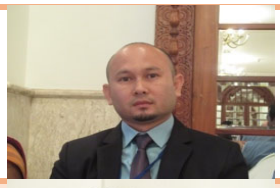
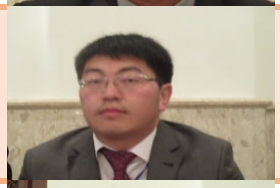
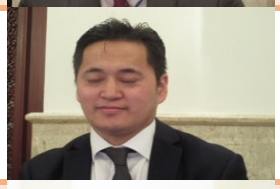
ATTACHMENT B: AGENDA

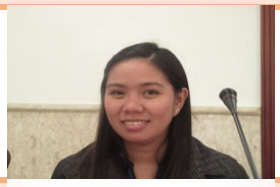
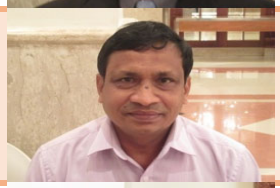
6TH REGIONAL REVIEW MEETING ON RADIOLOGICAL SECURITY

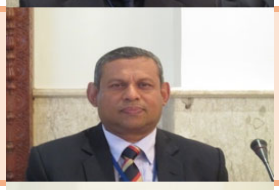
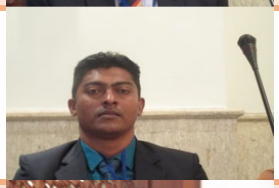
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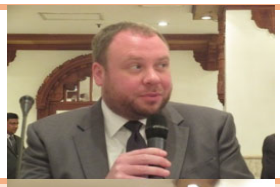
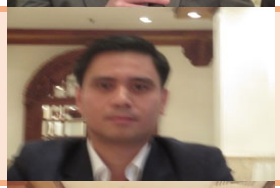
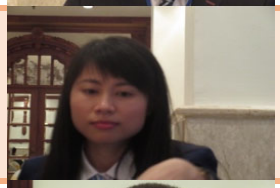
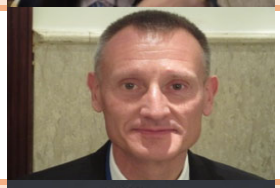
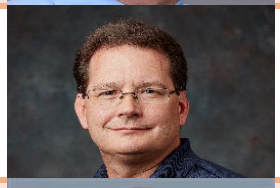
		Name/Contact	Position/Affiliation/Country
1		Dr. Subhanullah Shakir drsubhan.shakir@gmail.com	Specialist of Nuclear Technology Implementations in Medicine Afghan Atomic Energy High Commission Afghanistan
2		Dr. A.K.M. Fazle Kibria kibriaf@yahoo.com	Bangladesh Atomic Energy Commission Bangladesh
3		Mrs. Selina Yeasmin kibriaf@yahoo.com	Chief Scientific Officer & Head; Health Physics Division Atomic Energy Centre Dhaka / Bangladesh Atomic Energy Commission Bangladesh
4		Mr. Thorn Rothsa thorn.rothsa.eee@gmail.com	Officer of Nuclear Safety, Security and Safeguards Cambodia
5		Ms. Julia Gibson julia.gibson@international.gc.ca	Project Leader Global Affairs Canada Canada
6		Nathalie Semblat nathalie.semblat@international.gc.ca	Deputy Director and Senior Program Manager Global Affairs Canada Canada
7		Mr. Raphael Duguay raphael.duguay@canada.ca	Security Advisor Canada
8		Mr. Riten Gosai rgosai@baf.com.fj	Biosecurity Authority of Fiji Fiji
9		Mr. David Ladsous d.ladsous@iaea.org	Senior Nuclear Security Officer Transportation Security IAEA

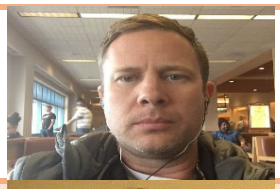
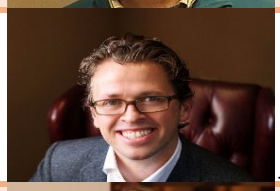
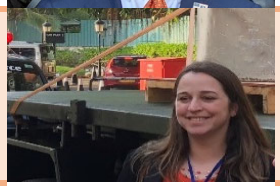
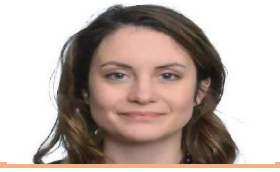
10		Ms. Cathleen Maura Roughan C.Roughan@iaea.org	Team Leader Source Management Unit IAEA
11		Mr. Ishak Hasanuddin i.ishak@bapeten.go.id	Director of Regulation Development for Radiation Facilities and Radioactive Materials Division BAPETEN Indonesia
12		Mr. Sugeng Sumbarjo s.sumbarjo@bapeten.go.id	Director for Inspection of Radiation Facilities and Radioactive Materials Division BAPETEN Indonesia
13		Mr. Khairul khairul@batan.go.id	Physical Protection Officer and Manager Center for Security Culture and Assessment (CSCA) / National Nuclear Energy Agency Indonesia
14		Mr. Sumarbagiono bagya@batan.go.id	Head of Waste Treatment and Disposal Technology Center for Radioactive Waste Technology Indonesia
15		Mr. John Buchanan j.buchanan@interpol.int	Specialized Officer INTERPOL
16		Mr. Bok Hyoung LEE llbh@kins.re.kr	Radiation Regulation Project Manager KINS Korea
17		Ms. Chandavone Phanthavong favip_1993@hotmail.com	Government Officer Ministry of Foreign Affairs Laos
18		Mr. Sathien Sylasern sylasern@gmail.com	Official Department of International Organizations, Ministry of Foreign Affairs Laos
19		Mr. Faeizal Ali faeizal@aelb.gov.my	Principal Assistant Director Division of Radiation Regulatory/ AELB Malaysia

20		Mr. Mohd Reduan Bin Abdul Razak mreduan@moh.gov.my	Physicist Medical Radiation Surveillance Division – Ministry of Health Malaysia
21		Mr. Mohd Nathir Bin Mohd Kamari nathir.mkamari@moh.gov.my	Physicist / Medical Radiation Surveillance Division Ministry of Health Malaysia
22		Mr. Khairul Izwan Bin Azman khairul_izwan@rmp.gov.my	Armament Inspector (CBRNE) Royal Malaysian Police Malaysia
23		Mr. Shagj Sandag-Ochir Sandagochir.nrrd@gmail.com	State Senior Inspector on Nuclear and Radiation Safety Mongolia
24		Mr. Enkhgerrel Nyamdavaa e.nyamdavaa@nea.gov.mn	Head of Nuclear Safety and Security Mongolia
25		Dr. Myint Aung myintaung.mtu@gmail.com	Director Division of Atomic Energy, Ministry of Education Myanmar
26		Mr. Ngwe Min Htwe ngweminhtwe@gmail.com	Assistant Director Division of Atomic Energy, Ministry of Education Myanmar
27		Dr. Kanchan P. Adhikari kanchanadhikari@gmail.com	Chief Medical Physicist / Radiation Safety Officer National Academy of Medical Sciences, Bir Hospital Nepal
28		Mr. Vishwa Nath Acharya acharyabishwonath@gmail.com	Administrative Officer MOST Nepal
29		Mr. George Otto george_otto@health.gov.pg	Manager, Radiotherapy/ Radiation Safety Papua New Guinea

30		Mr. Moses Taram mtaram_76@yahoo.com.au	Lecturer, Radiation Physics Papua New Guinea
31		Ms. Maria Teresa Alvarez Salabit mtasalabit@pnri.dost.gov.ph	Science Research Specialist II Philippine Nuclear Research Institute Philippines
32		Mrs. Marivic Candado mbcandado@up.edu.ph	Health Physicist III University of the Philippines, Philippine General Hospital Philippines
33		Dr. Carlo Abundo Arcilla caarcilla@pnri.dost.gov.ph	Director Philippine Nuclear Research Institute Philippines
34		Dr. Hoo Week Teck	Head – Ionizing Radiation Control Section National Environmental Agency Singapore
35		Mr. Anil Ranjith Hikkaduwa Liyanage anil@aerc.gov.lk	Director General Sri Lanka Atomic Energy Regulatory Council Sri Lanka
36		Mr. Neel Kurukulasuriya Roshan Fernando neel@aerc.gov.lk	Deputy Director Sri Lanka Atomic Energy Regulatory Council Sri Lanka
37		Miss Nimal Pathiranage Nirmali Karunarathna nirmali@aerc.gov.lk	Scientific Officer Sri Lanka Atomic Energy Regulatory Council Sri Lanka
38		Mr. Prageeth Indika Kumara Kadadunna Koralalage prageeth@aerc.gov.lk	Deputy Director, Inspection-Industrial Applications, Enforcement Sri Lanka Atomic Energy Regulatory Council Sri Lanka
39		Mr. Sumith Santha Kumara Kolambage sumith@aerc.gov.lk	Deputy Director Sri Lanka Atomic Energy Regulatory Council Sri Lanka

40		Dr. H.D.B. Herath hdbher@gmail.com	 Sri Lanka Disaster Management Centre Sri Lanka
41		Mr. K.V.A.W. Kumara kumarakvaw@gmail.com	Chief Physicist National Cancer Center Sri Lanka
42		Mr. E.D. Viraj Sampath virajed@aeb.gov.lk	Radiation Protection Officer Sri Lanka Gamma Centre, Atomic Energy Board Sri Lanka
43		Mr. Upul Marambage upulmenik@yahoo.com	SSP State Intelligence Service Sri Lanka
44		Mr. Amila Chinthaka Premarathne T.M.A. Gedara amilaforexstf@gmail.com	 Sri Lanka Police Special Task Force Sri Lanka
45		Mr. S.W.A.B. Doulagala adaulagala@yahoo.com	Superintendent of Police, Director-Training Sri Lanka Police - Special Task Force Sri Lanka
46		Mr. Chamath Nadinjaya Kottawa Gamage chamathstf@gmail.com	Inspector of Police Sri Lanka Police - Special Task Force Sri Lanka
47		Ms. Pennapa Kanchana pennapa.k@oap.go.th	Director of Nuclear and Radiation Licensing Division OAP Thailand
48		Dr. Rungdham Takam	Senior Radiation Physicist OAP Thailand
49		Capt. Surachai Rungsuk top_0844@hotmail.com	Forensic Chemist Police Forensic Science Center, Office of Police Forensic Science Thailand

50		Mr. Philip Gordon Richards philip.richards@beis.gov.uk	Deputy Head, Global Threat Reduction Program Department for Business, Energy, and Industrial Strategy United Kingdom
51		Mr. Kieu Ngoc Dung kieudung.nbc@gmail.com	Official Vietnam National Committee for Emergency Response, Natural Disaster, Search and Rescue Vietnam
52		Mr. Duong Hong Nhat duonghongnhat@gmail.com	Officer, Technical Support Center for Radiation and Nuclear Safety and Emergency Response Vietnam Agency for Radiation and Nuclear Safety Vietnam
53		Ms. Bui Thi Thuy Anh btanh@most.gov.vn	Deputy Director, International Cooperation Division Vietnam Agency for Radiation and Nuclear Safety Vietnam
54		Mr. Pierre Legoux Pierre.legoux@wins.org	Mr. Pierre Legoux/ World Institute for Nuclear Security
55		Mr. Michael Hazel Michael.hazel@pnnl.gov	Project Manager Pacific Northwest National Laboratory United States of America
56		Mr. Todd Haynie Todd.haynie@pnnl.gov	Regional Project Manager Pacific Northwest National Laboratory United States of America
57		Mr. Travis Chamberlain Travis.chamberlain@pnnl.gov	Regional Project Manager Pacific Northwest National Laboratory United States of America
58		Mr. Mike Schultze schultzems@ornl.gov	ORNL Asia/SE Asia Transportation Security Lead for ORS Oak Ridge National Laboratory United States of America
59		Mr. Jeff Jarry jfjarry@sandia.gov	Project Lead Sandia National Laboratory United States of America

60		Mr. Matt Thompson mthomp@sandia.gov	Physical Protection Specialist Sandia National Laboratory United States of America
61		Mr. Mark Ladd mdladd@sandia.gov	 Sandia National Laboratory United States of America
62		Mr. John Duda johnduda@summitet.com	Chief Executive Officer Summit Exercises and Training United States of America
63		Ms. Kristin Hirsch Kristin.hirsch@nnsa.doe.gov	Deputy Director Office of Radiological Security United States of America
64		Mr. Rob Rudich robert.rudich@nnsa.doe.gov	East Asia-Pacific Program Manager Office of Radiological Security United States of America
65		Ms. Malika Taalbi Malika.taalbi@nnsa.doe.gov	International Reduce Program Manager Office of Radiological Security United States of America
66		Ms. Sarah Norris Sarha.norris@nnsa.doe.gov	South-Central Asia/Caucasus Program Manager Office of Radiological Security United States of America

6TH REGIONAL REVIEW MEETING ON RADIOLOGICAL SECURITY
THE KINGSBURY HOTEL, COLOMBO, SRI LANKA. MARCH 6TH – 9TH 2018

MONDAY, MARCH 5TH 2018

(Afternoon/evening) Participants Arrive

TUESDAY, MARCH 6TH 2018

Opening of the 6th Regional Review Meeting on Radiological Security

08.00 – 09.00 Participant/Guest Sign-in

09.00 – 09.10 Opening Ceremony and Lamp Lighting

09.10 – 09.45 Welcoming comments

- *Sri Lankan Atomic Energy Regulatory Commission*
- *Sri Lankan Government Chief Guest*
- *Robert Hilton – Deputy Chief of Mission, US Embassy, Colombo*
- *Kristin Hirsch – Office of Radiological Security*
- *Vote of Thanks – Sri Lanka*

09.45 – 10.15 Participant Introductions

10.15 – 10.30 Photo

10.30 – 10.45 Coffee Break (Time Approximate)

The Threat of Radiological Terrorism

10.45 – 11.15 Radiological Security Threats: Presentation on the threats posed by Radiological Dispersal Devices (RDD) and Radiological Exposure Devices (RED). Presentation will cover recent events that targeted radiological material as well as information on who might currently be targeting material and for what purposes.
(*John Buchanan – International Criminal Police Organization*)

11.15 – 12.15 ORS Economic Impact Study: Presentation on the financial impact of a hypothetical dispersal of radiological material in Manhattan, New York.
(*Mark Ladd– Sandia National Laboratory*)

12.15 – 13.15 Lunch: Working lunch with discussion questions
Topic: Screening of the ORS International Video

Radiological Security Regulations: Progress and Trends

13.15 – 13.45 IAEA Guidance Document Update: Presentation on updates to *NST048, Security of Radioactive Material in Use and Storage and of Associated Facilities* (revision of NSS 11)
(*David Ladsous – IAEA Nuclear Security*)

13.45 – 14.30 Recent Regulatory Experiences: A panel on challenges and successes from recent experience enacting new regulations. 10 minute presentations followed by 15 minutes Q&A.

- *Nuclear Energy Regulatory Agency of Indonesia (BAPETEN)*

- *Duong Hong Nhat – Vietnam Agency for Radiation and Nuclear Safety*
- *Maria Teresa Alvarez Salabit – Philippine Nuclear Research Institute*

(Facilitated by: *TBD*)

Advances in Physical Protection

14.30 – 15.00 ORS Initiatives in Physical Protection: An introduction to The Global Cesium Security Initiative (GCSI) and related In Device Delay (IDD) Project.
(*Kristin Hirsch – U.S. Office of Radiological Security*)

15.00 – 15.15 Coffee Break (Time Approximate)

Transportation Security Experiences and Training

15.15 – 16.15 Transportation Security: A panel on challenges and successes in transport security in Asia. 10 min presentation followed by 20 minutes Q&A.

- *David Ladsous – IAEA Nuclear Security*
- *Mike Schultze – U.S. Office of Radiological Security*
- *Pennapa Kanchana – Thailand's Office of Atoms for Peace*
- *Sumith Kumara – Sri Lanka Atomic Energy Regulatory Commission*

(Facilitated by: *Robert Rudich – U.S. Office of Radiological Security*)

16.15 – 17.15 Sri Lankan Special Task Force in Action: A Demonstration of Sri Lanka's transportation security and response capabilities
(*S.W.A.B. Athula Daulagala– Sri Lankan Special Task Force*)

WEDNESDAY, MARCH 7TH 2018

09.00 – 17.30 Session on Alternative Technologies to High Activity Radioactive Sources: details available on the World Institute for Nuclear Security agenda.
(*Hosted and Facilitated by the World Institute for Nuclear Security*)

18.30 Sri Lankan Cultural Dinner
(*Hosted by the Sri Lanka Atomic Energy Regulatory Council*)

THURSDAY, MARCH 8TH 2018

Radiological Theft Response Experiences, and Training Techniques

09.00 – 09.15 Welcome and daily objectives

09.15 – 10.15 Radiological Theft Response: A panel on building partnerships between site staff and local responders, target folder development, and partnership between regulators and law enforcement. 10 min presentation followed by 20 minutes Q&A

- *TBD*
- *Prageeth Kadadunne – Sri Lanka Atomic Energy Regulatory Commission*
- *Sri Lankan Special Task Force*

(Facilitated by: *Raphaël Duguay – Canadian Nuclear Safety Commission*)

10.15 – 10.30 Introduction to the Facilitated Scenario Discussion: Explanation of the capabilities, benefits and techniques for table top exercises and facilitated scenario discussions

as they relate to radiological theft response. Instructions on how to participate in the upcoming facilitated scenario discussion.
(*John Duda – Summit and Matt Thompson – Sandia National Laboratory*)

10.30 – 10.45 Coffee Break (Time Approximate)

10.45 – 11.45 Facilitated Scenario Discussion: A scenario driven event that guides participants through a site level response to hypothetical radiological material theft. The discussion and presentation will highlight the value of table top exercises and similar activities. The scenario, site and resources being discussed in this event are all fictitious.
(*John Duda – Summit and Matt Thompson – Sandia National Laboratory*)

11.45 – 12.45 Lunch: Working Lunch with Mini Table Top Exercise Groups
Topic: Participants will discuss what they learned and prepare a brief dialog on lessons learned during the discussion

12.45 – 13.45 Retrospective and Lessons Learned: A 10 minute presentation on how table top exercises have helped identify gaps and improved or change response plans, standard operating procedures and interagency agreements and a Q&A focused on participant insights and lessons learned from the Facilitated Scenario Discussion.
(*Matt Thompson – Sandia National Laboratory*)

National Radiological Theft Response Introduction and Experiences

13.45 – 14.15 NRTRC Briefing: A briefing followed by Q&A on Sri Lanka's National Radiological Theft Response Code, the process to develop it and their recent TTX.
(*Neel Fernando – Sri Lanka Atomic Energy Regulatory Council*)

14.15 – 14.45 PRTRP Briefing: A briefing followed by Q&A on Vietnam's Provincial Radiological Theft Response plan, the process to develop it and their recent TTX.
(*Kieu Ngoc Dung – Vietnam's National Committee for Incident, Disaster Response, and Search and Rescue*)

14.45 – 15.00 Coffee Break (Time Approximate)

Security Culture Experiences and Training

15.00 – 15.30 Radiological Site Security Culture Training: An introduction to the key concepts of radiological site security culture and basic steps for building and evaluating a security culture program.
(Khairul– *National Nuclear Energy Agency of Indonesia (BATAN)*)

15.30 – 17.00 Radiological Site Security Culture: A panel with audience participation, questions will focus on major challenges to security culture implementation, examples of success, way to improve. Emphases will be on site level security culture but may include national level programs. 15 minute presentations followed by 45 minutes of Q&A.

- *Mohd Nathir Bin Mohd Kamari – Malaysian Ministry of Health*

- *Dr. Kanchan P. Adhikari – Nepal's Ministry of Science Technology and Environment*
- *Raphaël Duguay – Canadian Nuclear Safety Commission*
- *Khairul – National Nuclear Energy Agency of Indonesia (BATAN): Q&A only*

(Facilitated by*: Phil Richard – U.K. Department for Business, Energy and Industrial Strategy*)

FRIDAY, MARCH 9TH 2018

Sustainability and Transition

09.00 – 09.15 Welcome and daily objectives

09.15 – 10.00 ORS Sustainability and Transition Discussion: Introduction to ORS's approach to sustainability for both the national and site levels. The program will offer its perspective on goals for building a sustainable radiological security program. (*Kristin Hirsch – U.S. Office of Radiological Security*)

10.00– 10.30 Site Transition Process: Overview of the process for communicating site level transitions and tools for regulators or other national authorities to support site level sustainability and transition. (*Mike Hazel – Office of Radiological Security*)

10.30 – 10.45 Coffee Break (Time Approximate)

10.45 – 11.00 ASEANTOM Efforts in Radiological Security: A briefing on the Association's contributions and aspirations to radiological security sustainability. (*Wee Teck Hoo – Singapore's National Environment Agency*)

11.00 – 12.00 Site Sustainability and Transition: A panel on stakeholder strategies, thoughts and questions regarding site level transition activities. 10 min presentation followed by 30 minutes Q&A.

- *Nuclear Energy Regulatory Agency of Indonesia (BAPETEN)*
- *Dr. Kanchan P. Adhikari – Nepal's Ministry of Science Technology and Environment*
- *Bui Thi Thuy Anh – Vietnam Agency for Radiation and Nuclear Safety*

(Facilitated by: *Julia Gibson – Global Affairs Canada*)

12.00– 13.00 Lunch: Working lunch with discussion questions
Topic: Future Challenges to Radiological Source Security

Life Cycle Source Management

13.00 – 13.15 Geologic Disposal of Spent Nuclear Fuel: Perspectives for Archipelagic Countries (*Dr. Carlo Arcilla – Philippine Nuclear Research Institute*)

13.15 – 13.45 Update to IAEA guidance document: Information and updates to *Code of Conduct Supplemental Guidance on the Management of Disused Radioactive Sources* (*Kate Roughan – IAEA Nuclear Fuel Cycle & Waste Technology*)

13.45 – 15.00 Lifecycle Management and Final Disposition: A Panel on national strategies for management of disused radioactive sources. 10 min presentations followed by 25 minutes Q&A.

- *Faeizal Ali – Malaysia Atomic Energy Licensing Board*
- *Dr. A.K.M. Fazle Kibria – Bangladesh Atomic Energy Commission*
- *Kate Roughan – IAEA Nuclear Fuel Cycle & Waste Technology*
- *Pennapa Kanchana – Thailand's Office of Atoms for Peace*
- *Husen Zamroni – National Nuclear Energy Agency of Indonesia (BATAN)*

(Facilitated by*: Dr. Carlo Arcilla – Philippine Nuclear Research Institute*)

15.00 – 15.15 Coffee Break (Time Approximate)

Closing of the 6th Regional Review Meeting on Radiological Security

15.15 – 16.00 Future Challenges in Radiological Security: A facilitated discussion on stakeholder concerns regarding emerging adversaries, technologies and techniques which threaten radiological source security.
(*Facilitator: Pierre Legoux – World Institute for Nuclear Security*)

16.00 – 16.30 Event Summary and Report Approval
(*Jeff Jarry – Sandia National Laboratory*)

16.30 – 17.00 Closing Remarks

- *Anil Ranjith – Sri Lanka Atomic Energy Regulatory Council*
- *Athula Daulagala – Sri Lankan Special Task Force*
- *Kristin Hirsch – Office of Radiological Security*

SATURDAY, MARCH 10TH 2018

Morning/Afternoon Participants Depart