

Co-Chairs' Summary Report
ASEAN Regional Forum
Workshop on Non-proliferation Nuclear Forensics
Bangkok, Thailand
7-9 December, 2011

Pursuant to the decision of the 18th ASEAN Regional Forum in Bali on July 2011, the European Union, Thailand and the United States co-chaired an ARF Workshop on Non-proliferation Nuclear Forensics on 7-9 December 2011 in Bangkok. The workshop was co-chaired by Mr. Chaivat Toskulkao, Secretary General of Thailand's Office of Atoms for Peace (OAP), Mr. Wayne Mei of the United States National Nuclear Security Administration, and Dr. Klaus Mayer of the European Union Joint Research Centre - Institute for Transuranium Elements.

The workshop was attended by representatives of the ASEAN Regional Forum Secretariat, the International Atomic Energy Agency, the United Nations, Australia, Cambodia, China, Indonesia, Japan, Malaysia, Mongolia, Myanmar, Papua New Guinea, Russia, the Republic of Korea, Sri Lanka, Thailand, the United States, and Viet Nam. The list of participants appears as **Annex 1**. The workshop's key objectives were to facilitate an exchange of information among ARF participants to develop a common understanding of nuclear forensics principles and to discuss how countries can best contribute to the international nuclear forensics framework. More specifically the following subjects were covered:

- Background on Technical Nuclear Forensics;
- Present Status, Challenges and Emerging Areas;
- Demonstration of Detection Equipment and Core Capacity Scenario;
- Technical Collaborations as well as Coordination between Core Capability and Advanced Capability.

In addition to technical presentations and discussions, workshop participants greatly benefited from a visit to the Laem Chabang Port (LCP) on December 8th, where LCP Custom Bureau demonstrated their extensive capabilities to facilitate legitimate economic trade and increase the competitiveness of Thai exporters while advancing the goals of the joint U.S.-Thai Container Security Initiative (CSI) and Megaports Initiative. Thai officials demonstrated their national response plan in the event of the detection of radioactive material outside of regulatory control. Workshop participants also participated in a table top exercise at the Laem Chabang Port Authority, which helped participants to understand the benefits of establishing and maintaining core nuclear forensics capabilities to assist in meeting nuclear security goals of preventing and prosecuting incidents of illicit trafficking in nuclear and other radioactive materials. The programmes of the Workshop are attached as **Annex 2 and 3**.

Introductions and Welcoming Comments

Mr. Chaivat Toskulkao, Secretary General of the Office of Atoms for Peace, Thailand, opened the workshop by welcoming participants and providing an overview of the goals and objectives. He noted

the importance of Southeast Asia as a key transport link with other strategically important trade hubs, such as the Middle East and South Africa. He stressed the importance of secure and safe transportation to keep the region free from illicit nuclear trafficking. He emphasized the purpose of ASEAN Charter in preserving the region as free from nuclear weapons and weapons of mass destruction as committed by the Treaty on Southeast Asia Nuclear Weapon-Free Zone. He emphasized the importance of regional cooperation and the establishment of informal linkages because the security of regional states is indivisible. He noted that work on nuclear trafficking would be very important to Thailand's Nuclear Nonproliferation Center, and thanked the Thai MFA, EU, and U.S. DOE for organizing the event. The remarks appear as **Annex 4**.

Mr. Peter Hazdra, Attaché of the EU delegation to Thailand, stressed that nuclear security is a high priority for the European Union and that nuclear security requires international cooperation. He noted that the CBRN Centers of Excellence, being supported by the EU, would be important to the establishment of a regional network of experts. Mr. Hazdra strongly encouraged participants to take advantage of this opportunity to share information and experiences with nuclear forensics to further enhance international nuclear security.

Ms. Judith Beth Cefkin, Deputy Chief of Mission of the U.S. Embassy, Bangkok, Thailand, expressed gratitude to the Thai officials for hosting the workshop despite the obstacles presented by the recent floods. She noted that nuclear forensics is critical to nuclear security and that President Obama has called for increased regional cooperation with ASEAN on security and recognizes the important contributions Southeast Asia can make in helping to achieve a world without nuclear weapons by promoting regional cooperation and capacity-building to counter proliferation threats and advance peaceful uses of nuclear technology. She expressed particular hope that the workshop, including the Table Top Exercise and Megaports demonstration, would promote the development of a regional approach to nuclear forensics.

Day 1 Presentations

The workshop began with an overview of the goals of the workshop, as explained by Dr. Donna Smith of the U.S. Department of Energy. The most important goals were to facilitate an exchange of information on how ARF participants could best contribute to the developing international nuclear forensics framework and to make progress toward fulfilling the Work Plan and Communiqué of the 2010 Washington Nuclear Security Summit. The presentation appears as **Annex 5**.

Following her presentation, a brief overview of the previous workshop, held in September in Singapore, was presented by Dr. Jean Galy of the European Union. He noted that the focus in Singapore had been on increasing awareness and on the need for each country to develop a national response plan. The objectives of the previous workshop were to exchange information, learn from each other, explore the potential for mutual assistance, and to develop proposals for enhanced cooperation in order to improve preparedness and response capabilities. The presentation appears as **Annex 6**.

A basic introduction to the emerging field of nonproliferation nuclear forensics was provided by Dr. Donna Smith. She offered a definition of nuclear forensics and basic questions that the science seeks to

answer, and she expressed that the illicit trafficking of nuclear materials and nuclear forensic investigations are international issues. She also discussed the importance placed on nuclear forensics in the 2010 Nuclear Security Summit and the creation of the Nuclear Forensics International Technical Working Group (ITWG) in 1995 to foster cooperation in combating illicit trafficking. Finally, she explained that every state should possess “core capabilities” in nuclear forensics, such as national nuclear forensics libraries, national response plans, chain of custody methods and an understanding of the synergies between nuclear and traditional forensics for attribution. The development of advanced analytical techniques may require more extensive investments in human capital, facilities and instrumentation. The presentation appears as **Annex 7**.

Mr. Peter Colgan from the IAEA Office of Nuclear Security provided a very useful timeline of the activities involved in responding to a nuclear smuggling incident and how nuclear forensics is incorporated into that response. His presentation drew upon publications that are part of the IAEA Nuclear Security Series which provide guidance to Member States as they work to develop their nuclear forensics capabilities and improve nuclear security in their countries. In addition to the review of a variety of detection devices, his presentation stressed the need for planning and coordination at the national and international level and described the activities undertaken by different coordinating bodies, including the Border Monitoring Working Group and the Nuclear Forensics Coordination Group. The presentation appears as **Annex 8**.

Ms. Siriratana Biramontri of Thailand’s Office of Atoms for Peace (OAP) described how Thailand is addressing its nuclear security concerns with considerable focus on international cooperative activities with the IAEA, Australia, Germany, the Nuclear Suppliers Group, and the U.S. Department of Energy. Thailand’s OAP has a subcommittee that deals with the nonproliferation of WMD and radiological materials. The OAP also offers national workshops for frontline officers – customs, police, border police, port authority, intelligence – to train them how to use radiation detection instruments and how to respond to incidents of illicit nuclear trafficking. The presentation appears as **Annex 9**.

Core Capabilities in Nuclear Forensics were described by Dr. Klaus Mayer of the Joint Research Centre, Institute for Transuranium Elements (ITU), Karlsruhe, Germany. Core capabilities are those that provide information on nuclear material of *immediate relevance* for law enforcement and other agencies, including the main characteristics of the material, the radiological hazard, and the amount of material. Core capabilities require the appropriate administrative and technical infrastructure and equipment. Administrative capabilities include a national response plan and national forensics library. Technical infrastructure requires incident site management, forensics evidence management, and a trained staff. Core capabilities were contrasted with the concept of advanced capabilities which are those required for comprehensive investigation and may include a full analysis of characteristic parameters, comparison information and other means of providing interpretation and attribution of analytical results. The presentation appears as **Annex 10**.

Ms. Maria Eugenia de los Angeles Rettori from the United Nations Interregional Crime and Justice Research Institute (UNICRI) described the approach and accomplishments to date of the Chemical, Biological, Radiological and Nuclear Centres of Excellence (CoE) to date. The initiative, funded by the EU

and jointly implemented by the UN and the EU, promotes regional coordination, long-term national and regional capacity building for responsible authorities and administrative infrastructures, specific projects, and policy reinforcement in the area of CBRN risk mitigation. The CBRN CoE is presented in 8 different regions in the world, namely South-East Europe, the Caucasus, Moldova and Ukraine; South-East Asia; the Middle East; North Africa; the African Atlantic Façade; Sub-Saharan Africa; Central Asia; and the Gulf Cooperation Countries.. The CBRN COE Secretariat temporarily started operations in Bangkok, October 2011 and will move to the Manila in early 2012. UNICRI's participation in this workshop represents the support of the CBRN CoE to the cooperation established among JRC ITU, the ASEAN Regional Forum (ARF) and the Governments of Thailand and the USA within the framework of the regional pilot project of the CBRN CoE in South East Asia as well as its its first direct interaction with the ARF. The presentation appears as **Annex 11**.

Dr. Smith described the relationship between nuclear forensics and conventional forensics and the approach that has been taken by the U.S. FBI. There is the need to perform specialized nuclear forensic analysis on nuclear and radioactive materials and conventional forensics analysis on non-nuclear materials that have been contaminated by exposure to nuclear and radioactive material. She described U.S. activities to conduct nuclear forensic analysis in a manner that will meet the legal requirements for use in criminal investigations and prosecutions and encouraged participants to understand their legal requirements to best set up their nuclear forensic capabilities. The presentation appears as **Annex 12**.

Dr. Zhao Yonggang from the China Institute of Atomic Energy (CIAE) of the China National Nuclear Corporation provided a presentation entitled, "Activities Related to Nuclear Forensics in China" which described the relevant Chinese regulations related to nonproliferation and nuclear security and a case study involving nuclear forensics. He also discussed the relationship between the morphology of uranium grains and production processes as an important nuclear signature. Dr. Zhao noted the importance of international collaboration in nuclear forensics, establishing national nuclear forensics libraries, and technical exchanges to aid in improving national nuclear forensics capabilities and preventing nuclear material smuggling. The presentation appears as **Annex 13**.

The day concluded with a presentation by Dr. Mayer on several case studies of nuclear forensics investigations that had been carried out by JRC-ITU. He underlined that main characteristics of the (intercepted) material can be obtained with core capabilities. Providing clues on the history of material (i.e. its likely place and date of production and its intended use) requires, however, a more thorough analysis and sophisticated data interpretation as available only in few laboratories and described as advanced capabilities. The presentation appears as **Annex 14**.

Day 2 at Laem Chabang Port

At the Laem Chabang Port, participants were briefed on current activities at the port, including nuclear and radiological screening technology and processes that have been adapted under the Megaports Initiative. Participants then witnessed a simulated response of authorities to the detection of nuclear or radioactive materials outside of regulatory control and worked on a nuclear forensic table top exercise which involved coordination between two countries.

Simulated Response to Detection of Nuclear Material outside of regulatory control

This exercise demonstrated the detection and response activities when a truck carrying a container with radioactive materials entered the port. The role of the central alarm station, perimeter and secondary inspections, and the integrated activities of the Office of Atoms for Peace, Customs and Port Officials, and the Forensic Police were all demonstrated. The need for advance planning and trained personnel to assure nuclear safety and the preservation of forensic evidence were clearly shown.

Table Top Exercise

Workshop participants took part in a table top exercise which highlighted the need and utility of nuclear forensics core capabilities for meeting nuclear security goals. The scenario involved a radioactive material that was detected at a border crossing of a fictitious country that had limited nuclear forensic capabilities. Participants belonged to either the country that had the limited capabilities or its neighboring country which had complete nuclear forensic core capabilities. They then worked through how they would use core capabilities to respond to an incident of illicit trafficking to ensure all national security goals are met. Participants experienced how law enforcement, customs, regulatory officials, Ministry of Foreign Affairs officers, and other experts could work together internally to their country. They also worked through how a country could reach out to another country with more capabilities to fill the gaps of capabilities. Additionally, they discussed the advantages of having legal agreements and standards to be in place to assist with information sharing. If prosecution is the end goal, it is important to have standard operating procedures for how information is obtained to ensure it is admissible into court. Participants also talked through chain of custody of materials and how that may be met even without a detailed standard for chain of custody for their country. Ultimately participants were able to see, or at least gain insights into, how core capabilities are able to assist with each phase of responding to an illicit trafficking incident and the possible needs of improving legal procedures, bilateral/multilateral arrangements, and technical capabilities (i.e. handheld equipment, incident management plans).

Day 3 Presentations

Dr. Kath Smith of Australia described the three important international fora on nuclear forensics: the Nuclear Security Summit involving heads of State; the senior working level activities of the Global Initiative to Combat Nuclear Terrorism (GICNT); and the activities of the ITWG, an informal association of nuclear forensics practitioners. She described the results of a recent GICNT table top exercise in Germany and provided additional information on ITWG activities. The need for databases and nuclear forensics libraries was highlighted as well. The presentation appears as **Annex 15**.

Dr. Heather Dion of Los Alamos National Laboratory described the current R&D challenges in nuclear forensics and the role that interpretation and development of signatures relating characteristics of the material to nuclear forensic questions of interest (i.e. how old is the material, where might it have been produced, etc.) play in the identification of unknown materials. Signatures are observable characteristics that have forensic value in distinguishing the origins and histories of materials. To illustrate the importance and complexity of signatures she described in some detail the international

effort to characterize uranium ore concentrate, or yellowcake. She concluded by explaining that the complexity of the process illustrates the need for international cooperation. The presentation appears as **Annex 16**.

Dr. Masaaki Magara of the Japan Atomic Energy Agency (JAEA) outlined the current research and development, international collaboration, and planned activities of JAEA. This includes the development of a domestic Japanese nuclear materials database, in collaboration with the U.S. DOE, and hosting a regional/national introductory training course on nuclear forensics in April 2012. The bilateral activities in nuclear forensics by JAEA were also described. The presentation appears as **Annex 17**.

Dr. Suriya Chindawongse, Director of the ASEAN Division 1 of the Thai Ministry of Foreign Affairs, addressed workshop participants to express his satisfaction with the level of participation in the workshop and to stress that the workshop is an important step towards meeting ASEAN's goal of a competitive, integrated, and safe region. He stated that the ASEAN community is on track for 2015, and a critical measure is that the ASEAN community is able to respond to new challenges in the region. He provided an overview of the increasing interconnectivity between ASEAN member states which promises great benefits, but also raises concerns about transnational crime. The WMD threat is a key priority, and it is part of the ASEAN charter to be a WMD free region. With enhanced interconnectivity, there is a need for greater safeguards and better security as a whole. In the context of human security and border controls, the work on nuclear forensics makes an important contribution to nuclear security and the overall connectivity of states in the ARF. Dr. Suriya expressed his contentment that the workshop was still able to take place despite the recent flooding in Bangkok and noted that this was the first international workshop in Bangkok since the flooding.

In the presentation on Core Capability Infrastructure Needs, Dr. Donna Smith focused on the technical infrastructure necessary to have a core capability in nuclear forensics. She made the point that the handling of nuclear forensics evidence should follow health and safety, and law enforcement requirements. She explained what equipment is necessary not only for forensic analysis but also for health and safety precautions and for avoiding cross-contamination of evidence. She concluded by explaining that a core capability in nuclear forensics can draw upon existing nuclear personnel, infrastructure, and equipment. It can be achieved with minimal investment because many of these capabilities should already exist and may already be in use by other authorities within a country. The presentation appears as **Annex 18**.

Dr. Heather Dion gave an overview of what instrumentation might be represented in an advanced nuclear forensic capability by discussing the many different techniques that can be applied to nuclear forensic analysis. Describing procedures used in the United States, she illustrated their applications to uranium ore concentrate or yellowcake where more than over eighty different characteristics of a nuclear "fingerprint" were determined using a variety of techniques. The yellowcake example also clearly demonstrated the importance of a national nuclear forensics library to track characteristics and signatures for ease in comparative identification. An important point is that much of the sophisticated equipment used for nuclear forensics in the United States is used primarily for other purposes (health and safety, nuclear safeguards, exploratory R&D in fundamental science, etc). Nuclear forensics is a

capacity that is leveraged on many scientific disciplines, and no scientist does nuclear forensic analysis full-time. The presentation appears as **Annex 19**.

Dr Yuri Lobach, of the Kiev Institute of Nuclear Research, Ukraine, provided an overview of nuclear forensic capabilities in the Ukraine and its proposal for regional cooperation with Azerbaijan, Georgia, and Moldova (GUAM states) as a possible source of ideas for how the ARF region could collaborate to have a central regional advanced capability and then several countries with core capabilities. Ukraine is working towards developing an advanced regional nuclear forensics laboratory that builds off of its analytical capabilities from the nuclear fuel and health and safety in Ukraine with Azerbaijan, Georgia and Moldova having core capabilities. The presentation appears as **Annex 20**.

Mr. Colgan of the IAEA, Dr. Jean Galy of the EU's JRC-ITU, and Mr. Wayne Mei of the U.S. DOE gave presentations on the resources of their organizations and their capabilities and plans to cooperate and provide assistance to South East Asian States. Mr. Colgan explained that the IAEA can provide technical guidance and assistance in nuclear forensics to member states who request it, and also noted that nuclear forensics is fully integrated into the IAEA's 2010-2013 Nuclear Security Plan. Dr. Galy discussed a plan for a European Nuclear Security Training Centre, which by 2012 will offer hands-on training involving nuclear materials to 10 participants from ASEAN. Mr. Mei reiterated the multitude of opportunities for international collaboration in nuclear forensics. He stated that it is still a fairly new concept and that there remains much work to do in raising awareness and in advancing the science. The presentations appear as **Annex 21, 22, and 23** respectively.

Dr. Kyuseok Song of the Korea Atomic Energy Research Institute (KAERI) provided a presentation on ROK's technical capability in the analysis of nuclear material and environmental samples, as well as on ROK's efforts. Following a detailed explanation of the current R&D efforts at KAERI, Dr. Song discussed major steps ROK has taken in incorporating nuclear forensics into their nuclear security regime. ROK is involved in the ITWG, it collaborates extensively with the IAEA, it cooperates with the United States through a bilateral Permanent Consulting Group mechanism, and a government funded R&D plan is being established. Finally, he discussed ROK's efforts to establish an international training center for nuclear security as a Nuclear Security Summit deliverable. The presentation appears as **Annex 24**.

Conclusions and Steps Forward- Dr. Donna Smith & Dr. Klaus Mayer

Participants agreed that developing nonproliferation nuclear forensics capabilities within and among ARF member states works to fulfill three crucial goals: 1) demonstrating commitment to international nonproliferation norms; 2) building international capacity to deter illicit smuggling of nuclear materials and/or to safeguard the civilian nuclear fuel cycle; and 3) supporting the implementation of the 2010 Nuclear Security Communiqué.

The co-chairs agreed that this workshop had been a significant step forward, building upon the results of the September workshop in Singapore. Participants gained a deeper understanding of the technical requirements, personnel, and organizational linkages needed for states to make and implement decisions about their national nonproliferation nuclear forensics capabilities. In particular it was demonstrated that there is great benefit and need for scientific and technical cooperation between

organizations to establish standards for sharing information and to validate analytical results. In this regard, states within the ARF may want to consider a regularized series of workshops to further achieve the benefits of regional cooperation on nonproliferation nuclear forensics within the region.

The co-chairs note that the responsibility for nuclear material security rests within each state and that nuclear forensics is an important component of a State's integrated nuclear security capability. The development of a core capability is achievable with reasonable resources and there is great value in having this capability established before a nuclear or radiological incident.

Advanced capabilities are specialized and require a substantial investment to sustain an extensive knowledge base, infrastructure to conduct complex assessments and assess nuclear information, and well developed nuclear libraries.

As states determine their appropriate level of capability relating to nonproliferation and nuclear security, including nuclear forensics, an important consideration will be how states may identify gaps in their desired capabilities and the measures necessary to fill these gaps on an interim or permanent basis. In this regard, states should be encouraged to take advantage of the assistance and cooperation that are available from more advanced states and from regional or international organizations.

The co-chairs also noted that this workshop is fully consistent with and advances the goals of the Nuclear Security Summit, the Global Initiative to Combat Nuclear Terrorism and the Nuclear Forensics International Technical Working Group. The co-chairs agreed that continued progress in this field is highly dependent on sustained and frequent exchanges amongst networks of regional and international technical experts and that the ARF Intersessional Meeting (ISM) on Nonproliferation and Disarmament is an ideal framework for promoting technical capacity building in nuclear forensics in Southeast Asia.

Finally the co-chairs expressed their appreciation to the Royal Thai Government for its hosting of this important workshop, which marks an important first step by the ARF to develop a regional framework for nonproliferation nuclear forensics. The following areas were identified for future cooperation:

- Development of national response plans;
- Development of national nuclear forensics libraries;
- Development of a regional network of experts in nuclear forensics;
- Development of nuclear forensics capabilities (core capabilities or advanced capabilities)
- Development of a framework for regional and multilateral cooperation;
- Identification of needs for follow-on training in nuclear forensics.
