Enhancing Nuclear Governance in the Asia Pacific

A Conference Report of the Nuclear Energy Experts Group Meeting

by
David Santoro and Carl Baker

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Pacific Forum CSIS

Based in Honolulu, the Pacific Forum CSIS (www.pacforum.org) operates as the autonomous Asia-Pacific arm of the Center for Strategic and International Studies in Washington, DC. The Forum's programs encompass current and emerging political, security, economic, business, and oceans policy issues through analysis and dialogue undertaken with the region's leaders in the academic, government, and corporate areas. Founded in 1975, it collaborates with a broad network of research institutes from around the Pacific Rim, drawing on Asian perspectives and disseminating project findings and recommendations to opinion leaders, governments, and members of the public throughout the region.

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The views expressed in this report represent personal impressions and reflections of participants; they do not necessarily represent the position of their respective governments, organizations, and institutes.

Key Findings and Recommendations
Nuclear Energy Experts Group
October 29-30, 2014, Bangkok, Thailand

The Pacific Forum CSIS, in partnership with Chulalongkorn University's Department of Nuclear Engineering, and with the support of the Carnegie Corporation of New York and the Nuclear Threat Initiative, held a Nuclear Energy Experts Group (NEEG) meeting in Bangkok, Thailand, on October 29-30, 2014. It brought together 29 specialists from 19 countries from throughout the Asia-Pacific and beyond, all attending in their private capacity. The participants joined two days of off-the-record discussions on nuclear governance, the role of the Nuclear Security Summit (NSS) process, gaps and limitations in nuclear governance, technical approaches to improving management of civilian nuclear activities, and regional approaches to improving nuclear safety and security governance. Participants also visited the Thai Research Reactor 1/Modification 1 (known as the TRR-1/M1), which is operated by Thailand's Office of Atoms for Peace. At the reactor facility, they received briefings from various scientists and technical staff from the facility. Key findings from the meeting include:

Nuclear security governance is one piece of the broader nuclear-governance puzzle. A holistic approach to nuclear governance that includes nuclear safety, security, and safeguards is needed.

The institutionalization of nuclear governance has been fragmented and unsystematic. While a piecemeal approach wisely recognizes that it takes time to change attitudes on such sensitive topics, it ignores the urgency of working to better prevent, detect, and respond to a nuclear accident or incident.

Nuclear security mostly relies on voluntary obligations. There is no comprehensive international legal architecture allowing for evaluation of security consistency and competency across borders. There is no requirement for peer review or even communication among states about their security strategy and practices.

NSS process has helped strengthen nuclear-security rules and norms since its launch in 2010. It is unclear, however, how momentum will be sustained after the summit of 2016. NSS stakeholders and interested parties should develop a strategy to ensure that progress continues. Nuclear security, after all, is a journey, not a destination.

Sharing information on good standards, practices, and technologies is one way to improve nuclear security; another is to share bad practices to learn from mistakes. In recent years, progress has been made via discreet, behind-closed-doors initiatives. Yet, as a general rule, and unlike in the nuclear-safety domain, states have been reluctant to share information for national security reasons.

The Nuclear Security Summit process has not addressed important areas of concern. The security of weapon-usable nuclear materials, which accounts for 85 percent of nuclear materials worldwide, is not discussed. Other areas, such the use of highly-enriched uranium (HEU) in naval reactors, are also ignored. States need to better balance national security and global responsibility.

Different countries and regions face different nuclear threats and the burden falls on states to address these threats. National threat assessments are needed to scope the problem, establish priorities, and guide policy in each state. Assessments should encompass at least three management areas: facilities that use/store nuclear and radioactive materials, transport of these materials, and nuclear accident/incident response and mitigation.

In the Asia-Pacific, priority should be given to the management of radioactive source materials outside the nuclear power industry. All states in the region possess such materials and have a vested interest in learning how to manage them in safe and secure manner. In particular, there is a need for better understanding of the processes involved in (and the implications of) the conversion of research reactors and isotope production facilities from the use of HEU to low-enriched uranium (LEU), and the removal and disposal of excess nuclear and radioactive materials.

Overemphasis on the safe and secure management of nuclear energy programs should be avoided. Only a handful of regional states (in Northeast Asia and South Asia) have nuclear energy programs and, while many others (in Southeast Asia) have expressed interest, very few nuclear power plants will be operational in the near future.

Nevertheless, in-depth discussions are needed to better inform nuclear energy users and aspirants of their choices. Incentives for states interested in nuclear energy to refrain from developing indigenous enrichment and reprocessing facilities or to explore alternative options would be helpful.

There is both optimism and confusion about the role that the newly-launched ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM) could play in strengthening nuclear governance in the Asia-Pacific. Preliminary discussions suggest that it will solely be a technical body and that, unlike the European Atomic Energy Community (EURATOM), it will not guide policy. A comprehensive assessment of its goals and objectives is needed to better understand how it can best contribute to top-down nuclear governance in the region.

The nuclear security centers of excellence in Japan, the Republic of Korea, and China – and others emerging elsewhere in the Asia-Pacific – can help build momentum for better bottom-up nuclear governance. While their focus has been on training and education, the centers could expand their mandate to include research and development and policy recommendations. They should also coordinate their activities to avoid duplication and take advantage of economies of scale. However, while there is general agreement among regional stakeholders that they represent an opportunity for cooperation in the Asia Pacific, there is no consensus on the division of labor among the centers.

Participants generally supported the idea of conducting a table-top exercise featuring a nuclear accident/incident in Southeast Asia at the next NEEG meeting. In addition to raising awareness about the challenges involved in such accidents/incidents, this exercise would help tease out the gaps and limitations in the response of regional states.

Enhancing Nuclear Governance in the Asia Pacific

A Conference Report of the Nuclear Energy Experts Group Meeting
October 29-30, 2014, Bangkok, Thailand
By David Santoro and Carl Baker

As part of an effort to institutionalize nuclear governance in the Asia Pacific, the Pacific Forum CSIS, in partnership with the Department of Nuclear Engineering at Chulalongkorn University, and with the support of the Carnegie Corporation of New York and the Nuclear Threat Initiative, held a Nuclear Energy Experts Group (NEEG) meeting in Bangkok, Thailand, on Oct. 29-30, 2014. It brought together 29 specialists from 19 countries from throughout the Asia Pacific and beyond, all attending in their private capacity.

The participants joined two days of off-the-record discussions on nuclear governance, technical approaches to improving management of civilian nuclear activities, and regional approaches to improving nuclear safety and security governance. Participants also visited the Thai Research Reactor-1/Modification 1 (known as the TRR-1/M1), which is operated by Thailand's Office of Atoms for Peace. At the reactor facility, they received briefings from various scientists and technical staff from the facility.

Nuclear Governance

Manpreet Sethi (*Centre for Air Power Studies, India*) explained that nuclear governance has been built over the past five decades, mainly in response to emerging threats. With renewed interest in nuclear energy worldwide, there is today increased emphasis on nuclear safety, security, and the risks of proliferation to state and non-state actors. Yet, while it has become customary to address safety, security, and safeguards issues together, management of the first two has proven to be more difficult because implementation of guidelines is voluntary and there are no mandatory monitoring and verification standards.

Over the past decade, much has been invested to raise awareness on nuclear security threats. Yet, the nuclear security governance framework remains incomplete. It includes international agreements (such as the Convention on the Physical Protection of Nuclear Material (CPPNM) and the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT)), United Nations (UN) Security Council resolutions, advisory guidelines of the International Atomic Energy Agency (IAEA), multilateral partnerships (such as the Global Initiative to Combat Nuclear Terrorism), ad hoc cooperative measures (such as the Proliferation Security Initiative), and domestic laws and regulations. Most of these mechanisms are voluntary and do not include sanctions for noncompliance. The result is a fragmented approach that relies on voluntary obligations without mandatory international standards that would allow for effective evaluation of security consistency and competency across borders, and without any requirement for peer review or even communication among countries about security practices. Finally, there is no consensus on how to prioritize nuclear security in the context of national, regional, and global security considerations.

To improve the current governance framework, it is important to recognize that nuclear security is a journey, not a destination. In other words, it is an intrinsic problem and there is no ultimate solution that will eliminate the risks associated with utilization of nuclear and radioactive materials. The journey begins with the realization that integration of nuclear security standards into nuclear activities is paramount. This requires both "hard" and "soft" measures, i.e., treaties and conventions as well as the development of norms and a security culture. In this context, sharing detection and nuclear-forensics technologies among states as well as exchanges of good practices and experiences in enforcement would be useful, as would information-sharing to manage spent fuel and nuclear waste.

Sabar Bin Md Hashim (*Tenaga Nasional Berhad, Malaysia*) stressed that enhancing nuclear safety and security have become paramount in the Asia Pacific. Citing energy security as a core rationale, all Northeast Asian states are investing in nuclear power plants and Japan plans to restart some of its shut-down facilities. While there may be opportunities for cooperation in nuclear safety, technical challenges make it difficult because South Korea, Japan, and China use different technologies. More importantly, the tense diplomatic situation among the three has made cooperation difficult. He also noted that especially in Southeast Asia, it was important to ensure that radioactive materials are included in the framework of nuclear security governance.

The newly-established ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM) aims to facilitate information exchange and cooperation in the areas of nuclear safety, security, and safeguards among Southeast Asian states. The group has agreed to organize workshops and training courses on emergency preparedness and response as well as promote nuclear security culture and management during 2015-2016. But it is unclear what contribution ASEANTOM will make to improve nuclear governance in Southeast Asia because its central purpose has not yet been clearly defined. Nevertheless, states are making progress in promoting better nuclear security awareness and improving management capacity, especially in the case of Malaysia, Vietnam, Indonesia, and Singapore. In September 2014, Indonesia launched the Center to Promote Nuclear Security Culture, which aims to enhance nuclear security culture both in Indonesia and, ultimately, in Southeast Asia.

Participants discussed the urgent need to conceptualize a framework for nuclear governance. Understanding the scope of the problem is the first step. For some, it has been conceptualized as a part of national security, but it has to be more than that. While the current global nuclear agenda has tended to promote greater nuclear security, Asian states have stressed nuclear safety as their primary concern. It was suggested that nuclear security governance is just one piece of the broader nuclear governance puzzle. There was general agreement that progress toward greater nuclear security is critical, but that success could only be achieved with a holistic governance framework that includes nuclear security, nuclear safety, *and* nuclear safeguards.

To be effective, the institutionalization of nuclear security governance has to be both top-down (multilateral agreements and conventions, along with national standards, rules, and

regulations) and bottom up (building capacity to implement and industry acceptance of these mechanisms). Piecemeal approaches can be advantageous because it takes time to change attitudes on such sensitive topics, but better prevention, detection, and response capabilities with respect to a nuclear accident or incident demands a more systematic approach. Accordingly, there were several suggestions on how to improve governance through cooperation in building both multilateral governance mechanisms as well as building capacity through sharing good practices and providing training and management skills within the nuclear industry. In the end, full institutionalization will require political will at the global, regional, and national level.

Role of the Nuclear Security Summit Process

Chang-Hoon Shin (*Asan Institute for Policy Studies, South Korea*) pointed out that nuclear terrorism is a low-probability event with high consequences. He further highlighted that the Nuclear Security Summit (NSS) process was designed to respond to this threat and help strengthen the ad hoc and piecemeal nuclear-security regime. Since its establishment in 2010, the NSS process has helped secure 6,000 tons of vulnerable nuclear material. Participating states have also brought forward initiatives and "gift baskets" to strengthen protection over both nuclear and radioactive materials.

However, the current nuclear security regime lacks key elements. In particular, the scope of nuclear security has not been defined. No clear vision or goals have been established. There is no commonly accepted international standard for the development of a national nuclear-security regime. More importantly, the NSS process is not universal and not all states recognize the IAEA's role and authority in developing nuclear security guidelines. [Of note, the NEEG meeting took place before Russia's decision not to participate in the 2016 NSS.] Given these circumstances, priorities between now and 2016 should be to make the nuclear-security regime as comprehensive as possible, share information on nuclear-security implementation to help build confidence, implement measurable good practices and standards, create a sustainable mechanism for continuous progress, and offer plans for eliminating civilian highly-enriched uranium (HEU) and reducing plutonium.

Andrew Stuchbery (*Australian National University*) stressed that the NSS process has focused predominantly on preventing, detecting, and responding to the theft of HEU, plutonium, and other nuclear and radiological materials and to sabotage, unauthorized access, and other malicious acts against relevant facilities. Major technical initiatives have included the removal and consolidation of facilities using nuclear and radiological materials, reactor conversion or shutdown, and research and development in detection and forensics, among others. Beyond these initiatives, many investments have been made in training and education. The Australian National University's Department of Nuclear Physics, for instance, has played its part in training the next generation of nuclear security and safeguards specialists, notably by offering a new Master of Nuclear Science program.

During the discussion, participants highlighted the unique features of the nuclear security regime in comparison with the nuclear safeguards and nuclear safety regimes. As

discussed during the first session, the nuclear security regime mostly relies on voluntary obligations, lacks a comprehensive international legal architecture, and has no mechanism for peer review or even communication among states about current policies and practices. While the NSS process has helped strengthen nuclear security rules and norms since its launch in 2010, it is unclear how momentum will be sustained after the summit of 2016. It was recommended that NSS stakeholders and interested parties should develop a strategy to ensure that progress continues indefinitely. Several participants echoed Manpreet Sethi's statement at the first session that nuclear security is a journey, not a destination.

One way to strengthen nuclear security is through information-sharing on good standards, practices, and technologies. Significantly, a few participants noted that sharing good *and* bad practices could be beneficial. In recent years, progress has been made via discreet, behind-closed-doors initiatives. Yet, as a general rule, and unlike in the nuclear-safety domain, states have remained reluctant to share information for national security reasons.

Gaps and Limitations in Nuclear Governance

Jorshan Choi (*University of California, Berkeley*) began by pointing out that while nuclear safety aims to prevent nuclear accidents, nuclear security is intended to prevent nuclear terrorism and nuclear safeguards to prevent nuclear proliferation. The three goals are mutually-reinforcing, however, and should be viewed and approached holistically to enhance nuclear governance, as was discussed during the previous sessions.

There are numerous gaps and limitations in nuclear governance. For instance, the need to account not only for system failure and natural disasters, but also for human error and malicious activities is a challenging task. The continuing use of HEU in medical isotope production is another important challenge to nuclear safety and security. Progress has been made to strengthen nuclear forensic capabilities worldwide, but it has been slow, and many states continue to resist cooperation. Fortunately, in Asia, the Japanese, South Korean, and Chinese nuclear-security centers of excellence can help address many of these challenges. Ideally, each would opt to focus on one specific area. While the Japanese center could focus on nuclear safeguards and material control and accounting, the South Korean center could concentrate its activities on emergency preparedness and response, and the Chinese center could make strategic trade controls its specialty.

Suharyanta Suharyanta (*BAPETEN, Indonesia*) gave an overview of Indonesia's nuclear-security regime. BAPETEN is the country's nuclear energy regulatory agency, an independent national authority in charge of nuclear safety, security, and safeguards. Indonesia's facilities include BATAN, its national nuclear energy agency, which includes a multipurpose reactor and two TRIGA-type reactors, and several other radiation and radioactive material facilities (hospitals and industries). Indonesia's nuclear-security regime provides physical protection for these facilities through domestic laws and regulations. The country has also ratified the CPPNM and its amendment, as well as the ICSANT.

Key gaps in Indonesia's nuclear-security regime include the lack of a Nuclear Security Act, which is currently being drafted. Also needed is the installation of additional radiation portal monitors in seaports. More broadly, the Indonesian government recognizes the need to enhance training and education in nuclear safety, security, and safeguards. It has also undertaken initiatives to develop a stronger nuclear security culture. Efforts are being made to address these gaps, but more are needed.

Robert Finch (Sandia National Laboratories) provided an overview of Sandia National Laboratories' technically-based regional cooperation programs. They include collaborations with foreign researchers to develop concepts of technical cooperation in nuclear safety, security, and safeguards and to formulate technically-informed and tailored policy solutions to address specific regional challenges focused on concerns about nuclear-energy expansion and underlying motivations for proliferation.

Sandia National Laboratories has worked with academic organizations (notably Monterey Nuclear Security Fellows in California and South Asian graduate students) and the Jordan Atomic Energy Commission, among others. It has participated in the development of the Gulf Nuclear Energy Infrastructure Institute, the Egypt Center of Excellence on Radioactive Waste Management, and the Radiation Monitoring Cross Calibration (to improve nuclear measurement and monitoring capabilities among Middle Eastern and North African countries). Its International Nonproliferation Export Control Program has also helped develop/enhance strategic trade controls in numerous countries. It has also done work in several other areas, ranging from research on nuclear waste repository to nuclear reactor safety and security. Its expertise and experience make it a valuable organization to partner with for Asia-Pacific countries interested in building capacity to enhance nuclear governance at the institutional and national level.

The discussion highlighted that the current nuclear security agenda does not address important areas of concern. For starters, the security of weapon-usable nuclear materials, which accounts for no less than 85 percent of nuclear materials worldwide, is not discussed. Other areas, such the use of HEU in naval reactors, are also ignored. Progress in these areas will require states to better balance national security and global responsibility. At the moment, however, there is no indication that solutions will be brought to these problems in the near future.

The need to tailor solutions to specific problems and regions/countries was also noted. As many participants pointed out, different countries/regions face different nuclear threats. Given that there is no international legal architecture on nuclear governance framework, however, the onus is on states to address these threats, and to do so as they see fit. As a first step, participants recommended that states should draw up national threat assessments. The latter are needed to scope the problem, establish priorities, and guide policy in each state. As a rough guide, assessments should organize the problem in three main management areas: facilities that use/store nuclear and radioactive materials, transport of these materials, and nuclear accident/incident response and mitigation.

Technical Approaches to Improving Management of Civilian Nuclear Activities

With a shift in focus to promoting nuclear security at civilian nuclear facilities, Atsuyuki Suzuki (*University of Tokyo and Japan Atomic Energy Agency*) stressed that improved management begins with the steady creation of incentives for states to forego the development of independent enrichment and reprocessing capabilities. On the front-end of the nuclear fuel cycle, the priority is to retain the current strong competitive market of using gas-centrifuge technology, which seems to be most effective option.

As of today, no incentives are available to deal with back-end issues and it is essential to create some, both in the short and long terms. At present, in the short-term, interim storage on-site or off-site is the only option for states. Cooperation and transparency is needed to ensure that this is done in a safe and secure manner. Significantly, the establishment of regional or international storage facilities would be the most effective way to manage the problem. As a first step, the establishment of a regional network of spent-fuel management facilities (which would include mutual inspections coordinated with IAEA inspections) would be most useful. In the long-term, states will have to commit to geological disposal, despite the well-known challenge of achieving public/political acceptance.

Teofilo Leonin (*Philippine Nuclear Research Institute*) gave an overview of how the Philippines manages its nuclear activities. Located in Manila, the Philippines Nuclear Research Institute (PNRI) has a dual mandate to promote the peaceful applications of atomic energy and to license and regulate the use of radioactive materials.

Two facilities are under safeguards in the Philippines: the Philippines Research Reactor (PRR-1), located at PNRI, and the Bataan Nuclear Power Plant (BNPP). Should the country decide to operate a nuclear power plant, the front-end of the nuclear fuel-cycle would be sourced through foreign expertise, as was planned for the BNPP in the 1970s. Spent fuel would be stored on-site until the government makes a decision on how to manage it otherwise. The Philippines currently does not intend to engage in reprocessing activities. Regarding waste management, PNRI has identified a suitable site within the Philippines to serve as a national rad-waste repository center.

The two presentations led to a discussion on what Asia-Pacific states should prioritize. There was general agreement that priority should be given to the management of radioactive source materials because all regional states possess such materials and have a vested interest in learning how to manage them in safe and secure manner. In particular, there is an urgent need for better understanding of the processes involved in (and the implications of) the conversion of research reactors and isotope production facilities from the use of HEU to low-enriched uranium (LEU), and the removal and disposal of excess nuclear and radiological materials.

By contrast, overemphasis on the safe and secure management of nuclear energy programs should be avoided. After all, only a handful of regional states (in Northeast Asia and South Asia) have nuclear energy programs and, while many others (in Southeast

Asia) have expressed interest, very few nuclear power plants will be operational in the near future. Still, in-depth discussions are needed to better inform nuclear-energy users and aspirants of their choices. Many participants agreed that the creation of incentives to dissuade states interested in nuclear energy from developing indigenous enrichment and reprocessing facilities was a critical first step. Options to better deal with both front-end and back-end issues of the nuclear fuel-cycle also need to be identified and discussed more systematically.

Regional Approaches to Improving Nuclear Safety and Security Governance

Jamal Khaer Ibrahim (*Malaysia Nuclear Power Corporation*) gave an overview of current regional approaches to civilian nuclear activity management in Southeast Asia. There are three pertinent areas under ASEAN: the political-security pillar, which includes the Southeast Asian Nuclear-Weapon-Free Zone (SEANWFZ, or Bangkok Treaty) and ASEANTOM; the energy pillar, which focuses primarily on nuclear safety; and the science and technology pillar. In Southeast Asia, the safeguards regime is managed by individual states and the IAEA. The Agency also cooperates with regional states on a variety of programs, including technical assistance, research and development, nuclear safety, and nuclear education and training. Other forms of regional cooperation take place outside the IAEA framework, such as the work of the Forum on Nuclear Cooperation in Asia.

Southeast Asian states are mainly interested in radioactive source material management because all use such material for medical or industrial purposes. The basis for radioactive source material management is the IAEA Code of Conduct on the Safety and Security of Radioactive Sources and the IAEA Guidance on the Import and Export of Radioactive Sources, which most regional states have adopted in their respective national safety and security regulations. But more efforts are needed to strengthen current standards and the assistance provided by Australia, the European Union, and the United States should be enhanced.

Sharon Squassoni (*Center for Strategic and International Studies*) explained that nuclear energy growth in Asia will increase stocks of nuclear materials in the region, presenting numerous safety, security, and nonproliferation challenges.

In Asia, the range of nuclear capabilities is diverse. A handful of states have large (and growing) nuclear power programs: Japan, China, South Korea, India, and Pakistan. Other Asian states, such as Vietnam, are also committed to developing nuclear power programs, and all regional states use radioactive source materials for medical or industrial purposes. The challenges differ for nuclear technology holders and aspirants. As a nuclear technology holder and a nuclear weapon state, China has military stocks and fuel cycle plans that may increase plutonium stocks. Japan possesses stocks of separated plutonium without a credible plan for use, and the future of its fast-reactor program is uncertain. South Korea, for its part, has plans to develop enrichment and reprocessing capabilities, and numerous questions remain about how Seoul intends to manage them. Finally, aspiring nuclear energy states are focused on building the necessary physical and

intellectual nuclear infrastructure for the safe and secure operation of nuclear power plants, which is a long and challenging process.

Regional solutions can promote better management of nuclear energy growth in Asia, be it through front-end fuel supply, training of key personnel, or the development of a multinational back-end repository. Asian states should also strive to develop independent nuclear regulatory agencies for safety and security. Another important goal is to limit the amount of weapon-usable nuclear material by discouraging the use of HEU and plutonium in civilian nuclear activities and, pending the launch of negotiations for a fissile-material cut-off treaty, by expanding the moratorium on fissile material production for nuclear weapons beyond France, Russia, the United Kingdom, and the United States to also include China, India, Israel, North Korea, and Pakistan.

More generally, maintaining "regime sustainability" is paramount – the ability of the nuclear security framework to continually strengthen the weakest links, be it at the national, regional, or global levels. As the epicenter of nuclear energy growth, Asia's role is critical to enhance regime sustainability, and the existing and emerging nuclear security centers of excellence are the best organizations to achieve this.

Andrew Newman (*Nuclear Threat Initiative*) discussed good practices in managing the nuclear fuel cycle. He began by stressing that the current regime is not sustainable because states in full compliance with the Nuclear Nonproliferation Treaty can legally engage in activities that could contribute to a nuclear weapon program, namely the development of enrichment and reprocessing capabilities. The problem is technical (because of the dual-use nature of enrichment and reprocessing capabilities), organizational (because determining noncompliance with safeguards agreements is a difficult process), and political (because states rarely agree on a determination of noncompliance). The development of the front-end and back-end of the nuclear fuel cycle is politically charged for different reasons. While questions of rights and sovereignty persist at the front-end, several challenges continue to dominate at the back-end because very few states have been willing and able to take responsibility for themselves, let alone others, with respect to radioactive waste management.

In this context, a new approach is needed. The problem is that while there is general agreement among states to protect against the spread of nuclear weapons and acts of nuclear terrorism, there is no consensus on how to do so and on the priority this should receive. Solutions must be based on economic incentives (i.e., not disrupt the market), political incentives (i.e., be acceptable both by suppliers and consumers), technical incentives (i.e., leverage technology where possible), and institutional incentives (i.e., create sufficiently high barriers against proliferation and nuclear terrorism).

The most basic premise for rethinking fuel cycle management is that the risk of misuse can be reduced by shifting away from national control. Yet, in and of itself, changing control or ownership structures would be insufficient. A good-practice approach among key stakeholders is needed. The core tenets of this approach would include a commitment not to increase production of weapon-usable material, eliminate such material wherever

possible and require justifications for facilities that perpetuate production (unless there is unmet commercial market demand), reduce the risks posed by existing stockpiles, and recognize the need for all countries to find spent fuel and high-level waste solutions at the regional and international levels. Moreover, this new system should minimize the possibility of sensitive materials/equipment being diverted to illicit use by protecting those materials during transit and by minimizing the time between material production and use. The system should also ensure that governments and industry benefit more from adhering to their commitments than from breaking them. Early detection of diversion is another critical element, as is the need to preserve and create opportunities for other countries to invest in commercial ventures.

This session's discussion concentrated on options for Asia-Pacific states to strengthen nuclear governance at the regional level. There was broad agreement that both top-down and bottom-up approaches are needed. In the top-down approach, participants expressed both optimism and confusion about the role that ASEANTOM could play in strengthening nuclear governance in the Asia Pacific. Preliminary discussions suggest that it will solely be a technical body and that, unlike the European Atomic Energy Community (EURATOM), it will not guide policy. A possible next-step for this dialogue is to conduct a comprehensive assessment of ASEANTOM's goals and objectives to better understand how it can best contribute to top-down nuclear governance in the region.

The nuclear security centers of excellence in Japan, the Republic of Korea, and China – and others emerging elsewhere in the Asia-Pacific – are grassroots organizations intended to build momentum for better bottom-up nuclear governance. While their focus has been on training and education, several participants argued that the centers should expand their mandate to include research and development and policy recommendations. Another recommendation was that they should also coordinate their activities to avoid duplication and take advantage of economies of scale. However, while there was general agreement among regional stakeholders that they represent an opportunity for cooperation in the Asia Pacific, there is no consensus on the division of labor among the centers and recognition that competition between them is unavoidable (but not necessarily harmful).

Wrap-Up and Recommendations

Anton Khlopkov (*Center for Energy and Security Studies, Russia*) summarized the meeting's key conclusions and made recommendations for next steps. He began by pointing out that all HEU has been now removed from Southeast Asia, which constitutes a major success for the region. But several challenges remain. For starters, nuclear governance norms and standards have not been defined. Only non-systematic steps have been made to improve nuclear governance. There is no vision or strategy, and the NSS process can only be a partial response to this problem. In Asia, ASEANTOM and the nuclear security centers of excellence are promising organizations to enhance nuclear governance, but without a broader vision and strategy, the prospects for substantial progress are dim.

Participants suggested that this dialogue can help conceptualize and institutionalize nuclear governance in the Asia Pacific. While this can be done through targeted presentations and papers in a workshop format, a table-top exercise featuring a nuclear accident or incident in Southeast Asia could yield interesting findings and help draft a course of action to improve nuclear governance in the region. In addition to raising awareness of the challenges involved in such accidents/incidents, this exercise would help tease out the gaps and limitations in the response of regional states, highlighting where progress needs to be made.

Appendix A

Nuclear Energy Experts Group Meeting (NEEG)
October 29-30, 2014, Bangkok, Thailand

Agenda

Wednesday, October 29, 2014

8:30 **Registration**

9:00 **Session 1: Nuclear Governance**
This session will look at the state of play of the nuclear safety and security regimes. What are the objectives of these regimes? What have they achieved? What are their gaps and limitations? What are the priorities to strengthen them, especially in the Asia-Pacific region? [Discussions about the Nuclear Security Summit process should be withheld until Session 2.]

Moderator: Carl Baker
Speakers: Manpreet Sethi
Sabar Bin Md Hashim

10:30 **Coffee Break**

10:45 **Session 2: Role of the Nuclear Security Summit Process**
This session will focus on the role of the Nuclear Security Summit process. How much progress has it made since it was initiated in 2010, especially in the Asia-Pacific region? Specifically, what has the 2014 Summit achieved? What are the priorities between now and the next Summit in 2016? What are the options after the 2016 Summit? What are the implications for the Asia-Pacific region?

Moderator: Sharon Squassoni
Speakers: Chang-Hoon Shin
Andrew Stuchber

12:15 **Lunch**

13:45 **Session 3: Gaps and Limitations in Nuclear Governance**
This session will examine the gaps and limitations that exist to prevent, detect, and respond to nuclear accidents and incidents. What are the gaps in relation to nuclear facility management, transport of nuclear materials, and information management? Are there other gaps?

Moderator: Min Lee
Speakers: Jorshan Choi
Suharyanta Suharyanta

15:15 **Coffee Break**

15:30 **Session 4: Technical Approaches to Improving Management of Civilian Nuclear Activities**

This session will explore the technical approaches to improving management of civilian nuclear activities. What is the range of technical choices available to better manage the front and back ends of the nuclear fuel cycle? How can R&D trends be reconciled with international nuclear safety and security standards? What is the best way to manage fuel supply and radioactive source materials?

Moderator: Andrew Stuchbery
Speakers: Atsuyuki Suzuki
Teofilo Leonin
Robert Finch

17:00 **Session adjourns**

18:30 **Dinner**

Thursday, October 30, 2014

9:00 **Session 5: Regional Approaches to Improving Nuclear Safety and Security Governance**

This session will examine regional approaches to improving nuclear governance in the Asia-Pacific region. What are the roles for multilateral cooperation? What roles can the ASEAN Regional Forum play? The ASEAN Network of Regulatory Bodies on Atomic Energy? What role should the established and emerging nuclear security centers of excellence play?

Moderator: Carl Baker
Speakers: Jamal Khaer Ibrahim
Sharon Squassoni
Andrew Newman

10:30 **Coffee Break**

10:45 **Session 6: Wrap-Up and Recommendations**

This session will summarize the meeting's key findings and make policy recommendations. What is the way forward for nuclear governance? Specifically, what should it look like in the Asia-Pacific region? What can the region achieve by the next Nuclear Security Summit in 2016 and beyond? What should be the priorities?

Moderator: Carl Baker
Speaker: Anton Khlopkov

12:15 **Lunch**

13:45 **Site Visit – Thai Research Reactor-1/Modification 1 (TRR-1/M1)**

18:30 **Farewell Dinner**

Appendix B

Nuclear Energy Experts Group Meeting (NEEG)
Bangkok, Thailand | October 29-30, 2014

Participant List

1. **Carl BAKER**
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5. **Denia DJOKIC**
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7. **Francesca GIOVANNINI**
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8. **Jamal Khaer IBRAHIM**
   Director
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