

NUCLEAR SAFETY AND SECURITY CULTURE: POWERING NUCLEAR GOVERNANCE IN EAST ASIA RSIS ROUNDTABLE AT THE 10TH SINGAPORE INTERNATIONAL ENERGY WEEK

Event Report
27 October 2017

Event Report

NUCLEAR SAFETY AND SECURITY CULTURE:

**POWERING NUCLEAR GOVERNANCE IN EAST ASIA
RSIS ROUNDTABLE AT THE 10TH SINGAPORE
INTERNATIONAL ENERGY WEEK**

**27 October 2017
MBS Expo and Convention Centre
Singapore**

Organised by:

The Centre for Non-Traditional Security Studies (NTS Centre),
S. Rajaratnam School of International Studies (RSIS),
Nanyang Technological University (NTU),
Singapore

Rapporteur:

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This report summarises the proceedings of the RSIS Roundtable as interpreted by the rapporteur. This report does not necessarily reflect the views of RSIS.

Recommended citation

RSIS' Centre for Non-Traditional Security Studies (NTS Centre), Nuclear Safety and Security Culture: Powering Nuclear Governance in East Asia, 27 October 2017 (Report, Singapore: RSIS' Centre for NTS Studies, 2018)

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EXECUTIVE SUMMARY



(from left) Dr Phiphat Phruksarojanakun, Dr Su Jin Jung, Ambassador Ong Keng Yong, Dr Claude Guet, Ms Sabariah Bt Kader Ibrahim, Dr Mely Caballero-Anthony, and Dr Alvin Chew

RSIS, in collaboration with the Energy Market Authority of Singapore, organised a roundtable on “*Nuclear Safety and Security Culture: Powering Nuclear Governance in East Asia*” at the 10th Singapore International Energy Week on 27 October 2017.

Roundtable speakers included **Dr Phiphat Phruksarojanakun**, Head of International Co-operation Section, Office of Atoms for Peace, Thailand; **Ms Sabariah Bt Kader Ibrahim**, Head of International Training Sector, Nuclear Malaysia Training Centre of Malaysia Nuclear Agency; **Dr Alvin Chew**, Adjunct Fellow, RSIS; **Dr Claude Guet**, Programme Director at Energy Research Institute at NTU and Senior Advisor to the CEO of CEA (French Alternative Energies and Atomic Energy Commission); and **Dr Su Jin Jung**, Manager of Strategy and Performance Department, Korea Institute of Nuclear Safety.

The speakers emphasised that the majority of past nuclear incidents, such as the 2011 Fukushima nuclear disaster, occurred because of human errors and management gaps, that is, a weak nuclear safety-security culture. The risks associated with nuclear energy do not originate from the technology itself but from the mindsets, attitudes, and behaviours of those who are

involved in the operation and regulation of nuclear facilities and radioactive materials. The discussions therefore focused on strengthening nuclear safety-security culture in Southeast Asia and the lessons learnt from South Korea and France. The roundtable also identified various national and regional programmes that promote a nuclear safety-security culture among radiation workers and regulators and enhance nuclear energy governance in the region.

Session 1 accentuated the importance of developing the nuclear safety-security culture in Southeast Asia. Several countries in the region are interested in adding nuclear power to their future energy mix. They are also using radioactive materials for various civilian applications in hospitals and industries, among other uses. Regulatory policies are being revised in several ASEAN member states to ensure a consistent and institutionalised approach to the cultivation of a safety-security culture. The roundtable also underscored the role of the State in establishing nuclear education and training programmes to deepen a safety-security culture. The ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM) is spearheading regional cooperation on nuclear safety and security capacity-building. However, multiple challenges remain in the region such as lack of funding support for implementation of capacity-building projects, varying degrees of knowledge and expertise among ASEAN member states, lack of well-trained staff and infrastructure, and weak commitment from policymakers down to the technical staff.

Session 2 served as a platform to highlight the experiences of France and South Korea, which have been harnessing nuclear energy for decades. Both countries have drawn on the lessons of past nuclear incidents and placed more attention on strict regulatory inspections of facilities in order to identify management gaps. Regular training workshops for nuclear staff and managers are also conducted to promote a safety-security culture. Given the long history of nuclear energy in South Korea and France, both showcase three best practices in terms of developing a nuclear safety culture and a nuclear security culture. These are: (i) a comprehensive nuclear policy framework; (ii) a proactive and independent regulatory body; and (iii) holistic nuclear education and training programmes.

SESSION 1

NUCLEAR SAFETY-SECURITY CULTURE IN SOUTHEAST ASIA



(from left) Ambassador Ong Keng Yong, Dr Phiphat Phruksarojanakun, Ms Sabariah Bt Kader Ibrahim, and Dr Alvin Chew

What is a Safety-Security Culture?

An important lesson from the 2011 Fukushima nuclear disaster is the need to have broader perspectives on unthinkable events and unforeseen circumstances. It is necessary for nuclear staff, managers and emergency responders to be prepared for such contingencies and sudden developments. Human errors such as complacency and the lack of critical thinking have been identified as key contributors to the Fukushima nuclear disaster. Yet, the nuclear industry has focused only on technological improvements, leaving out the need to cultivate a nuclear safety and security culture. Nuclear power and utilisation of radioactive materials for non-power applications do not merely involve technological aspects.

The International Atomic Energy Agency (IAEA) defines nuclear safety culture as “the assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance.”

Meanwhile, nuclear security culture is defined by the IAEA as “the assembly of characteristics, attitudes, and behaviours of individuals, organisations and institutions which serves as a means to support and enhance nuclear security.” These definitions highlight the importance of human factors, such as attitudes, beliefs and behaviours, in upholding nuclear safety and security.

While both nuclear safety and nuclear security consider the risk of inadvertent human error, nuclear security places additional emphasis on deliberate acts that are intended to cause harm. The principal shared objective of security culture and safety culture is to contain the risks resulting from the failure to manage nuclear materials and associated facilities that handle such materials. This objective is largely based on common principles such as critical thinking, accountable workers and managers, high priority to safety and security, two-way communication between employees and managers, a learning culture, and top management commitment to safety and security. There are instances wherein the differences between safety and security requirements need to be acknowledged. On the one hand, since nuclear security deals with deliberate acts, security culture therefore requires confidentiality of information to deter malicious acts. On the other hand, safety culture encourages sharing of information due to its overriding concern for transparency. Nonetheless, safety culture and security culture overlap, co-exist and reinforce each other.

A safety-security culture cannot be instilled and cultivated instantly because three essential elements need to be developed first. These are: (i) beliefs and attitudes, (ii) management systems, and (iii) behaviours. Firstly, one must have a strong belief that risks and threats do exist and therefore safety and security have to be upheld at all times. Without strong beliefs and attitudes, an effective nuclear safety-security culture will not exist. Secondly, a system of management must be put in place to manage expectations, requirements and standards for the conduct of work and training among staff and managers. Thirdly, the strength of a nuclear safety-security culture of an organisation is observable in the behavioural patterns of its personnel which can be improved by continual learning, self-assessment, and application of best practices and lessons learnt.

Significance for Southeast Asia

As countries look for additional clean sources of energy to help mitigate climate change, nuclear power may be included in the energy mix of Southeast Asia after 2030, according to the latest forecast by the IAEA. The *5th ASEAN Energy Outlook* of the ASEAN Centre for Energy predicts that nuclear power will be added to Southeast Asia's energy mix by 2035.

While Vietnam postponed its first nuclear power plant (NPP) project in 2016, Indonesia, Thailand, Malaysia, and the Philippines are in the process of building up their human resource capacity and amending legal and regulatory frameworks on the civilian use of nuclear energy. Myanmar, Laos and Cambodia have also recently signed nuclear cooperation deals with countries like China and Russia for financial, technological and training assistance. In April 2017, a pre-feasibility study, unveiled during the 7th Annual Meeting of the ASEAN Nuclear Energy Cooperation Sub-Sector Network, showed that many ASEAN member states are in favor of tapping nuclear energy for peaceful and commercial use.

Given that a safety-security culture may take years to deepen, potential newcomer countries in the region should now invest in it simultaneously with their ongoing human resource development programmes for nuclear energy. Even with the absence of NPPs in the region, radioactive sources are already widely used for non-power applications. For instance, Malaysia has 4,444 workplaces involved with ionizing radiation for medical, industrial and non-destructive testing applications. The number of radiation workers in Malaysia is steadily increasing, with around 21,436 radiation workers as of 2015. It is important that all of them demonstrate a strong nuclear safety-security culture. If their individual and collective commitments to safety and security are weak, radioactive materials can be accidentally leaked, stolen and used for malicious purposes, or released indiscriminately by non-state actors. The potential transboundary impact of nuclear accidents, radioactive leaks, and nuclear terrorism on affected populations, states, public health, environment, food safety, and economy should drive all ASEAN member states to deepen their safety-security culture through national and regional initiatives.

Role of the State

A key role of the State is to establish a legal and regulatory framework, which is one factor in the development of an effective safety-security culture. The State, through its legal and regulatory framework, has to define the (i) duties, responsibilities, and rights of various actors in the nuclear field; (ii) procedures for licensing nuclear facilities with adequate participation of the general public; and (iii) the means of regulatory control: rule making, safety evaluations, and inspections. Specifically for security culture, it is necessary for the State to establish general rules for authorised access to facilities and information, with the goal of securing sensitive information, radioactive materials, facilities and transport.

In Southeast Asia, several outdated national regulatory laws are being reviewed for amendments or have just been amended. For example, Thailand already passed its new regulatory law, the *Nuclear Energy for Peace Act of 2016*. It allows Thailand to formally ratify and comply with international conventions and treaties on nuclear safety, security and safeguards. This new law, in particular, establishes additional nuclear security and safeguards principles as well as regulatory control over radioactive materials, which were not covered by the old law.

In Malaysia, the *Atomic Energy Licensing Regulations of 2010, Sub-Regulations 15(8)* requires “the licensee or the employer to provide appropriate training, retraining and facilities for updating the skills and knowledge of their workers”. The Atomic Energy Licensing Board, which serves as Malaysia’s regulatory body, recognises that regulatory clarity is still needed in order to ensure a consistent approach to developing a safety-security culture. The regulatory body therefore intends to clarify its safety-security culture definitions and characteristics; update its guidelines on licensees’ self-assessments of their safety-security culture; and elucidate the regulatory body’s oversight role and the role of the licensees.

In this regard, Malaysia started participating in IAEA’s Occupational Radiation Protection Appraisals (ORPAS) in 2017. ORPAS promotes self-assessment, a radiation safety culture, and quality management systems. ORPAS review missions are conducted as an independent appraisal service or peer review in the field of radiation protection of workers. This appraisal service is an opportunity for Malaysia to have its regulatory framework and radiation protection regulations independently reviewed and evaluated based on international safety standards.

Education and Training

The State has the responsibility to develop national education and continuous training programmes on nuclear safety and security. Training and professional development are essential to the cultivation of norms and expected cultural behaviours in nuclear facilities. In addition, at all levels of an organisation, managers must ensure that training is provided to employees in order to develop skills and promote a safety-security culture.

The case of Malaysia clearly demonstrates the role of the State in nuclear education and training. Nuclear Malaysia Training Centre of the Malaysia Nuclear Agency (Nuclear Malaysia) has been providing training courses on radiological protection for more than 30 years and has extensive experience in developing training materials. Nuclear Malaysia offers 114

training courses, methods of training provision, course content and training infrastructure. In 2016, it trained around 2,845 participants from several sectors such as radiation safety and health (64.5 percent), medical X-ray (16.5 percent), non-destructive testing (10.1percent), and environmental safety and health (8.9 percent). Through training courses, radiation workers will be able to understand and apply the concept of radiation protection at workplace, aimed at continuously striving for a healthy, accident-free and environmentally sound workplace and community. International participants from Asia are also trained at Nuclear Malaysia every year. Hence, IAEA has recognised and designated Nuclear Malaysia as a regional training centre in radiation protection and nuclear safety.

Role of Regional and International Institutions

Providing education and training programmes is not just limited to States. Regional and international institutions, too, can offer human resource development and capacity-building assistance to States.

In Southeast Asia, the ASEANTOM has been driving regional cooperation on civilian nuclear capacity-building among ASEAN member states. Since its inaugural meeting in 2013, ASEANTOM has been addressing key challenges to nuclear safety and security such as lack of funding support to implement capacity-building projects, varying degrees of knowledge and expertise among ASEAN member States, lack of well-trained staff and infrastructure, and weak commitment from policymakers down to the technical staff. All of which may have an impact on how nuclear safety-security culture is cultivated in Southeast Asia. Hence, ASEANTOM conducts, throughout the region, expert missions/exchange programmes, workshops, and technical cooperation projects with international organisations to address such challenges.

For instance, ASEANTOM has reached out to Laos which does not have enough well-trained staff and regulatory infrastructure, especially for the regulation of radioactive materials. In 2017, ASEANTOM launched the *Lao PDR-Thailand Technical Cooperation Workshop on Strengthening Capacity-Building on Radiation Safety and Radioactive Measurement and Monitoring in the Environment*. It entails on-site training and expert missions by Thailand's regulatory body to help Laos establish its own regulatory infrastructure. ASEANTOM also organises annually the *Regional Workshop on Capacity-Building and Strengthening the Nuclear and Radiation Safety and Security Network in the ASEAN Region*, which includes 130 participants, lecturers, and speakers from ASEAN member states, South Korea, Japan and Taiwan.

Furthermore, global and regional institutions provide technical and funding assistance to ASEANTOM. For instance, ASEANTOM and the IAEA co-organise workshops, training courses, expert missions, and meetings under the *Technical Cooperation Project on Supporting Regional Nuclear Emergency Preparedness and Response in the Member States of ASEAN Region*. ASEANTOM and the European Union (EU) jointly manage a capacity-building project entitled *Enhancing Emergency Preparedness and Response in ASEAN: Technical Support for Decision Making*. These regional projects are aimed at enhancing the quality and coherence of decision-making within ASEAN following a radiological or nuclear emergency. Through ASEANTOM's regional projects and initiatives, with the generous assistance from the IAEA and the EU, it is hoped that a collective nuclear safety-security culture among ASEAN member states will begin taking root in the region.



Dr Phiphat Phruksarojanakun speaking about Thailand's and ASEANTOM's initiatives



Ms Sabariah Bte Kader Ibrahim explaining Malaysia's efforts to cultivate safety-security culture



Dr Alvin Chew discussing the importance of nuclear security culture

SESSION 2

LESSONS FROM SOUTH KOREA AND FRANCE



(from left) Dr Mely Caballero-Anthony, Dr Su Jin Jung, and Dr Claude Guet

Nuclear Power Development

In spite of the 2011 Fukushima nuclear disaster, nuclear power remains among the primary sources of energy in both South Korea and France. In fact, France gets about 75 percent of its electricity from nuclear energy (403.7 TWh) due to a long-standing policy on upholding energy security through harnessing reliable power sources. However, the share of nuclear power may be reduced to 50 percent by 2025, depending on the reliability of renewables by that time. France has 19 NPPs with 58 nuclear reactors operated by Electricite de France (EDF), the only operator of NPPs in the country. Meanwhile, South Korea operates 24 nuclear reactors located in five NPPs, providing about 30 percent of its power supply. South Korea's NPPs have installed capacity of 22,500 MWe. However, President Moon Jae-in vows to phase out nuclear energy over 45 years by stopping the construction of new planned reactors and prohibiting extension of the lifespan of existing NPPs.

Both South Korea and France have long experience and deep expertise in harnessing nuclear power. The French nuclear energy sector emerged in the 1970s in response to the first global oil crisis. The French nuclear complex is primarily composed of the French Nuclear Safety Authority, which acts as the independent regulatory body, the Institute of Radiological Protection and Nuclear Safety (IRSN), EDF as operator of all NPPs, AREVA as the constructor of NPPs, ANDRA as the nuclear waste management agency, relevant ministries, universities, and scientific research institutes. France also exports electricity from its NPPs to European countries, earning US\$3.5 billion annually.

South Korea's nuclear energy industry began in the 1970s with the construction of its first NPP. Since then, nuclear energy has been South Korea's primary source of energy given that it has limited renewable energy potential and it cannot import excess energy supply from its neighbouring countries in Northeast Asia. The major actors in the country's nuclear energy sector include an independent regulatory body—the Nuclear Safety and Security Commission (NSSC), which is assisted by the Korea Institute for Nuclear Safety (KINS) and the Korea Institute of Nuclear Non-proliferation and Control (KINAC). Korea Hydro and Nuclear Power Ltd serves as the sole operator of all NPPs. Other actors include research institutes, universities, and relevant ministries. South Korea is also an exporter of nuclear technology; its most recent project is the ongoing construction of the United Arab Emirates' first NPP.

Given the long history of nuclear energy in South Korea and France and their robust expertise in operating and regulating NPPs, both countries can offer several key lessons in terms of developing a nuclear safety culture and a security culture. Moreover, both countries have institutionalised the lessons of past nuclear incidents, particularly the need to strengthen a safety-security culture of employees, managers, and organisations that are involved in the nuclear industry. Three key lessons from South Korea and France are the following: (i) a comprehensive nuclear policy framework; (ii) a proactive regulatory body; and (iii) holistic education and training programmes.

A Comprehensive Nuclear Policy Framework

At the state level, there must be a policy framework on developing a nuclear safety-security culture. The South Korean model provides this best practice. South Korea's nuclear policy framework covers not just the technical aspects of nuclear safety and security but also the development of right mindsets and attitudes of the operators of nuclear facilities and licensees for radioactive sources. In 2001, the South Korean government issued the *Nuclear Safety*

Charter, which codifies top-level philosophy and principles, including the promotion of a nuclear safety culture in all nuclear-related organisations and facilities.

Meanwhile, the concept of security culture was developed much later due to lack of attention given to it in the past. Nonetheless, to demonstrate the national commitment on promoting a security culture, the regulatory body (NSSC) issued the *Nuclear Security Culture Implementing Guide* in 2013. It explains the importance of human factors and leadership in nuclear security and the interactions between safety culture and security culture. The implementing guide is intended for regulatory bodies, organisations, institutions and individuals involved in activities utilising nuclear energy or other radioactive materials. It is also for those who would be called upon to respond to a security incident involving radioactive materials. Consequently, all nuclear-related organisations, facilities, and agencies in South Korea have established their respective nuclear security action plans and organisational policies based on the implementing guide.

A Proactive and Independent Regulatory Body

The establishment, implementation, and maintenance of a robust nuclear safety-security culture are also dependent on a strong and independent regulator. The nuclear regulatory body must oversee the implementation of the policy framework, including the implementing guide, across all organisations. In South Korea, the regulatory oversight scope has been widened to cover human and organisational issues since 2013. This was triggered by the cover-up by the plant manager of a station blackout incident at Kori NPP and the falsification of safety documents for NPP components in 2012. These two incidents occurred due to the complacency and lack of critical thinking and initiative of staff and managers involved. South Korean regulator NSSC concluded that the operator did not strictly follow safety regulations and that the concealment showed the lack of a safety culture and strong leadership and management. NSSC therefore saw the need to impose stricter requirements since then.

Learning from the past incidents, NSSC has become more proactive in ensuring that a safety culture is observed in all nuclear facilities. South Korea's safety culture review is conducted every 10 years for each NPP as mandated by the current legal framework. Safety culture assessment is held every 2 years for each NPP on a voluntary basis. KINS, which serves as a technical support agency of NSSC for safety culture, launched a research project in 2013 on the development of the NSSC's regulatory infrastructure for safety culture oversight. This project examines the appropriate oversight

model, methodology, inspection guides, education and training programmes for NSSC inspectors, and legal and institutional frameworks on which oversight activities should be based on. KINS staff also meet licensees so frequently to ensure that a safety culture is maintained and developed in the licensees' facilities.

Meanwhile, since nuclear security culture has only just received attention in post-Fukushima years, the NSSC has been striving to keep pace with international efforts in nuclear security culture. KINAC, which serves as a technical support agency of NSSC for security and safeguards, conducted preliminary studies on the development of a nuclear security culture. The outcome of these studies is the *Nuclear Security Culture Implementing Guide*.

In the case of France, the strong regulatory and legal framework ensures that the Nuclear Safety Authority, which acts as the regulatory body, is not conniving with the NPP operators and radiological licensees. Another factor that makes the French regulatory body efficient is the appointment of decisive and firm directors since its establishment in 2006. It demonstrates that strong leadership is essential in ensuring a safety-security culture from the regulatory perspective. Thus, it is normal for the French regulatory body to order temporarily closure of nuclear facilities for weeks whenever it detects even minor errors. As demonstrated in France, the independent nuclear regulatory body must be able to make decisions and perform its duties without undue pressure or constraints from the government, organisations, and utilities that promote nuclear power.

Holistic Nuclear Education and Training

While local and/or national cultures might influence how a safety-security culture is being developed, an effective nuclear safety-security culture heavily depends upon personnel and managers equipped with the necessary knowledge and skills to perform their functions based on the desired standards and norms. Hence, a holistic approach to nuclear education and training is required to sustain and develop a safety-security culture.

In 2008, France's Ministry of Higher Education and Research created the French Council for Education and Training in Nuclear Energy (CFEN) primarily to assess the adequacy and relevance of nuclear education programmes based on the needs of universities, the nuclear industry and research institutes. The members of the CFEN, which is chaired by the High Commissioner for Atomic Energy, include representatives of governmental

authorities in education, research and industry; academic institutions (universities and engineering schools); main industrial actors (AREVA, EDF, sub-contractors), nuclear research institutions (CEA, IRSN, ANDRA). The work of CFEN resulted in the creation of new and holistic curricula and a threefold increase in the number of graduates within a three-year period.

Several nuclear-related academic programmes have also been designed for international students. The most prominent one is the Master of Science in Nuclear Energy Science, which is offered in English to educate both French and international students on principles and knowledge required for the nuclear industry, including how to cultivate a safety-security culture.

The majority of in-depth training activities on safety-security culture are conducted within nuclear facilities, research institutes, regulatory body and technical support agencies through their respective in-house training programmes. For instance, NPP operator EDF has developed a comprehensive in-house training for its employees and officers. Its in-house training provides conducive working environment for its employees and managers, motivating them to strictly follow regulations. The training also encourages constructive working relationship among them. EDF spends 10 percent of its total labour cost for specialised in-house training, allots three million hours of training per year (large fraction for incoming staff), and offers 650 different training courses conducted in its 19 training centers, located at NPP sites. Enhancing human and organisational factors is part of EDF's in-house training. In fact, EDF has a support management division for safety and human factors to lead its in-house training on safety-security culture.

In South Korea, KINAC regularly trains experts, operators, and officials through domestic and international training programmes on nuclear security culture, safeguards, and strategic trade controls. Since 2010, KINAC has been conducting annually its nuclear security culture awareness survey to determine the efficacy of its training and education programmes. The survey contains questions about beliefs and attitudes, leadership behaviour, employee behaviour, and management systems. The annual survey results show that the awareness rate among those who are involved in nuclear and radiological-related activities has increased from 64.1 percent in 2010 to 85.3 percent in 2015, indicating the positive outcome of KINAC's nuclear security education and training programmes.

Meanwhile, KINS offers education programmes to license holders (NPP operators, radiation workers, and safety inspectors) to enhance their nuclear safety culture awareness. Whenever licensees apply for the renewal of their licenses at the regulatory agency, their workers and managers have to undergo again short-term education and training programmes. KINS'

International Nuclear Safety School also offers the International Nuclear and Radiation Safety Master's Degree Programme which is designed to educate overseas professionals working in the field of nuclear and radiation safety.

However, nuclear safety and security education should not just be limited to nuclear professionals, radiation workers and regulators. The general public should also be well informed on the importance of human factors in safety and security, which may also boost overall public acceptance of nuclear power and allay their fears. A majority of South Koreans (60.5 percent) support nuclear phase out policy by President Moon due to their fear that a Fukushima-like earthquake and nuclear disaster can hit their country. In this regard, KINS run nuclear safety field trip programmes and various education programmes for the general public and local communities, emphasising nuclear emergency and disaster preparedness. Indeed, a nuclear safety-security culture can only be fully developed if the country has a comprehensive education programme targeting the general public, licensees, students, and local residents near NPPs.



Dr Claude Guet sharing France's nuclear experience



Dr Su Jin Jung discussing safety-security culture development in South Korea



A participant posing a question to the panelists

ROUNDTABLE PROGRAMME

	Programme	Speaker
8:30am-9:00am	Registration	
9:00am-9:05am	Welcome Remarks	Ambassador Ong Keng Yong Executive Deputy Chairman, RSIS
9:05am-9:25am	<u>Presentation</u> Perspective from Thailand and the role of ASEAN Network of Regulatory Bodies on Atomic Energy	Dr Phiphat Phruksarojanakun Head, International Cooperation Section, Office of Atoms for Peace, Thailand
9:25am-9:45am	<u>Presentation</u> Perspective from Malaysia	Ms Sabariah Bt Kader Ibrahim Head, International Training Sector, Nuclear Malaysia Training Centre, Malaysia Nuclear Agency
9.45am-10:05am	<u>Presentation</u> Perspective from Singapore	Dr Alvin Chew Adjunct Fellow, RSIS
10:05am-10:30am	<u>Open Forum Discussion</u>	<u>Moderator</u> Ambassador Ong Keng Yong Executive Deputy Chairman, RSIS Speakers 1. Dr Phiphat Phruksarojanakun 2. Ms Sabariah Bt Kader Ibrahim 3. Dr Alvin Chew
10:30am-10:45am	Tea Break	

	Programme	Speaker
10:45am-11:05am	<u>Presentation</u> Perspective from France	Dr Claude Guet Visiting Professor and Programme Director, Energy Research Institute @ NTU; Senior Advisor to the CEO of CEA (French Alternative Energies and Atomic Energy Commission)
11:05am-11:25am	<u>Presentation</u> Perspective from South Korea	Dr Su Jin Jung Manager, Strategy and Performance Department, Korea Institute of Nuclear Safety
11:25am-12:00pm	<u>Open Forum Discussion</u>	<u>Moderator</u> Assoc Prof Mely Caballero-Anthony Head, Centre for Non- Traditional Security Studies, RSIS Speakers 1. Dr Su Jin Jung 2. Dr Claude Guet
12:00pm	End of Programme	

ABOUT THE SPEAKERS

Dr Phiphat Phruksarojanakun

Earning a Ph.D. in Nuclear Engineering and Engineering Physics from University of Wisconsin-Madison, USA in 2007, Dr. Phiphat Phruksarojanakun has strong interest in radiation transport, transmutation and activation analysis and Monte Carlo techniques for nuclear system. Dr. Phruksarojanakun had a brief experience as a post-doctoral researcher at the Fusion Technology Institute where he was a part of research team investigating the possibility of utilizing fusion Z-Pinch device. He has worked for the Office of Atoms for Peace or OAP, a nuclear and radiation regulator in Thailand, since October 2008. As a nuclear engineer, he had been responsible for assessing and verifying criticality and other safety-related parameters during reactor core reconfiguration. He has been a guest lecturer at the Mechanical Engineering Department, King Mongkut's University of Technology Thonburi and also has been actively involved with OAP's public engagement as a speaker. From 2013 to 2015 and since 2016, he has been serving as Head of International Cooperation at OAP and more importantly a National Liaison Officer or NLO to the Technical Cooperation Department, the International Atomic Energy Agency.

Ms Sabariah Bte Kader Ibrahim

Ms Sabariah Kader Ibrahim graduated with BSc (Hons) in nuclear science from Universiti Kebangsaan Malaysia (UKM) in 2004. She obtained her Master's degree in Nuclear Safety from Korea Advance Institute of Science and Technology (KAIST), South Korea in 2012. At present, she is heading the International Training and Nuclear Science and Engineering Sector of Nuclear Malaysia Training Center. Currently, she is involved in the development of national strategy for education and training in radiation transport and waste safety. Since 2013, she is responsible for organising IAEA Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources (PGEC). She is also actively involved in promoting radiation protection in Malaysia and the region through lectures, workshops, seminars, and public engagement.

Dr Alvin Chew

Dr Alvin Chew is an Adjunct Fellow and formerly a faculty member of RSIS. He has been working with the Centre for Non-Traditional Security Studies, RSIS on nuclear issues in the region.

Dr Claude Guet

Dr Claude Guet is a Visiting Professor and Students & Research Programme Director at Energy Research Institute at NTU (ERI@N).

He is Senior Advisor to the CEO of CEA (French Alternative Energies and Atomic Energy Commission). At CEA he had been the Chief of Staff of the High Commissioner for Atomic Energy, Director of Nuclear Education and Training, Chief of Science of the Defence Division, Head of the Department of Theoretical Physics of the Defence Division, Head of the Atomic Physics Laboratory of the Basic Science Division.

Holding a Doctorat d'Etat from University Joseph Fourier in Grenoble, he conducted his research activities at: CEA, Institut Laue Langevin, Institute of Theoretical Physics at Regensburg, the Niels Bohr Institute in Copenhagen, Institute for Theoretical Atomic and Molecular Physics at Harvard, Yukawa Institute of Theoretical Physics at Kyoto.

His research achievements include theoretical and experimental contributions to nuclear physics, atomic physics and nanophysics. He is the author or co-author of more than 100 peer-reviewed papers with more than 4000 citations and an H-index of 34.

Today, Claude Guet devotes special attention to science and technology for energy research as a whole, and to education and training in energy science and technology.

Claude Guet has been given the French awards of *Chevalier dans l'ordre de la Légion d'honneur* and *Chevalier dans l'ordre des Palmes académiques*.

Dr Su Jin Jung

Dr Su Jin Jung is a manager of Strategy and Performance department at Korea Institute of Nuclear Safety. Her area of knowledge and expertise includes Nuclear Safety Culture, Nuclear Safety Policy Analysis, Strategy Development and Performance Assessment. She was a project manager of R&D project “Development of Regulatory Infrastructure for the Safety Culture Oversight (2013-2016)”. She lectures in ‘nuclear safety culture’ to nuclear reactor operators and supervisors (RO/SRO) and ‘nuclear safety culture oversight’ to nuclear inspectors since 2015. She is a member of Korean Nuclear Society and authored eight papers in the field of Nuclear Safety Policy and Nuclear Safety Culture.

ABOUT THE CENTRE FOR NON-TRADITIONAL SECURITY STUDIES

The **Centre for Non-Traditional Security Studies (NTS Centre)** conducts research and produces policy-relevant analyses aimed at furthering awareness, and building the capacity to address NTS issues and challenges in Asia. The centre addresses knowledge gaps, facilitates discussions and analyses, engages policymakers and contributes to building institutional capacity in the following areas: Humanitarian Assistance and Disaster Relief; Food, Health and Energy Security; Climate Change, Resilience and Sustainable Development; and Peace and Human Security. The NTS Centre brings together myriad NTS stakeholders in regular workshops and roundtable discussions, as well as provides a networking platform for NTS research institutions in the Asia Pacific through the NTS-Asia Consortium.

More information on NTS Centre and a complete list of available publications, policy briefs and reports can be found here: www.rsis.edu.sg/research/nts-centre.

ABOUT THE S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES

The **S. Rajaratnam School of International Studies (RSIS)** is a professional graduate school of international affairs at the Nanyang Technological University, Singapore. RSIS' mission is to develop a community of scholars and policy analysts at the forefront of security studies and international affairs. Its core functions are research, graduate education and networking. It produces cutting-edge research on Asia Pacific Security, Multilateralism and Regionalism, Conflict Studies, Non-Traditional Security, International Political Economy, and Country and Region Studies. RSIS' activities are aimed at assisting policymakers to develop comprehensive approaches to strategic thinking on issues related to security and stability in the Asia Pacific.

For more information about RSIS, please visit www.rsis.edu.sg

