

**Republic of Singapore**

**NATIONAL REPORT  
ON THE IMPLEMENTATION  
OF OBLIGATIONS UNDER THE  
CONVENTION ON NUCLEAR SAFETY**

## **INTRODUCTION**

1 Ionising radiation such as x-ray and gamma radiation, and radionuclides are used in scientific, medical and industrial applications in Singapore. Scientific research using radiation and radionuclides are carried out in institutes of higher learning. The applications of radiation and radioactive materials in the medical field include nuclear medicine, diagnostic and therapeutic radiology, and radiation sterilisation of tissue grafts. Radiation is also used in industrial non-destructive testing (NDT) inspections and in gamma-ray sterilisation of surgical consumables. These applications are controlled under the Radiation Protection Act of Singapore established since 1973.

2 In Singapore, about 95 percent of Singapore's electricity is generated from natural gas. Singapore does not have any nuclear power or research reactors, and at present does not have plans to adopt nuclear energy for power generation.

## Summary

3 Singapore concluded a two-year Pre-Feasibility Study in 2012 as a preliminary step to assess the feasibility of nuclear energy as an option to meet Singapore's long-term energy needs. The Pre-Feasibility Study sought a deeper understanding of the potential and limitations of current and emerging nuclear energy technologies from Singapore's perspective, with safety being of paramount importance. The pre-feasibility study had three conclusions: First, nuclear energy technologies available at that time were not yet suitable for deployment in Singapore. Second, Singapore needed to continue to strengthen our capabilities to understand nuclear science and technology. This would enable us to assess the implications of evolving nuclear energy technologies and regional nuclear energy developments for Singapore, and enhance our emergency preparedness. Third, Singapore should play an active role in global and regional cooperation to improve nuclear safety.

### Strengthening capabilities to understand nuclear science and technology

4 In building up Singapore's nuclear capabilities to prepare for the growth of nuclear energy in our region, the National Environment Agency (NEA) of Singapore signed a Letter of Intent (LOI) with the Danish Emergency Management Agency (DEMA) to collaborate in the areas of nuclear and radiation safety, and emergency preparedness and response. The LOI was signed on 15 December 2012 at the sidelines of the Fukushima Ministerial Conference on Nuclear Safety held in Fukushima, Japan. Since 2013, NEA has sent its officers to attend postgraduate programmes in nuclear engineering and relevant training courses and workshops on nuclear safety to acquire a deeper understanding and knowledge of the subject.

5 The National Research Foundation (NRF), Prime Minister's Office, Singapore also announced in April 2014, the allocation of S\$63 million spread over the next five years, for the Nuclear Safety Research and Education Programme (NSREP). Under the NSREP, the Singapore Nuclear Research and Safety Initiative (SNRSI) was set up to focus on research and developing capabilities in nuclear safety, science and engineering. SNRSI is a national resource hosted in the National University of Singapore (NUS) that taps into the existing expertise in local research institutions and builds up new capabilities. SNRSI is led by Professor Lim Hock, currently Director, Research Governance and Enablement, Office of Deputy President (Research and Technology) and Professor of Physics, NUS.

6 In 2014 and 2015, Singapore collaborated with the IAEA to implement the following national Technical Cooperation (TC) projects:

- a) Strengthening Capacity in Radiation Protection, Environmental Monitoring and Waste Safety
  - To support Singapore government agencies in building the necessary expertise in the areas of radiation protection, environmental monitoring and waste safety.
- b) Developing a National Medical Guidance Dose Code of Practice
  - To develop a national medical guidance dose document with diagnostic reference levels (DRLs) to give guidance on principles,

and to give explanations on the establishment and applications of DRLs.

c) Enhancing Radiation Emergency Preparedness and Response Capabilities

- To enhance the emergency preparedness and response capability of NEA staff through training and developing expertise for environmental and food monitoring, sampling and analysis, which are the key components in responding to a nuclear or radiological emergency.

Playing an active role in global and regional cooperation to improve nuclear safety

7 At the 6th Review Meeting of the Convention on Nuclear Safety (CNS) held in Austria, from 24 March to 4 April 2014, Singapore supported Switzerland's proposal to amend the CNS to provide a legally binding obligation for nuclear power plants to be designed and constructed with the objective of preventing accidents and mitigating long-term off-site radiological contamination. The Review Meeting agreed with a two-third majority to convene a Diplomatic Conference (DC) in 2015 to discuss the Swiss proposal. At the CNS DC in 2015, Contracting Parties adopted the Vienna Declaration on Nuclear Safety by consensus. Singapore reiterated our call for all CNS Contracting Parties, in particular those with nuclear installations and those planning to embark on a civilian nuclear programme, to implement the safety objectives contained in the Declaration expeditiously and in good faith.

8 As part of Singapore's continual efforts in supporting nuclear safety, Singapore regularly attends the Asia-Europe Meeting (ASEM) Seminar on Nuclear Safety (ASNS). The ASEM is an annual seminar held to promote greater cooperation and dialogue on nuclear safety amongst Southeast Asian nations by drawing upon the knowledge and experience of the European Union, so as to establish a robust global nuclear safety framework. The most recent 4th ASEM was held in Spain, from 29 to 30 October 2015 with the theme "Knowledge Management to Enhance Nuclear Safety".

9 Singapore is also a member of the ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM) established in 2012. The ASEANTOM is a sectoral body under the ASEAN Political-Security Community, which comprises nuclear regulatory bodies from all ten ASEAN member states. It serves as a platform for cooperation amongst nuclear regulatory bodies within ASEAN in order to enhance regional nuclear safety, security and safeguards, based on the implementation of relevant commitments to the International Atomic Energy Agency's (IAEA) standards and guidelines and other multilateral agreements which ASEAN member states are party to. The 3rd ASEANTOM Meeting in 2015 reviewed activities conducted thus far and discussed further activities under the ASEANTOM work plan for 2016 – 2017. This includes the implementation of the four-year IAEA-ASEANTOM regional cooperation project beginning in 2016, to support the development of a regional environmental radioactivity database and a nuclear emergency preparedness and response framework in Southeast Asia.

## ARTICLE-BY-ARTICLE REPORT

### **Article 4. Implementing Measures**

*[Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.]*

10 Singapore became a party to the CNS on 15 March 1998. The legislative framework for ensuring radiation safety is well established in Singapore as reported by the IAEA peer review mission in 2000. Regulations have been updated to take into account developments, such as the International Commission on Radiological Protection (ICRP)-60 recommendations and the IAEA Basic Safety Standards (BSS). Singapore undertakes to implement the obligations under the Convention through regulatory or administrative means.

### **Article 5. Reporting**

*[Each Contracting Party shall submit for review, prior to each meeting referred to in Article 20, a report on the measures it has taken to implement each of the obligations of this Convention]*

11 Submission of this report fulfils the obligation of this Article.

### **Article 6. Existing Nuclear Installations**

*[Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary, in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.]*

12 Singapore does not have any nuclear installation within its territory and at present does not have plans to embark on a nuclear energy programme.

### **Article 7. Legislative and Regulatory Framework**

*[Each Contracting Party shall establish and maintain the legislative and regulatory framework to govern the safety of nuclear installations.]*

*The legislative and regulatory framework shall provide for:*

- (i) the establishment of applicable national safety requirements and regulations;*
- (ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;*
- (iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses;*

(iv) *the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.]*

13 In Singapore, the Radiation Protection Act was first enacted in 1973 and the Radiation Protection Regulations were gazetted in 1974. This Act was revoked in 1991 and re-enacted to include the control of non-ionising radiation. The Radiation Protection (Non-Ionising Radiation) Regulations were gazetted in 1991.

14 The Radiation Protection Regulations 1974 were amended in 2000 to take into consideration the 1990 Recommendations of the ICRP on dose limits for occupationally exposed individuals and members of the public, and the BSS requirements. The Regulations for the transport of radioactive materials were also amended in 2000, to be in line with the IAEA Safety Standards Series No. ST-1, 1996 Edition – Regulations for the Safe Transport of Radioactive Materials.

15 In 2007, the Radiation Protection Act was repealed and re-enacted with amendments to transfer the roles and functions of the Centre for Radiation Protection (CRP), as well as the administration of the Radiation Protection Act, from the Health Sciences Authority (HSA) to the NEA.

16 With the transfer of CRP from HSA to the NEA, a new department, the Centre for Radiation Protection and Nuclear Science (CRPNS) was formed under the NEA for the administration of the Radiation Protection Act. The Centre is the current national regulatory authority for radiation protection in Singapore. The CRPNS was renamed the Radiation Protection and Nuclear Science Department (RPNSD) in 2013.

17 On 22 September 2014, Singapore deposited its instrument of accession to IAEA's Convention on the Physical Protection of Nuclear Material (CPPNM) and its instrument of acceptance to the 2005 CPPNM Amendment, and became a party to the CPPNM on 22 October 2014. This completed the accession process which was announced by Singapore Prime Minister Lee Hsien Loong at the 3rd Nuclear Security Summit in the Netherlands in March 2014. The Radiation Protection Act was amended to meet the obligations under the CPPNM and its 2005 Amendment, such as the criminalising of misconduct pertaining to nuclear material. Amendments to the RPA were passed in the Singapore Parliament in 2014. Singapore tracks every case of nuclear material (as defined under the CPPNM) transiting through its sea ports.

## **Nuclear Safety**

18 As there are currently no plans for the introduction of nuclear energy in Singapore in the near future, there is no existing legislative framework on the safety of nuclear power plant installations.

## **Radiation Protection**

19 In Singapore, the manufacture, possession, use, dealing in, import and export of radioactive materials and irradiating apparatus are controlled by the Radiation Protection Act. Under this Act, there are four sets of Regulations, namely:

- a) Radiation Protection (Ionising Radiation) Regulations, Revised edition 2001.
- b) Radiation Protection (Transport of Radioactive Materials) Regulations, Revised Edition 2001.
- c) Radiation Protection (Non-Ionising Radiation) Regulations Revised Edition 2001.
- d) Radiation Protection (Exemption for Transit, Transshipment and Carriage of Conveyance Equipment) Regulations 2014.

20 The Act defines the appointment of the Director-General of Environmental Protection (of the NEA) who is charged with the administration of the Act. Under the Act, licenses are required for the manufacture, possession, use, dealing in, import and export of radioactive materials or irradiating apparatus. A licence is also necessary for the transport of radioactive materials.

21 The Director-General may grant or renew a licence subject to such conditions, limitations and exceptions as may be specified by him. During the currency of the licence, he may vary, revoke or add any conditions, limitations or exceptions attached to the licence. He may also refuse an application for a licence, suspend the licence for a period of time, or cancel the licence.

## **Other Relevant Legislation**

22 There are no other relevant legislations specific to nuclear or radiation applications.

## **Bilateral Agreements**

23 Singapore signed a Memorandum of Understanding (MOU) on the Third Country Training Programme (TCTP) with the IAEA in 2000. The MOU aims to jointly train participants from developing IAEA Member States in areas such as health, radiation protection, industry and environment. Under the MOU, Singapore has been providing training for professionals from various countries to help build up their regulatory infrastructure for radiation safety in medical and industrial applications.

24 During his visit to Singapore in January 2015, IAEA Director-General Yukiya Amano signed an enhanced Singapore-IAEA TCTP MOU with then-Singapore Second Minister for Foreign Affairs and Second Minister for the Environment and Water Resources, Ms Grace Fu. Under the enhanced MOU, Singapore and the IAEA will jointly provide technical assistance to developing countries in areas such as

nuclear medicine and nuclear safety. In June 2016, Singapore and the IAEA organised a Regional Workshop on Nuclear Law under the Singapore-IAEA TCTP, which covered various topics including the international nuclear legal framework for nuclear safety.

## **Article 8. Regulatory Body**

*[i) Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.*

*ii) Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organisation concerned with the promotion or utilization of nuclear energy.]*

25 Singapore does not have a regulatory body to govern the safety of nuclear installations, as it does not have any nuclear installation within its territory.

26 The NEA RPNSD, under the Ministry of the Environment and Water Resources is the national regulatory authority for radiation protection in Singapore. The RPNSD administers the Radiation Protection Act and its subsidiary regulations through a system of licensing, notification, authorization, inspection and enforcement on irradiating apparatus and radioactive materials.

27 There is currently no organisation promoting the use of nuclear power in Singapore. However, if such an organisation were to exist in the future, Singapore will ensure effective separation between this organisation and the national regulatory authority.

## **Article 9. Responsibility of the License Holder**

*[Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.]*

28 There are provisions in the Radiation Protection Act relating to occupational health and safety. Every licensee shall provide a safe working environment to his employees, as follows:

- a) Protect all employees from unnecessary exposure to radiation
- b) Provide training and supervision for employees so that they can perform their work safely
- c) Provide employees with radiation monitoring equipment including personal monitoring devices
- d) Provide all employees with prescribed medical examinations
- e) Ensure that members of the public are not exposed to risk to their health due to undertakings or activities of the licensee



## **Article 10. Priority to Safety**

*[Each Contracting Party shall take the appropriate steps to ensure that all organisations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.]*

29 Regular inspections of radiation facilities are carried out on a risk-based approach to ensure compliance with safety requirements. Licensees are educated of the need to ensure that radiation safety is maintained as a top priority.

## **Article 11. Financial and Human Resources**

*[i) Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.*

*[ii) Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.]*

30 Singapore does not have any nuclear installation within its territory.

31 Financial and human resources are available to support the safe use of radioactive materials and safe operation of equipment containing radiation sources in the hospitals and industries. All radiation workers are trained to ensure that they are able to carry out their work safely.

## **Article 12. Human Factors**

*[Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.]*

32 Singapore does not have any nuclear installation within its territory.

33 For high-risk premises using ionising radiation, systems of checks are in place to minimise human errors. Standard operating procedures are also required to deal with emergencies. This is established as part of licensing requirements.

## **Article 13. Quality Assurance**

*[Each Contracting Party shall take the appropriate steps to ensure that quality assurance programs are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.]*

34 Singapore does not have any nuclear installation within its territory.

35 Many facilities with radioactive materials have been ISO-accredited or are in the process of acquiring accreditation. Licensing requirements and compliance with safety requirements are incorporated as part of their quality assurance programmes.

## **Article 14. Assessment and Verification of Safety**

*[Each Contracting Party shall take the appropriate steps to ensure that:*

- i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;*
- ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.]*

36 Not applicable as Singapore does not have any nuclear installation within its territory and at present has no plans to embark on a nuclear energy programme in the near future.

## **Article 15. Radiation Protection**

*[Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.]*

37 Singapore does not have any nuclear installation within its territory.

38 For radioactive materials, under the Radiation Protection (Ionising Radiation) Regulations, the As Low As Reasonably Achievable (ALARA) principle as required by the International BSS is being applied. The exposure limits provided in these Regulations are the basis for planning and implementation of all protection measures necessary for the protection of occupationally exposed individuals and members of the general public.

39 The Regulations specify that anyone who is in possession of or using radiation sources must ensure that radiation work is carried out safely, and not cause any individual to receive a radiation dose more than that is justifiable and not more than the specified annual dose limit.

40 Any occupationally exposed individual who has received a radiation dose in excess of the annual dose limit, shall be suspended from radiation work and sent for a medical examination, including full blood examinations. An investigation will be made to determine the cause of the excessive dose and measures will be taken to ensure that the accident/incident does not happen again.

41 In the Regulations, the effective dose limit average over a defined period of 5 years, to the whole body is 20 mSv per year for occupationally exposed individuals and 1 mSv per year for members of the public.

42 Radioactive materials are required to be stored in a safe and secured place. The radiation levels outside the defined area where the radioactive materials are stored must not exceed the limits specified in the Regulations.

43 Radioactive waste generated in Singapore originates mainly from hospitals, educational/research institutions and some commercial companies.

44 Guidelines have been set up for the safe management and disposal of radioactive wastes. The waste generated has radionuclides with comparatively short half-lives and low radioactivity. According to current national legislation, short lived waste is stored to allow for decay and is subject to authorized discharge/disposal.

45 As a policy, all disused sealed radioactive sources are returned to the country of origin. However, there have been cases where disused Ra-226 needles and radioactive lightning conductors which were supplied before 1980 could not be returned to their country of origin as the vendors are no longer operating or cannot be identified. However, quantities of such sources are small and are at present being conditioned and stored safely by the NEA RPNSD.

46 In September and October 2011, the NEA RPNSD collaborated with the IAEA to successfully complete the following TC national projects:

- a) Repatriation of a high radioactive Cesium source of about 800 Ci from a disused radiotherapy irradiating equipment. The source was sent to Germany for recycling.
- b) Conditioning of disused radioactive sources comprising 360 lightning conductors, 200 smoke detectors and 160 check sources. A total of 3,212 pieces of radioactive sources (Radium, Americium, Cobalt, and Strontium) with a total radioactivity of ~570 mCi were conditioned.

## **Article 16. Emergency Preparedness**

*[ i) Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.*

*For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.*

*ii) Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the states in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.*

*iii) Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.]*

47 Although Singapore has no nuclear installation, several countries in our region are embarking on or planning for nuclear power programmes. The Government has

devoted efforts to build capability in nuclear safety, environmental radiation monitoring, and emergency preparedness due to the transboundary nature of nuclear and radiological emergencies.

48 In 2013, a Singapore delegation undertook a scientific visit to Denmark under the NEA-DEMA LOI to learn about environmental radiation monitoring and radiochemistry, including the type of capabilities required pre-, during and post-radiological/nuclear incident. Following the scientific visit, NEA has devoted efforts to the setting up of a radiochemistry laboratory and a radiation monitoring network. The radiochemistry laboratory and monitoring network, when operational in 2017 and 2019 respectively, will establish and monitor baseline background levels of radiation in the environment.

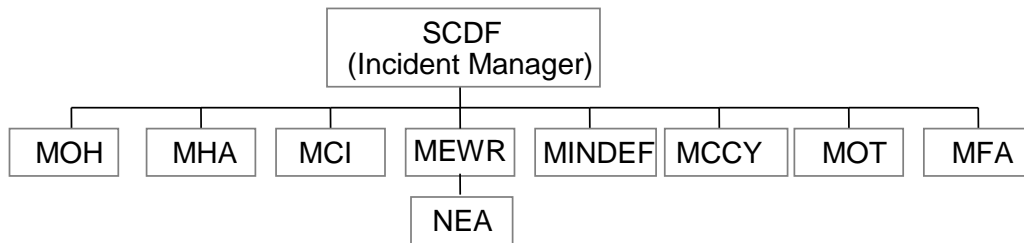
49 On the regional front, the IAEA and ASEANTOM are implementing a four-year Regional Technical Cooperation project, commencing in 2016, to support the development of a regional environmental radioactivity database and nuclear emergency preparedness and response framework in South East Asia. In line with the IAEA-ASEANTOM Regional Technical Cooperation project, the European Commission is also supporting ASEAN member states in developing a Strategy for Regional Cooperation on Radiological and Nuclear Emergency Preparedness and Response and an Action Plan for its Implementation. These two projects are intended to culminate in more harmonized emergency plans and response measures between ASEAN member states, while cooperating with international partners in nuclear issues.

50 In March 2011, Singapore developed response plans to respond to the Fukushima Daiichi nuclear power plant accident. These response plans are currently being reviewed to cater for an incident at an external nuclear power plant that may be in the proximity of key areas of interest such as sources of food produce exported to Singapore. The overall national response plan will seek to address trans-boundary implications that may arise from the radioactive fallout following an incident at an external nuclear power plant, including the movement of contaminated food, cargo and travelers.

51 Singapore also developed an inter-agency emergency plan to deal with radiological incidents happening within Singapore. The related agencies involved in the emergency plan are as detailed under 'the Organisation Structure' below.

#### Organisation Structure

52 Under the inter-agency emergency plan for radiological incidents, the respective related agencies have their own sub-plans for response. These operational sub-plans are coordinated by the Incident Manager, the Singapore Civil Defence Force (SCDF).



Footnote

SCDF: Singapore Civil Defence Force  
 MOH: Ministry of Health  
 MEWR: Ministry of the Environment and Water Resources  
 MHA: Ministry of Home Affairs  
 MCI: Ministry of Communications and Information  
 NEA: National Environment Agency

MINDEF: Ministry of Defence  
 MCCY: Ministry of Culture, Community and Youth  
 MOT: Ministry of Transport  
 MFA: Ministry of Foreign Affairs

Emergency Planning Zones

53 There are two planning zones:

- a) Evacuation area – persons within the evacuation zone will be evacuated to appropriate assembly points for further actions.
- b) Affected area – where contamination of water and foodstuff has to be monitored.

Intervention Levels

54 Singapore is considering adopting the intervention levels as recommended by the IAEA in the various Technical Documents (TECDOCs), and the BSS.

Protective Measures

55 The various protective measures are summarised below:

***Immediate Response & Protection***

- a) Immediate evacuation within the Evacuation Zone.
- b) Administering potassium Iodate (KI) tablets to the responders, if necessary, to block the uptake of radioactive iodine.
- c) Monitoring affected persons for contamination.
- d) Decontamination of the injured for medical treatment.
- e) Assessment of radiation dose received by first responders and affected persons.
- f) Food and water control.

***Longer Term Protective Measures***

- a) Decontamination of accident site.
- b) Radioactive waste disposal.
- c) Relocation of population if necessary.

### **Long Term Protective Measures**

- a) Medical follow-up of affected persons.
- b) Continue checks on food and water.

### **Public Information**

56 Information regarding status of emergency to be provided to the media/public will be released by the Ministry of Communications and Information.

### **Workshops and Exercises**

57 Exercises of the radiological emergency plan are held regularly to ensure effective communication and clear understanding of the individual roles and functions of each responding organisation. Such exercises are found to be beneficial especially for the training of new staff.

58 In December 2012, Singapore hosted an IAEA regional workshop on Notification, Reporting and Requesting Assistance. Participants from regional countries took part and shared their national capabilities in emergency preparedness and response.

59 In December 2015 and February 2016, Singapore participated in ConvEx-2c and ConvEx-2a exercises respectively conducted by the IAEA's Incident and Emergency Centre (IEC). Participation in the ConvEx exercises allowed Singapore to test its emergency response arrangements for a transnational radiological emergency.

60 In addition, Singapore also participated actively in emergency preparedness and response-related training courses and workshops, such as the Malaysia-Thailand Joint Table Top and Field Exercise on "Detection of Materials Out of Regulatory Control at National Borders" in August 2015.

### **Article 17. Siting**

*[Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:*

- (i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;*
- (ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;*
- (iii) for re-evaluating, as necessary, all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;*
- (iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.]*

61 Not applicable as Singapore does not have any nuclear installation within its territory and at present has no plans to embark on a nuclear energy programme in the near future.

## **Article 18. Design and Construction**

*[Each Contracting Party shall take the appropriate steps to ensure that:*

- (i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;*
- (ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;*
- (iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.]*

62 Not applicable as Singapore does not have any nuclear installation within its territory and at present has no plans to embark on a nuclear energy programme in the near future.

## **Article 19. Operation**

*[Each Contracting Party shall take the appropriate steps to ensure that:*

- (i) the initial authorisation to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning program demonstrating that the installation, as constructed, is consistent with design and safety requirements;*
- (ii) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;*
- (iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;*
- (iv) procedures are established for responding to anticipated operational occurrences and to accidents;*
- (v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;*
- (vi) incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body;*
- (vii) programs to collect and analyze operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organisations and regulatory bodies;*
- (viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.]*

63 Not applicable as Singapore does not have any nuclear installation within its territory and at present has no plans to embark on a nuclear energy programme in the near future.

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