

SNSTC'S PRACTICE IN TRAINING AND HUMAN CAPACITY BUILDING IN THE FIELD OF NUCLEAR SECURITY

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Abstract

Nuclear security is a shared responsibility of the international community. China claimed political views to build sustainable and balanced global nuclear security framework through stepping up political input, national responsibility, international cooperation and nuclear security culture, which fully demonstrates China's responsibility to work with other countries to promote global governance of nuclear security. Since State Nuclear Security Technology Center(SNSTC) established, hundreds of training courses and workshops have been held, training more than 3500 professionals for international community. SNSTC focus on nuclear security training to raise nuclear security awareness, fill gaps between the actual performance of practioners and the required competencies and skills, and will continue to contribute to nuclear security training and human capacity building for the Asia-Pacific region and the world[1].

1. OVERVIEW OF SNSTC

As of December 31st 2018, a total of 451 nuclear power reactors have been put into operation of in the world, and another 55 are under construction[2]. The world's growing demand on nuclear power as clean energy resource requires equal safety and security considerations. Nuclear terrorism has become one of the most urgent threats to international serenity. Currently, along with the spread of nuclear technologies, the risk of terrorist groups acquiring nuclear material and triggering a nuclear incident is growing. Up to December 2018 31st, IAEA Incident and Trafficking Database(ITDB) contained a total of 3497 confirmed incidents reported by participating States since 1993[3]. The 2012 Nuclear Security Summit stated that nuclear terrorism is 'one of the most challenging threats to international security.

Up to September 30st 2019, China has put into commercial operation of a total of 47 nuclear power units (excluding nuclear power information in Taiwan), with installed capacity of 48751.16 MWe[4]. Chinese government attaches great importance to nuclear security. During the 2014 nuclear security summit in The Hague, President Xi Jinping proposed a 'rational, coordinated and balanced' nuclear security approach. That was a major contribution of China on world's nuclear security. As the competent authority, China Atomic Energy Authority(CAEA) has made efforts to enhance the security of nuclear materials and facilities and ensure the sustainability of nuclear security.

The State Nuclear Security Technology Center(SNSTC) was established in November 2011, which is located in Fangshan District, Beijing, covering an area of 53,300 square meters. As an affiliate to China Atomic Energy Authority(CAEA), SNSTC's main function are to provide technical support for nuclear material regulatory, nuclear security and nuclear export&import; to provide nuclear security training; to conduct nuclear security international exchange and cooperation; to undertake the construction and operation of the Center of Excellence(COE) on nuclear security. Since SNSTC's establishment, nuclear security capacity of China is furthered strengthened. The main outcome of SNSTC include:

- To promote the establishment and improvement of nuclear security regulations and standards
- To conduct nuclear security inspection and provide technical support for nuclear material licensing

- To conduct nuclear security technology R&D on measurement of nuclear material, NMA&C, environmental testing of nuclear security equipment, development of reference materials and standards methods, nuclear forensics etc.
- To conduct nuclear security contingency response drill
- To conduct effectiveness evaluation of physical protection system
- To host more than 150 workshop/trainings with more than 3500 national, regional and international participants
- To cooperate with the United States to design and establish the COE
- To undertake IAEA Coordinated Research Programme and act as Coordinated Center of IAEA on nuclear security technology

2. TRAINING FACILITIES AND EQUIPMENTS

COE was completed and put into operation in March 2016, which integrates advanced technology and instruments at home and abroad which cover nuclear security, nuclear safeguards, nuclear material control, physical protection and other fields, including Demo&Training building, Analytical Laboratory, Environmental Testing Laboratory, MOCK facility, Nuclear Material Bunker, Response Force Training and Exercise Facility and Physical Protection Test Area. COE acts as an international platform for nuclear security human resource development, technology R&D, international exchanges, equipment testing and certification[5]

➤ Analytical Lab

Analytical Lab maintains a full suite of equipment to make the very high accuracy measurements that form the foundation of a strong material accountancy program, and offers sampling and testing of nuclear material, demo and training of DA and NDA measurement. In the DA lab, the major equipment includes Quadrupole Inductively Coupled Plasma Mass Spectrometer(Q-ICP-MS), High Resolution ICP-MS, Thermal Ionization mass spectrometer(IMS), Scanning electron microscope(SEM) and so on. In the NDA lab, the major equipment includes Tomographic Gamma Scanner(TGS), Waste Drum Assay System(WDAS), Active Well Coincidence Detector, etc. Some pictures of Analytical Lab can be seen below Fig. 1.



Fig. 1. Analytical Lab

➤ Environmental Test Lab

In view of the diversity of operating environment, the environmental test is necessary for most nuclear security products. The Environmental Test Lab can simulate various environment conditions by using different example vibration, temperature, humidity, sun light, salt and dust, water and electromagnetic interference. The major equipment includes vibration table, temperature and humidity test box and chamber, xenon-arc light aging test box, salt mist test box, dust and sand test box, water lab and electromagnetic compatibility test lab. Some pictures of Environmental Test Lab can be seen below Fig. 2.

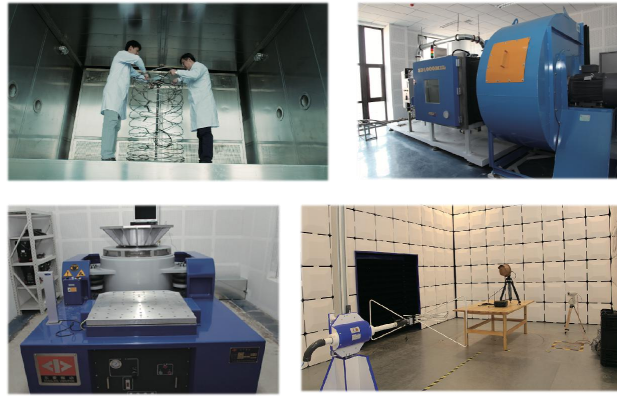


Fig. 2. Environmental Test Lab

➤ Response Force Training and Drill Facility

Response Force Training and Drill Facility is divided into two areas, live fire shooting range and non-live fire tactical training area. The main purpose is to train nuclear security guards on facility protection tactics.

Shooting Range provides a simulated image-based training system and an area which allows live fire instruction. This system includes eight projectors and eight rubber display screens, and allows up to eight trainees conducting live fire or laser gun shooting. The largest shoot distance is 50 meters. A natural environment simulation system which includes wind, rain, thunder, lightning, snow provides a diversified learning environment.

The Non-Live Fire Tactical Training Area is used for anti-terrorist training tactics and also simulates the rooms in a nuclear facility. There will be human adversaries, and mechanic and image targets staged beforehand in every room. In the training process, trainees are divided into groups, pass through specified routes within a designated time, and execute the task of eliminating terrorist threats room-by-room. Some pictures of Environmental Test Lab can be seen below Fig. 3.



Fig. 3. Response Force Training and Drill Facility

3. NUCLEAR SECURITY TRAINING OF SNSTC

SNSTC recognizes that professional training for the practioners in the field of nuclear security is pivotal for enhancing both China and international security. SNSTC focuses its resources to address the need to ensure that the people in the nuclear security community are well trained, creative, and that the human side of the nuclear security enterprise is sustainable.

At the regulatory level, SNSTC has drafted a Departmental Rules for the Management of Training for Nuclear Security Practitioners. In that draft Rules the relevant competencies required for jobs with nuclear security functions were identified, such as Physical Protection, NMAC, CAS...

The objective of SNSTC's training is to improve professional quality of employees and create the potential leaders and specialists in nuclear security. To accomplish these, a set of 26 training courses in nuclear security has been established, which create needed training offerings, building on the collective organization and capabilities of SNSTC. A joint working group takes part in the development of training materials, which includes managers from nuclear facilities, design institutes, customs officials and front line officers as well as competent authorities.

150 training activities/workshops at national, regional and interregional level have been conducted since 2016. More than 3500 participants involved in the activities, 30% of them from foreign countries. Related Statistics can be seen below table.1.

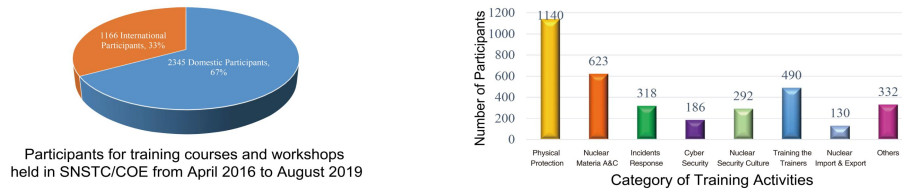


Table.1 Related Statistics

SNSTC has fostered, developed, and/or added new courses (or upgrades) to the training offerings in the topical area of nuclear security. These courses are now drawing increasing numbers of students across the academic spectrum to this field. SNSTC is also actively engaged in international nuclear security training. We are active members of the Nuclear Security Support Center network.

The Agreement between the IAEA and CAEA concerning the designation of the CAEA as an IAEA collaborating Center has been signed this month. SNSTC will act as one of the supporting organizations for promotion of nuclear security technology development and capacity building of IAEA and States. SNSTC's expertise and capabilities serve as the foundation for nuclear security mission, that includes training and demonstrations in most aspects of nuclear security and nonproliferation. Lab subject matter experts have in-depth, practical and technical experience in radiation detection and measurements, Nuclear Material Accounting and Control (NMAC), nuclear forensics, physical protection systems, nuclear security event response, and export controls. SNSTC offers one-of-a-kind fully operational nuclear facilities equipped for a variety of hands-on, immersive nuclear security exercises in realistic training environments, using a wide range of nuclear materials and equipment. Some of trainings hosted by SNSTC can be seen below fig.4.



Fig. 4. Response Force Training and Drill Facility

In summary, the role of SNSTC that provides nuclear security education and training in China has been more and more important. As highlighted above, it has provided assistance in various areas with its capabilities and wide-ranging capacities in nuclear security. It offers basic and advanced level training through different types of training courses, workshops, fellowships etc. in various sub-domains of nuclear security. It also provides expertise and information sharing at the expert level, through participation and contribution in IAEA missions. Additionally, SNSTC can impart training for selection, procurement, testing, and maintenance of radiation detection and physical protection equipment.

4. CHALLENGE AND FEED BACK

SNSTC needs to evolve and expand to meet growing needs, and continue to sustain its expected high standards of nuclear security education and training due to potential future challenges. The following paragraphs discuss these challenges, as well as some possible solutions. Nuclear security training will require more advanced technology labs, equipped with all the necessary tools. More simulation- and animation-based techniques should be used to make training effectively. In addition, emerging challenges in nuclear security demand that further courses be introduced to manage them.

Government support and commitment to nuclear security capacity building is essential, in particular from competent authorities and Ministry of Finance; Furthermore, actively take part in international cooperation, through bilateral and multilateral mechanism, to strengthen domestic and international capacity building on nuclear security, in particular in collaboration with IAEA; Lastly, to ensure the authenticity and increase the awareness of nuclear security training, more support from IAEA is needed, for both domestic training, regional and international training.

5. CONCLUDE

SNSTC has made great progress in terms of nuclear security education and training, and has earned global recognition for its practices in concordance with international standards. In future, efforts should be made continuously. Considering the rapid development of new technologies, a continued global effort to share advanced technologies, research, and development can make a reality of China's vision of nuclear security.

6. REFERENCES

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- [2]. IAEA Nuclear power reactors in the world 2019 Edition.
- [3]. IAEA INCIDENT AND TRAFFICKING DATABASE (ITDB) Incidents of nuclear and other radioactive material out of regulatory control 2019 Fact Sheet.
- [4]. China Nuclear Energy Association, "National nuclear power plant operation from January to August 2019"(http://www.china-nea.cn/site/content/36044.html)

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