

# Instructor Training Program Newsletter

Vol.  
**4**

March 2018



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Science in Tokai



# Instructor Training Program (ITP)

## ~Develop instructors in the nuclear field in Asia~

ITP is conducted by Nuclear Human Resource Development Center (NuHRDeC), the Japan Atomic Energy Agency (JAEA) since 1996 under contract with the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT). The aim of ITP is to contribute to human resource development (HRD) in the field of nuclear technology in Asian countries, and to make nuclear facility located areas in Japan as a hub for international activities. ITP initially started with two participating countries, and currently the number of the countries has increased up to 12.

### ■ Instructor Training Course (ITC) -Training in Japan-

Instructor Training Course (ITC) consists of 5 courses: Reactor Engineering I, II, III, Environmental Radioactivity Monitoring and Nuclear/Radiological Emergency Preparedness. The purpose of ITC is to foster technical instructors in ITC participating countries through 6-8 week courses in Japan where participants can join lectures by experts, exercises using a variety of equipment, and visits to nuclear facilities.

### ■ Follow-up Training Course (FTC) -Training in ITC Participating Countries-

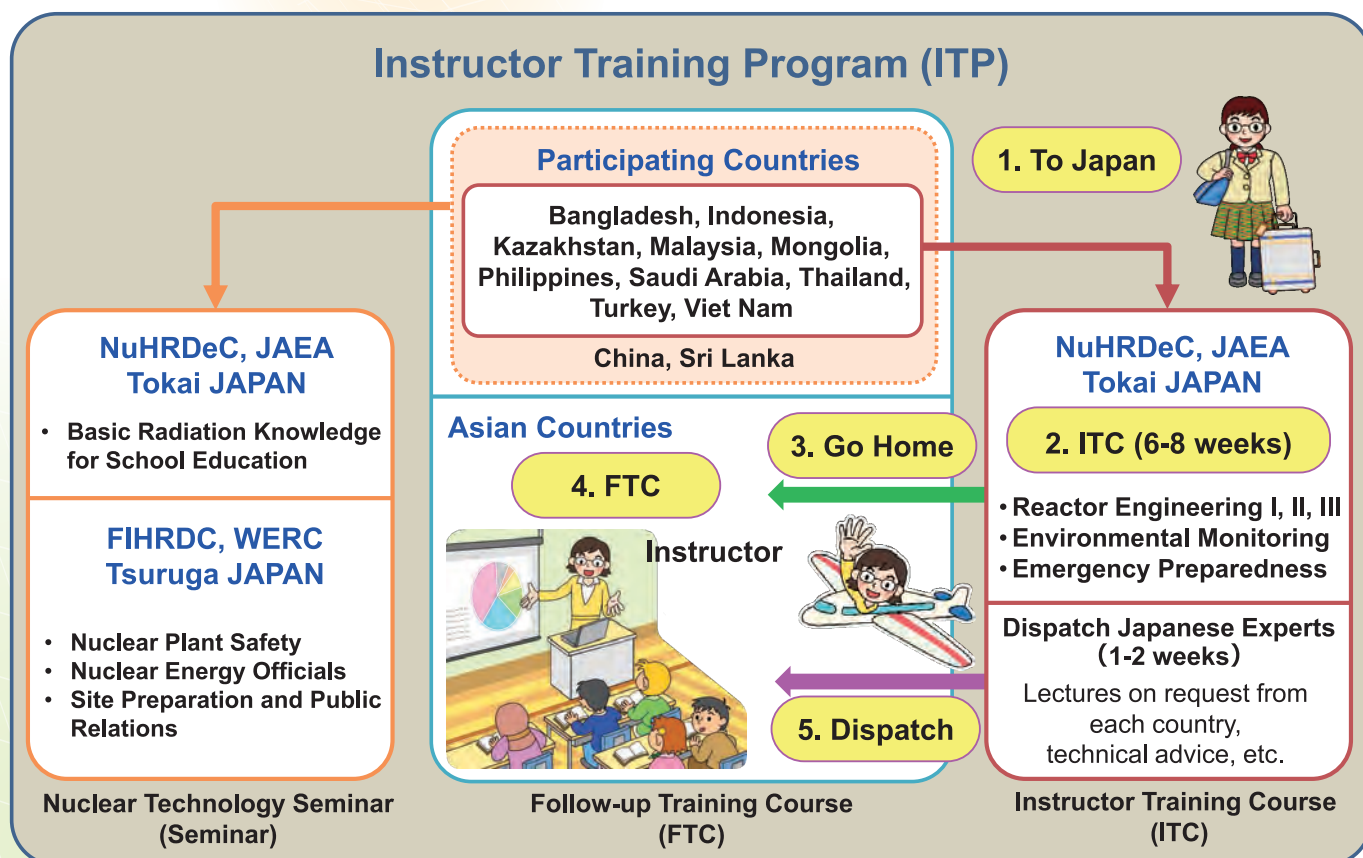
Follow-up Training Course (FTC) is held in each ITC participating country. The ITC participants give lectures in FTC by making the best use of knowledge and experience gained from ITC. They become an excellent instructor by the accumulation of teaching experiences year by year through FTC. Japanese experts are dispatched to FTC to give lectures and technical advice for the establishment of the self-sustainable training courses.

### ■ Nuclear Technology Seminar (Seminar) -Development of Engineers and Specialists-

Nuclear Technology Seminar (Seminar) is designed to cultivate engineers and specialists in the specific area of nuclear technology. The seminar participants are invited to Japan for 1-4 weeks to learn necessary knowledge at lectures and to have experience of international cooperation through facility tours and joint events with residents of nuclear facility located areas. In Fukui prefecture, 3 seminars are held, and 1 seminar is held in Ibaraki prefecture.

## Develop instructors in Asian countries

- Establish a nuclear HRD network in Asia
- Build an international activity base at nuclear facility located areas
- Facilitate cooperation between Japan and Asian countries in the nuclear field



WERC: The Wakasa Wan Energy Research Center

FIHRDC: Fukui International Human Resources Development Center for Atomic Energy





- 1** ITC on Reactor Engineering  
Neutron Experiment
- 2** FTC on Environmental Radioactivity Monitoring  
In situ Measurement (Viet Nam)
- 3** Seminar on Basic Radiation Knowledge for School Education  
Decontamination Exercise

**Instructor Training Program**  
The Accumulated Number of ITP Participants  
(1996~2017)

**Instructor Training Course : 364**  
**Follow-up Training Course : 4,434\***  
**Nuclear Technology Seminar : 407**

\*The expected number of participants (as of 8 February 2018)



# Instructor Training Course (ITC)

## ~Training in Japan~



Reactor Engineering, Boiling Heat Transfer Experiment

### Reactor Engineering I, II, III

Period: 21 August – 13 October 2017 (8 weeks)

Place: Tokai, Ibaraki Prefecture, JAPAN

Participants: 20

#### Course Outline:

Participants acquire the wide range of basic knowledge on nuclear engineering and teaching skills as an instructor in their own countries. The course is open to engineers, researchers in nuclear related organizations and academic staff. The course consists of Reactor Engineering I (reactor physics), Reactor Engineering II (thermal hydraulics, nuclear fuels/materials) and Reactor Engineering III (nuclear safety), and provides 25 lectures, 12 experiments/exercises and 16 facility tours.



#### Inspect Internal Defects in Structures from the Outside

Metal structures such as pipes are used everywhere in nuclear facilities. Their connection is often made by welding. If a large defect is formed inside the structure around the welded part, it can trigger a serious accident in the operation of the facility. Ultrasonic testing (UT) and radiographic testing (RT) are widely used as methods of non-destructive inspection to examine the presence of such defects from the outside of structure. Some of ITP participating countries are hastening to develop human resources for non-destructive testing because of the shortage of technical experts.

Participants in ITC on Reactor Engineering III conducted practical experiment of UT and RT using test pieces within which contain artificial flaws.

In UT, high-frequency sound waves were sent into the specimens and then the echoes were received by a probe on the surface and displayed into Cathode Ray Tube (CRT). Through examining the echo patterns reflected in the CRT from the defected area, they could learn how to trace the size and location of internal imperfections.

In RT, they studied the way to direct radiation effectively to project clear images of internal defects onto the X-ray films. Through these exercises, they had a better understanding of the basics as well as expanded their insight on both UT and RT.



## Environmental Radioactivity Monitoring

Period: 19 June – 28 July 2017 (6 weeks)

Place: Tokai, Ibaraki Prefecture, JAPAN

Participants: 8

### Course Outline:

Participants acquire knowledge and skills on environmental radioactivity monitoring. The course is open to engineers, researchers in nuclear related organizations and academic staff, and provides 22 lectures, 11 experiments/exercises and 13 facility tours. Part of the course curricula is common to ITC on Nuclear/Radiological Emergency Preparedness.

### In situ Measurement of Radioactive Fallout Deposited onto the Ground over Large Area

Following the accident at Fukushima Daiichi Nuclear Power Station (Fukushima Daiichi NPS accident), Tokyo Electric Power Company Holdings, Incorporated (TEPCO), radioactive fallout deposited onto the ground over a large area was measured by the in situ gamma spectrometry using Ge semiconductor detector. The participants of ITC on Environmental Radioactivity Monitoring learned this in situ method through a lecture and an exercise. Generally, radioactivity in soil samples is measured in a laboratory, whereas radioactivity concentrations and air dose rates can be measured on the site by using this in situ method. In situ gamma spectrometry can quantify average inventories over a large area around the point of measurement, resulting less statistical fluctuation of the obtained data than that obtained by soil-sampling-based evaluation.

The exercise carried out at a baseball ground in Tokai as this in situ measurement is usually conducted over a large area of land. The detector was set at 1m high from ground level. At the same time, radiation dose rate was also measured by another measurement device to compare the results. Through this exercise, the participants could learn the method of measuring radioactive fallout deposited onto the ground over a large area.



## Nuclear/Radiological Emergency Preparedness

Period: 19 June – 28 July 2017 (6 weeks)

Place: Tokai, Ibaraki Prefecture, JAPAN

Participants: 8

### Course Outline:

Participants acquire knowledge and skills on emergency response, in case of a radiation accident inside and outside nuclear or radiation handling facilities. The course is open to engineers, researchers in nuclear related organizations and academic staff, and provides 21 lectures, 13 experiments/exercises and 9 facility tours. Part of the course curricula is common to ITC on Environmental Radioactivity Monitoring.

### Integrated Drill for Nuclear and Radiological Emergencies

Since the Fukushima Daiichi NPS accident, nuclear emergency preparedness has been drawing much attention and considered very important. Throughout 6 weeks of the course, participants were able to get extensive hands-on experience of radiological emergency preparedness through practical training in addition to acquiring knowledge on radiation and radiation protection.

Above all, 'Integrated Drill on Nuclear/Radiological Emergency Preparedness' is regarded as the most important practice, which is a compilation of all the training for 6 weeks. Prior to the integrated drill, the participants carried out 'Table Top Exercise' to make an accident scenario and its action plan. In the year of 2017, they created a realistic scenario in which a traffic accident occurred during transportation of radioactive liquid for medical use. The accident resulted in an injured driver and a contaminated road due to breakage of the containers for radioactive materials.

On the day of the integrated drill, the participants took their action based on their scenario. They responded promptly to the emergency such as aiding injured people, identifying contaminated areas, decontaminating the site as well as media communication. After completing all the drill, there was a post-performance review where the participants were listening carefully to instructors' advice. Experiencing the integrated drill could help the participants to deepen their understanding of what they had learned through the lectures.





# Follow-up Training Course (FTC)

## ~Training in ITC Participating Countries~



**1** Nuclear/Radiological Emergency Preparedness Integrated Emergency Response Drill



**2**

**2** Nuclear/Radiological Emergency Preparedness Radiation Measurement



**3**

**3** Environmental Radioactivity Monitoring Radionuclide Analysis

\* All the pictures were taken at FTC in Turkey.

## PICK UP New Member Country, Turkey

### Nuclear/Radiological Emergency Preparedness

In the year of 2017, a new page was added to the history of FTC. Turkey became a new member of FTC, and the first FTC in Turkey was held at Saraykoy Nuclear Research and Training Center of the Turkish Atomic Energy Authority (TAEK) as a joint course of Nuclear / Radiological Emergency Preparedness and Environmental Radioactivity Monitoring.

Currently, Turkey is planning to construct 2 Nuclear Power Plants (NPP) with a total of 8 units in coastal areas of the Mediterranean and the Black Sea. Therefore, preparing for a serious accident like the Fukushima Daiichi NPS accident is an important issue not only for Turkey's future introduction of NPP but also from the viewpoint of dealing with nuclear related incidents in neighboring countries.

In consideration of the country's circumstances, TAEK held the first FTC focused on nuclear/radiological emergency preparedness along with the basics on environmental radioactivity monitoring over two weeks. 11 personnel from the related departments within TAEK attended FTC. 18 lectures and 7 training practices were jointly managed with 4 past ITC participants and 4 Japanese experts.

The first FTC in Turkey was a success and the results were very satisfying in that the participants demonstrated a significantly increased level in comprehension after the course. JAEA will continue to give support to the establishment of Turkey's independent personnel development system through ITC and FTC.

### Reactor Engineering

Creation of Experimental Equipment as Learned from ITC - Viet Nam

In Viet Nam, the construction plan of the first nuclear power plant (NPP) was canceled. Apart from this situation, a new research reactor with thermal power level of 10 to 15 MW is planning to be built so that there is a high demand for learning JAEA's know-how accumulated for a long time in designing, constructing and operating reactors.

FTC in Viet Nam has been held alternately in Da Lat and Ha Noi, and it was Da Lat Nuclear Research Institute (NRI) that held FTC for the year of 2017. The strength to conduct FTC at NRI is its well-equipped environment for experiments in reactor engineering such as



## FTC Activities in JFY2017

Country			Course		Duration		Participant
Bangladesh	Reactor Engineering		11 Feb	-	1 Mar	2018	37*
	Environmental Radioactivity Monitoring		14 Jan	-	18 Jan	2018	25
	Nuclear/Radiological Emergency Preparedness		5 Nov	-	16 Nov	2017	22
Indonesia	Reactor Engineering		31 Jul	-	11 Aug	2017	16
	Environmental Radioactivity Monitoring		7 Aug	-	11 Aug	2017	28
Kazakhstan	Reactor Engineering		23 Oct	-	27 Oct	2017	11
	Environmental Radioactivity Monitoring		3 Jul	-	7 Jul	2017	17
	Nuclear/Radiological Emergency Preparedness		15 Jan	-	19 Jan	2018	14
Malaysia	Reactor Engineering		23 Oct	-	3 Nov	2017	27
	Environmental Radioactivity Monitoring		19 Feb	-	2 Mar	2018	14*
	Nuclear/Radiological Emergency Preparedness		19 Feb	-	2 Mar	2018	20*
Mongolia	Reactor Engineering		12 Jun	-	16 Jun	2017	23
	Environmental Radioactivity Monitoring		28 Aug	-	1 Sep	2017	15
	Nuclear/Radiological Emergency Preparedness		4 Sep	-	8 Sep	2017	23
Philippines	Reactor Engineering		29 Jan	-	9 Feb	2018	18
	Environmental Radioactivity Monitoring		25 Sep	-	3 Oct	2017	21
	Nuclear/Radiological Emergency Preparedness		12 Feb	-	16 Feb	2018	26*
Thailand	Reactor Engineering		22 May	-	26 May	2017	12
	Environmental Radioactivity Monitoring		12 Feb	-	23 Feb	2018	10*
Turkey	Reactor Engineering		5 Jun	-	9 Jun	2017	18
	Environmental Radioactivity Monitoring and Nuclear/ Radiological Emergency Preparedness(Joint course)		16 Oct	-	27 Oct	2017	11
Viet Nam	Reactor Engineering		2 Oct	-	13 Oct	2017	13
	Environmental Radioactivity Monitoring		21 Aug	-	25 Aug	2017	20
	Nuclear/Radiological Emergency Preparedness		18 Sep	-	22 Sep	2017	21
9 Countries		24 Courses					Total 462

\* The expected number of participants. (as of 8 February 2018)

a research reactor. In particular, it was impressive that a neutron moderation and diffusion experiment was being conducted with the equipment for their own made as what they learned at ITC. The equipment is also highly used for basic experiments of reactor physics. All the lectures and practical exercises were conducted by 8 past ITC participants. Since they are experienced lecturers who have worked at the Reactor Center for many years, they could carry out the fulfilling FTC. The instructors mainly used ITC's materials translated into Vietnamese and about half of the curriculum consisted of practical exercises which looked well-balanced with making the full use of the equipment at NRI. In 2015, a large-scale computer system was introduced to NRI and full core neutronics simulation became possible by using the Monte Carlo code MCNP, and this has contributed to conducting better code calculation exercises.

## Environmental Radioactivity Monitoring

### New Workshop to Conceptualize Environmental Radioactivity Monitoring - Philippines

FTC is a good avenue to develop human resources in the field of environmental radioactivity monitoring. Aside from this, it fosters collaboration between Philippine Nuclear Research Institute (PNRI) of Department of Science and Technology and its stakeholders, disseminates information and promotes awareness in the field of nuclear science and technology. In 2017, a new activity 'project conceptualization workshop' was introduced as part of FTC to further achieve these objectives.

The project was held on the last part of FTC, after all the lectures and exercises. The aim of this activity is for the participants to come up with their own project concepts on environmental radioactivity monitoring that they can implement in their respective institutions. In this activity, participants were grouped together according to their background. Then, the participants brainstormed on a project that is relevant to their field of interests. During this workshop activity, the JAEA experts as well as the PNRI lecturers gave advice to the FTC participants and guided them in writing their own project concepts.

The participants presented project concepts, e.g. 'Measurement of Rn-222 Concentration in the Philippine Science High School Dormitories' and 'Radiological Assessment of Bivalves in Marine and Freshwater Environment'. Experts in the field of environmental radioactivity monitoring gave their evaluations and suggestions on how they can further improve and implement their project concepts. The workshop activity engaged the participants to be able to use the knowledge they learned, and share it with their colleagues in their own institutions.



# Actively Contributing to HRD



## Mr. Yevgeniy Tur

National Nuclear Center of the Republic of Kazakhstan (NNC RK)  
ITC 2010 on Nuclear/Radiological Emergency Preparedness

### My Experience in ITC

I was lucky enough to participate in ITC on Nuclear/Radiological Emergency Preparedness in 2010. During the course, Japanese experts showed us excellent skills. They have a lot of experience in training instructors and were always ready to provide us with any information or assistance we needed.

I clearly remember that my visit in Japan was really nice. I was impressed by JAEA staff's warm hospitality. On weekends, we visited a lot of interesting places and enjoyed cultural and historical sightseeing. Thanks to such experiences, we became more familiar with Japanese specific style of work, education and the rest.

### FTC in Kazakhstan

I am working as a senior engineer in NNC RK and responsible for coordination of FTC on Nuclear and Radiological Emergency Preparedness. Since I participated in ITC in Tokai, instructors of Kazakhstan and experts from Japan have conducted FTC for 5 times and trained about 50 people in my country. Furthermore, in the spring of 2017, our Special Radiological Emergency Response Team conducted personnel training for the first time in Kazakhstan. This team is currently fully staffed with necessary materials and equipment, and available for deployment in any place of our country at short notice to mitigate any consequences from emergencies occurred at nuclear-related facilities.

I believe that our training significantly contributes to improving a sense of safety among our country's residents, which brings to grow public confidence in nuclear and radiation technologies.

## Voice from the Pa



## Dr. Saensuk Wetchagarun

Thailand Institute of Nuclear Technology (TINT)  
ITC 2010 on Reactor Engineering III

### Enhanced My Knowledge by Participating in ITC

In 2010, I was a mechanical engineer who just graduated from university and had very limited knowledge of nuclear field, especially on reactor engineering. Participating in ITC on Reactor Engineering not only improved my teaching skills but also enhanced my knowledge. Scientific site visits and on-the-job training were also a great opportunity for me to experience the real world activities in nuclear science and technology. These hands-on and firsthand experiences increased my understanding on the subject in the lecture classes. Through attending ITC, not simply was my academic background improved but Japanese culture was learnt a lot. Also, I made many good friends. We still keep in touch and help each other. I would like to express my gratitude to NuHRDeC, JAEA and MEXT for giving me such a great opportunity to join ITC.

### My Experience in FTC

After ITC, FTC on Reactor Engineering was initiated in 2012 and has been held annually since then. About 10-20 human resources are developed each year. The curriculum for FTC has been adjusted to suit the background of the participants and needs of our country. I have been involved in the course from the beginning as a lecturer on thermal hydraulics, COOLOD and EUREKA code exercise. In 2015, it was an honor to be invited to ITC as a guest lecturer of the nuclear reactor thermal hydraulics. I could once more fully utilize my knowledge and experience obtained from both ITC and FTC.



# in My Country as Instructors

## st ITC Participants

### Learnings from ITC Helped Step Up My Career

**Viet Nam Agency for Radiation and Nuclear Safety (VARANS)**

**Director General  
Dr. Nguyen Tuan Khai**

ITC 2013 on Reactor Engineering I

### Professional Background

My educational background is nuclear physics and nuclear technology, and I obtained Ph.D. in Nuclear Physics at the Institute of Physical and Chemical Research (RIKEN), Japan in 2006. I had worked as the Deputy Director of the Institute of Nuclear Science and Technology (INST), Viet Nam Atomic Energy Institute (VINATOM) since 2013 and was appointed the Director General of VARANS in November 2016.



**Ms. Jannatul Ferdous**

Bangladesh Atomic Energy Commission (BAEC)  
ITC 2012 on Environmental Radioactivity Monitoring

### My Experience in ITC

I have been actively engaged in environmental radiation monitoring, analysis and measurement of radionuclides in various environmental samples in Health Physics Division of the Atomic Energy Center, Dhaka. In 2012, I participated in ITC on Environmental Radioactivity Monitoring in NuHRDeC, JAEA. ITC was well organized and well prepared. This training program gave me a splendid opportunity to acquire knowledge and skills of environmental radiation and radioactivity monitoring. The coordinators of this training course were very supportive and encouraging. Through the course, I also improved my understanding and expertise by experimental activities and facility visits. ITC also helped me establish effective human network in the fields of peaceful application of nuclear energy.

### My Turn to Teach

After participating in ITC, I arranged FTC on Environmental Radioactivity Monitoring in 2013 as a course coordinator and an instructor for the first time. It was a testimony for me; the theoretical and practical knowledge which I achieved from ITC was the propulsive force to act as the lecturer and the course coordinator. In 2017, JAEA invited me as a guest lecturer to ITC on Environmental Radioactivity Monitoring. I delivered two lectures on 'Environmental Radioactivity Monitoring in Bangladesh' and 'Introduction of Liquid Scintillation Counter'.

I always remember friendly NuHRDeC staff, especially the kind and generous faces of the ITC instructors. I also miss the beautiful nature of Ibaraki Prefecture. I am very grateful to JAEA to give me an opportunity for the participation of ITC in Japan.



**Mr. Widodo Soemadi**

National Nuclear Energy Agency (BATAN)  
ITC 2009 on Environmental Radioactivity Monitoring and the other two courses

### Learned a lot by ITP

ITP was launched in 1996, and I was one of the first participants. I was lucky enough to attend three different courses and learned 'Radiation Measurement and Radiation Protection', 'Application of Nuclear Technique in Industry and Environment' as well as 'Environmental Radioactivity Monitoring'. Thanks to these experiences, I was able to enhance my knowledge on nuclear science. Fortunately, I was invited as a guest lecturer of ITC on Environmental Radioactivity Monitoring in 2013 and had a chance to use my knowledge gained from ITP.

### Organized FTC for 17 Years

After I had completed 3 training courses, I shared my knowledge with my colleagues of BATAN by organizing FTC on Radiation Protection, Instrumentation and Nuclear Spectroscopy, Application Nuclear Technique in Industry and Environmental Radiation Monitoring. FTC started 17 years ago, and up to now it has been very effective for training new employees. Not only the employees of BATAN but also workers of Nuclear Energy Regulatory Agency, hospitals, nuclear related institutions and university students have participated in FTC. Its role for human resource development in nuclear field is significant in Indonesia.



# Nuclear Technology Seminar (Seminar)

~Development of Engineers and Specialists~



Nuclear Plant Safety, Research Reactor Operation Exercise at Kindai University

## PICK UP Exercise at Research Reactor of Kindai University

### Nuclear Plant Safety

Period: 18 September – 13 October 2017 (4 weeks)

Place: Tsuruga, Fukui Prefecture, JAPAN

Participants: 10

#### Course Outline:

The course is open to engineers and researchers who are engaged in operation of commercial and research reactors or research and development in the field of radiation application and fundamental nuclear technology in Asian countries. The course provides participants with lectures on safety technology of reactor facilities such as commercial and research reactors in Japan, exercises, nuclear related-facility tours as well as information exchange and discussion on each country's nuclear power generation plan.

#### Reactor Operation Training at Kindai University

10 participants of Seminar on Nuclear Plant Safety visited Atomic Energy Research Institute at Kindai University and had training on reactor operation and neutron radiography experiment.

In the reactor operation practice, the participants had the orientation on the facility overview, experiment procedures and safety instructions, and then studied on the mechanism of a research reactor observing the reactor's main body and nuclear fuel at a short distance. In the control room, they tried to operate control rods under the guidance of the instructor and learned how to reach a critical condition and measure reactivity. The training was performed with the most careful attention as there were some participants who had never experienced in operating a reactor.

The practice of neutron radiography started with the explanation on the principles of neutron radiography compared to X-rays. Neutron beams of the reactor were irradiated to a test object such as a toy by the participants. The beams passed through the object to reflex the images of its internal structure onto the imaging plate. With inspection of the projected images, they came to understand on the efficiency of neutron radiography. Through these practical trainings, they were able to acquire practical knowledge on operational technology and safety on a research reactor.





## Nuclear Energy Officials

Period: 23 October – 10 November 2017 (3 weeks)

Place: Tsuruga, Fukui Prefecture, JAPAN

Participants: 10

### Course Outline:

The course is open to governmental officials who are engaged in nuclear administration. The course provides participants with lectures on a wide range of necessary topics for nuclear administrators such as nuclear energy policy, security administration, safety culture, safety measures and safety management for nuclear facilities, and human resource development. The course also offers tours to nuclear-related facilities as well as information exchange and discussion on each country's nuclear power generation plan. In the year of 2017, participants visited Tsuruga Nuclear Emergency Preparedness Center, in which they were given an explanation about nuclear disaster prevention systems and equipment such as the organizational responses and the emergency response support system in nuclear accidents. The participants were taking a tour very attentively to become knowledgeable to support their own countries in case of such emergencies.



## Basic Radiation Knowledge for School Education

Period: 6 November – 17 November 2017 (2 weeks)

Place: Tokai, Ibaraki Prefecture, JAPAN

Participants: 17

### Course Outline:

The course objective is to foster human resources who will disseminate accurate knowledge of nuclear energy and radiation to the public and students in Asian countries. The course is open to officials in public relations and educational administration of nuclear research institutes and governmental agencies, and to school teachers. The course covers basic topics such as an introduction to nuclear energy and radiation, radiation effects on human body, radiation education in Japan, and public information. The course also offers exercises to learn effective methods for teaching radiation knowledge for the public and students. In 2017, a joint exercise of radiation measurement with local high school students was held continuing from the last year. Along with the exercise, they had a short session to introduce each other's culture. Participants and the students enjoyed cultural exchange as well as the exercise very much.



## Site Preparation and Public Relations

Period: 15 January – 19 January 2018 (1 week)

Place: Tsuruga, Fukui Prefecture, JAPAN

Participants: 7

### Course Outline:

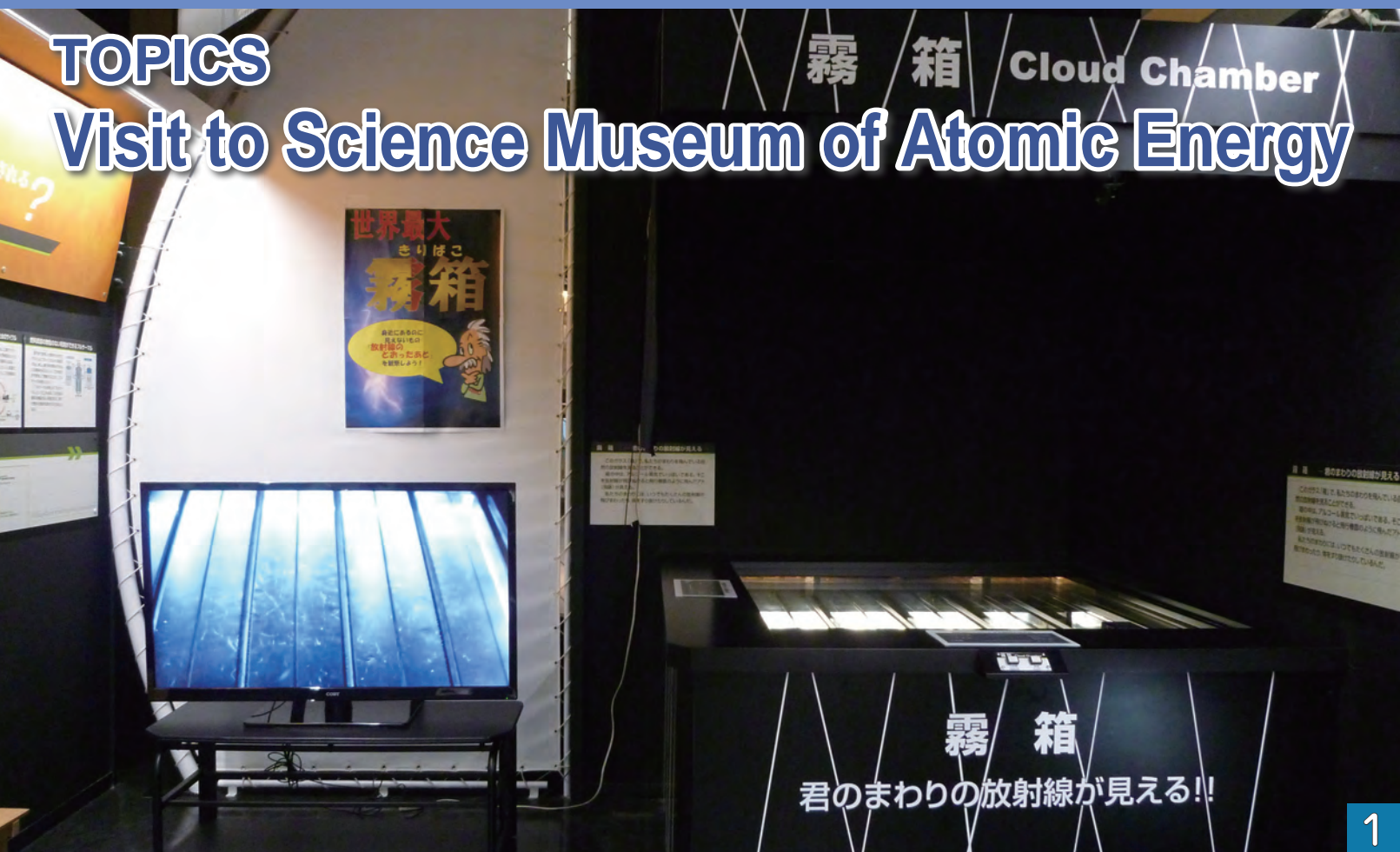
The course is open to governmental officials who are engaged in nuclear regulation and public relations. The course offers lectures on laws and assessment regarding site preparation of nuclear facilities, public relations activities, risk communication as well as a visit to a planned construction site of NPP and information exchange and discussion on each country's nuclear power generation plan. In the year of 2017, participants had a facility visit to the construction site of Japan Atomic Power Company's Tsuruga Power Station Units 3 and 4 which would be the first Advanced Pressurized Water Reactor (APWR) introduced in Japan. During the visit, the participants were carefully listening to the explanation of APWR.





# TOPICS

## Visit to Science Museum of Atomic Energy



1 Ibaraki Museum of Nuclear Science  
World-class Large Cloud Chamber

2 Ibaraki Museum of Nuclear Science  
Radiation Tracks in Cloud Chamber

3 Seminar on Basic Radiation Knowledge for School Education  
Crafting Cloud Chamber



### Ibaraki Prefecture : Ibaraki Museum of Nuclear Science

17 participants who came from 10 countries for Seminar on Basic Radiation Knowledge for School Education visited Ibaraki Museum of Nuclear Science in Tokai, Ibaraki Prefecture. Since the participants in this seminar were mostly the persons who are engaged in public relations of nuclear related organizations or educational administrators or school teachers, they took an active interest in this visit to the museum specialized in atomic energy and radiation.

Ibaraki Museum of Nuclear Science introduces the science of atoms and the nature of radiation by following the footprints of scientists such as Albert Einstein. The exhibition hall is divided into 3 different concept zones which are, 'Basics of Atoms and of Nuclear Power', 'Utilization of Radiation and Nuclear Power', and 'Nuclear Safety'. Each zone is subdivided into two zones where you can learn about the basic principles of atomic energy and the future of nuclear technology.

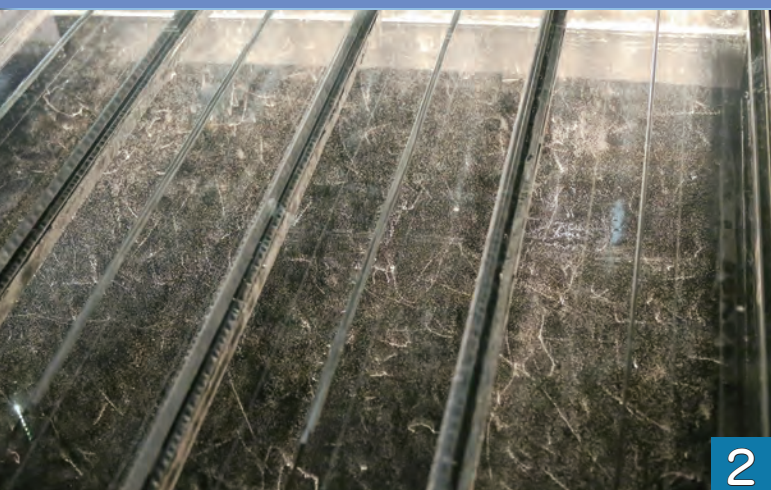
The participants enjoyed learning while they were playing games such as dominos that simulated the chain reaction of nuclear fission and puzzles of choosing essential elements to the human body. There was also a booth where they could try to measure the radiation level of the substances easily found in our daily life like rice, dried mushrooms, dried seaweed and so forth with a simple radiation survey meter. When a mantle used for a lamp found to have a relatively high level of radiation, they seemed to be a bit surprised. After the facility visit, the feedback was given from the participants such as 'I learned while experiencing various kinds of information about nuclear science,' or 'I want to introduce this kind of facility in my country because there were many interesting experiments'. This visit to Ibaraki Museum of Nuclear Science gave them a very beneficial experience to promote dissemination of knowledge of radiation and nuclear energy in each country for the future.



#### Ibaraki Museum of Nuclear Science

Address : 225-2 Muramastu, Tokai-mura, Naka-gun, Ibaraki Prefecture TEL : +81-29-282-3111 Opening Hours : 9:00 AM~4:00 PM  
Closing Days : Every Monday (Mondays that fall on holidays will be open, the museum closes the next day), Year-end and New Year's Holidays(12/29~1/3)  
Admission : Free





2



3



## Tokai, Ibaraki Prefecture : A World-class Large Cloud Chamber

Radiation is not detectable by human's five senses but the passage of radiation can be visualized by a cloud chamber, invented by a British physicist, Charles Thomson Rees Wilson. The principle of a cloud chamber is similar to that of an airplane leaving a white cloud trail in the sky. In a cloud chamber, there is alcohol in a super-saturated state, and when radiation passes through it, white trails are seen along the paths. Depending on the types of radiation, the thickness and length of the tracks are different, so you can visually identify what kind of radiation you have.

Participants of Seminar on Basic Radiation Knowledge for School Education made a cloud chamber using tools around us such as a plastic container, and observed the trails of radiation (alpha rays and beta rays). After that, they visited to Ibaraki Museum of Nuclear Science in Tokai, Ibaraki Prefecture where there is one of the world's largest cloud chambers which is many times bigger than the cloud chambers made by the participants. They were impressed to be able to see many trails of radiation all around, including cosmic rays. Through these activities to study the principle of cloud chamber, they could gain a very valuable experience to make natural radiation visible around them.



## Fukui Prefecture : Fukui Atomic Energy Science Museum 'At Home'

There is an amusement facility called Atomic Energy Science Museum 'At Home' in Fukui Prefecture where many nuclear related facilities and nuclear power plants are located. Fukui Atomic Information Center was opened in October 1976 and it was renamed Atomic Energy Science Museum 'At Home' later in April 1995 as 'Amusement Park for Learning Atomic Power and Energy'. There are 8 educative galleries inside the hall with different themes to experience and study electricity, energy, environment, atomic energy and so on. Visitors can enjoy learning about the themes through various attractions and interactive activities with hands-on exhibit equipment. For instance, visual attractions such as quizzes, games and movies run daily in the theater with 3 big screens and 50 touch panel PCs, and science shows and workshops are organized during holidays to attract many children and families.

To introduce nuclear power generation, gaining understanding and acceptance from public and local community is the most important and challenging issue. To further learn the importance of such issue, visiting 'At Home' is conducted as part of the curriculum of Seminars in Tsuruga. Since the primary visitors of 'At Home' are children and families, the facility visit is scheduled on one of the holidays. Carefully listening to an explanation about the facility, participants observed how children interacted with the exhibits. After the visit, some favorable comments were received from the participants; 'Learning atomic energy through playing is very effective for children', 'An excellent facility to help earn public understanding'. The visit to 'At Home' turned out to be meaningful for them to work for public understanding of nuclear energy.



### Fukui Atomic Energy Science Museum 'At Home'

Address : 37-1 Yoshikawa, Tsuruga City, Fukui Prefecture TEL : +81-770-23-1710 Opening Hours : 9:00 AM~5:00 PM  
Closing Days : Year-end and New Year's holidays(12/29~1/3) E-mail : athome@atom.pref.fukui.jp  
Admission : Free



# Interview



**Director General**  
**Dr. Mohd Ashhar Bin HJ. Khalid**  
**Malaysian Nuclear Agency (Nuklear Malaysia)**

## Professional Background

My career started at Nuklear Malaysia as a nuclear engineer of TRIGA type reactor in 1982 and I have been working here since then. As my background was electrical engineering, I learned nuclear science, such as nuclear instrument and maintenance, nuclear application, nuclear safety etc., by participating in training courses provided by International Atomic Energy Agency (IAEA) and JAEA. After those experiences, I obtained Ph.D. in Electrical Engineering (Control and Instrumentation) in the UK. In the year of 2017, I was inaugurated as the Director General of Nuklear Malaysia.



## Human Resource Development (HRD) Policies in Nuclear Field in Malaysia

HRD is very important, especially in nuclear field as nuclear is a very sensitive issue and making mistakes is not forgiven. Therefore, it is necessary for staff to have not only good technical knowledge and skills but also good understanding of safety. There are many training opportunities from Japan, IAEA, Korea and Russia. Safety is the most important so high level of competency is required, hence we need continuous training to upgrade our technique on safety.

Our employees must attend training at least for 7 days in a year to develop sufficient expertise in nuclear technology and application fields. We also encourage people to get higher qualifications, and now 70-80% of researchers have M.Sc. and Ph.D.



## Evaluation of ITP and Expectations for Japan

Malaysia joined ITP in 2010. Since then, we have sent capable personnel to Japan every year. It has been successful in terms of raising skilled workers. The past ITC participants became good lecturers as well as good researchers and they appreciate hands-on training in ITC. FTC conducted by the past ITC participants is able to expand the trainees' knowledge and skills of nuclear science and technology. The number of FTC participants has been increased over the years, and they are from various agencies, industries and universities (students and lecturers).

We would like JAEA to keep offering current courses for Malaysia and to share advanced knowledge on nuclear science. In addition, as Japan has accumulated knowledge on radiotherapy and nuclear medicine, we would be grateful if you could give us a chance to learn knowledge in those fields by offering a new training course.





# Nuclear Education at Asian Universities



## National University of Mongolia (NUM) Nuclear Research Center (NRC)

### History and Current Nuclear Education in Mongolia

Nuclear education program at NUM started in 1968 when several students who had finished their undergraduate study in Department of Physics and Mathematics, majored nuclear physics in graduate school. In 1993, the nuclear technology program was established. Since then, on average 25 students enrolled in the program every academic year. In 2013, there was a restructure of NUM and the current nuclear engineering education program in undergraduate course was established at School of Engineering and Applied Sciences. As for the graduate course, there are 2 programs related to nuclear education: nuclear technology and nuclear energy for Master course and nuclear technology for Ph.D. course. Currently, over 50 undergraduate and 10 graduate students are being enrolled in the programs. The role of NUM is vital to nuclear human resource development since it is the only organization to provide the course specialized in nuclear science in Mongolia. So far, over 200 graduates from the programs are working as specialists at Nuclear Energy Commission, Government of Mongolia, and as researchers or engineers at scientific research centers and so on.

### Past ITC Participants' Contribution toward Nuclear Education

NRC of NUM is the only institute where researches on low energy nuclear physics, nuclear non-power technology and nuclear energy are carried out. So far, 7 young researchers from NRC have participated in ITC on Reactor Engineering in Japan since 2012. After finishing ITC, they have organized FTC in Mongolia together with associate professors of NUM, and these courses have been highly successful until now. In addition, at NRC, scientific seminars are held by the past ITC participants and they present and share what they have learnt in ITC with their colleagues.



## University of Technology Malaysia (UTM) Nuclear Engineering Program

### Nuclear Engineering Education

Nuclear engineering program in the energy engineering department was introduced in 2012. It was the first and is the only program of such kind in Malaysia. It is a 4-year program with 136 credit hours. The curriculum of the program was formulated based on the guidelines of IAEA with engagement of all stakeholders in the country. It is benchmarked against top universities in other countries that offer similar programs. Currently there are 10 teaching staff and on average, the annual enrolment to the program is 28 students and 2 batches of students of 61 have graduated. The curriculum has just been revised to include recommendations made by external examiners and stakeholders. All experimental courses are conducted in our laboratories except the reactor experimental course which is conducted at the TRIGA MarkII Research reactor, Nuklear Malaysia.

### Past ITC Participants' Contribution toward Nuclear Education

6 teaching staff participated in ITC on Reactor Engineering in JAEA. Upon their return from Japan, they have been actively involved in teaching radiation and nuclear core courses such as nuclear physics, nuclear reactor materials, nuclear fuel cycle and waste management, thermodynamics, radiographic testing, nuclear safety, regulation and safety and other related courses. Apart from teaching, they are heavily engaged in the nuclear engineering curriculum revision exercises by incorporating inputs from various stakeholders. They also take part in the annual FTC organized by Nuklear Malaysia. It is hoped that JAEA continues to include our teaching staff in future activities because such activities indirectly help in improving the nuclear engineering program in UTM.





## ● ITP Schedule in JFY2018

Course		Course Period	Announcement	Deadline	Selection Result	Place	Participant
ITC	Reactor Engineering	20 Aug - 12 Oct 2018	Mar, 2018	May, 2018	Jun, 2018	Tokai, JAPAN	18
	Environmental Radioactivity Monitoring	18 Jun - 27 Jul 2018		Apr, 2018	May, 2018		8
	Nuclear/Radiological Emergency Preparedness	18 Jun - 27 Jul 2018					6
Seminar	Nuclear Plant Safety	17 Sep - 12 Oct 2018	Apr, 2018	Jun, 2018	Jul, 2018	Tsuruga, JAPAN	10
	Nuclear Energy Officials	22 Oct - 9 Nov 2018	Apr, 2018	Jun, 2018	Jul, 2018	Tsuruga, JAPAN	10
	Basic Radiation Knowledge for School Education	5 Nov - 16 Nov 2018	Jun, 2018	Jul, 2018	Aug, 2018	Tokai, JAPAN	14
	Site Preparation and Public Relations	14 Jan - 18 Jan 2019	Apr, 2018	Jun, 2018	Jul, 2018	Tsuruga, JAPAN	10

\*The course period of seminars held in Tsuruga may change.

(Total Participants : 76)



**Mr. Satoshi Sakurai**

Director  
Nuclear Human Resource Development Center (NuHRDeC)  
Japan Atomic Energy Agency (JAEA)

## ● Interview with Director of NuHRDeC



### Future Prospects of ITP

ITP celebrates its 22nd anniversary and, until now, more than 5,000 participants have completed the program, who have played important roles for nuclear energy use in Asian countries. However, the situation in each country differs. Some countries are ready to introduce nuclear power plants while others are trying to learn the basics of radiation. For the former, the ITP project should evolve with the keywords of 'Advanced' and 'Specialized'. And for the latter, it is important to customize the courses based on the needs of target countries.



### Japan's Responsibility in Asia

It is said that Japan had imported the newest-at-the-time knowledge of science and technology from the European countries. Nevertheless, Japan has produced the most Nobel Prize winners in Asia in this field. This is because of the long history from the Meiji period that we translated huge amount of the imported knowledge into our own language, studied it and made it of our own. Making the most use of this experience, Japan should positively contribute to development of the infrastructure for use of nuclear energy in each country in Asia from the viewpoint of human resource development as well.

## ● Editor's Note

For the publication of Newsletter, we contacted many people who had been involved in ITP to ask the manuscripts and to share their ideas. Recalling the courses in 2017 made us feel nostalgic about the participants and everything. With editing articles and selecting pictures for Newsletter, it was also a great pleasure for us to get to know how the past ITC participants had been doing so far.

In 2017, Turkey joined FTC as a newcomer. The past ITC participants were gathered in cooperation for the first FTC hosted by Turkey and it ended with a great success.

In the Topics of Newsletter Vol. 4, Science Museums in Tokai and in Tsuruga are featured as they are the museums specialized for atomic energy and offer interactive learning experiences. We hope all the learnings and insights got from the facility visits can inspire the participants' contribution to the peaceful utilization of nuclear energy.

## ● ITP Counterparts in JFY2017

Country	Organization
Bangladesh	Bangladesh Atomic Energy Commission (BAEC)
Indonesia	National Nuclear Energy Agency (BATAN)
Kazakhstan	National Nuclear Centre of the Republic of Kazakhstan (NNC RK) Institute of Nuclear Physics (INP)
Malaysia	Malaysian Nuclear Agency (Nuklear Malaysia)
Mongolia	Nuclear Energy Commission (NEC)
Philippines	Philippine Nuclear Research Institute (PNRI)
Saudi Arabia	King Abdullah City for Atomic and Renewable Energy (KACARE)
Sri Lanka	Sri Lanka Atomic Energy Board (SLAEB)
Thailand	Thailand Institute of Nuclear Technology (TINT)
Turkey	Turkish Atomic Energy Authority (TAEK)
Viet Nam	Viet Nam Atomic Energy Institute (VINATOM)



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