



High Temperature Engineering Test Reactor in JAEA



ITP on Nuclear/Radiological Emergency Preparedness and Environmental Radioactivity Monitoring, Türkiye

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# Developing Instructors in Nuclear Field in Asia

## Instructor Training Program (ITP)

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 aims of ITP are 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 become a hub for international activities. ITP initially started with two participating countries, and currently the number of the countries has increased up to eleven.

### Training in Japan

#### Instructor Training Course (ITC)

ITC is designed to foster technical instructors concerning three areas: Reactor Engineering, Nuclear/Radiological Emergency Preparedness and Environmental Radioactivity Monitoring. During the three-to-five-week courses in Tokai-mura, Ibaraki Prefecture, Japan, participants from Asian countries aim to acquire necessary basic knowledge as instructors through joining lectures by experts, exercises using a variety of equipment, and visits to nuclear facilities.

#### Advanced Instructor Training Course (AITC)

AITC is designed for enhancing FTC instructors' quality in three areas: Reactor Engineering, Nuclear/Radiological Emergency Preparedness and Environmental Radioactivity Monitoring. Participants of this course stay in Tokai-mura, Ibaraki prefecture, Japan for about ten days. They are expected to acquire advanced technical knowledge and skills through the course. The lectures and exercises are organized to learn deeply about themes of each area.

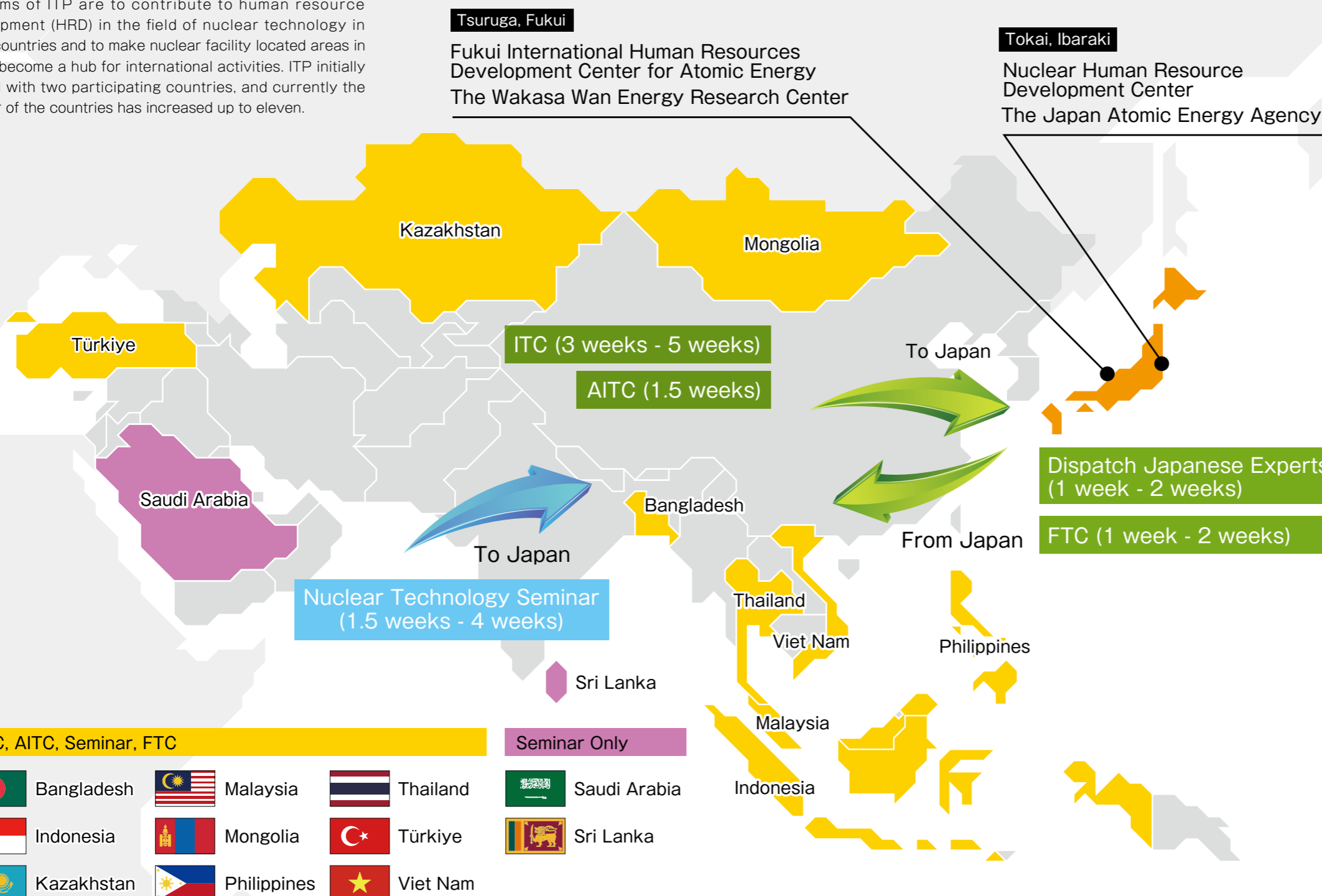
#### Nuclear Technology Seminar (Seminar)

Seminar is designed to cultivate engineers and specialists in specific areas of nuclear technology. In Tsuruga city, Fukui prefecture, three seminars are held: Nuclear Plant Safety, Nuclear Energy Officials, and Site Preparation and Public Relations. Basic Radiation Knowledge for School Education is held in Tokai-mura, Ibaraki Prefecture. Participants of Seminar are invited to Japan for one to four weeks to improve their specialty through tours to nuclear facilities, discussion and interaction with people at nuclear facilities located areas, as well as lectures and exercises.

### Training in Participating Countries

#### Follow-up Training Course (FTC)

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 excellent instructors by the accumulation of teaching experiences year by year through FTC. Two or three Japanese experts are dispatched to FTC to give lectures and technical advice for the establishment of the self-sustainable training courses.



## Developing Instructors in the Nuclear Field 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

### The Accumulated Number of ITP Participants (JFY 1996~2023)

Instructor Training Course	724
Advanced Instructor Training Course	71
Follow-up Training Course	6943*
Nuclear Technology Seminar	647

\*The number is as of 1 February 2024.

## Reactor Engineering

Period: 5 July – 8 August 2023 (5 weeks)  
 Venue: Tokai, Ibaraki  
 Participants: 8

Outline: Participants acquire a wide range of knowledge on nuclear engineering and the skills to disseminate the knowledge as a lecturer. The course is open to engineers, researchers and academic staff in the nuclear field. In JFY 2023, the course provided 18 lectures, 6 exercises, and 9 facility visits.



Hydrogen production test facility, JAEA

### Visiting the Next-Generation Innovative Reactor at the JAEA

High Temperature Engineering Test Reactor (HTTR) is a research reactor of the High Temperature Gas-cooled Reactor (HTGR), which is actually operated at JAEA. The HTTR is one of the small modular reactors (SMR) that have been attracting worldwide attention in recent years and are being designed and developed in many countries. The participants were briefed on the characteristics of HTGR; HTTR uses black spherical fuel of about 1 mm in diameter with four layers of coating, helium gas is used to cool the reactor instead of water because the temperature at the reactor outlet is very high (950 ° C), and graphite, which is resistant to high temperatures, is used for the core structural material. The participants were especially

interested in the high safety features of the HTGR, such as the fact that the fuel will not melt even if the reactor cannot be cooled by an accident in which all external power sources are lost (station blackout). The participants visited the Hydrogen production test facility adjacent to HTTR to see the research facility for carbon-free hydrogen production technology using high-temperature helium gas (thermochemical hydrogen production method that thermally decomposes water using iodine (I) and sulfur (S) compounds). They also visited Joyo, a research reactor for sodium-cooled fast reactor, one of the other SMRs, and were able to deepen their knowledge on various aspects of next-generation innovative reactors.



Exercise on Radiation Protective Gear

## Nuclear/Radiological Emergency Preparedness

Period: 5 July – 26 July 2023 (3 weeks)  
 Venue: Tokai, Ibaraki  
 Participants: 6

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 and academic staff in the nuclear field. In JFY 2023, the course provided 13 lectures, 11 exercises and 6 facility visits. Some parts of the curriculum were joint classes with ITC on Environmental Radioactivity Monitoring.

### Blocking the Internal Uptake of Radioactive Substances

In the event of a radiation-related incident, the foremost priority in emergency response is to protect human lives and ensure safety. This involves the prevention of exposure to radiation. Various equipment has been developed worldwide to prevent the internal exposure, in which radioactive materials are taken into the body through inhalation or different other ways.

In this course, participants learned about protective gear covering the body and limbs, as well as the correct

method to put on and take off mask-like respiratory protective gear. Incorrect wearing could allow radioactive substances to enter the protective gear through gaps during work. Similarly, improper removal could spread radioactive substances adhering to the protective gear, causing the spread of contamination. Participants practiced the step-by-step process of wearing and taking off protective gear, enhancing their understanding of the correct procedures.

## Environmental Radioactivity Monitoring

Period: 5 July – 26 July 2023 (3 weeks)  
 Venue: Tokai, Ibaraki  
 Participants: 6

Outline: Participants acquire knowledge and skills on environmental radioactivity monitoring. The course is open to engineers, researchers and academic staff in the nuclear field. In JFY 2023, the course provided 12 lectures, 10 exercises and 7 facility visits. Some parts of the curriculum were joint classes with ITC on Nuclear/Radiological Emergency Preparedness.



Ambient dose rate measurement in Fukushima

### Measuring Radiation Levels in Fukushima

What is the current radiation situation in Fukushima? In the ITC on Environmental Radioactivity Monitoring, participants conducted practical training with the participants of ITC on Nuclear/Radiological Emergency Preparedness to give a firsthand experience of the current status of Fukushima. The training took place in the area where evacuation orders has lifted in 2017, namely the region where residents of Iitate, Soma, Fukushima, have resumed their lives. Participants engaged in hands-on radiation measurement exercises.

To ensure accurate measurements on-site, participants learned in advance about the principles of

measuring instruments, measurement methods and precautions to make the correct measurements on site. Working together in groups, participants meticulously followed each step of the measurement process. Additionally, they compared their measurements with those from the monitoring post and experimented with different heights of the measurement device from the ground to observe how radiation levels changed. During this practical training, participants were able to confirm, through actual measurements that radiation levels in areas of Fukushima where decontamination had been completed had dropped to the same level as natural radiation.

### Comments from ITC Participants



#### Reactor Engineering

**Mr. Mark Dennis Anak USANG**  
 Malaysian Nuclear Agency (Nuklear Malaysia)

The most valuable experiences of ITC are the opportunities of visiting some of the most advanced laboratories and facilities. Let's not even mention the research reactors and accelerators that host some of the cutting-edge experiments in the world. We also saw a laboratory investigating sensors for quantum computing and another laboratory measuring plasma temperature of fusion reactors using lasers. We were also able to visit an actual nuclear power reactor and the corresponding operation control room full scope simulator. These visits allow the participants to glean some insights on how these facilities came together and the inspiration to improve their scientific work.



#### Nuclear/Radiological Emergency Preparedness

**Mr. Trung Trong Hoang NGUYEN**  
 Vietnam Atomic Energy Institute (VinAtom)

I was very excited because it was my first time to visit Japan and attend the training course. The ITC exceeded all my expectations. The enthusiasm and hospitality of the staff of NuHRDeC made me feel at home. Not only did I gain a lot of the expertise needed for my job from JAEA's experts but also I had the opportunity to exchange knowledge and collaborate with my new colleagues from other Asian countries. I'm eagerly looking forward to sharing my newfound experience and knowledge with the FTC participants in my country.



#### Environmental Radioactivity Monitoring

**Ms. Funda BARKAS ŞİMŞEK**  
 Turkish Energy, Nuclear and Mineral Research Agency (TENMAK)

This ITC training has been one of the most beneficial learning experiences for me. The quality and content of the training not only refreshed my knowledge but also helped me to improve my presentation skills.

The meticulously prepared presentations not only gave theoretical information, but also helped me to understand and grasp the concepts by turning them into practice. The examples in the training provided us with a great perspective.

Additionally, the interactive classroom environment and group activities fostered a fantastic team spirit. Collaborating with other participants and understanding their viewpoints enriched the social and learning experience of the training.

# Voice from Guest Lecturers

## What is a Guest Lecture?

Past ITC participants who showed excellent performance in ITC and actively contribute to FTC in their own countries are invited as guest lecturers to ITC. This system has started in JFY 2010 and 39 guest lecturers have been invited from each country so far. In JFY 2023, three past ITC participants were selected as the guest lecturers.

### Mr. Arman MINIAZOV

National Nuclear Center of the Republic of Kazakhstan (NNC RK)  
Completed ITC 2017 on Reactor Engineering II

Kazakhstan



#### My Experience in Nuclear HRD and FTC

I have been working with NNC RK and ten years ago, I was interested in human resource development in the field of peaceful use of atomic energy. That's why I started to take part in conducting FTC with my colleagues. I had a first experience as an instructor of practical classes in reactor materials science. Then, in 2015, I got a chance to give a lecture on my own under the topic of "Reactor materials science". To improve the knowledge and get experience, I became interested in participating in ITC on Reactor Engineering. And after successful completion of the ITC in JFY 2017, I was able to improve the lecture materials significantly due to the high quality of the lecturers and exercises of ITC.

#### My Experience and Impression as a Lecturer

In JFY 2023, I was given the honor and responsibility of being a guest lecturer. It was a unique experience. It is in such conditions that lecturers reach a new professional level, which ensures the sustainable development of the personnel training program for the nuclear industry.

At the same time, I am actively participating in the FTC as a coordinator. Now, NNC RK has a strong team of coordinators and instructors, most of whom have successfully completed the ITC. Today, personnel training is steadily developing in NNC RK, and the cooperation with NuHRDeC of JAEA plays a vital role in this. I sincerely look forward to the continued success of ITC and our ongoing cooperation in the future.

### Ms. Gantsetseg PUREVBAATAR

Nuclear Energy Commission (NEC)  
Completed ITC 2016 on Nuclear/Radiological Emergency Preparedness

Mongolia



#### My Experience of FTC as a Coordinator

I became an instructor after participating in the ITC in JFY 2016 and have been working as a coordinator of FTC since then. I have organized 8 more trainings apart from FTC during this time. During the accompanying training, the trainer participates in classes alongside other trainers, covering specific topics such as wearing and removing radiation protective gear, measuring radioactive contamination, working with measurement devices and equipment, planning response measures for a radiological emergency, and conducting and executing full-scale exercises to improve the role and response of relevant agencies.

In JFY 2023, I was invited as a guest lecturer of ITC, where I gave a presentation on how to organize Mongolia's radiation emergency

preparedness and response measures, as well as the associated trainings. It was a life-changing event for me because I could share my knowledge and expertise with people from many nations.

#### The Future Plan as an Instructor

Duties and positions of emergency workers and first responders has been changing often in our country, thus newly appointed personnel for radiation emergency must be trained. As a result, we organize basic trainings on radiation protection, radiation safety and security, and response measures in the event of nuclear and radiation emergencies, and to improve human resource capacity in this area for employees of relevant government organizations. I'm certain that my expertise and experience in ITC will significantly help in successfully fostering the necessary personnel in Mongolia.



### Mr. Ryan Joseph ANIAGO

Philippine Nuclear Research Institute (PNRI)  
Completed ITC 2016 on Environmental Radioactivity Monitoring

Philippines



#### Benefits of ITC

After attending ITC on Environment Radioactivity Monitoring, my technical knowledge and skills widened a lot. On top of this, it also made me grow as an instructor. I learned practical lessons in delivering lectures, facilitating exercises, and organizing training courses. Listening to experts from JAEA provided me with lots of ideas on how to explain technical lectures in a more practical manner to participants and subordinates in PNRI. Their lectures and experiments also gave me ideas in preparing learning and exercise materials that students can more easily understand and appreciate. Furthermore, my interaction with co-participants of ITC became a perfect venue to learn the best FTC practices from their respective countries.

#### My Experience as an FTC Coordinator

Being a practical person, I personally liked how we were able to demonstrate what we learned from

the lectures and exercises during our final presentation at JAEA. Inspired by this, I included a workshop activity for the participants during the time I was the FTC coordinator, wherein they conceptualized original environmental radioactivity monitoring projects. This activity got positive feedback from participants and was included again in the FTC syllabus in the following year. This activity can also foster the interest of and collaboration with participants from other organizations in conducting environmental radioactivity monitoring projects.

#### The Future Plan of FTC

In the future, I hope that FTC on Environmental Radioactivity Monitoring will include more exercises and practical experiments. I believe that participants will highly appreciate and be very interested in hands-on experiments and exercises in environmental radioactivity measurement using various techniques and different kinds of detectors.

# Advanced Instructor Training Course (AITC)

## Reactor Engineering

Period: 14 November - 24 November 2023 (1.5 weeks)  
Venue: Tokai, Ibaraki  
Participants: 9

In this course, to enhance knowledge related to nuclear safety, participants gained an overview of nuclear accidents and nuclear regulations. Following this, they delved into advanced core technologies supporting nuclear safety, including calculation methods for thermal-hydraulics events and radiation damage of materials, and analysis techniques for nuclear fuel. As part of their specialized training, participants conducted practical exercises on the fundamentals and applications of the radiation transport code called PHITS. They learned how the PHITS code could be widely applied in the field of nuclear engineering, such as for the calculation of decay heat from irradiated nuclear fuels and for the calculation of radiation damage by neutrons and charged particles.

Additionally, information obtained directly through the visit to the Tokyo Electric Power Company (TEPCO) Decommissioning Archive Center and the Fukushima Daiichi Nuclear Power Station left a profound and meaningful impression on the participants.

Outline : For the JFY 2023, the main theme was focused on nuclear safety and its underlying fundamental technologies. The objective was to acquire advanced and specialized knowledge and skills in nuclear reactor engineering. The course provided 10 lectures, 3 exercises and 2 facility visits. Some parts of the curriculum were joint classes with other courses of AITC.



Fukushima Daiichi nuclear power station  
Source: TEPCO

## Nuclear/Radiological Emergency Preparedness

Period: 14 November - 24 November 2023 (1.5 weeks)  
Venue: Tokai, Ibaraki  
Participants: 5

In the event of a nuclear/radiological accident, the most important thing is to assess radiation levels quickly and accurately using portable radiation measurement devices in various situations. In this course, under the theme of "Radiation Measurement Technics at Nuclear/Radiological Emergency", participants learned about radiation measurement devices currently used in Japan and their application, as well as deepened their knowledge of the latest measurement equipment currently being developed. Participants also engaged in discussions on radiation accident case studies from various countries, exchanging opinions on emergency response methods and technical challenges.

Participants also visited the Facility of Radiation Standards (FRS) at Nuclear Science Research Institute of JAEA, one of the world's largest comprehensive radiation calibration facility. They observed how radiation measuring instruments are maintained to correctly measure radiation based on national standards and understood on the importance of calibrating instruments, leaving a lasting impression on the significance of maintaining precision in radiation measurement.

Outline : For the JFY 2023, the goal was to acquire advanced and specialized knowledge and skills in radiation measurement technology during emergency situations. The course provided 10 lectures, 5 exercises and 2 facility visits. Some parts of the curriculum were joint classes with other courses of AITC.



Facility of Radiation Standards (FRS), JAEA

## Environmental Radioactivity Monitoring

Period: 14 November - 24 November 2023 (1.5 weeks)  
Venue: Tokai, Ibaraki  
Participants: 6

In environmental radioactivity monitoring, it is necessary not only to observe and measure but also to analyze and evaluate the observation and measurement data according to specific objectives. Participants learned statistical analysis methods and uncertainty assessment techniques using actual measurement data.

Participants also learned about environmental radioactivity monitoring in the event of a nuclear disaster from a researcher at JAEA. This researcher, who has been conducting monitoring in Fukushima after the accident at TEPCO's Fukushima Daiichi Nuclear Power Station, shared insights on devising ways to monitor the environment under actual contaminated conditions. Although the practical exercise was carried out in the cold, gusty wind, participants found it to be a valuable learning experience, particularly in acquiring techniques for sample collection in contaminated areas.

Outline : For the JFY 2023, the aim was to acquire advanced and specialized knowledge and skills in the analysis and evaluation of environmental radiation measurement data. The course provided 9 lectures, 5 exercises and 2 facility visits. Some parts of the curriculum were joint classes with other courses of AITC.



Exercise on soil sampling

# Follow-up Training Course (FTC)



FTC on Environmental Radioactivity Monitoring, Viet Nam

## Nuclear/Radiological Emergency Preparedness



### Learning Practical Skills

FTC on Nuclear/Radiological Emergency Preparedness in Viet Nam is alternately held between in the northern city of Hanoi and the southern city of Da Lat. In JFY 2023, the FTC took place at the Dalat Nuclear Research Institute of the Vietnam Atomic Energy Institute (VinAtom). The course was led by past ITC participants, attracted 36 participants from various regions in central and southern Viet Nam.

The FTC in Da Lat emphasized a lot of hands-on exercises, allowing participants to acquire practical skills. They learned how to use radiation detectors to decontaminate areas contaminated with radioactive substances, and how to properly wear radiation protection gear such as full-face masks and protective suits. As a summary of the training, participants conducted an emergency integrated

drill based on the assumption that a storage container of radiopharmaceuticals was damaged in a traffic accident while transporting it by car. After the exercise, participants reviewed the recorded videos to discuss how to respond effectively during real situations and deepen their understanding with the guide of instructors. Through a week of intensive training, participants not only grasped theoretical knowledge but also acquired practical skills.



Emergency response drill

## Reactor Engineering



Kazakhstan

### FTC Held in Two Cities

The government of Kazakhstan has decided on the installation policy of its first commercial nuclear power plant, marking a significant step towards introducing cutting-edge nuclear technology. The country is actively seeking a technical partner from globally renowned companies for this venture. FTC on Reactor Engineering in Kazakhstan in JFY 2023 was held for about two weeks at two locations; not only at the National Nuclear Center of the Republic of Kazakhstan (NNC RK) in Kurchatov, where FTC-RE was only held until last year, but also at the Institute of Nuclear Physics (INP) in Almaty for the first time in nine years.

The training at NNC RK involved eleven young professionals from NNC RK and one university faculty member. This year, the training duration was extended from four to five days to enhance practical training and site visits. Participants engaged in lively discussions during the Monte Carlo simulation exercise, evaluating the criticality of a container with plutonium solution. Additionally, they visited the Semipalatinsk Nuclear Test Site, once part of Soviet Union, where a little amount of

radioactive contamination still remains. NNC RK proposed to improve their FTC based on advice from Japanese experts, aiming to achieve a higher level of training.

After a nine-year gap, the FTC at INP saw the participation of ten researchers and engineers from INP, as well as eight students from Al-Farabi Kazakh National University during the three-day event focused on lectures and facility tours. The training at INP received positive feedback with active question-and-answer sessions during all lectures. Due to its success, INP propose to continue FTC in the future.



Exercise on Monte Carlo simulation code

## Environmental Radioactivity Monitoring



Bangladesh

### Wide-ranging Training from Fundamentals to Practical Applications

As the Rooppur Nuclear Power Plant in Bangladesh approaches commissioning, the importance of environmental radioactivity monitoring has grown significantly. In this context, the Bangladesh Atomic Energy Commission (BAEC) organized the annual FTC on Environmental Radioactivity Monitoring at Atomic Energy Research Establishment (AERE) in Savar. This year, 19 participants including BAEC and university staff joined under a guidance of the past ITC participants leading various lectures and practical sessions.

The curriculum is designed to enable students to learn a wide range of topics in one week, starting from the basics such as the properties of radiation to more specialized topics such as the principles of various radiation measuring instruments. Instructors progressed through the lectures, confirming the participants' understanding and providing detailed explanations, including drawing diagrams in response to their questions. Participants showed a strong interest in the lectures, actively participating in discussions with the instructors.

In the practical training, participants collected water and soil samples which are the fundamental investigation subject of environmental radioactivity monitoring, and deepened their understanding of how to use germanium semiconductor detectors and other equipment by actually seeing them in use. Additionally, facility tours of the tandem accelerator and research reactor enhanced participants' knowledge not only in environmental radioactivity monitoring but also in the broader field of nuclear science and technology.



Exercise on radioactivity measurement of environmental samples

# Nuclear Technology Seminar

## Basic Radiation Knowledge for School Education

Period: 21 September – 4 October 2023 (2 weeks)  
 Venue: Tokai, Ibaraki  
 Participants: 12

Outline : The course objective is to foster human resources who will disseminate correct knowledge of nuclear energy and radiation to the public and students in Asian countries. The course is open to persons in charge of public relations in nuclear research institutes or governmental agencies, persons involved in educational administrations and school teachers. In JFY 2023, the course provided 8 lectures, 5 exercises and 6 facility visits.



Radiation measurement exercise with high school students

## Learning About Nuclear Disasters and the Latest Nuclear Technology

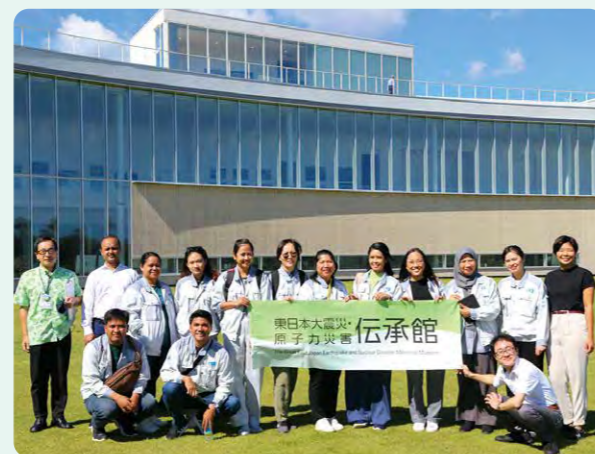
The Great East Japan Earthquake has provided many lessons for those in a position to teach the fundamentals of radiation, particularly in understanding nuclear disasters. Participants visited the Great East Japan Earthquake and Nuclear Disaster Memorial Museum (cf. NewsLetter Vol.8) and Ukedo Elementary School in Futaba, Fukushima, to learn about the conditions following the earthquake and tsunami that triggered the TEPCO's Fukushima Daiichi Nuclear Power Station Accident. They explored videos and exhibits to understand the events that became apparent after the nuclear accident. Additionally, during their visit to Riprun Fukushima, participants gained insights into techniques for the secure disposal of extensive amounts of soil and waste contaminated with radioactive substances. Participants expressed that they gained a good understanding of how Japan has worked towards recovery after this significant disaster, and they appreciated the opportunity to visit many impressive facilities.

Furthermore, the participants visited the High-Temperature Engineering Test Reactor (HTTR), which is garnering attention as one of the next-generation innovative reactors (cf. page 4 for details). HTTR aims to develop technology for producing hydrogen without emitting carbon dioxide, and the participants were impressed by the opportunity to visit the next-generation innovative reactor. They expressed anticipation for the practical application of high-temperature gas reactors in the future.



Riprun Fukushima

## Comments from Participants

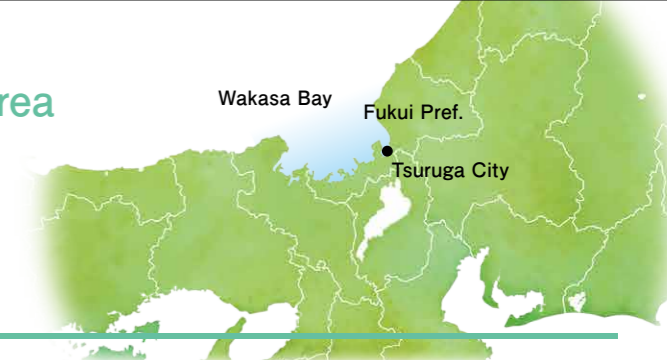


### Visiting the Great East Japan Earthquake and Nuclear Disaster Memorial Museum

The tour of the Memorial Museum was one of the most memorable facility visits. Exploring the Memorial Museum allowed me to comprehend the challenges that the Japanese people have faced. While the disaster itself was incredibly frightening, the way the Memorial Museum conveyed the actual events to visitors was astonishing and deeply resonated with me. Witnessing how the Japanese people came together and made maximum efforts to save lives was truly inspiring. I also want to express my respect for those who have wholeheartedly dedicated themselves to addressing and mitigating the impacts of this disaster.

## The Characteristics of the Coastal Area along Wakasa Bay in Fukui

The coastal area of Wakasa Bay in Fukui Prefecture stands out as an exceptional concentration of various types of nuclear facilities, including nuclear reactor facilities, training and research facilities, and other nuclear-related establishments, making it distinctive on a global scale. Leveraging this unique characteristic, we have been organizing the Nuclear Technology Seminar in Tsuruga, Fukui. The seminar included courses on Nuclear Plant Safety, Nuclear Energy Officials, and Site Preparation and Public Relations.



## Nuclear Plant Safety

Period: 25 September – 20 October 2023 (4 weeks)  
 Venue: Tsuruga, Fukui  
 Participants: 10

### Experience of Operating a Research Reactor

Participants had the opportunity to experience the operation of the research and educational nuclear reactor of the Atomic Energy Research Institute, Kindai University. Through hands-on exercises such as starting up, increasing output, and operating the reactor from criticality to shut down, participants deepened their understanding of the characteristics of nuclear reactors. Additionally, they visited various nuclear-related facilities such as nuclear power plants and plant manufacturers. Through direct interactions and discussions with professionals, they acquired a broad knowledge of safety measures in the nuclear industry.

Outline : The course is open to researchers and engineers engaged in the field of radiation application, fundamental nuclear technology, and operation of commercial or research reactors in Asian countries. The course provides participants with lectures on safety measures and risk assessment for nuclear facilities, operation and maintenance of nuclear reactors, prevention of nuclear disaster and management of radioactive wastes. Moreover, it provides exercises and nuclear related facility visits as well as information exchange and discussion on each country's nuclear power generation plan. In JFY 2023, the course provided 20 lectures, 3 exercises, 8 facility visits and 3 discussions.



Research reactor operation exercise in Kindai University

## Nuclear Energy Officials

Period: 4 December – 22 December 2023 (3 weeks)  
 Venue: Tsuruga, Fukui  
 Participants: 10

Outline : The course is open to governmental officials 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 JFY 2023, the course provided 18 lectures, 8 facility visits and 3 discussions.

### Discuss the Leadership

Participants learned about laws and their enforcement in the field of administration of nuclear energy from organizations such as the Nuclear Regulation Authority and the Fukui Prefectural Government. Additionally, they visited the Fukui Prefectural Environmental Radiation Research and Monitoring Center as well as the Fukui Prefectural Mihama Nuclear Disaster Prevention Center to study the efforts of administrative agencies responsible for safety measures. Furthermore, they discussed the leadership required in administration concerning nuclear safety.



Group discussion

## Site Preparation and Public Relations

Period: 1 November – 10 November 2023 (1.5 weeks)  
 Venue: Tsuruga, Fukui  
 Participants: 10

Outline : The course is open to governmental officials in nuclear regulation and public relations. The course provides participants with lectures on laws and assessment regarding site preparation of nuclear facilities, public relations activities, and risk communication as well as a visit to a planned construction site of nuclear power plants. Furthermore, participants exchange information and have discussions on each country's nuclear power generation plan. In JFY 2023, the course provided 10 lectures, 5 facility visits and 2 discussions.

### Learn How to Choose Site

Participants visited the construction site of Units 3 and 4 at the Tsuruga Power Plant by the Japan Atomic Power Company, overlooking the site from a high spot. They received detailed explanations on environmental impact assessments and seismic design initiatives during the construction preparation phase, deepening their understanding of what they had learned in lectures. Additionally, they visited the Atomic Energy Science Museum called At Home, where they learned about the importance of public relations activities for the local community.



Construction sites of Tsuruga Power Station Units 3 and 4

# Current Initiatives in NPP Sited Areas



The guidance theater in the museum

## Ibaraki Museum of Nuclear Science

■Address: 225-2 Muramatsu, Tokai, Naka, Ibaraki, 319-1112  
 ■TEL: +81-29-282-3111 ■Website: <http://ibagen.or.jp>



Appearance of WERC

## The Wakasa Wan Energy Research Center

■Address: 64-52-1 Nagatani, Tsuruga, Fukui, 914-0192  
 ■TEL: +81-770-24-2300 ■Website: <https://www.werc.or.jp/>



Mr. KATAYAMA Shigeatsu  
 Technical Coordinator,  
 The Wakasa Wan Energy Research Center

### Ibaraki

## Navigating the Interplay between Radiation, Nuclear Power, and Society: Disseminating Accurate Knowledge and Information

Conducted an interview with Mr. ASANO Yukio, the director of the Ibaraki Museum of Nuclear Science in Tokai, Ibaraki, operated by the Ibaraki Nuclear Energy Committee

**JAEA** Could you please share the purpose for establishing the Ibaraki Museum of Nuclear Science?

**Mr. Asano** The organization was established with the goal of disseminating a wide range of knowledge on radiation fundamentals and the safety of nuclear power from a socially neutral standpoint as well as to contribute to the development of science and technology. In addition to operating the Ibaraki Museum of Nuclear Science, we also organize special exhibitions, events, and outreach programs such as off-site lectures.

**JAEA** What exhibits are featured at the Ibaraki Museum of Nuclear Science?

**Mr. Asano** The exhibits designed to promote a correct understanding of radiation and nuclear power, encouraging visitors to contemplate their personal connection to these elements and their future. Especially, the world's largest cloud chamber allows observation of the traces left by radiation, creating a mesmerizing experience. Other exhibits include a section for measuring radiation in everyday objects such as foods, interactive displays for learning about radiation through quizzes, and exhibitions covering actual incidents such as the JCO Criticality Accident that happened in Tokai.

**JAEA** What do you do in terms of planned special exhibitions, events, and off-site lectures?

**Mr. Asano** We host themed exhibitions on science, space, and nature for children and parents, along with accessible lectures and experimental workshops led by experts. During extended breaks like summer vacation, we offer science-focused experiment and craft workshops to engage children's interest. We also visit local schools to conduct radiation-related experiments as part of their curriculum as well as providing training courses for school teachers on the basics of nuclear power and radiation. For the general public, we organize "Fundamentals of Radiation and Nuclear Power" courses where experts explain topics of high interest such as nuclear safety, disaster prevention and radioactive waste.

**JAEA** In managing the facility and organizing various events, when do you find yourself most rewarding?

**Mr. Asano** Each year, we accept junior high school students for workplace experiences. When I ask their motivations for choosing our museum, they tell us that they are interested in nuclear power because they have been familiar with the facility since their childhood. I am happy to think that we are contributing to the children's interest in science by running this facility.

**JAEA** Do you have a message for our readers?

**Mr. Asano** We will continue striving to be attractive and work towards satisfying a broader visitor. The ongoing renovation of exhibits which started in JFY 2020 will continue until JFY 2024, ensuring that the Ibaraki Museum of Nuclear Science evolves and remains dynamic. We would like to invite everyone to visit us, deepen their understanding of radiation and nuclear power, and reflect on their connection to future societies.

The tracks of naturally occurring radiation in the environment can be observed in the cloud chamber.



The world's largest cloud chamber and Mr. ASANO Yukio, Executive Director of the Ibaraki Nuclear Energy Committee and Director of Ibaraki Museum of Nuclear Science

### Fukui

## Contributing to Regional Revitalization Across Diverse Fields: From Healthcare and Agriculture to Space Development

Mr. KATAYAMA Shigeatsu from the Wakasa Wan Energy Research Center (WERC) in Tsuruga, Fukui, shared insights during the interview.

**JAEA** Could you please share the background and objectives of the establishment of the Wakasa Wan Energy Research Center (WERC) in Fukui?

**Mr. Katayama** In the area around Wakasa Bay, various nuclear reactors are concentrated, resulting in the accumulation of science and technology related to nuclear power and energy. WERC was established in November 1998 with the purpose of conducting investigations and research and development to utilize this scientific knowledge for the region's development. In addition to promoting research and development that is useful in various fields such as medicine and industry by utilizing accelerators and advanced scientific instruments. Furthermore, we are also engaged in projects to support local industries as well as foster and exchange nuclear human resources both in Japan and abroad.

**JAEA** What are some of the major research topics you have worked on and what have been the results?

**Mr. Katayama** Research on proton beam therapy for cancer utilizing accelerators has been one of the main themes since its establishment. In order to provide more efficient treatment with less burden on patients, we conducted foundational studies to comprehend appropriate proton irradiation doses, advancing basic research to optimize treatment doses. In the field of ion beam irradiation for biological mutation induction, we collaborated with the RIKEN, National Research and Development Agency, to develop mutation-inducing technology as well as fast-growing leaf lettuce and self-pollinating Midi tomatoes. Ion beams are also employed in space development research to enhance the radiation resistance evaluation of electronic components for space applications, contributing to the technological strengthening of the local space industry through collaborative research with Japan Aerospace Exploration Agency (JAXA), universities within Fukui, and various companies. In the laser field, we developed a self-propelled decontamination system and a compact automated pipe-cutting system to improve laser decontamination and cutting technology for the decommissioning of nuclear power plants.

**JAEA** In your research and development endeavors, which achievements stand out the most?

**Mr. Katayama** In the realm of proton cancer therapy research, we conducted clinical studies on 62 cases, including 55 prostate cancer cases from JFY 2002. The post-treatment observation yielded positive results. Clinical irradiation at WERC was concluded in March 2010, and the research results were transferred to the Proton Therapy Center of

**JAEA** What research and development themes are you currently emphasizing, and what is your outlook for them?

**Mr. Katayama** We are placing emphasis on four fields: Medical, Breeding, Laser Technology, and Space Development. While strengthening collaboration with local companies and prominent national research institutions, we are engaged in research and development aimed at practical applications in each field. In the medical field, our focus is on further advancing and streamlining cancer treatment, while in the breeding field, we aim to address challenges in local agriculture.



Ion beam breeding research has led to the development of leaf lettuce that can be harvested approximately one week earlier than conventional varieties, allowing for shipment in just three weeks.



The combination of a microwave ion source ion implantation device, a tandem accelerator, and a synchrotron enables versatile applications in various research fields.

## Royal Thai Embassy Delegation in Tokyo Visited JAEA to Observe ITC



Commemorative photo with participants during the internship

On 24 July 2023, His Excellency Mr. Singtong LAPISATEPUN\*1, the Ambassador of Thailand to Japan, and his delegation\*2 visited NuHRDeC, JAEA. The group observed a lecture on the thermodynamics of nuclear reactors as part of the ITC on Reactor Engineering, and the integrated drill of emergency response to radiation accidents in the ITC on Nuclear/Radiological Emergency Preparedness.

During their visit, there was a discussion on the instructor training program. His Excellency Mr. LAPISATEPUN expressed gratitude for the contributions made by the JAEA to Thailand and other Asian countries through trainings. He also conveyed expectations for continued collaboration in the future.

We hope this visit will be an opportunity to further strengthen the friendship between Japan and Thailand. NuHRDeC aspire to build stronger and cooperative relationships with people from various Asian countries including the Royal Thai Embassy and Team Thailand in the future.

\*1 Mr. Singtong LAPISATEPUN retired from the position of Ambassador of Thailand to Japan in September 2023.  
\*2 Total six delegates from Team Thailand, including the Royal Thai Embassy, the Board of Investment of Thailand (BOI) Tokyo Office, and the Office of Industrial Affairs.

## JAEA Highlights Successful Instructor Training Program at IAEA's 67th General Conference

At the 67th General Conference of the International Atomic Energy Agency (IAEA) held in Vienna from 25 to 29 September, JAEA presented a side event to IAEA member states on 26 September regarding JAEA's nuclear human resource development including the effectiveness of its instructor training program.

Dr. Mego PINANDITO, Deputy Chairman for Development Policy of the National Research and Innovation Agency (BRIN) of Indonesia, representing a participating country since the program's inception in 1996, shared insights into the positive outcomes of the initiative in nurturing instructors across Asia.

From the Philippines, one of the ITC participating countries since 2010, Dr. Carlo A. ARCILLA, Director of the Philippine Nuclear Research Institute (PNRI) highlighted the significant contributions of past ITC participants from the Philippines. He emphasized their pivotal role in establishing the Educational Experimental Facility (PRR-1 SATER, cf. page 15).

The event was attended by about 80 participants from IAEA member countries and providing a platform to disseminate information about the success and significance of the Instructor Training Program on a global scale.



Dr. Mego PINANDITO, Deputy Chairman for Development Policy of BRIN



Dr. Carlo A. ARCILLA, Director of PNRI



The scene at the event

## Nuclear Energy and Research in Asian Countries



Philippines

### Dr. Alvie Jadia ASUNCION-ASTRONOMO

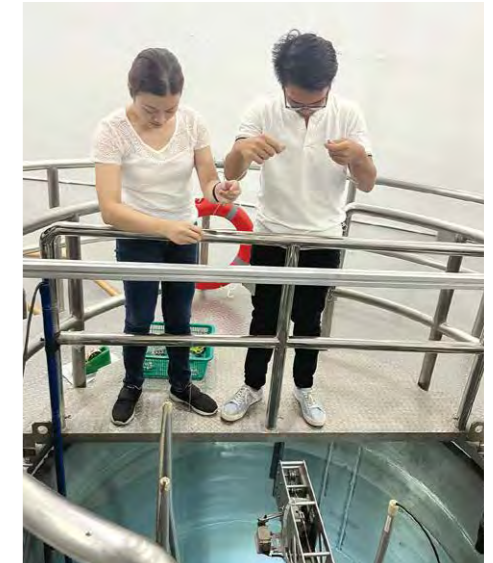
Philippine Nuclear Research Institute (PNRI)  
Completed ITC 2012 on Reactor Engineering I

### Establishment of the PRR-1 SATER as a Reactor Training Facility

The PRR-1 Subcritical Assembly for Training, Education, and Research (SATER) of the Philippine Nuclear Research Institute (PNRI) was recently authorized to operate. The facility is the first training reactor in the Philippines after 35 years. The previous lack of a nuclear facility in the Philippines caused the decline of knowledge in reactor engineering. This was one of the challenges during the establishment of the facility. However, more than ten past participants of ITC on Reactor Engineering from PNRI over the last ten years have significantly contributed to the establishment of the PRR-1 SATER. The participation in the ITC provided valuable contributions to both the establishment of the facility and its safety measures.

PRR-1 SATER aims to achieve the following objectives: 1. Supporting nuclear manpower development. 2. Providing local access to an operating nuclear facility. 3. Training reactor operators, users, and regulators. 4. Engaging stakeholders in nuclear and reactor engineering. 5. Repurposing available resources of the historical PRR-1 facility. These objectives are also relevant to the current plan of the Philippines to implement a nuclear energy program.

Since the start of PRR-1 SATER operation in March 2023, the facility has accommodated 690 visitors and two Master's students. The facility was also used for the first time during the FTC on Reactor Engineering in October 2023. To further support nuclear manpower development in the Philippines, there are plans to upgrade the PRR-1 SATER to an accelerator-driven subcritical assembly by 2025. This upgrade will allow SATER to operate in continuous and pulse operation modes, expanding the number of experiments that can be done in the facility.



Exercise using PRR-1 SATER



Indonesia

### Mr. Tagor Malem SEMBIRING and Ms. Rasya IZZAH

PT ThorCon Power Indonesia  
Mr. SEMBIRING Completed ITC 2010 on Reactor Engineering I

### The Plan to Install Nuclear Power Plant in Indonesia

During the 2022 G20 Summit in Bali, Indonesia, the President Jokowi highlighted Indonesia's dedication to executing an energy transition aimed at mitigating the impact of greenhouse gases and achieving Net Zero Emissions (NZE). This ambitious goal is expected to be reached by the support of various sectors, one of which is the energy sector. The Ministry of Energy and Mineral Resources plans to achieve NZE by 2060 or sooner to meet the growing demand for electricity. Consequently, the first nuclear power plant (NPP) development is planned, and it is expected to operate in 2032 with 1 GW - 2 GW. Additional NPP capacity will be added every two years, reaching 6 GW - 8 GW by 2040.

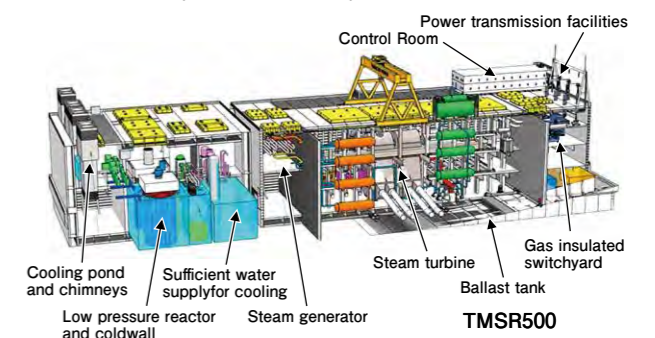
The global nuclear industry has responded positively to the government's efforts, with several NPP vendors expressing interest in constructing nuclear facilities in Indonesia, as conveyed during preliminary consultations with the Nuclear Energy Regulatory Agency (BAPETEN) in recent years. The government is also considering the installation of small modular reactors (SMR) in Indonesia.

The ThorCon TMSR500 plan is an advanced nuclear reactor that is under pre-licensing in BAPETEN, providing clean, safe, and affordable energy using molten salt reactor (MSR) technology. TMSR500 is an SMR with MSR technology that generates 500 MW by two modules of reactor (2 x 250 MW) in one unit which integrated into a floating barge hull. Construction of the reactor will take place in a shipyard, then it will be towed to the site candidate,

Kelasa Island, Bangka Belitung Islands Province.

The safety philosophy of TMSR500 is characterized by totally passive, ensuring unavoidable shutdown and cooling without the need for any operator intervention. It incorporates a negative fuel salt temperature coefficient and a significant margin between the operating temperature (700 °C) and the fuel salt's boiling temperature (1430 °C). In the event of persistently high fuel temperatures, a thermo-switch interrupts the cooling of the freeze valves, leading to the passive handling of decay heat in the drain tank by the silo cold wall. Importantly, the system has complete passive safety, meaning that no electricity, no valves or pumps and no operator action will be required to shut down and cool down the reactor in the event of abnormal behavior.

These initiatives signify a significant step for Indonesia towards a sustainable energy future, drawing attention from stakeholders both domestically and internationally.





# ITP Schedule in JFY 2024

Course		Course Period	Announcement	Deadline	Selection Result	Place	Participant
ITC	Reactor Engineering	4 Sep - 10 Oct 2024	Apr 2024	May 2024	Jul 2024	Tokai, Ibaraki	8
	Nuclear/Radiological Emergency Preparedness	4 Sep - 26 Sep 2024					5
	Environmental Radioactivity Monitoring	4 Sep - 26 Sep 2024					4
AITC	Reactor Engineering	27 Nov - 6 Dec 2024	Jun 2024	Jul 2024	Aug 2024	Tokai, Ibaraki	8
	Nuclear/Radiological Emergency Preparedness	27 Nov - 6 Dec 2024					4
	Environmental Radioactivity Monitoring	27 Nov - 6 Dec 2024					5
Seminar	Basic Radiation Knowledge for School Education	27 Jun - 10 Jul 2024	Apr 2024	Apr 2024	May 2024	Tokai, Ibaraki	14
	Nuclear Plant Safety	Sep - Dec 2024 (4 weeks)	May 2024	Jun 2024	Jul 2024	Tsuruga, Fukui	10
	Nuclear Energy Officials	Sep - Dec 2024 (3 weeks)					10
	Site Preparation and Public Relations	Sep - Dec 2024 (1.5 weeks)					10

※In the event of unavoidable circumstances, changes are possible.

## Message from Director of NuHRDeC



Director

**NAKANO Yoshihiro**

Nuclear Human Resource Development Center  
Japan Atomic Energy Agency

Hello, everyone! This fiscal year, it has been a profound experience to welcome participants, present them with certificates bearing my signature, and reflect on this year's trainings as the Director. I have been involved in ITP for ten years, fostering connections with numerous participants in trainings held in Japan. Over this period, I have visited the participating countries multiple times to engage in discussions on human resource development. These visits allowed me to deepen the relationship with the respective counterpart organizations, contributing to the establishment of friendships.

I believe that the unity between nations is a reflection of the friendships among their people. The JAEA is dedicated to contributing to the development of nuclear human resources in participating countries through our ITP in collaboration with MEXT. We hope that these efforts will further strengthen the bonds of friendship between the countries and Japan.

## ITP Counterparts

Country	Organization	Abbreviation
Bangladesh	Bangladesh Atomic Energy Commission	BAEC
Indonesia	Indonesia National Research and Innovation Agency	BRIN
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
Türkiye	Turkish Energy, Nuclear and Mineral Research Agency	TENMAK
Viet Nam	Vietnam Atomic Energy Institute	VinAtom

## Impressive Memory

With the lifting of restrictions related to the COVID-19 pandemic, during JFY 2023, instructors and participants were able to communicate with each other much like they did in the past. Not only did they enjoy socializing during break times, such as lunch breaks, but participants continued discussions on future human resource development even after returning to the accommodation while sharing dinner. The photo captures a moment during the lunch break when ITC participants were on practical training in Fukushima. It was heartening for us, the organizers, to witness the participants' smiles without masks.



**Japan Atomic Energy Agency (JAEA)**

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Our Website



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