JN-HRD.NET NUCLEAR HUMAN RESOURCE DEVELOPMENT NETWORK

# 2015
# Introduction of Training Programs Being provided by Japan for Newcomer Countries

# Contents


02 Message

03 About Pamphlet

04 Outline of current status of nuclear power in Japan

09 Activities – Japan Nuclear Human Resource Development Network (JN-HRD.Net)

11 Training organizations providing various kinds of education for newcomers


# Message

Here I would like to extend a greeting in completion of the pamphlet.

After the accident at the Fukushima Daiichi NPS, we have kept on making an effort to reassess and enhance the nuclear safety. Even after the accident, many countries around world have worked to introduce or expand nuclear power from the viewpoints of stable energy supply, global warming measures, and stabilizing and reducing costs. Those countries have pinned high expectations on Japanese nuclear technology. It is our responsibility to share the lessons learned from the accident and to utilize them to improve the safety of nuclear power plants around the world. Also, we would like to contribute to human resources development in newcomer countries to make good use of Japanese experience through continuous construction of NPPs during past 50 years.

In order to offer how Japan can contribute to foster human resources and correspond to various demands from overseas, we have discussed periodically under Sub-Working Group of Japan Nuclear Human Resource Development Network (JN-HRD. Net) with cooperation among nuclear-related organizations from industries, academia and the government. We arranged HRD programs in Japan comprehensively and organized them into the data base such as matrix form for the purpose of visualization of HRD programs which being provided by Japan.

With using this pamphlet and data base which is available in our website, you will be able to find the most appropriate Japanese education for your country.

We will continue to carry out multifaceted efforts to foster nuclear human resources not only in Japan but also every country seeking to benefit for the use of nuclear power. I greatly appreciate your continuous cooperation with our activities.


## Takuya HATTORI

President, Japan Atomic Industrial Forum (JAIF) & JAIF International Cooperation Center (JICC)
Represent at Sub-Working Group for supporting nuclear HRD programs in newcomer countries,
Japan Nuclear Human Resource Development Network (JN-HRD. Net)


It is our great pleasure to publish the second version of the pamphlet of Japan Human Resource Development activity. We have collected the updated information of all the activities. As you know, there are several electric power utilities, production industries, research institutes and universities in Japan. In order to make those activities more visible, we established the Japan Nuclear Human Resource Development Network (JN-HRD. Net) five years ago. Of course, all activities should be based on the lessons from TEPCO Fukushima Daiichi NPP accident happened in March 11, 2011. We have formed the roadmap of HRD for coming ten years. We are going to open and present it this year, especially at the IAEA general conference in September. Each activity has its own and specialized mission/role. Among them, we have operated the Japan-IAEA Nuclear Energy Management School for three times so far and are going to host the 4$^{th}$ school this June in Tokyo and Tokai. IAEA knowledge management section of the energy department is leading the international nuclear management initiative to form master courses on the nuclear management in the world. Japan and IAEA are developing the e-learning system in order to contribute to this task. Moreover, we are discussing the six weeks practical nuclear engineering school with the nuclear power plant simulators and site training. As you can understand, we have decided to reform the HRD programs based on the Fukushima lessons more international. We are collaborating well with IAEA to let our programs more global. We hope many engineers, managers and students to refer to this pamphlet for upgrade of their knowledge, experience, confidence and safety culture.


## Mitsuru Uesaka

Professor, Nuclear Professional School, School of Engineering, the University of Tokyo
Chief examiner, Sub-Working Group for supporting nuclear HRD programs in newcomer countries,
Japan Nuclear Human Resource Development Network (JN-HRD. Net)

The purpose of this pamphlet is to introduce the outline of current status of nuclear power in Japan and training organizations providing various kinds of education for newcomer countries.

For reference of details of training programs, please access to following website.
http://www.jaif-icc.com/english/jn-hrd.net/2015.html

You can download:

- **Matrix forms of training programs (for Phase Ⅰ / Phase Ⅱ countries)**
- **Outline of each training program**
- **Pdf data of this pamphlet**

**Matrix forms:**

Training programs provided by Japan are classified by subject (Vertical axis) and are also assorted into four target groups – 1) NEPIO, 2) Regulatory Staff, 3) R&D Organizations/Academics and 4) Nuclear Power Operators (Transverse axis). These matrix forms are prepared separately for phase Ⅰ and phase Ⅱ countries.

We hope this pamphlet and data base would be a useful entrance for you to take advantage of Japanese resources effectively. If you are interested in some of training programs, please contact with the organization which provide the program directly or a secretariat (JICC) for your inquiry.

SAMPLE

**Overall Matrix of Activities for Development of Human Resources**
**<Target: Phase Ⅰ Countries>** [Basic Science / Basic Engineering]

| Major Items \ Objects | | NEPIO- Administrative or Governmental Staff | Regulatory Staff | R&D Organizations, Academics | Nuclear Power Operators |
|---|---|---|---|---|---|
| Basic Science | - Basic Radiation<br>- Nuclear Physics<br>- RI Utilizations<br>- Testing Reactors<br>- Radiation Measurements<br>- Biological Impacts | ID:20 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Japan, English, 9 weeks | ID:36 Nuclear Safety Research Association (NSRA), Japan, English, 3-6 months | ID:20 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Japan, English, 9 weeks | ID:37 The Japan Atomic Power Company (JAPC) / Tokai Training Center, Japan, Local Language (Interpretation), 2 times (2 weeks each) |
| | | ID:21 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Japan, English, 6 weeks | ID:37 The Japan Atomic Power Company (JAPC) / Tokai Training Center, Japan, Local Language (Interpretation), 2 times (2 weeks each) | ID:21 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Japan, English, 6 weeks | ID:40 The Wakasa Wan Energy Research Center (WERC) / Fukui International Human Resources Development Center for Atomic Energy, Japan, English (Interpretation), 4 weeks |
| | | ID:23 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Japan, English, 2 weeks | ID:40 The Wakasa Wan Energy Research Center (WERC) / Fukui International Human Resources Development Center for Atomic Energy, Japan, English (Interpretation), 4 weeks | ID:23 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Japan, English, 2 weeks | |
| | | ID:24 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Each Couuntry, English / Local Language, 1-2 weeks each | | ID:24 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Each Couuntry, English / Local Language, 1-2 weeks each | |
| | | ID:25 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Each Couuntry, English / Local Language, 1-2 weeks each | | ID:25 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Each Couuntry, English/ Local Language, 1-2 weeks each | |
| | | ID:26 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Each Couuntry, English / Local Language, 2 weeks each | | ID:26 Japan Atomic Energy Agency (JAEA) / Nuclear Human Resource Development Center (NuHRDeC), Each Couuntry, English / Local Language, 2 weeks each | |
| | | ID:36 Nuclear Safety Research Association (NSRA), Japan, English, 3-6 months | | ID:36 Nuclear Safety Research Association (NSRA), Japan, English, 3-6 months | |
| | | ID:37 The Japan Atomic Power Company(JAPC) / Tokai Training Center, Japan, Local Language (Interpretation), 2 times (2 weeks each) | | ID:37 The Japan Atomic Power Company(JAPC) / Tokai Training Center, Japan, Local Language (Interpretation), 2 times (2 weeks each) | |
| | | ID:40 The (WERC) / Developme English (In | | ID:40 The Wakasa Wan Energy Research Center (WERC) / Fukui International Human Resources Development Center for Atomic Energy, Japan, English (Interpretation), 4 weeks | |
| Basic Engineering | - Mechanical Engineering<br>- Electrical and Instrumentation Engineering<br>- Water Chemistry, etc.<br>- Thermal and Hydraulics<br>- Structural Dynamics | ID:36 Nuc Japan, En | lear Safety Research Association (NSRA), Japan, English, 3-6 months | ID:36 Nuclear Safety Research Association (NSRA), Japan, English, 3-6 months | |

Transverse axis:
Target Groups

Vertical axis:
Major Subjects

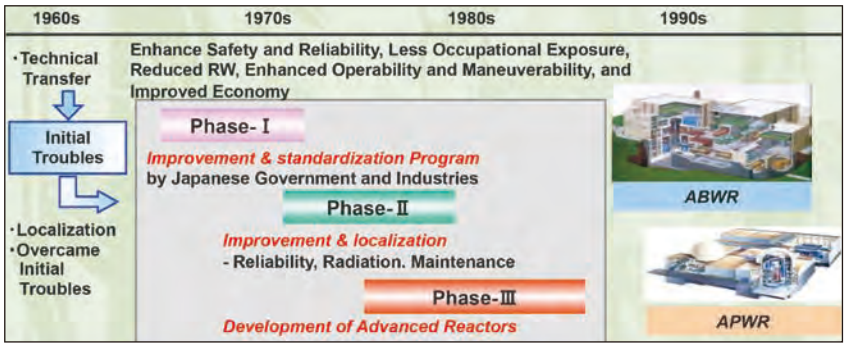
# Outline of current status of nuclear power in Japan

## History of Nuclear Power Development in Japan

1953 “Atoms for Peace” : The US President, Mr. Eisenhower’s Speech in UN
1955 Atomic energy Basic Act of Japan
1956 JAERI (Japan Atomic Energy Research Institute)
1957 Inauguration of IAEA
1961 Long Term Plan of Nuclear Development and Utilization
1963 JPDR (Japan Power Demonstration Reactor) (BWR)
1967 JAPC Tokai (GCR -- First Commercial Use Reactor)
1970 JAPC Tsuruga-1 (BWR), KEPCO Mihama-1 (PWR)
1971 TEPCO Fukushima-1 (BWR)

---

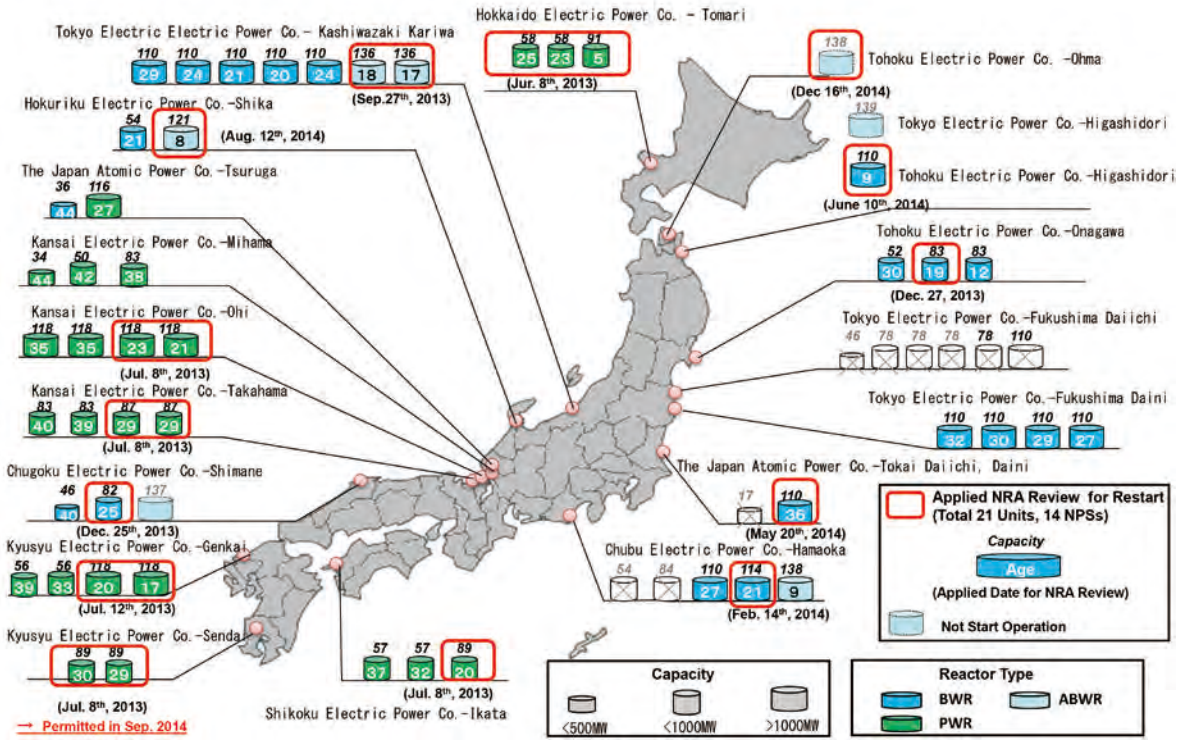
2011 Fukushima Daiichi Accident




## Current Status of the Nuclear Power Plants in Japan

＊ There are 48 nuclear power plants for commercial use in Japan.
＊ All units are in stoppage now.
＊ 21 units are under review by the Nuclear Regulation Authority with the new regulations.

**(Ref.) Nuclear Electric Power Plants in Japan (As of December, 2014)**



# Current Policy in Japan

## Strategic Energy Plan（April, 2014）

### Perspectives and Basic Principles of Energy Policy

- 3E + S
- Multilayer, multiplex supply-and-demand structure
- Increase self-sufficiency with domestic energy
- Contribute to global $CO_2$ reduction

**Nuclear Energy is an Important Base-Load Power Source**

## Enhancement of Safety

### Action Taken by the Government

- Reform of Nuclear Regulatory Body
- Designing new regulatory requirements
- Safety assessment regarding 48 NPPs

### Action taken by the operators

- Securing power source
- Securing water supply
- Measures against inundation
- Enhancement of emergency preparedness

## Future of Nuclear Generation in Japan

### Restarts

The national government has shown its intention to restart nuclear power plants（NPPs）whose safety is confirmed under the new regulatory standards, while obtaining local understanding.

### Important Issues

Information disclosure to gain people's understanding; ensuring transparency; promoting energy education; true dialogue（two-way communication）

## Japan's Best Mix

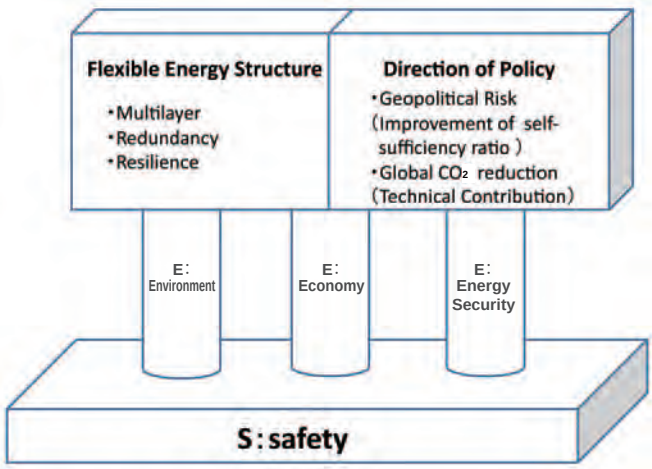
### Constitution of Electric Power Supply

- Ensuring an appropriate balance without depending excessively on any specific power source or fuel
- Discussions to start by experts hereafter（Premise is to reduce nuclear dependency; construction of new NPPs has not been stated until now）

### Adverse Effects of Not Having Decided on a Best Mix

- No clear basis for nuclear operators making investment plans
- Hinders nuclear research and the fostering/maintenance of human resources
- Cannot determine target for reduction of greenhouse gas emissions for COP21

**（Ref.）Principal of Japan's Energy Policy and View Point of Reform**



# Outline of current status of nuclear power in Japan

## Role of Nuclear Power

- Nuclear power is clean, safe, affordable and reliable energy source.
- Even after Fukushima Daiichi accident, role of Nuclear power is not changed.
- World energy demand increase would be inevitable.
- For sustainable future of the planet, we have to try to realize low carbon society.
- Nuclear power has played an important role for energy supply assurance and reduction of $CO_2$ emission.

## International Cooperation

Japan will fully support development of oversea projects.

- Respond to expectation from oversea countries on the Japanese technologies.
- Securing 3S is the basic principle of Nuclear Policy of Japan.
- Commitment by our Prime Minister

## Strength of Japan in nuclear Technology

- Continuous construction of NPPs during the past 50 years
- Supply chain of high quality and reliability materials and components
- Highly competent engineers and well-trained technicians
- Project management capability to maintain schedule and cost as planned
- High technology and experience of seismic design
- 1500 reactor-years of operation experience
- World class research and development

## Japanese Industry is Good at Project Management – Japan Model –

- Industrial Safety, Quality, Schedule and Budget Control
- Coordination among utility, vendors and constructors
- To cooperate, even beyond a contract, among project participants, it is necessary to respect each other and share the common goal
- "Just in Time Delivery" of high quality components
  - Clean working circumstances
  - Simple working procedure
  - Organizations with "Safety Culture"

  Effort for "Just in Time Delivery" finally brings "On Time and On Budget".

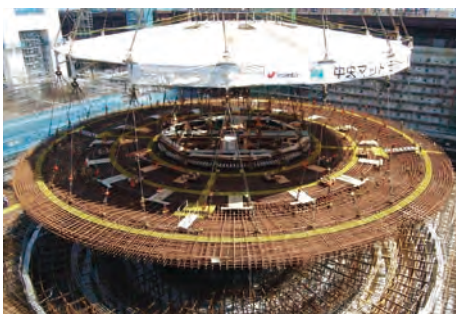
*** Keeping questioning in every work for everlasting improvement**

- Sharing the lesson learned from Fukushima Daiichi accident and enhancement of safety are crucial for steady development of nuclear energy.
- For the sustainable development of the planet, nuclear power will play an important role. Without public confidence and support, nuclear technology cannot be deployed.
- International cooperation is crucial for secure development of nuclear power.
- Japan will continue to contribute for the future development of nuclear energy in the world.

### How to Prepare for Emergency

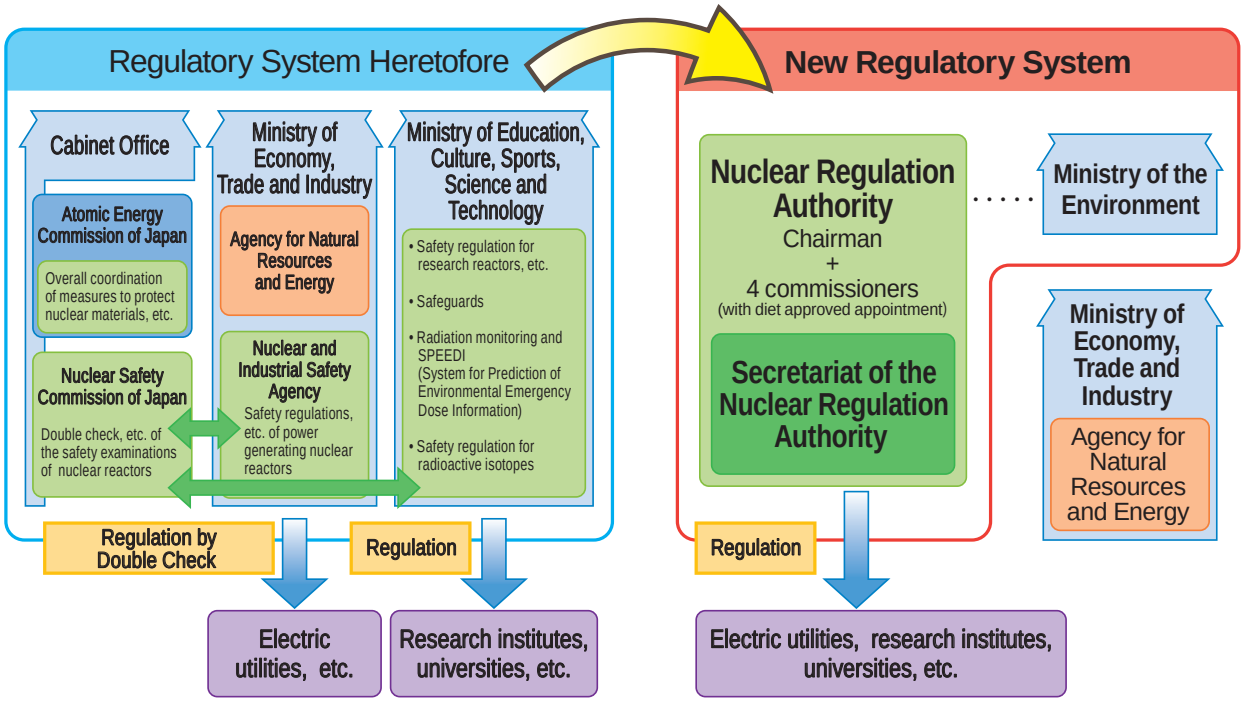
- ◆ Well prepared total management systems consist of:
  - Robust Hardware
  - Flexible Software
  - Capable Human Resources with Safety Culture
- ◆ Proactive performance by operators is the most crucial.

A lecture on Japan's current nuclear energy policy by the officer of METI

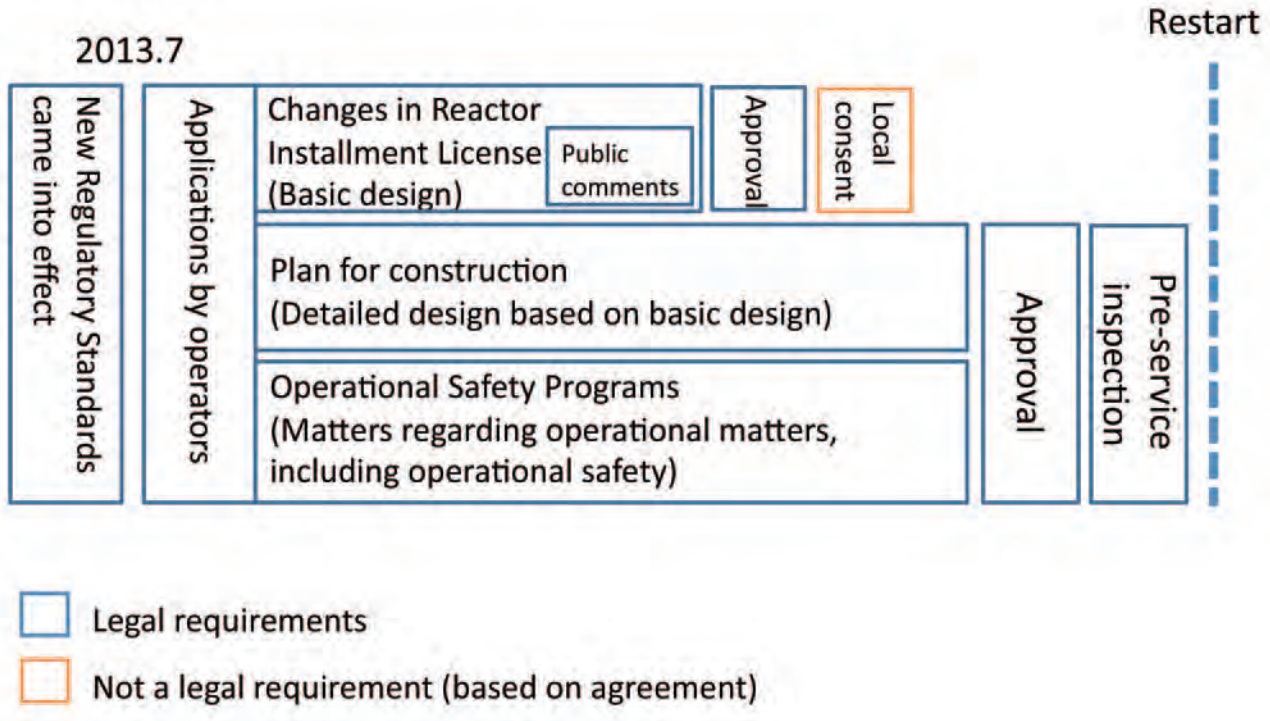


Construction view of Ohma NPP (Full Mox ABWR), J-Power(Electric Power Development Co., Ltd.)

## (Ref.)Reform of Nuclear Regulatory Body

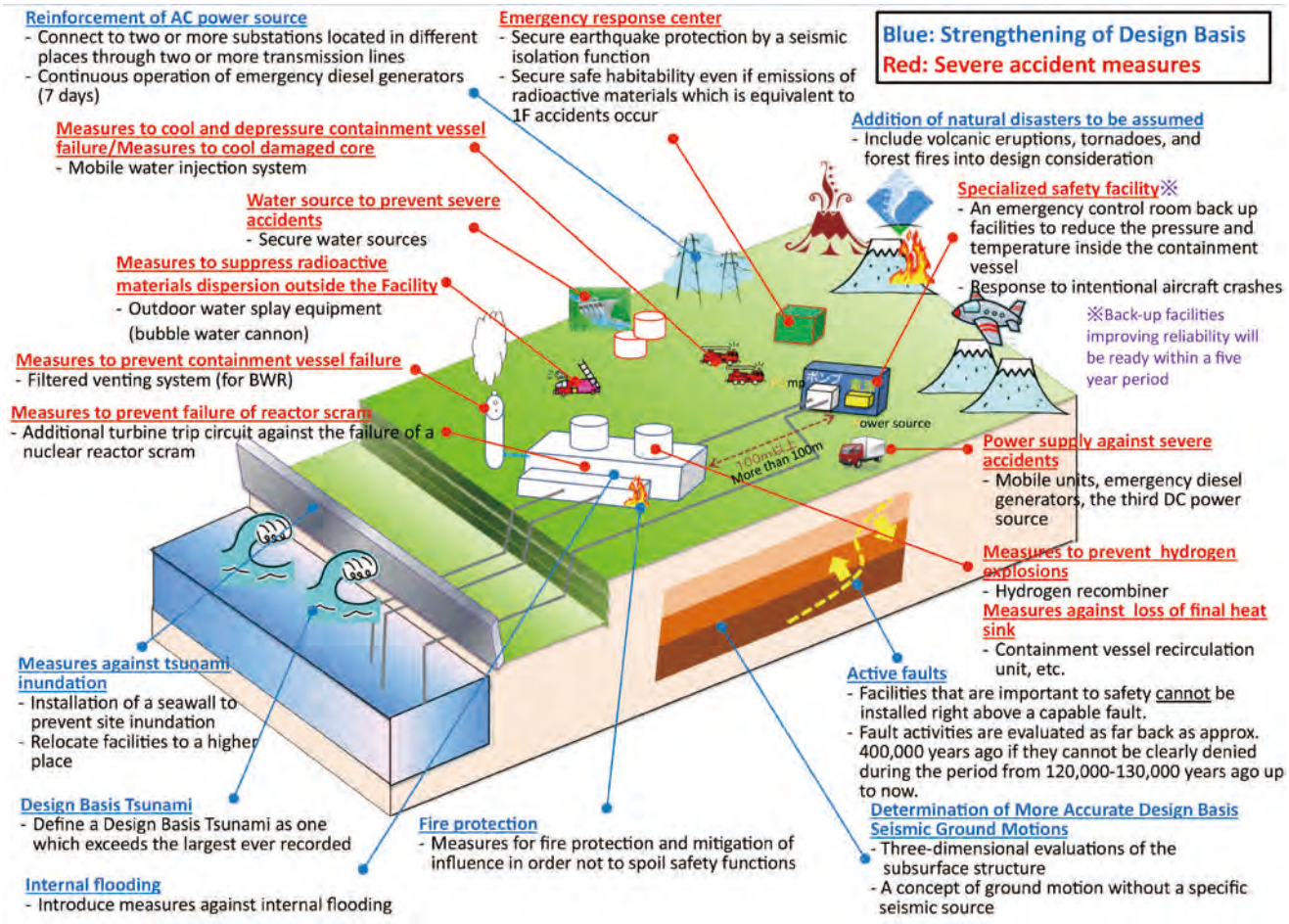



## (Ref.)Flow of NRA Examination for restart of plant



# Outline of current status of nuclear power in Japan

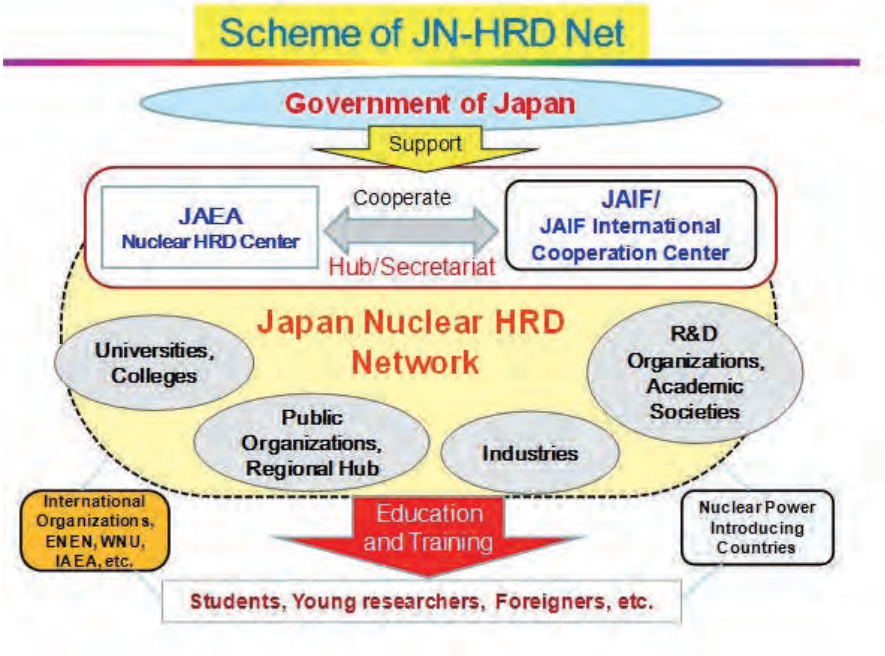
## (Ref.)Examples of Proposed Safety Requirements



## Japan Nuclear Human Resource Development Network (JN-HRD.Net)

Japan Nuclear Human Resource Development Network (JN-HRD.Net) was established in November 2010 in order to conduct and promote various national and international HRD activities in strategic and integrated manner, effectively and efficiently.

With continued discussion under the Establishment Committee for Nuclear HRD Network in response to the call from the government, the JN-HRD Net, an all-Japan framework based on mutual beneficial relationship among nuclear-related organizations from industries, academia and the government was established.




At present, JN-HRD Net has five important subjects on nuclear HRD and each subject is now being discussed under Sub-Working groups for implementing the relative activities.

1. Supportive Activities for Elementary to High School Education (JAIF)
2. Nuclear Education at Universities and Colleges (JAEA)
3. HRD for Working Engineers (JAIF)
4. HRD to Internationalize National Human Resources (JAEA)
5. Supportive HRD Activities to newly NPP Introducing Countries (JICC)

( ) shows the Secretariat for the Sub-Working Group

# Activities – JN-HRD.Net

To enhance international cooperation with related organizations of various countries, JN-HRD Net plans to hold an international conference once a year. And, especially for newly nuclear power introducing countries, new activities are planned in this framework of JN-HRD Net;

- Short term seminars led by Japanese university professors in each country
- Dispatch of Japanese experts to exchange knowledge and experiences with the engineers of each country
- International seminars and training courses in Japan including visit to nuclear power plants and nuclear facilities
- Consultation and support to establish nuclear HRD programs in each country, mostly in close collaboration with international organizations, such as IAEA and FNCA.

Sub-Working group which support nuclear HRD programs in newcomer countries is organized in July, 2012 under JN-HRD Net aiming to provide effective and efficient HRD program. This pamphlet is edited by the Sub-Working Group as part of their activities to introduce comprehensive HRD organization and training programs provided by Japan to the countries planning to introduce nuclear power.

## Secretariat

**Japan Atomic Energy Agency (JAEA)** and **Japan Atomic Industrial Forum, Inc. (JAIF)** play a central role in coordinating participating organizations/institutions and local networks, and also in conducting inter-organ HRD activities. Especially, for countries introducing nuclear power, **JAIF International Cooperation Center (JICC)** acts as the contact office for inquiries concerning their HRD activities.

### Contact

[For nuclear HRD in general]

**Japan Nuclear HRD Network**
2-2-2 Uchisaiwaicho, Chiyoda-ku, Tokyo, 100-0011 JAPAN
TEL: +81-3-3592-2185　FAX: +81-3-3592-2185
e-mail: jn-hrd.net@jaea.go.jp
URL: http://jn-hrd-n.jaea.go.jp/en/index.html

[For supporting nuclear HRD programs in newcomer countries]

**JAIF International Cooperation Center (JICC)**
17th floor, NBF Hibiya Building,
1-1-7 Uchisaiwaicho, Chiyoda-ku, Tokyo, 100-0011 JAPAN
TEL: +81-3-3591-2210　FAX: +81-3-3591-2215
e-mail: info@jaif-icc.com
URL: http://www.jaif-icc.com/english/index.html

# Training organizations providing various kinds of education for newcomers

## Universities


**Kyoto University**
- Department of Nuclear Engineering ····· 12
- Research Reactor Institute ····· 13

**Nagaoka University of Technology**
- Extreme Energy-Density Research Institute (EDI) ····· 14
- Radioisotope Center ····· 15

**The University of Tokyo**
- Department of Nuclear Engineering and Management ····· 16
- Nuclear Professional School ····· 17

**Tokai University**
- Head Office of International Affairs (HIAT) ····· 18

**Tokyo Institute of Technology** ····· 19


## Training Organizations


**JAIF International Cooperation Center (JICC)** ····· 20

**Japan Atomic Energy Agency (JAEA)**
- Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) ····· 21
- Neutron Irradiation and Testing Reactor Center (NITRC-JMTR) ····· 22
- Nuclear Human Resource Development Center (NuHRDeC) ····· 23

**Japan Electric Power Information Center, Inc. (JEPIC)**
- International Cooperation Center ····· 24

**Nuclear Safety Research Association (NSRA)** ····· 25

**The Japan Atomic Power Company (JAPC)**
- Tokai Training Center ····· 26
- Tsuruga Training Center ····· 27

**The Wakasa Wan Energy Research Center (WERC)**
- Fukui International Human Resources Development Center for Atomic energy ····· 28


## Industries


**Hitachi-GE Nuclear Energy, Ltd.** ····· 29

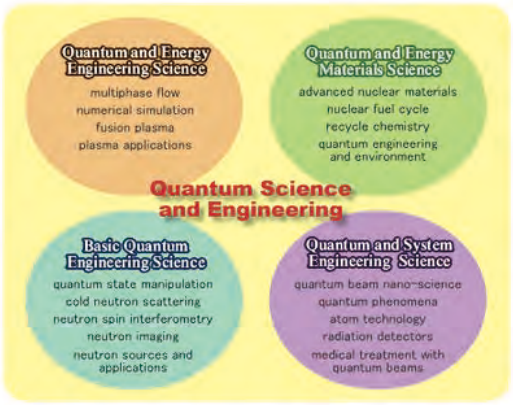
**Mitsubishi Heavy Industries, Ltd.** ····· 30

**Toshiba Corporation** ····· 31


A lecture scene

Technical Tour

# Kyoto University Department of Nuclear Engineering




## Overview

The aim of the Department of Nuclear Engineering is to explore quantum technologies leading to the frontiers of science such as quantum beams, nanotechnology, and atomic technology. This is done from a microscopic point of view based on the science of quantum phenomena relating to elementary particles, atomic nuclei, and atoms and molecules. The department also strives to construct recycling systems by developing technological applications in materials, energy, life sciences, and the environment.

Through systematic and comprehensive programs of education and research, we are training highly skilled researchers and engineers who are capable of working in their fields of specialization at advanced levels. In this way, we aim to contribute to the development of a more prosperous and sustainable society.

## Introduction to Research

The Department of Nuclear Engineering is divided into four research groups, with cooperation between each divisions and sub-departments. Each group consists of members from the faculty (the Nuclear Engineering program of the Faculty of Engineering Science) and the graduate school (Department of Nuclear Engineering).

## 1. Quantum and Energy Engineering Science

Safe and efficient use of the nuclear energy are required to realize the nuclear energy system which suits environment. The purpose of the nuclear energy science group is to contribute to the development of such energy system by the research of physics and basic engineering related to the generating and conversion of the nuclear energy.

Activities of our group include research for securing the safety of the apparatus in nuclear reactors (fission and fusion) and research of the fluid and thermal engineering relevant to the efficient use of generated nuclear energy. We, especially, put emphasis on the establishment of the multiphase flow science where gas, a liquid, and a solid are intermingled.

## 2. Quantum and Energy Materials Science

Materials are studied to ensure the safety of nuclear energy systems of power reactors and nuclear fusion reactors and to safely manage radioactive wastes which are produced from nuclear energy utilization. Advanced materials are developed by using nano-technology which becomes available in the field of nuclear engineering.

For the efficient utilization of nuclear energy, physico-chemical properties and chemical processing of nuclear materials are studied in order to recycle limited resources and to achieve 'zero emission' from nuclear fuel cycles. These advanced technology will be extended to more general chemistry and technology which are needed to establish the recycling-based society.

## 3. Quantum and System Engineering Science

Material science and life science look very far fields of research each other, however, they have common elements if you study them in the dimension of micron, and in far smaller dimension, nano size.

With view point of state-of-the-arts, we are conducting comprehensive studies for a wide-spread research fields, and are performing basic studies and technology developments, which are common to numbers of research fields.

The tools of our study are ions, electrons, X-rays, and laser beams, which are quantum beams with high performance, to make super-high temperature, super-high pressure and super-high density of deposited energy. We are studying and utilizing non-equilibrium states in the extreme environments described above.

## 4. Basic Quantum Engineering Science

Characteristic phenomena and properties of quantum systems are studied theoretically, including elementary particles, neutrons, particle beams, lasers, atoms and molecules. Thereby various developments are advanced for quantum technologies on nanostructures, quantum state manipulation and detection, and so on.

Recently, intense pulsed neutron sources are under construction in US and Japan. The application of the intense neutron beam lies widely from fundamental science to engineering. We are now developing new design of sources for slow neutrons and new applications of slow neutrons to various fields, extending conventional nuclear engineering sciences.

Address : Kyoto University Katsura C3
Nishikyo-ku, Kyoto, 615-8530, JAPAN
TEL : +81-75-383-2051
FAX : +81-75-383-2038
e-mail : 090kryugakusei@mail2.adm.kyoto-u.ac.jp
URL : http://www.ne.t.kyoto-u.ac.jp/en?set_language=en

# Kyoto University Research Reactor Institute

## Overview

Kyoto University Research Reactor Institute（KURRI）was established in 1963 for the joint use program among Japanese universities to promote the research and education in the fields of nuclear energy and radiation application. Two nuclear reactors, the Kyoto University research Reactor（KUR）and the Kyoto University Critical Assembly（KUCA）, and related research facilities have been being used since then, and nowadays greater expectations are being put on the research and education activities at our institute for the issues of energy and environment and for the innovative applications of radiation.

Actually, the issues of energy and environment are becoming more and more serious in the 21st century, The worldwide demand for energy is remarkably increasing with the development of Asian and African nations. On the other hand, natural resources such as oil and coal are finite, and moreover carbon dioxide emission limits are under consideration to conserve the global environment. Many issues thus queue up to be solved. Although the development and use of new energy sources such as solar batteries are pushed forward, those capacity is limited and insufficient. Therefore, there are movements to again promote the use of nuclear energy in Europe and America. In our country with poor energy resources, it has been extremely important to keep the stable energy supply, and the use of nuclear energy has been promoted. However it is now required to again ensure the safety of nuclear energy for its continuous use. As for the applications of radiation, in addition, various technologies have been established in combination with the development of nuclear energy use, and much more various and effective application technologies are expected to be realized in the fields such as medical care and materials development in the future.

In these situations, the importance of the research and education of nuclear energy in universities is recognized for personnel training from the viewpoint of a mid/long term, and greater expectations are being placed on the research and education activities using the research facilities with proper performances. To meet those expectations, it is necessary to operate the KUR as long as possible in our institute. Its significance and our responsibility are really large considering the use of such research facilities by students and researchers from all Japanese universities not only in the nuclear engineering field but also in various fields. In addition to the above activities, we have research activities in the fields of nuclear engineering science, material science, radiation life science, and radiation medical science. Basic and essential studies are being performed under the academic traditions of Kyoto University, of which results have been highly rated in a recent external evaluation. Based on these results, we are planning to further extend neutron utilization studies centering the KUR, and to promote essential studies on safe nuclear energy systems including nuclear fuel cycles and next generation reactors in perspective.

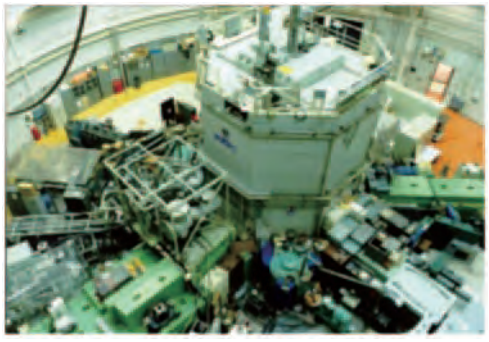
## Research Departments

KURRI has three core departments for scientific research: Department of Nuclear Science and Engineering, Department of Material Science, and Department of Radiation Life Science and Radiation Medical Science. Department of Nuclear Science and Engineering is comprised of Division of Nuclear Engineering Science, which has eleven research laboratories for nuclear engineering research, and auxiliary Reactor Utilization Center.

Department of Material Science is constituted by Division of Quantum Beam material Science which comprises six research laboratories for material research. Department of Radiation Life Science and Radiation Medical Science is comprised of Division of Radiation Life Science, having three research laboratories, and Radiation Oncology Research Laboratory.

These departments conduct progressive studies in various research fields, such as nuclear physics, nuclear engineering, radiation utilization, beam science , nanotechnology, material science, life science, and radiation oncology etc., and these serve as the basis for the collaborative researches done by the researchers coming from other universities and institutes.

All research laboratories cooperate in educating students of five Graduate Schools of Kyoto University: Graduate School of Engineering, Graduate School of Science, Graduate School of Energy Science, Graduate School of Agriculture, and Graduate School of Medicine.



Address : Asashiro-nishi 2-1010, Kumatori, Osaka, 590-0494, JAPAN
TEL : +81-72-451-2376
FAX : +81-72-451-2603
e-mail : misa@rri.kyoto-u.ac.jp
URL : http://www.rri.kyoto-u.ac.jp/en

# Nagaoka University of Technology
## Extreme Energy-Density Research Institute

Linear Induction Accelerator “ETIGO III”,


Electrostatic Accelerator

**Extreme Energy-Density Research Institute (EDI)** was founded in 1999 for the researches on development and application of Extreme Energy-Density State (EEDS). EEDS is a state of extremely high temperature, density and pressure, which is only presented on fixed stars or in the earth. After carrying out former researches, it was possible to obtain artificial EEDS. By using EEDS, we have opened frontiers on researches including syntheses of novel functional materials, low cost production of next generation nanotechnology materials, and production of apparatus for sterilization and flue gas treatment. Further, we have been performing both basic and application researches under collaboration with local, domestic and international universities, laboratories and industries.

## Research Apparatus for Collaborative Research

• Intense Pulsed Power Generator “ETIGO-II”

Rated output
Accelerating voltage: 3MV, Current: 460kA,
Pulse width: 50ns
Application
Pulsed ion beams, High power microwave

• Linear Induction Accelerator “ETIGO III”

Rated output
Accelerating voltage: 8MV, Current: 5kA,
Pulse width: 30ns
Application
Pulsed intense relativistic electron beam for R and D on environmental improvement

• Linear Induction Accelerator “ETIGO III”

Rated output
Accelerating voltage: 400kV, Current: 13kA,
Pulse width: 150ns, Frequency: 1Hz
Application
High power microwave

• Electrostatic Accelerator

Rated output
Accelerating voltage: 1.7MeV
Application
Rutherford backscattering spectroscopy,
Elastic recoil detection analysis

## Research Topics

1. Generation and Applications of Pulsed Power, Charged-Particle Beam and High-Power Electromagnetic Radiation
   1) Repetitive pulse high-voltage generator for industrial applications
   2) High-power microwave generation and applications
   3) Pulsed particle beam generation and applications
   4) Intense pulsed X-ray source development
   5) Water Treatment Application of Pulsed Power

2. Novel Functional Compounds Synthesized by using Pulsed Power Technologies
   1) Development of compositionally gradient thin film preparation methods with simultaneous dual-ablation and new hard oxynitrides and luminescent oxides
   2) Synthesis and development of novel functions in oxides by molecule dipole, high pressure and plasma
   3) Development of metal nanosized powders and nano-structures and their industrial application

3. Development of Novel Functional Composite Materials using Energy Density Field
   1) Development of due sensitized solar cells using $TiO_2$ nanotubes and natural dyes
   2) Particle alignment and orientation technology in organic-inorganic composite materials using electro-magnetic fields
   3) Fabrication of patterned ceramics by nanoimprint methods and development of anisotropic nanostructures
   4) Development of nanocomposite ceramics with high specific strength

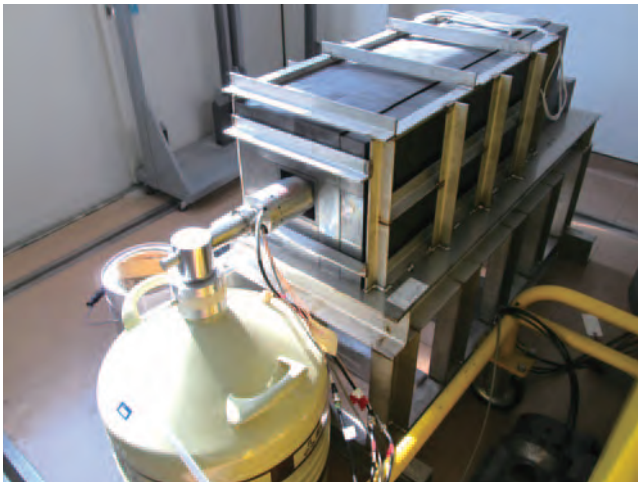
Address : 1603-1, Kamitomioka, Nagaoka, Niigata, 940-1144, JAPAN
TEL : +81-258-47-9891
FAX : +81-258-47-9890
e-mail : kyokugen@etigo.nagaokaut.ac.jp
URL : http://etigo.nagaokaut.ac.jp/index.html

# Nagaoka University of Technology Radioisotope Center

The radioisotope center is equipped with facilities for handling radioactive elements and nuclear fuel substances. It also houses equipment to prevent radiation hazards.

There are 5 experimental rooms in the radioisotope center.

We have some equipments to measure the alpha, beta and gamma ray.



We can use sealed or unsealed radioisotopes for research and education. Each year about 100 people register to use the radioisotope center.

Address : 1603-1 Kamitomioka, Nagaoka, Niigata, 940-2188, JAPAN
TEL : +81-258-47-9881
FAX : +81-258-47-9880
e-mail : matumoto@vos.nagaokaut.ac.jp
URL : http://ric.nagaokaut.ac.jp/

# The University of Tokyo

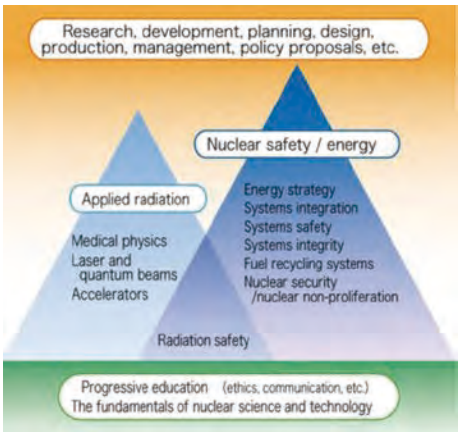
## Department of Nuclear Engineering and Management, School of Engineering

### Education and Research Policies

1. Incorporating Social Science Knowledge in the Engineering Framework
2. Balance between conceptual skills and a panoramic perspective

### Human resources this Department aims to foster

1. Human resources who have a good understanding of people and society
2. Human resources who have built upon a progressive education to acquire knowledge and a systematic way of thinking about nuclear safety, energy, and the basics of radiation science and their applications
3. Human resources who can handle research, development, planning, design, production, management, policy proposals, etc. in an academic setting and how to make use of academics in various fields in a responsible manner with an international perspective
4. Human resources who can contribute to the sustainability and development of society by becoming pioneers in unexploited fields and boldly pursue research that can lead to new technological innovation



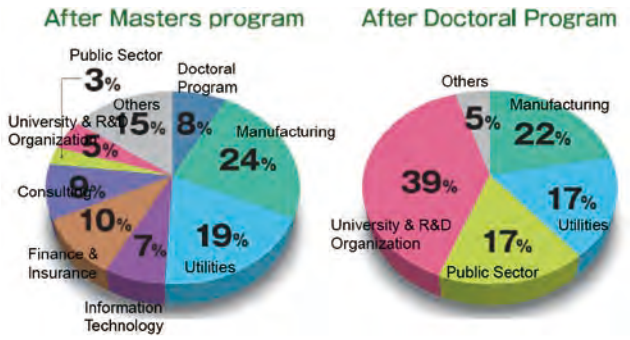

### Brief Introduction of Our Department

1. Excellent Environment for Research and Education
2. Welcoming Students from Diverse Backgrounds
3. Global Networks and International Collaboration

### Curriculum

Lecture courses in this Department are categorized as
(1) Nuclear engineering core courses
(2) Specialist foundation courses
(3) Advanced courses
All courses are generally taught in English. In addition to the lecture courses, there are
(4) Course seminars/exercises/labs
to give hands-on learning experience. From time to time, special omnibus-format lectures may be given by external lecturers.

### Career Paths (2011-2013)




Address : 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, JAPAN
TEL : +81-3-5841-6015
FAX : +81-3-5841-8713
URL : http://www.n.t.u-tokyo.ac.jp

# The University of Tokyo Nuclear Professional School

## Nuclear Professional School

### Purpose

- To meet the needs of highly educated professionals such as chief licensed reactor engineers of nuclear power plants
- To establish comprehensive schooling of nuclear engineering

### Administration

- Located in Tokai-mura
- A type of professional school, like a law school
- Jointly operated with JAEA (Japan Atomic Energy Agency).

## Education in Nuclear Professional School

### Characteristics

- One-year graduate school providing extensive schooling, but requiring no thesis study
- Giving master's degree of nuclear professional
- Lectures are sent to Tokyo (Dep. NEM) via internet TV.

### Contents

- Lectures, Exercises* and Experiments** of full 5 days of summer and winter semesters
- Exercises* and Experiments** and Internship between the semesters

* at the international training center of JAEA
**at the plant simulator of JAPC (Japan Atomic Power Company)
**at the facilities of the University of Tokyo and JAEA such as research reactors, critical assemblies and thermal hydraulics loops

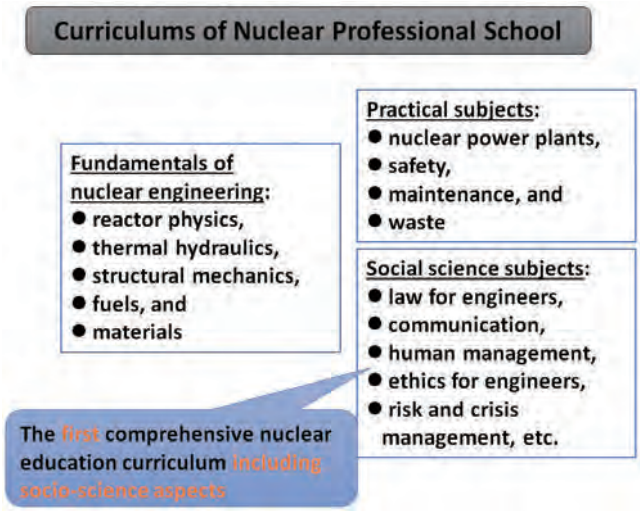

## Students and Professors

### Students

- Capacity:15
- Language: Japanese (at present)
- Most students from utilities, vendors, research institutes and governments
- A few students who are not the employees

### Professors

- Professors (P5, AP5) of the University of Tokyo,
- 6 Guest professors (5 from JAEA and 1 from CRIEPI), and 37 part-time lecturers and 17 special guest lecturers from JAEA and Japanese industries




Address : 2-22 Shirane Shirakata, Tokai, Naka,Ibaraki, 318-1199, JAPAN
TEL : +81-29-287-8400
FAX : +81-29-287-8488
e-mail : jimu@nuclear.jp
URL : http://www.tokai.t.u-tokyo.ac.jp/english.html

# Tokai University

## Establishment

Research and education in nuclear engineering, based on the concept of the peaceful use of nuclear energy, is one of the foundations of Tokai University. The founder of Tokai University, Dr. Shigeyoshi Matsumae, contributed to the establishment of the Atomic Energy Basic Law in 1955 when Tokai University established the first ever nuclear engineering course in Japan.

## Nuclear Engineering Education

[1] In the Department of Nuclear Engineering, we strive to nurture the development of people who not only have specialized knowledge in advanced nuclear technology, safety, and radiation application but also have both a common sense and conscience regarding energy issues more broadly.
Our curriculum consists of three fields: 1) Nuclear Reactor Engineering (Completion of Nuclear Fuel Cycle), 2) Radiation Application (Application of radiation for medical and industrial use), and 3) Energy Application (Development of materials related to nuclear technology).

[2] In addition to classroom lectures, students conduct various experiments and receive practical training including opportunities to handle an actual reactor (research reactor) and radioactive substances.

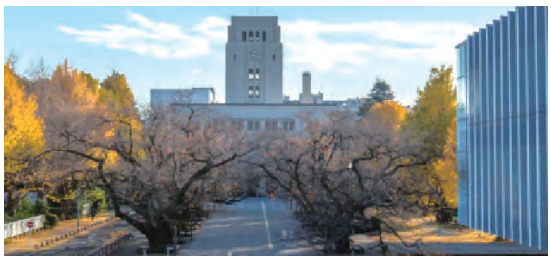
## Support of Japanese Language learning

To support international students to attain their goals, Tokai University offers special support courses in topics ranging from mathematics, physics, and chemistry. Students who have completed the Japanese Language Course may enter the undergraduate course by passing an examination especially conducted for those students.

Training Students from Vietnam Electricity

Address : TOKAI UNIVERSITY
Head Office of International Affairs(HIAT)
4-1-1 Kitakaname, Hiratsuka, Kanagawa
259-1292, JAPAN
TEL : +81-463-58-1211
FAX : +81-463-50-2470
e-mail : ipo@ml.tokai-u.jp
URL : http://www.u-tokai.ac.jp/international/index.html

# Tokyo Institute of Technology (Tokyo Tech)
## Department of Nuclear Engineering



Tokyo Tech main building

### <Overview>

Department of Nuclear Engineering at Tokyo Tech, established in 1957, is one of the oldest Nuclear Engineering graduate programs in Japan. It offers students of various backgrounds from different undergraduate schools the education and research opportunities in nuclear engineering. The nuclear engineering course defines its education and research programs in collaboration with Department of Energy Sciences, Interdisciplinary Graduate School of Science and Engineering. As a whole, the Nuclear Engineering Department undertakes a broad view of the graduate curriculum including nuclear fission and fusion power engineering and safety, nuclear fuel cycle, radioactive wastes, materials science and engineering, radiation technology, bio-medical areas, and a recent addition of the back-end process engineering in collaboration with industries and national institutes.

In 2003, the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT) had selected our Department as one of the 21st Century COE (Center of Excellence). Our department was granted a Support Program for Improving Graduate School Education on “Special Program for Nuclear Education” (GP-ATOM) from MEXT for 2008-2010 FY.

One of our continuing educational programs is “Academy for Global Nuclear Safety and Security Agent” (U-ATOM), which is a MEXT program on leading graduate schools for 2011-2017 FY. The educational goal is to develop global human resources for nuclear safety, security and safeguards: personnel who can serve as international leaders in industry, government and academia with respect to nuclear power in Japan and abroad. Recently,“Decommissioning Basic Research: Human resource development program” supported by MEXT starts from 2014 FY.

As for 2014 FY, 30 students for Master course and 14 students for Doctor course were newly enrolled, respectively. 11 students (5 in Ms, 6 in Dr) were from overseas.

### <International Graduate Programs>

Our institute provides the following programs for students from abroad, who wish to study in Graduate Schools to pursue a Master’s or Doctor’s degree. Lectures and seminars are given in English. Each applicant is required to directly contact the prospective academic advisor of his/her preference. Before sending the application to the Admission Division, the applicant should obtain the consent of a faculty member who will agree to become his/her academic advisor, in the event that he/she passes the entrance examination.

### 1. International Graduate Program (A)

In this program, applicants with outstanding academic results are recommended for Japanese Government (MEXT) Scholarship. Students selected as recipients as the MEXT Scholarship are provided with a monthly allowance and one round trip air ticket to and from Japan and are exempted from paying the entrance examination, admission, and tuition fees. For this program, our department accepts students only for Integrated Graduate Program. All students are enrolled in the Master's Program (Pre-Doctoral Program), regardless of pre-received Master's degree.

### 2. International Graduate Program (B)

#### 2-1. Preliminary Selection for Receiving Government and Other Scholarships

This program aims to recruit qualified students who are expected to apply for government and other scholarships before admission and who need a letter of acceptance issued in mid-March in order to receive the above scholarships.

#### 2-2. Tokyo Tech - RIKEN International School

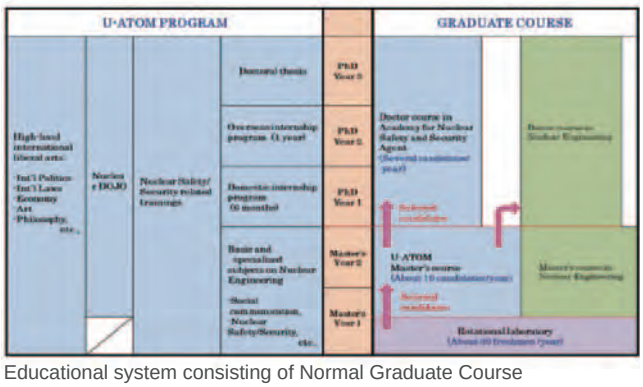
Tokyo Tech and RIKEN, a leading advanced research institute in Japan, have inaugurated Tokyo Tech-RIKEN International School on April 1st, 2007.

### 3. International Graduate Program (C)

This program is for students not applying to or not applicable to International Graduate Program(A)or(B). Master’s Program and Doctoral Program are offered and there are two periods of enrollment. Students who are living abroad at the time of application should apply to Overseas Application and those living in Japan at the time of application should apply to Domestic Application.

### <Non-degree Programs>

There are some non-degree programs, such as European Japanese Exchange Project in nuclear disciplines (EUJEP), Young Scientist Exchange Program (YSEP), Academic Cooperation Agreement Program (ACAP), and Young Scientist and Engineer Advanced Study Program (AYSEAS).




Educational system consisting of Normal Graduate Course and U-Atom Program


Address : 2-12-1 Ookayama, Meguro-ku Tokyo 152-8550 JAPAN
TEL : +81-3-5734-3054
FAX : +81-3-5734-2959
e-mail : chair@ne.titech.ac.jp, office@ne.titech.ac.jp
URL : http://www.ne.titech.ac.jp

# JAIF International Cooperation Center (JICC)


JICC Infrastructure Seminar, Tokyo

## Establishment

On March 18, 2009, JAIF International Cooperation Center (JICC) was founded by Japan Atomic Industrial Forum, Inc. (JAIF). To provide cooperation for countries planning to introduce nuclear power in effective and efficient manner, with the strong commitment of the Government of Japan, JICC plays a key role as a one-stop window and a facilitator to promote concrete cooperative activities.

## Services

JICC coordinate and implement a variety of cooperative activities in introducing nuclear energy development in foreign countries such as:

**(a) Support of Human Resources Development (HRD)**
Providing all Japan training system and tailor-made arrangement and coordination of various practical trainings and education programs implemented in Japan according to demands of recipient countries

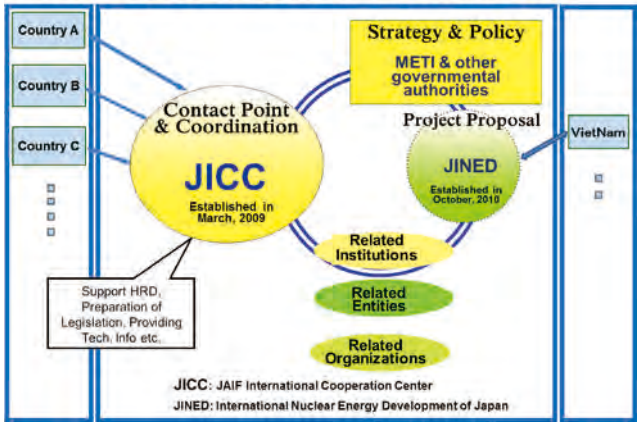
**(b) Dissemination of nuclear knowledge**
Sharing the experience and knowledge accumulated during the past half century of peaceful uses of nuclear energy in Japan as well as lessons learned from the Fukushima Nuclear Accident to enhance the safety and foster safety culture in newcomer countries

**(c) Support of infrastructure development for introducing new nuclear power programs**
Addressing common challenges and demands for newcomers such as the establishment of legal systems, etc.

## Methods

- Delegating Japanese or overseas nuclear experts
- Inviting VIPs and trainees to Japan
- Hosting or co-hosting seminars and workshops in Japan and newcomer countries
  e.g., JICC Infrastructure Seminar

**Cooperation Regime of Japan with Newcomers for Nuclear Power**




Address : 17th floor, NBF Hibiya Building, 1-1-7 Uchisaiwaicho, Chiyoda-ku, Tokyo, 100-0011, JAPAN
TEL : +81-3-3591-2210
FAX : +81-3-3591-2215
e-mail : info@jaif-icc.com
URL : http://www.jaif-icc.com/english/index.html

# Japan Atomic Energy Agency(JAEA)
## Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN)

## Establishment

The first Nuclear Security Summit was held in Washington DC in 2010, in response to which the Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) was established under the Japan Atomic Energy Agency (JAEA) in December of the same year, aiming at strengthening nuclear nonproliferation and nuclear security in Asia. In April 2014, ISCN merged with Department of Science and Technology for Nuclear Material Management (STNM) and new ISCN was formed expanding its range of activities to include policy research, nuclear forensics, and CTBT support.

## Capacity Building Support

Utilizing Japan's knowledge and experiences in peaceful uses of nuclear energy, ISCN supports our partners for capacity building and infrastructure development mainly in Asia.

– Training Courses –

**1) Nuclear Security**

- Design and evaluate process for physical protection systems of nuclear material and facilities
- Other physical protection related topics
- Nuclear security culture

**2) Safeguards and State System of Accounting for and Control of Nuclear Material.**

- IAEA safeguards
- National system of safeguards
- Material accounting system
- Additional protocol

**3) International Nuclear Nonproliferation and Nuclear Security Framework**

- History and international trend of peaceful uses of nuclear energy, nuclear nonproliferation and nuclear security
- International framework of nuclear nonproliferation and nuclear security
- Japan's efforts to ensure nuclear nonproliferation and nuclear security

## Characteristics

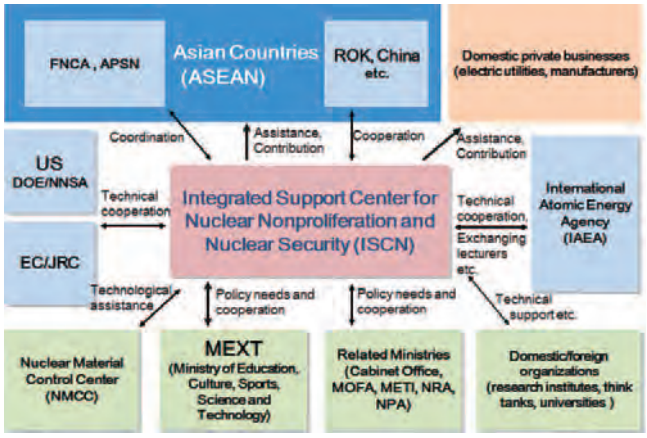
**Training Tools:**

In order to ensure effective learning, ISCN adopts the unique teaching methods, effective integration of lectures, small group exercises, practical and hands-on exercises using the Physical Protection Exercise Field equipped with actual security devices including sensors and cameras, and the Virtual Reality System which constructs a 3D hypothetical nuclear power plant in a virtual space.

**Needs Oriented Approach:**

ISCN provides various course types, such as international/regional/bilateral, or dispatching courses, depending on the target participants. ISCN courses are tailored for their specific needs.

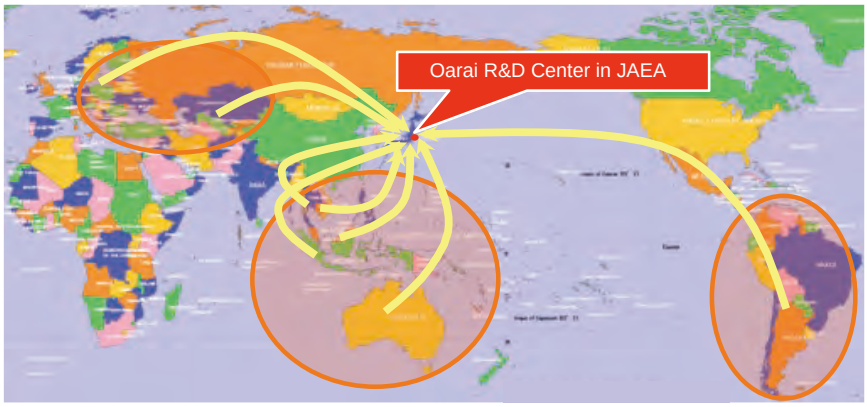
### Cooperation with Related Agencies





Address : 3-1-1 Funaishikawa Eki-higashi, Tokai-mura, Naka-gun, Ibaraki, JAPAN, 319-1118
TEL/FAX : +81-29-283-4115
e-mail : iscn-info@jaea.go.jp
URL : http://www.jaea.go.jp/04/iscn/iscn_old/index_en.html

# Japan Atomic Energy Agency(JAEA)
## Neutron Irradiation and Testing Reactor Center (NITRC-JMTR)




## Establishment

The JMTR (the Japan Materials Testing Reactor) is expected to be a key infrastructure with related facilities to contribute the nuclear Human Resource Development (HRD) by a research and On-the-Job-Training (OJT) in order to support global expansion of nuclear power industry. This training program for foreign young researchers and engineers were started from JFY 2011.

Using JMTR and its facilities, various trainings such as an operations, simulation and examinations are performed for engineers, students of domestics and foreigner including non-nuclear personnel.

## Contents of activities

This program included lectures on the bases of nuclear energy, the irradiation research and safety management at the JMTR, and the practical trainings about neutronic and thermal design, the reactor operating of the JMTR facility using simulation system, the handling irradiated specimen at the JMTR Hot Laboratory. Having completed the three-week course, the participants also experience various sightseeing tour such as, other research reactor, JRR-3 JAEAs other Research reactor, RI production facility of private company and commercial BWR reactor.

### (a) Lecture and practical Intern Training

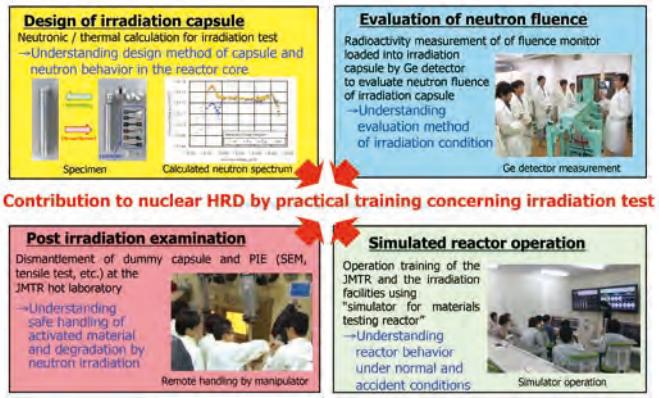
In these programs, basic understanding on irradiation test and post irradiation examination is aimed to achieve by overall and practical training such as the neutronic/thermal designs of irradiation capsule, evaluation of neutron fluence and post irradiation examination, etc.

### (b) Training of neutronic calculation

An analysis procedure using Monte Carlo method has been carried out in irradiation tests of JMTR to evaluate irradiation field at each specimen by using MCNP code.

### (c) Training of Reactor Operation using Simulator

This program can simulate events and actions on normal and the accident conditions in the reactor and the irradiation facility of JMTR.




## Achievements

The number of countries and trainees coming to NITRC-JMTR through this program has been increasing every year. In 2014, 19 participants joined this course from seven countries such as Malaysia, Thailand, Vietnam, Poland, Indonesia, Kazakhstan and Japan

| Year | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|
| Countries | 2 | 5 | 7 | 7 |
| Trainee | 10 | 16 | 18 | 19 |

Address : 4002 Narita-cho, Oarai-machi, Higashi-ibarakigun, Ibaraki-ken 311-1393, JAPAN
TEL : +81-29-266-7040
FAX : +81-29-266-7471
e-mail : nitrc-usersupport@jaea.go.jp
URL : http://new-jmtr.jaea.go.jp/english/index.html

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

ITC Reactor Engineering Course, Tokai

### NuHRDeC

NuHRDeC of JAEA has a responsibility for carrying basic knowledge about nuclear and experiences to younger generation through comprehensive nuclear education and training program. In recent years, NuHRDeC actively promotes international training & cooperation specially in Asia, in cooperation with domestic and overseas university, as well as education and training for domestic nuclear engineers. Totally cumulative number of trainees at NuHRDeC since 1958 reaches about 55,000 for Japanese and 1,500 for foreigners.

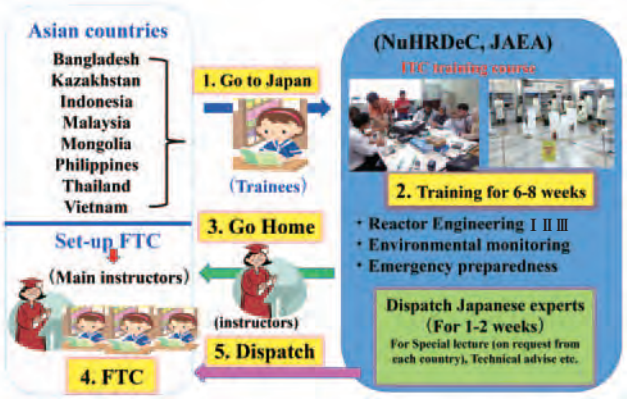
### Instructor Training Program (ITP)

NuHRDeC has been coordinating the Instructor Training Program (ITP), which is sponsored by ministry of Education, Culture, Sports, Science and Technology (MEXT), for Asian countries from 1996. ITP consists of the three major activities, i.e. Instructor Training Course (ITC), Follow-up Training Course (FTC) and Nuclear Technology Seminars.

#### (a) ITC and FTC

ITC and FTC are a packaged activity to educate the candidates of the future instructor in Asian countries indicated the figure. ITC FTC have three courses as below;

- **Reactor Engineering Course**
- **Environmental Radioactivity Monitoring Course**
- **Nuclear and Radiological Emergency Preparedness Course**




#### (b) Nuclear Technology Seminars

Seminars have four courses as below;

- **Nuclear Plant Safety Course**
- **Nuclear Energy officials Course**
- **Basic Radiation Knowledge for School Education Course**
- **Site Preparation&Public Relations Course**


Address : 2-4 Shirakata-shirane, Tokai-mura, Naka-gun, Ibaraki, 319-1195, JAPAN
TEL : +81-29-282-6748
FAX : +81-29-282-6543
e-mail : nakamura.kazuyuki97@jaea.go.jp
URL : http://nutec.jaea.go.jp/english/

# Japan Electric Power Information Center, Inc.
## International Cooperation Center

JEPIC・ICC


On-site Seminar II FY2014 in Vietnam

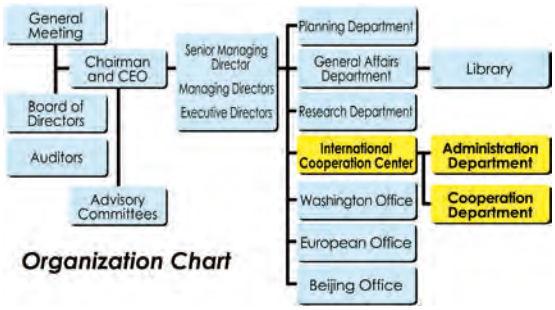
### Outline of JEPIC-ICC

Japan Electric Power Information Center, Inc. (JEPIC) was established in 1958 by Japan's electric power companies with the aim to implement a comprehensive and specific study systematically and continuously on electric power situation of foreign countries. It also commenced international cooperation program in the field of training of personnel from developing countries' power utilities.

After JEPIC's establishment, as the international reputation and interest in business management and cutting-edge technology of Japan's electric power companies had increased, the necessity of providing technical assistance and cooperation to developing countries by Japan's electric power companies has been risen. Under the circumstances, "International Cooperation Center" (JEPIC-ICC) was established in 1989 as its internal organization, in order to expand and reinforce its international cooperation activities.

JEPIC-ICC has been carrying out the activities mentioned below.

1. Cooperation with Power Utilities of ASEAN Countries
2. Technical Cooperation under JICA Programs
3. Technical Cooperation in Nuclear Power Safety
4. Exchange of Information with Foreign Power Utilities
5. Study of Electric Power Situation in Foreign Countries




Organization Chart

### Technical Cooperation in Nuclear Power

Based on the understanding that securing nuclear safety is a global task, Japanese Government carries out activities to secure and improve nuclear safety worldwide through international organizations, bilateral agreements, etc.

In line with such policy, JEPIC has implemented the under mentioned cooperation programs on nuclear power generation since FY 1985 under the contracts with or subsidy from government / agency.

For FY2013, JEPIC provided training courses for China, Vietnam and Lithuania respectively both in Japan and in these countries through the entrustment by government. These training courses in Japan are categorized as follows;

(1) Specific Subject Courses for China (3 courses)
(2) Advanced Training Courses for Vietnam (4 courses)
(3) Training Course for Lithuania (1 course)

From FY1985 to FY2013, JEPIC has invited 2,354 participants from over 30 countries/region in the training courses held in Japan, and dispatched 569 experts from Japan to the training courses held in overseas.

In addition, ICC has dispatched total 284 personnel to 17 countries for coordination meeting and project assessment from FY 1985 to FY 2013.

Address : 15-33, Shibaura 4-chome, Minato-ku,
Tokyo, 108-0023, JAPAN
TEL : +81-3-6361-8330
FAX : +81-3-3455-0994
URL : http://www.jepic.or.jp/en/index.html

# Nuclear Safety Research Association(NSRA)

## Establishment

Nuclear Safety Research Association (NSRA), established under the auspices of the Prime Minister and the Minister of International Trade and Industry of June 1, 1964, is an independent, non-profit research organization on the nuclear safety. NSRA was newly re-authorized by the Prime Minister in April, 2011, under the new public interest corporation system.

## Major Activities in Recent Years

NSRA, since its establishment, has carried out activities in various fields related to nuclear safety. The results and the outcome of these activities have been fully appreciated and highly evaluated by every side of nuclear related people. To perform these activities, various expert committees in which total several hundreds scientists and experts from the government, academic society and industry participate are organized in NSRA. To come up with the expectation of the people of nuclear industry, regulators of the governments and the other nuclear related people, we will continue the science-based challenges in the wide range of topics of peaceful use of nuclear energy. Main activities of NSRA in recent years are as follows:

### ◆Survey and Research

Emergency preparedness, Radioactive waste disposal, Radiation protection, Radiation effects on human being, IAEA safety standard, Environmental effect, Safety of nuclear installations, International cooperation research ("The Nuclear Researchers Exchange Program" for Asian countries(MEXT/NSRA), Forum for Nuclear Cooperation in Asia (MEXT/CAO/NSRA),), etc.

### ◆Activities to reduce radiation influence, the health Uneasiness in Fukushima area

Setting of the support base, Human resource development of local trainers, Risk communication, Personal dosimetry of local residents, etc.

### ◆Management and Dissemination of Information

World nuclear information, Publication of research reports, text books, etc.

Address : 5-18-7, Shinbashi, Minato-ku, Tokyo, 105-0004, JAPAN
TEL : +81-3-5470-1983
FAX : +81-3-5470-1991
e-mail : iard@nsra.or.jp
URL : http://www.nsra.or.jp/index-e.html

# The Japan Atomic Power Company (JAPC)
## Tokai Training Center


A Whole View of the Tokai Training Center

## Introduction

The purpose of the Tokai Training Center is to develop the human resources necessary for the reinforcement of management foundation of our company as well as for the achievement of the operation of nuclear power plants by the following education and training programs.

(1) General Training for all JAPC employees
(2) Specialized Training for technical staff
- From design, construction, operation, maintenance to decommissioning
- Practical training for operation and maintenance
- Radiation protection-Labor safety-Quality management system, etc.

(3) Training for obtaining qualification

Not only for our employees, we also provide training courses for engineers from electric utilities, affiliated companies and many others including students. And we accept foreign engineers through external institutions such as Japan International Cooperation Agency (JICA) and cooperate observation tours to the local community people.

Seminar Room

Water loop Facility

## Major Facilities

(1) Water Loop Facility
The water loop consists of pipes, pumps, valves,tanks, instruments, etc

(2) Electrical Equipments
Metal-clad switchgears, large scale motors,motor-operated valves, protective relay panels,sequencer panels, nuclear instrumentation panels, radiation monitoring panels, etc.

(3) Components Unique to Nuclear power plants
Hydraulic control unit for rod drive, safety- relief valve, mechanical seals of primary circuit recirculation pump, etc.

(4) Experimental Equipment of water, steam and heat
The equipment for understanding the behaviour of water, steam and heat(water flow, boiling, two phase flow, heat transfer, etc)

(5) Inspection Equipment
Non-destructive inspection(ultra-sonic, radiation,magnetic particle, liquid penetrant, eddy current)and various instruments for system diagnosis

(6) Welding Equipments
Equipments for ARC welding and TIG welding

(7) Others
Pumps, valves, and cutaway models, etc

(8) Tokai No.2 Power Station Full Scope Simulator(BWR)
Operation Training Facilities modeled the main control room of Tokai No.2 Power Station

(9) Educational Simulator of Nuclear Power Generation
Using the Educational Simulator with Large Display, the training is carried out to understand easily the characteristics of BWR and PWR, and each behavior.

Full Scope Simulator Room (BWR)

Educational Simulator of Nuclear Power Generation (BWR/PWR)

Address : 4-1, Tokai 3-chome, Tokai-mura, Naka-gun, Ibaraki Prefecture, 319-1117, JAPAN
TEL : +81-29-287-0111
FAX : +81-29-287-0112
URL : http://www.japc.co.jp/english

# The Japan Atomic Power Company (JAPC)
## Tsuruga Training Center

A Whole View of the Tsuruga Training Center

### Introduction

Tsuruga Training Center was established in Kutsumi, Tsuruga-city in 2012 as a training facility to provide systematic training. Trainees can learn safety culture and safety technology related to nuclear power through lectures and workshops. As well as JAPC associates, this center is also opened for engineers from local companies, electric utilities, affiliated companies and students in Japan and from the overseas.

Seminar Room

Laboratory

Full Scope Simulator Room (PWR)

Educational Simulator of Nuclear Power Generation (BWR/PWR)

### Major Facilities

(10) Water loop facilities
Water loop facilities consist of pipes, pumps, valves, tanks, heat exchangers, support structures, instruments, and other devices.

(11) Electrical and measuring equipments
High or low switch-gears, motors, moter-operated valves, uninterruptible power supply equipment, sequencer panels, ex-core nuclear instrumentation panels, radiation monitoring panels, and other devices.

(12) Equipment forpractical training on water & steam(heat)
Equipment for understanding the behavior of water, steam and heat (water flow, boiling, two-phase flow, heat transfer, etc.), performance of pumps, and cavitations

(13) Welding equipments
Equipments forAPC welding and Tig welding

(14) Others
Pumps, valves, and cutaway models, and other materials

(15) Educational Simulator of Nuclear Power Generation
Educational Simulator installed with simulation software of Tsuruga Power Station Unit 2 and Tokai No.2 Power Station Full Scope Simulator to understand the characteristics and behavior of each plants.

(16) Plant Model
Panoramic view of the nuclear power plant, reactor, steam generator, fuel assembly, and other devices

(17) Radiation meters
Ge semiconductor measuring devices, survey meters of scintillation dose rate, GM model contamination survey meters

(18) Chemical analysis equipments
pH meters, electrical conductivity meters,digital microscope

(19) Inspection devices
Inspection devices and measuring instruments for equipment diagnosis (vibration, motor oil, and infrared) such as magnetic particle examination and ultrasonic examination

(20) Tsuruga Power Station Unit 2 Full Scope Simulator (PWR)
Operation Training Facilities modeled the main control room of Tsuruga Power Station Unit 2

Address : 165-9-6, Kutsumi, Tsuruga-city, Fukui Prefecture, 914-0823, JAPAN
TEL : +81-770-21-9700
FAX : +81-770-21-9725
URL : http://www.japc.co.jp/english

# The Wakasa Wan Energy Research Center

## Fukui International Human Resources Development Center For Atomic Energy

THE WAKASA WAN ENERGY RESEARCH CENTER

### Establishment

Fukui International Human Resource Development Center（FIHRDC）, which was founded in April 2011, has intended to be the focal point of human resource development（HRD）in the field of nuclear energy in the Western Japan. To achieve this goal, the center has established close cooperation with not only research institutes and training centers in the Fukui prefecture but also universities and other related organizations in its neighboring regions such as Kansai and Chukyo. The activities of the center always aim to improve nuclear technology and human resources in the world, beginning with Asia, through fostering competent human resources to meet needs from home and abroad.

### Activities

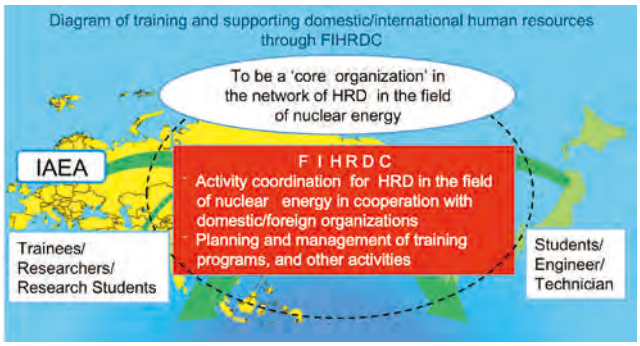
**International Activities for Nuclear HRD**

- Offering training programs for nuclear human resources from abroad
- Accepting overseas researchers/research students
- Dispatching Japanese lecturers to provide training courses in foreign countries
- Enhancing HRD programs in closer cooperation with the International Atomic Energy Agency (IAEA)

**Domestic Activities for Nuclear HRD**

- Offering training programs for nuclear human resources from Japan
- Supporting domestic human resources in the area of nuclear energy to become more familiar with international environment

**Strengthening the network with domestic/foreign organizations for HRD by holding international meetings and other activities.**




Address : 64-52-1, Nagatani, Tsuruga, Fukui, 914-0192, JAPAN
TEL : +81-770-24-7272
FAX : +81-770-24-7288
e-mail : international@werc.or.jp
URL : http://fihrdc.werc.or.jp/

# Hitachi-GE Nuclear Energy, Ltd.

## Establishment

Hitachi-GE Nuclear Energy was established in 2007 by Hitachi Ltd., and the General Electric Co., of U.S. as a means of participation in nuclear energy business. Hitachi-GE Nuclear Energy Ltd., having inherited the technologies and the experiences of both companies, each with a half-century of experience in the nuclear energy business, is working for progress in that field, while promoting highly reliable manufacturing practices. Furthermore, through synergistic collaboration with the supporting companies in the U.S. and Canada, we offer global services of consistently high quality, ranging from research and development to design, manufacturing and construction, as well as the maintenance of advanced boiling water reactors, fast reactors and nuclear fuel cycle facilities, etc. Hitachi Group's overall strength, is used to support the reliable, sustainable supply of energy, as part of an effort to build a more rich and comfortable future for the people and the globe.

## Training Services

As a support for the nuclear power, we provide following training services to the customers and members who involved in nuclear energy industry as well as potential customers

### (a) Trainings for users

Based on the service agreement, we provide a training program for users or potential users of our products. This is not limited to Japanese, but also for users in foreign countries.

### (b) Internship for university students

We provide a short or middle term internship program for engineering students or young faculties based on the request from universities or other educational or industrial entities.

### (c) Endowed Chair Program

We provide endow courses on the nuclear energy at universities, not only in Japan but also in foreign countries.

### (d) Scholarship

Together with the Hitachi Scholarship Foundation, we provide a opportunity for full scholarship program for postgraduate study in Japan. Award is provided to young faculty or researchers and Ph.D. candidates in the field of science or engineering, who wish to continue to study at the graduate school of Japanese university.

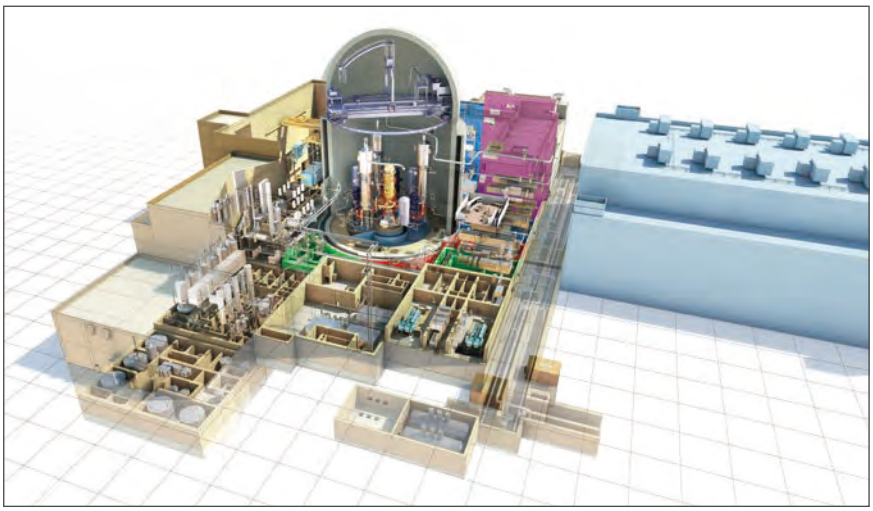
### (e) Professional Mission

Temporary mission of professionals or lecturers on nuclear energy is provided to the educational or training institutes, even for overseas.

Address : 1-1, 3-chome,Saiwai-cho, Hitachi-shi, Ibaraki-ken, 317-0073, JAPAN
TEL : +81-294-22-1000
Contact website : http://www.hitachi.com/contact/index.html
URL : http://www.hitachi-hgne.co.jp/en/index.html

# Mitsubishi Heavy Industries, Ltd.

MITSUBISHI HEAVY INDUSTRIES, LTD.



ATMEA1 (The mid-sized Generation III+ PWR)

## Corporate Information

**- Integrated, Comprehensive Technology to Meet Society's Needs, from Developing New Technologies to Design, Production, Service -**

All four of Mitsubishi Heavy Industries, Ltd. (MHI)'s operating business domains, our research and development centers throughout Japan, and our manufacturing facilities mesh together to develop the next generation of technologies from design and manufacturing to the provisional of services. Moreover, all of our technologies and expertise built within each of our fields are forged into an organic whole, into a global deployment of manufacturing writ large, to create new value.

## Nuclear Power Generation

As a leading manufacturer of nuclear power plants, MHI is active across the entire nuclear power industry by way of supplying pressurized water reactor (PWR) nuclear power plants, developing fast breeder reactors (FBR) and engaging in nuclear fuel cycle related business.

MHI has supported the successful operation of all of 24 PWR nuclear power plants in Japan with a total output of more than 20,000 MWe since 1970. MHI is continuously contributing to a stable electricity supply with our extensive experience and practical accomplishments.

## Sophisticated Production Capabilities Contribute to a Low-Carbon Society

Based on the customers' excellent trust in our abundant experience and capability with high technologies, MHI has been the No.1 Supplier, among other Japanese suppliers in the field, of major heavy components for the overseas market such as the United States, Europe, and other overseas countries.

In response to the increasing global demand for nuclear power plants, along with the momentum to control emission of greenhouse gas, MHI is aggressively promoting export business of PWR nuclear power plants and the major components required to contribute to the realization of a low-carbon society.

## Nuclear Power Plants

- PWR (Pressurized Water Reactor)
- APWR (Advanced Pressurized Water Reactor)
- ATMEA1 (Mid-sized PWR jointly developed with AREVA)
- U.S. / EU-APWR (The U.S. / EU large sized APWR)
- Next Generation PWR

## Advanced Reactors

- Fast Breeder Reactors (FBR)
- Nuclear Fusion Reactors (ITER)
- High Temperature Gas-cooled Reactors
- Small modular reactor

## Nuclear Fuel Cycle, etc.

- Fuel fabrication
- Spent Fuel Reprocessing Equipment
- Spent Fuel Transportation/Storage Cask
- Spent Fuel Interim Storage Facility
- MOX Fuel Fabrication Plant
- Various Disaster Support Robot, etc.

## Post-Operational Services

- Statutory Period Inspection
- Replacement
- Repair
- Degradation Prevention and Mitigation
- Long-Term Maintenance Planning
- Operational Support, etc.

Head Office : 〈Mitsubishi Heavy Industries Head Office Building〉
2-16-5 Konan, Minato-ku, Tokyo, 108-8215, JAPAN
TEL : +81-3-6716-3111
URL : www.mhi-global.com

# Toshiba Corporation TOSHIBA

## Corporate Information

Toshiba, with group company Westinghouse Electric Company, leads the global nuclear industry with capabilities in both Boiling Water Reactor (BWR) and Pressurized Water Reactor (PWR). Our comprehensive research and investment support advances in nuclear power safety and efficiency.

## Products and Services

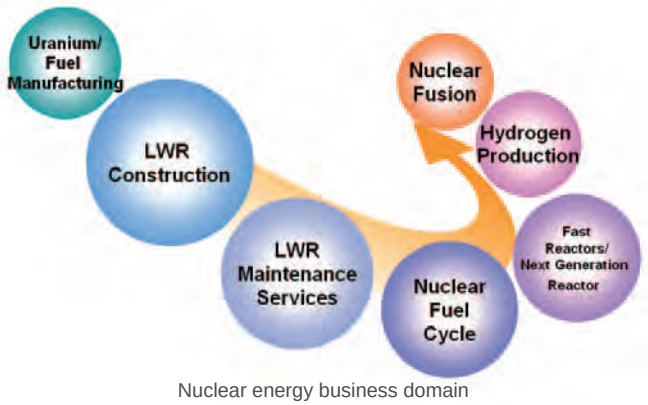
Abundant experience in plant construction and ceaseless efforts in technology development assure that we deliver nuclear power plants and services offering high levels of safety, reliability and economic efficiency.

With Westinghouse, we provide fuel, services, plant design, construction and equipment for both pressurized water reactor power plants and boiling water reactor power plants.

We also offer new solution in the field of energy, the environment and healthcare by drawing on advanced technologies derived from R&D in nuclear fusion, accelerator and superconducting magnets.

## Main Products

- LWR Construction
  - Advanced Boiling Water Reactor (ABWR)
  - Boiling Water Reactor (BWR)
  - Next generation pressurized water reactor (AP1000™)
  - Pressurized water reactor (PWR)
- Steam turbine and auxiliary Equipment
- Digital instrumentation, control and electrical systems
- Service and maintenance for operating plant
  - Laser Peening System for SCC mitigation
  - Laser Welding System




Nuclear energy business domain

ABWR Advanced Boiling Water Reactor
(Kashiwazaki-Kariwa Nuclear Power Station unit No.6 and No.7：Tepco)

AP1000™ Next Generation Pressurized Water Reactor
(Sammen Nuclear Power Station unit No.1：SNPC)

- Decommissioning
- Nuclear fuel
- New Technology Application
  - Fusion Reactor Equipment
  - Accelerator
  - Superconducting applications
- Fast Reactors (FR)
- Reprocessing facilities

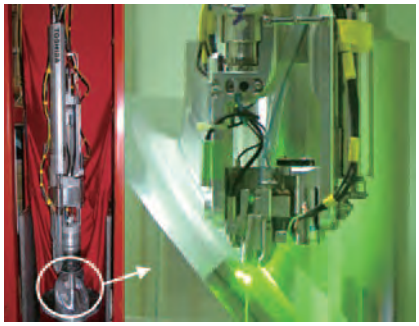
## Training Programs

- Factory tour
  - Manufacturing scene
  - Research development scene

  (Application to each representative is required)
- Training course
  - Induction course
  - Engineering course

  (Application to each representative is required)

High Performance Turbine



Portable Laser Peening Equipment


Fusion Reactor Vacuum Vessel
(JT60SA : JAEA)

Address : 72-34, Horikawa-cho, Saiwai-ku, Kawasaki 212-8585, JAPAN
TEL : +81-44-331-0552
FAX : +81-44-548-9500
URL : http://www.toshiba.co.jp/nuclearenergy/english


## Contact

[Secretariat of Sub-Working group for supporting nuclear HRD programs in newcomer countries]

**JAIF International Cooperation Center (JICC)**

17th floor, NBF Hibiya Building,
1-1-7 Uchisaiwaicho, Chiyoda-ku, Tokyo, 100-0011 JAPAN
TEL: +81-3-3591-2210 FAX: +81-3-3591-2215
e-mail: info@jaif-icc.com
URL: http://www.jaif-icc.com/english/index.html