Scope of Program of Fukui Pref. Gov. for Supporting the Nuclear Program of Asian Countries

Takahama Power Station

Monju

Tsuruga Power Station

Ohi Power Station

Mihama Power Station

March 19, 2014

Masato Hasegawa,
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Historical overview of Nuclear Energy in Fukui

Initial phase (1967 -)

Residents has 'exceeded expectations' for regional development with the use of Nuclear energy and the prefecture and local municipalities campaign to host the Nuclear Power Plants.

Operational phase (1970 -)

The interplay of hope and fear (The first nuclear-generated power from Mihama Unit No.1 was sent to the site of the EXPO '70 exhibition in Osaka or the other hand, a rash of events at nuclear power plants including radioactive releases threatened people.)

9 NPPs (1975 -)

New plant construction plan at the existing site and new sites has moved forwarded. Meanwhile, **Public fear and distrust increased** due to TMI accidents and other domestic and overseas nuclear events.

15 NPPs (1985 -)

“Oil crisis” led to a renewed interest in nuclear and a decision was made to construct new plants at the existing site and a research reactor “Monju”.

- **Decommission** (A prototype nuclear reactor “Fugen” has shut down permanently in 2003.)

New phase

The Fukushima nuclear accident has major impact on some issues about restarting the nuclear power plant after regular inspections, operational duration of aging plant over 40 years and replacement of plant.

Atomic Energy Spirit of Innovation and Accumulation of Fukui

①Various kind of nuclear power generating facilities

The greatest power supply area in Japan
- Amount of electric power generation by 13 NPPs. about 11.2 million KW
- About 1/4 of nuclear power generation in Japan
- About 1/2 of power consumption of Kansai area

The first reactors of the following types were constructed in Fukui
- Boiling Water Reactor (BWR)
- Pressurized Water Reactor (PWR)
- Advanced Thermal Reactor (ATR)
- Fast Breeder Reactor (FBR)

Various status of NPPs
- Operational (incl. Monju) 14
- Under planning (Tsuruga3,4) 2
- Decommissioning (Fugen) 1

Japan Atomic Energy Agency
Prototype Fast Breeder Reactor Monju

The Japan Atomic Power Company
Tsuruga Power Station

Japan Atomic Energy Agency
Fugen Decommissioning Engineering Center

Tsuruga City ◎

◎Obama City

The Kansai Electric Power Co. Inc.
Mihama Power Station

The Kansai Electric Power Co. Inc.
Ohi Power Station

The Kansai Electric Power Co. Inc.
Takahama Power Station

Operational
Performance test
Under planning
Decommissioning

Atomic Energy Spirit of Innovation and Accumulation of Fukui

② Concentrated HRD Organization

- 7 Facilities related to Operation & Maintenance Training and Energy R&D
- "Tsuruga Training Center" "Research Institute of Nuclear Engineering" newly opened

- 5 Off-site Centers,Environmental Radiation Research and Monitoring Center

※Red frame is an inspection place of this course

Atomic Energy Spirit of Innovation and Accumulation of Fukui

③ Accumulation of 50-years worth of experience and Human Resources

- Experience of introducing NPP[Senor Human resources of Electric Company]
  - Human Resources Development(HRD)Method needed when NPP siting
  - Troubles and Know-how experienced at NPP
- Local Public Acceptance(PA) and Communication
  - Popularization of knowledge concerning atomic energy peaceful utilization
  - Atomic energy education to primary school, junior and senior high school
- Safety measures and responses for troubles and local resident
  - Agreement of safety
  - Radiation monitoring in environment
  - Information disclosure (Open to public)
- Know-how regarding symbiosis with local society

Establishment of Fukui IHRDC

The potential of Fukui prefecture related to human resources development for atomic energy

① Various kind of nuclear power generating facilities

② Concentrated HRD Organization

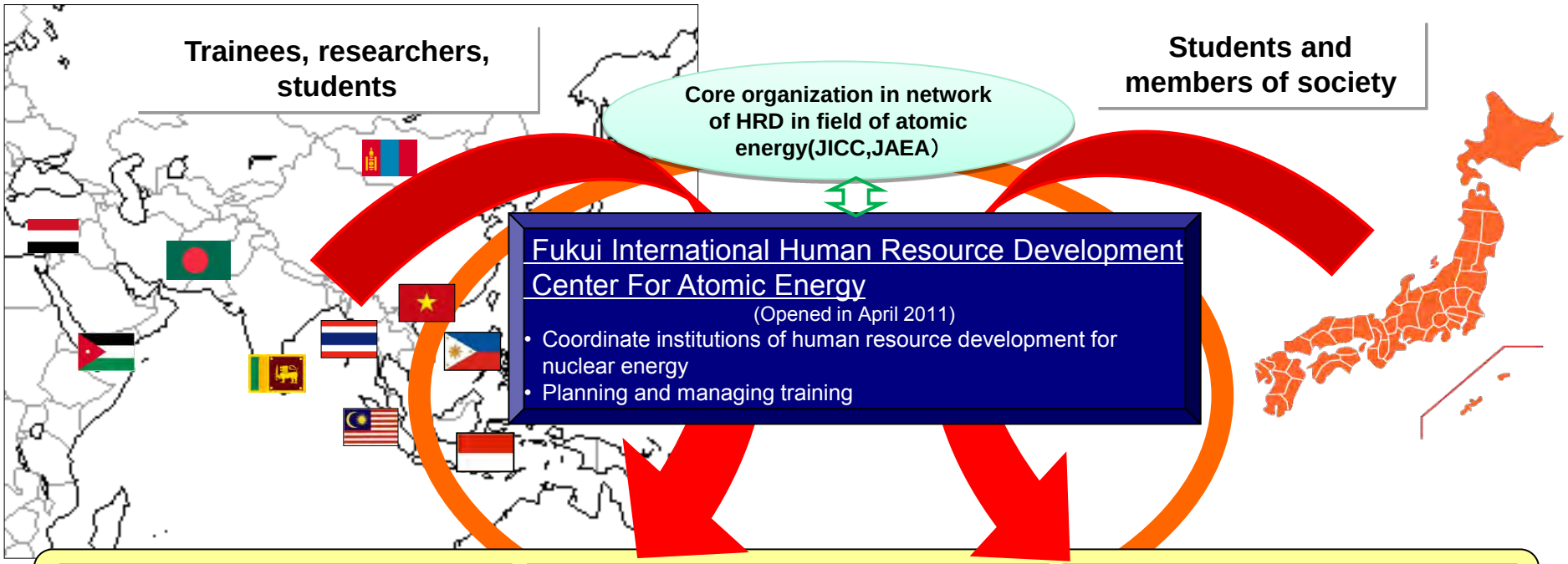
③ Experience for 50years, and Accumulation of Human Resources

The Fukui International Human Resources Development Center for Atomic Energy(Fukui IHRDC) was established in The Wakasa Wan Energy Research Center, April 2011.

- As the core organization of human resources development for atomic energy
- For the purpose of using effectively the potential of Fukui prefecture

The project development that utilized a network

- Fukui Prefecture,with Fukui International Human Resource Development Center For Atomic Energy as a core institute, accept researchers and trainees from countries which are embarking on nuclear power plants by utilizing atomic energy-related research institutes, training institutions, and universities in the prefecture



Research institutes

Wakasa Wan Energy Research Center
Fast breeder reactor, Monju
Institute of Nuclear Safety System, etc.

Administrative agency institutes

Fukui Prefectural Environmental Radiation Research and Monitoring Center

Training institutions

Tsuruga Training Center(JAPC)
Nuclear Technology and Education Center(KEPCO)
Nuclear Power Training Center Ltd, etc.

Universities

University of Fukui, Fukui University of Technology, Kyoto University, Osaka University, Nagoya University, etc.

Training utilizing potentiality accumulated in the Prefecture (1)

Training for experiencing site (example)

It is a rarity in the world that various types of nuclear power plants are concentrated in a single prefecture.
It is possible to experience nuclear power plants at each stage from establishment to decommissioning, as well as the site's coexistence with the community.

Visit plants of various reactor types


Ohi Power Plant (PWR)


Tsuruga Power Plant Unit 1 (BWR)


Monju (FBR)


Fugen (ATR)

Experience the livelihoods of people coexisting with nuclear power plants from construction to decommissioning.


Demolition work site of a nuclear power plant decommissioning (Fugen Power Station)


Construction site of a latest model nuclear power plant (APWR) (Tsuruga Power Plant Units 3 & 4)


Tourists enjoying swimming at a beach close to a power plant (Suisho-hama Beach, Mihama-cho)

Training utilizing potentiality accumulated in the Prefecture (2)

Experience-based practical training (example)

Making effective use of various types of nuclear-related facilities concentrated in the Prefecture.
Conduct training focusing on “practice” which corresponds to the needs of countries whose personnel are attending the training.

Operation of a nuclear power plant

Experience-based learning using an operation simulator

Nuclear Power Training Center Ltd.

Maintenance of a nuclear power plant

Experience-based learning using a maintenance training facility such as a mock-up

Nuclear Power Training Center, The Kansai Electric Power Co., Inc.

Nuclear emergency preparedness, radiation measurement

Experience-based learning on nuclear emergency preparedness structure, idea of radiation monitoring, operation management of observation equipment such as monitoring cars, radiation measurement technology, etc.

Fukui Prefectural Environmental Radiation Research and Monitoring Center

Project and Plan of FIHRDC

International human resources development

Fiscal 2011 (establishment)

Implementation of training programs utilizing existing facilities

Activities

- ○Oversea training
  - ・Reactor plant safety course
  - ・Public acceptance course
  - ・The training in foreign countries
- ○International conference
  - ・International Meeting on Human Resources Development for Nuclear Energy In Asia

Fiscal 2012

Expand project in conjunction with opening of nuclear Safety Training Center and Research Institute of Nuclear Engineering, University of Fukui

Activities

- ○Oversea training
  - ・Reactor plant safety course
  - ・Public acceptance course
  - ・Nuclear power generation safety bases course
  - ・Nuclear energy administration course
  - ・The training in foreign countries
- ○International conference
  - ・International Meeting on Human Resources Development for Nuclear Energy In Asia
- ○Acceptance of researchers and research students

Fiscal 2013

Expand project in cooperation with IAEA and other international energy/atomic bodies

Activities

- ○Oversea training
  - ・Reactor plant safety course
  - ・Public acceptance course
  - ・Nuclear power generation safety bases course
  - ・Nuclear energy administration course
  - ・The training in foreign countries
- ○Cooperation with IAEA
  - ・Invite training course organized by IAEA,etc
- ○International conference
  - ・International Meeting on Human Resources Development for Nuclear Energy In Asia
- ○Acceptance of researchers and research students

The number of trainees participating in training course

40	48	77

International HRD Training Project Introduction -1-

Reactor Plant Safety Course

Purpose ： The knowledge acquisition about the safe techniques such as nuclear energy facilities

Paticipant : Atomic energy-related engineers

Number of acceptance ：10

Duration ： 4weeks

Contents of curriculum：

Lecture

Visit to Mihama NPP

Visit to Training Center

①Basis of nuclear power plant safety
The fundamental agenda of NPS in each phase from location to design, construction and operation.

②Safety measures and evaluation
The safety measures and evaluation learned from actual cases.

③Operational techniques of nuclear power plant
The method of operation control (PWR, BWR)

④Maintenance management of the reactor plant
The system and timing of the plant equipment inspection, etc.

⑤Fukushima Daiichi NPS event
Outline of Fukushima Daiichi NPS event, Lessons learned from the accident, Action of IAEA and the debate of NPS construction plan of each county after the accident

⑥Facility visit
NPS, Training center, etc. in Fukui

International HRD Training Project Introduction -2-

Nuclear Energy Administration Course

Purpose : The knowledge acquisition necessary for management of the nuclear energy administration

Participant : Administrative officer on nuclear power

Number of acceptance : 10

Duration : 3 weeks

Contents of curriculum :

Lecture

Visit to Tsuruga NPP unit 3,4 construction site

①Japanese government and regulations on nuclear power

The government and regulation of nuclear power in Japan is learned after experiencing the Fukushima Daiichi power plant accident.

②Ensure the safety of nuclear power

Safety culture and safety measures relating to nuclear power, human resources development

③Fukushima Daiichi NPS event

Outline of Fukushima Daiichi NPS event, Lessons learned from the accident, Action of IAEA and the debate of NPS construction plan of each county after the accident

④Nuclear Applications

Nuclear Applications for Improvement of Agriculture,Industy and Human Health

⑥Facility visit

Tsuruga NPP unit 3,4 construction site, Off-site Center, Electron Beam Irradiation Facility,etc. in Fukui

International HRD Training Project Introduction -3-

Public Acceptance Course

Purpose : Improving public relations in countries aiming at introducing nuclear power plants

Participant : Press officers of electric company

Number of acceptance : 8

Duration : 1week


Lecture by Mayor of Ohi City


Debate with local residents

Contents of the curriculum :

①Basis of Atomic Energy
Role of Nuclear Power, Nuclear Policy in Japanese government and Fukui prefectural government, Outline of Nuclear Power Plant and Lessons learned from Fukushima Daiichi NPS Accident.

② Coexistence between Siting Municipality and Atomic Energy
the knowledge of the experience concerning coexistence with the atomic energy which Ohi city and Takahama city have cultivated（Lecture by Mayor）, the debate with local residents on the theme of "the communities and atomic energy"

③Risk Communication
The method and concept of Risk Communication, international and domestic success / failure example.

④Facility Visit
Fukui prefectural environmental research and monitoring center,
Fukui Atomic Information Center, AtHome

Application of Radiation Technology in Fukui

The Wakasa Wan Energy Research Center

○Selective Breeding Research

Research into Selective Breeding of Plants and Fungi

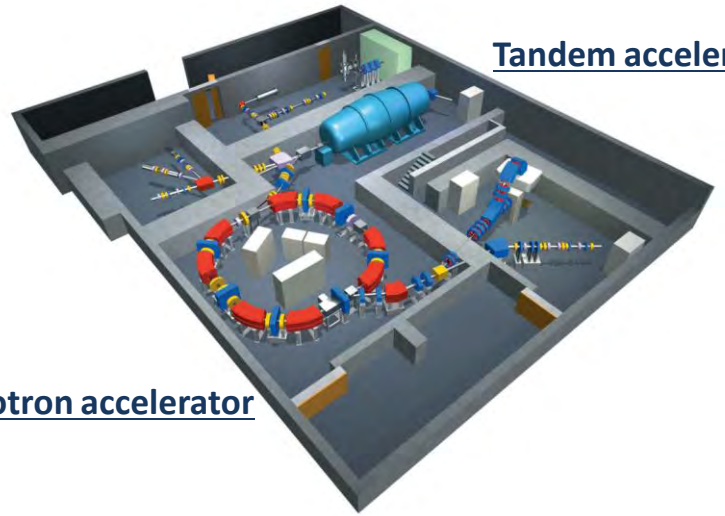
Improved tomato
(Sweeter, lower suberin content, and resistant to disease)

Conventional Improved

Improved green soybean
(Increase in grain size)

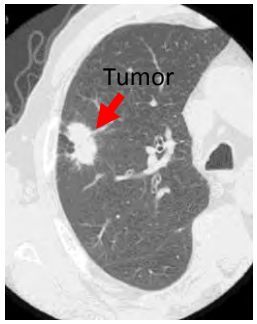
Conventional Improved

Accelerator System



○Proton Beam Cancer Therapy Research

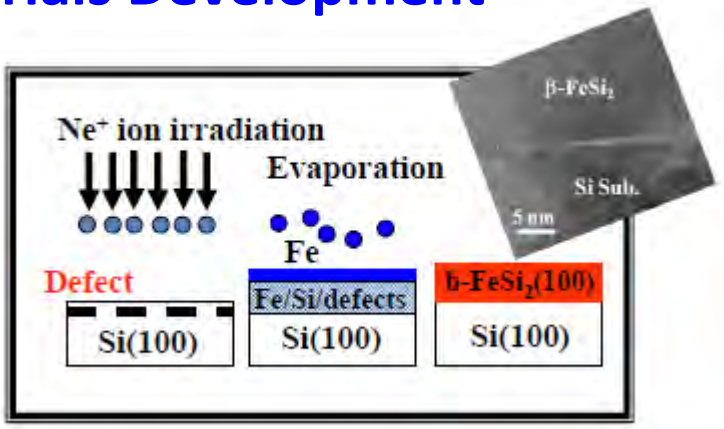
The WERC's R&D results have been applied to Proton therapy center in Fukui



Before lung cancer treatment

18.5 months after proton beam irradiation

○Energy and Environmental Materials Development



Proton Therapy Center in Fukui Prefectural hospital

- Open based on the clinical research of WERC(FY2002 - FY2009)
- Start of treatment: March, 2011
- Diseases targeted by proton beam therapy:
  Solid tumors with clear foci in the head and neck, lungs, liver, prostate, etc.
- Number of treated patients: 449 as of Jan.2014

Synchrotron

The synchrotron accelerates protons up to 70% of the speed of light (photograph: Shizuoka Cancer Center).

Rotating gantry irradiation room

Proton beams can be irradiated to patients from any direction .

Horizontal irradiation room

Proton beams is only irradiated from a horizontal direction and patients with prostate cancer are treated exclusively.

Waiting area

An atrium gives the waiting area a free and open feel.

The layer-stacking irradition system and the automated CT positioning system wil be used in this treatment room and these new technogies become unique among proton facilities in the world.

University of Fukui Biomedical Imaging Research Center

1. Characteristics
   - Conduct clinical researches on function measurement by use of PET and MRI, and fundamental researches aiming for functional molecular imaging

2. Divisions
   Medical Imaging
   Molecular Imaging
   Radiopharmaceutical Chemistry
   Functional Neuroimaging
   Oncology
   Image Engineering
   PET Engineering

Full view of the facility

Cyclotron

Clinical PET scanner

Image diagnostic technology: Images of X-ray CT (left), MRI (center), PET (right)

Kansai Electron Beam Co., Ltd.

(Facility outline) Facility which reforms and sterilizes materials such as textiles and plastics by irradiation with an electron beam.

(Operation started in) September 2011

(Location) Mihama-cho, Mikata-gun, Fukui Prefecture

(Case example of development) Development of antibacterial textile to which silver nanoparticles are absorbed by electron beam

(Facility) Electron accelerator
(Output: 10 MeV: Largest commercial facility in Japan)

Full view of the facility

<Business contents>

(1) Sterilization treatment ••• Irradiate, with an electron beam, packed and packaged products such as medical instruments, medical product containers, plastic bottle caps, and the like from outside of the packages to sterilize them.

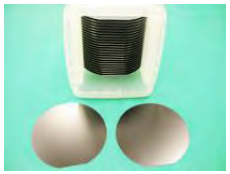
Medical instruments

Medical gauze, swabs

Eye-drop caps, eye lotion caps

Resin/aluminum caps

(2) Reform of materials ••• Improve function of high molecular materials (textiles, plastics); i.e., cross-linkage, decomposition, polymerization, etc., by irradiation with an electron beam



Improve characteristics of semiconductors

Improve heat resistance of plastics

Sophisticate the functions of textiles

Electron accelerator (Rhodotron, IBA Belgium)

International HRD - Researcher acceptance

Atomic Energy Researchers Acceptance Program

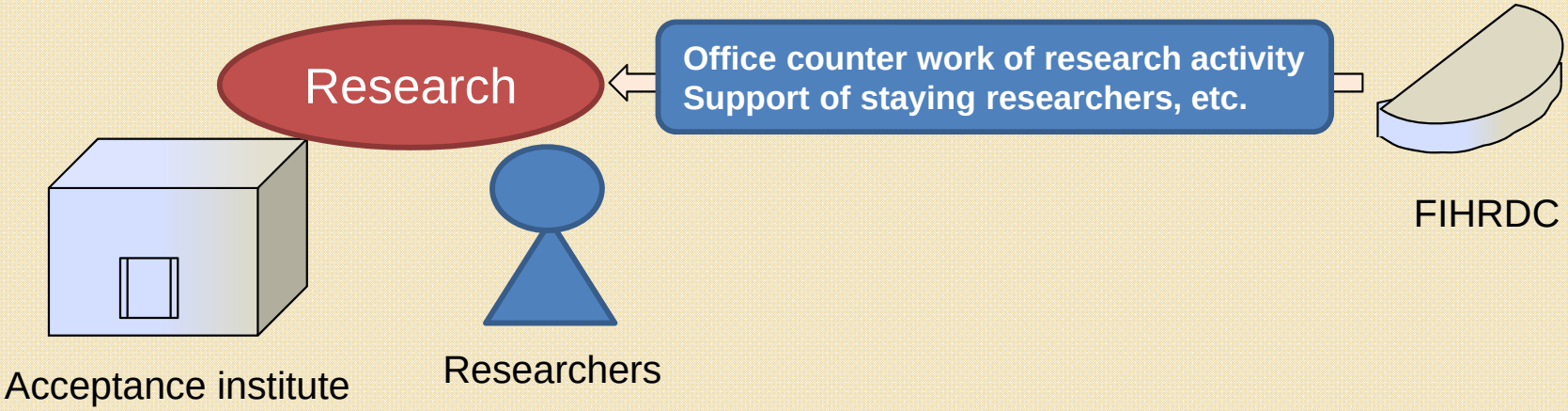
Purpose : Contributing to nuclear safety and improving safety technologies of atomic energy and encouraging collaboration and exchange with overseas research institutes

Country ：Asian countries, etc.

Participant : Researcher of the research institute, graduate student, etc.

Number of acceptance ：4（fy2013）

Acceptance institute : Universities and Research institutes in Fukui



Collaboration with international institutes（1）

Enrichment of endeavors by strengthening cooperation with international framework and agencies

FNCA（Forum for Nuclear Cooperation in Asia）

FNCA Coordinators Meeting
（7-9 March,2012 at　Fukui International Activities Plaza in Fukui）

FNCA WS of Project on Human Resource Development
（17-19 Sept.,2013 at The Wakasa Wan Enerugy Research Center in Fukui）

Collaboration with international institutes（2）

IAEA

Fukui International Meeting on Human Resources Development for Nuclear Energy in Asia(Organized by Fukui Prefectural Gov.and WERC;26-27 March,2013）

Invited county:
Indonesia,Kazakhstan,Malaysia,Thailand,Vietnam

Invited 2 Experts of IAEA

The IAEA/JICC/WERC
Mentoring Course（8-19 July,2013）
Nuclear Policy School（24-28 Feb.,2014）

Invited county:
Bangladesh,Indonesia,Jordan,Malaysia, Mongolia,Philippines,Sri Lanka,Thailand, Vietnam,Yemen

Practical Arrangements between The Fukui Pref. and IAEA

Area of Cooperation ：

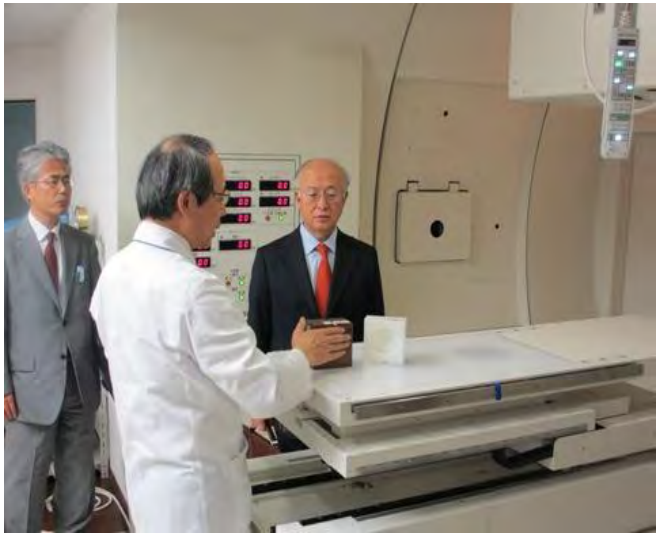
Human Resources Development in the area of Nuclear Energy,Nuclear Safety,and Nuclear Sciences and Application

Scope of Coorperation：

Assistance in training,disseminating information,exchanging experiences,etc.

date of signature : 7 October ,2013

Signed between Mr.Amano, DG, IAEA and Mr.Nishikawa, Governor, Fukui Pref.



Visit to Proton Therapy Center in Fukui Prefectural hospital by Mr.Amano,DG

What Fukui Prefecture should aim for

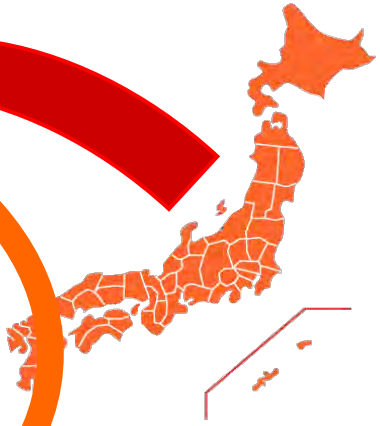
Establish bases for cultivating international nuclear human resources in Fukui Prefecture by centering on "Fukui Prefecture International Nuclear Human Resource Development Center"

Trainees, researchers, foreign students

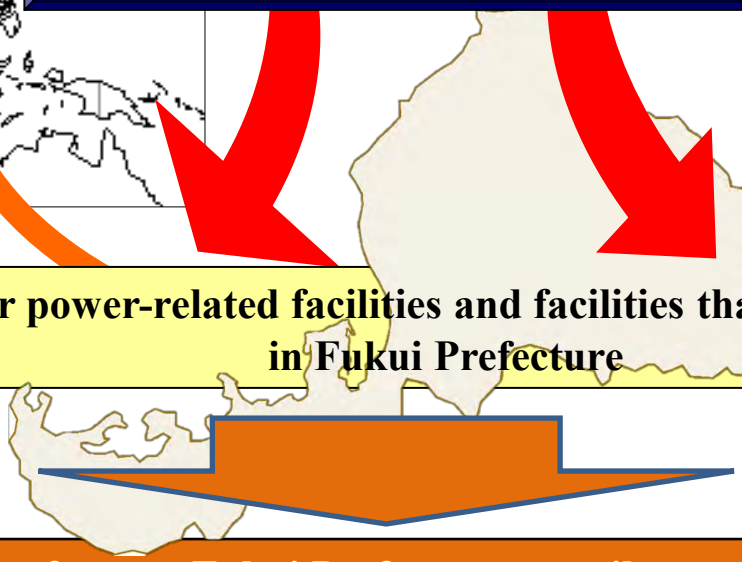
Core institution of Nuclear Human Resource Development Network (JICC, JAEA)

Students, business people

Fukui Pref. International Nuclear Human Resource Development Center



Nuclear power-related facilities and facilities that use radiation in Fukui Prefecture



As a nuclear power advanced prefecture, Fukui Prefecture contributes to safety technology and human resource development of countries including Asia which plans to introduce nuclear power plants and utilize nuclear power.