FIFTY-YEAR EXPERIENCE OF NUCLEAR&RADIATION EDUCATION AT NuTEC/JAEA

- Mainly on the Radiation Basic Course and a new Distance Learning System -

K.N. Kushita, H. Kato, H. Murakami, J. Sugimoto
Nuclear Technology and Education Center
Japan Atomic Energy Agency

History of JAEA, NuTEC, and training courses

1956 Foundation of JAERI and NFC
1957 Radioisotope School (RIS), in Tokyo
1958 Nuclear Reactor Training Center (NRTC)
1975 Organizational Integration of NuTEC
2005 Foundation of JAEA by integration of JAERI and JNC

1958 Radiation Basic Course at RIS
1959 Nuclear Engineering Course at NRTC

1960 Radioisotope Course for Qualified Engineers
1963 Reactor Operator's Training Course
1969 Health Physics Course
1970 Nuclear Fuel Engineering Course
1971 Basic Nuclear Course for the Public
1980 Nuclear Emergency Preparedness Course Qualification Course for Class 1 radiation Protection Supervisor
1988 Radioisotope Course
1989 Nuclear Engineering Seminar for the Public
1991 Nuclear Experiment Seminar for the Public
1996 International Atomic Energy Safety Technology Training Project Sponsored by MEXT.
1999 Nuclear Supervisor Training Course
2002 NuTEC, Tokyo was closed and a New Experimental Facility was installed at JAERI-Tokai

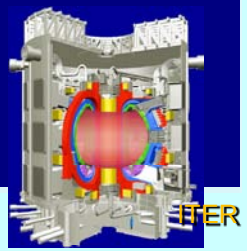
2009
accumulated number of domestic trainees exceeds **130,000** (international trainee - about 3,000).

Activities of JAEA

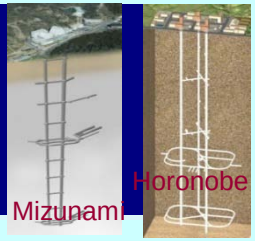
(1-4: main activities of JAEA)

1. FBR development

3. Fusion research



2. High-level waste management R&D



4. Quantum beam technology R&D

Light-water nucl. reactor, Hydrogen from nucl. energy, Radioactive waste management, etc.

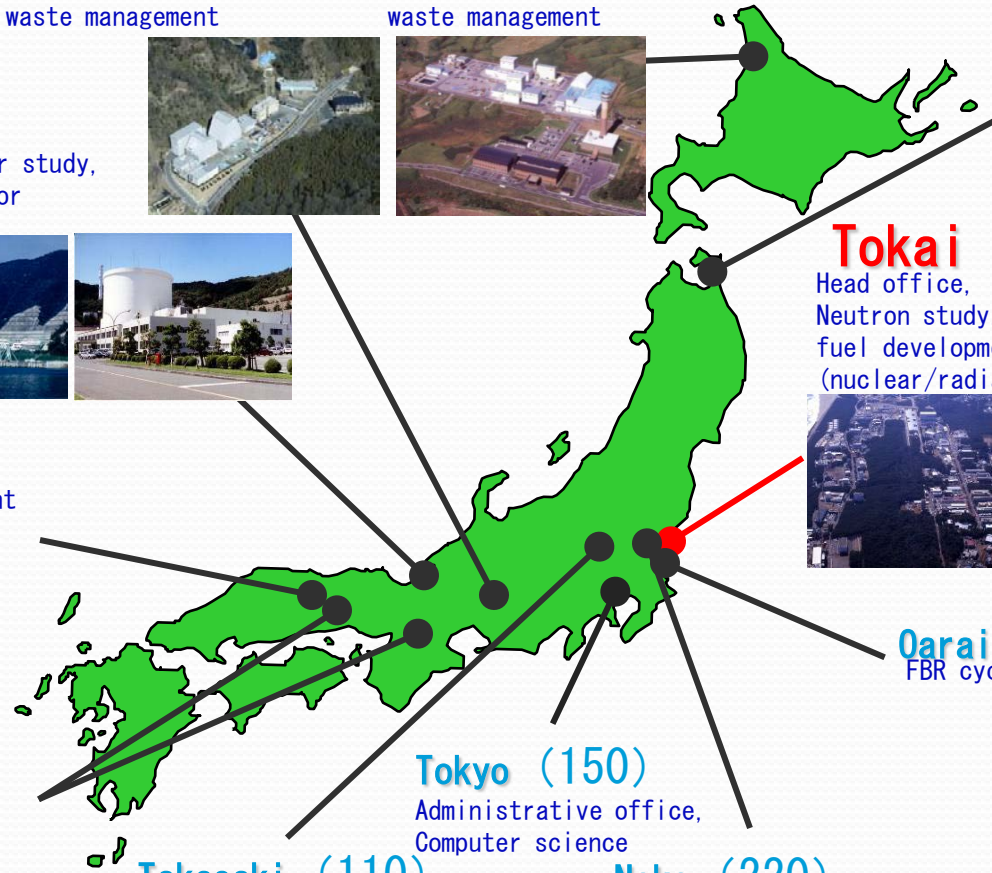
Safety study

Nuclear nonproliferation

Human resources development, in cooperation with domestic industries, universities and administrations, as well as with international organizations.

JAEA Research Centers in Japan

(Number of staff)
Total staff is about 4,000 in 2009.



Tono (60)
High-level radioactive-waste management

Horonobe (40)
High-level radioactive-waste management

Aomori (40)
Nuclear reactor dismantle, Ocean research, ITER support

Tsuruga (350)
FBR cycle study, Monju reactor study, Dicomissioning of Fugen reactor

Tokai (1,860)
Head office, Nuclear safety, Basic research, Neutron study, High-level waste management, FBR fuel development, **Human Resources Development** (nuclear/radiation training),

Ningyo (80)
Decomissioning of U-enrichment facility

Oarai (590)
FBR cycle development, HTTR, JMTR

Kansai (110)
Synclo-radiation beam study

Tokyo (150)
Administrative office, Computer science

Takasaki (110)
Charged particle beam application study

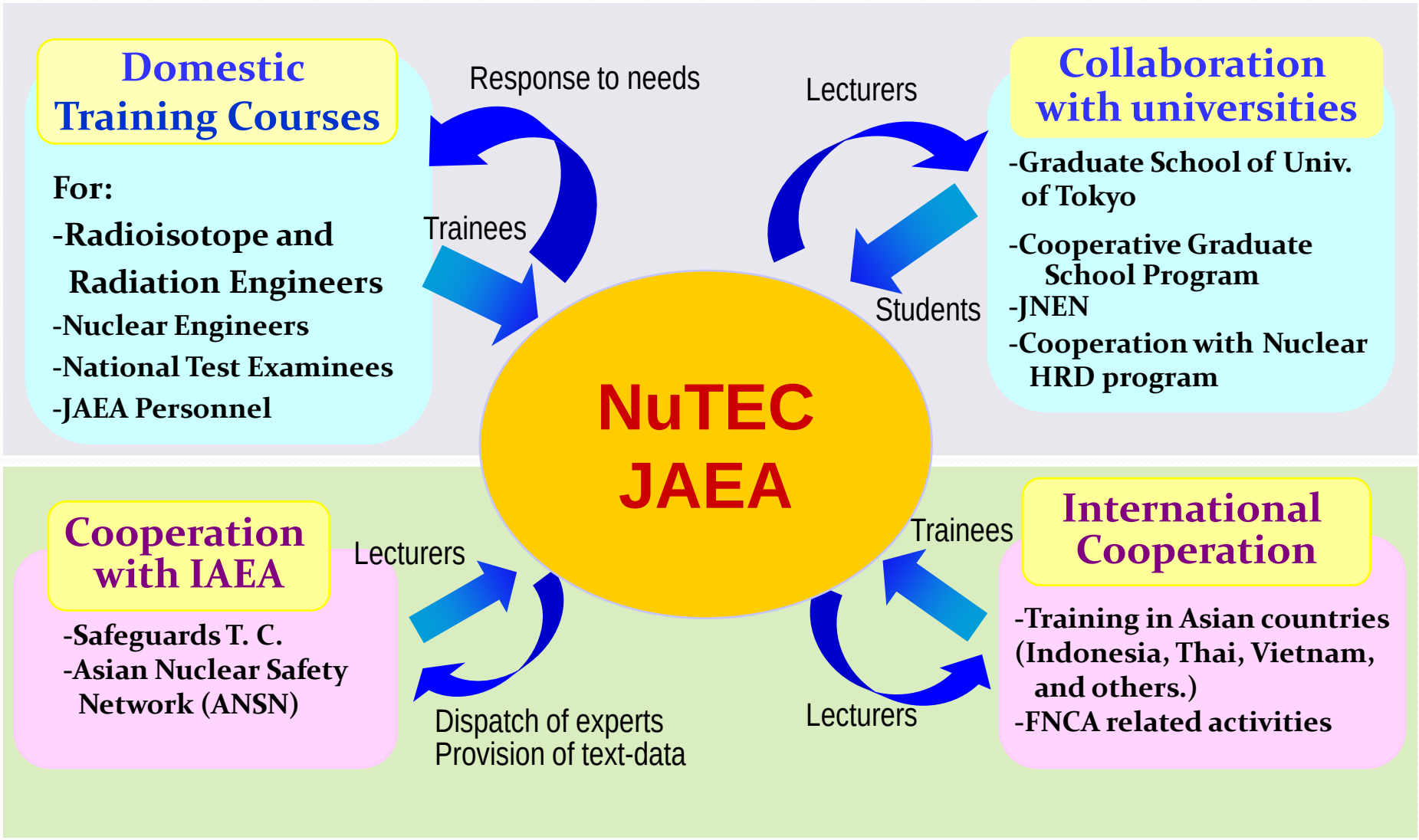
Naka (220)
Fusion reactor study, ITER related study, Plasma physics,

NuTEC

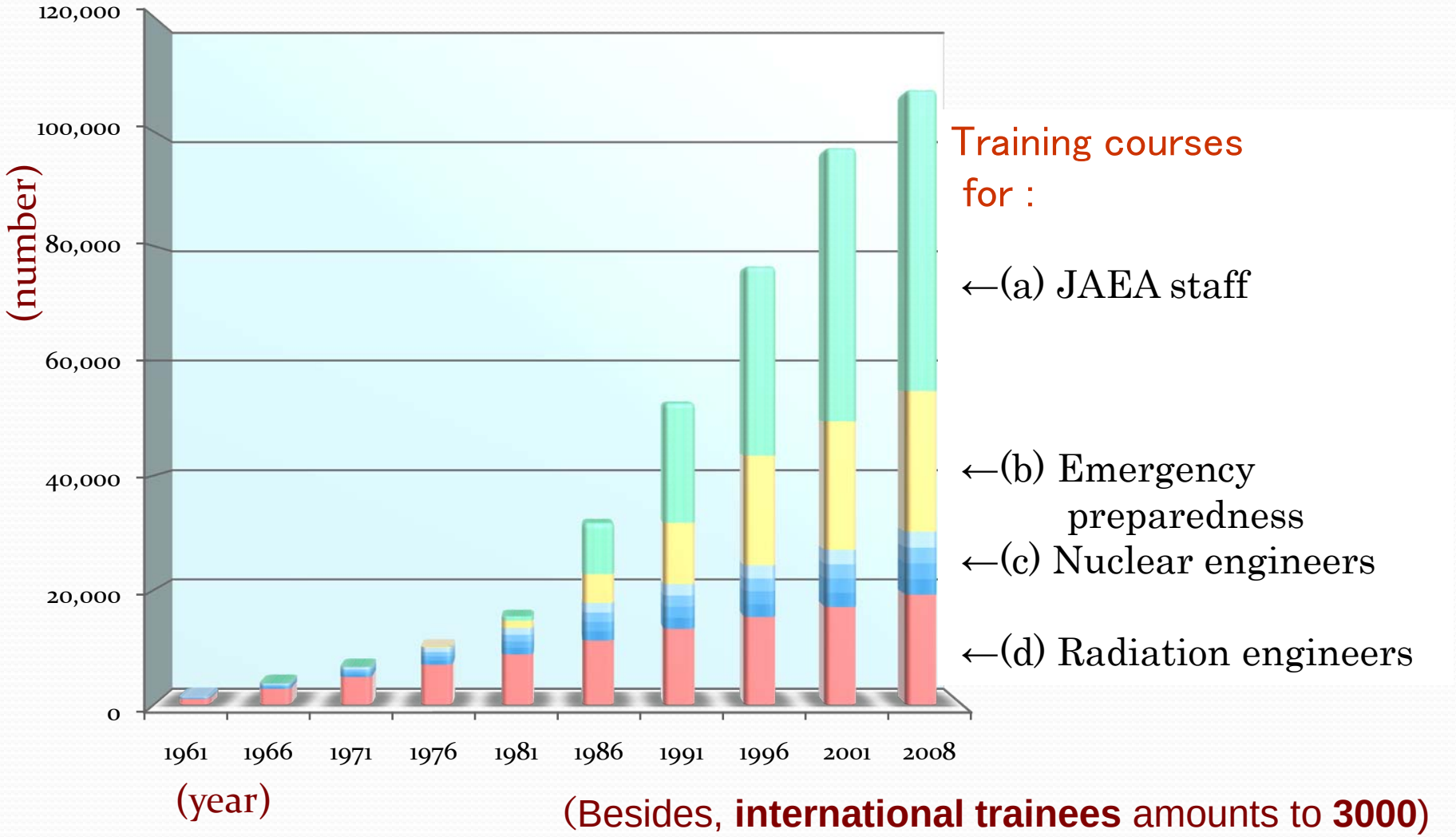
- Horonobe Underground Research Center
- SAPPORO
- Aomori Research and Development Center
- Fugen Decommissioning Engineering Center
- SENDAI
- Ningyo-toge Environmental Engineering Center
- Head Office
- Tokai Research and Development Center
  - Nuclear Science Research Institute
  - Nuclear Fuel Cycle Engineering Laboratories
- O-arai Research and Development Center
- Naka Fusion Institute
- ITAMI
- TOKYO
- NARITA
- KYOTO
- NAGOYA
- OSAKA
- FUKUOKA
- KANSAI
- Kansai Photon Scien

JAEA-Tokai Center

Outline of NuTEC Activities



Total number of trainees in the NuTEC domestic training courses



(Besides, **international trainees** amounts to **3000**)

Training Courses:

for Radioisotope and Radiation Engineers

1. Radiation Basic Course (15 days, once/year) (←283 times since 1958)
2. Radiation Safety Management Course (14 days, once/year)
3. Radiation Protection Basic Course (4 weeks, once/year)
4. 1st Class Radiation Protection Supervisor Course (5 days, 8 times/year)
5. 3rd Class Radiation Protection Supervisor Course (2 days, 3 times/year), since JFY. 2006
6. 1st Class Working Environment Expert Course (3 days, 2 times/year), until JFY. 2008

for Nuclear Reactor Engineers

1. Nuclear Beginners Course (4 weeks, once/year)
2. Reactor Engineering Course (6 months, once/year)
3. Introductory Neutron Experiment Course (3 days, once/year)

Curriculum of the Radiation Basic Course

Lecture (29 units)

1. Nuclear Physics (3 units)
2. Interaction of Radiation with Matter (2)
3. Radiochemistry (3)
4. Radiation Chemistry (2)
5. Radiation Biology (3)
6. Radiation Measurement (3)
7. Measurement of Radiation Dose (1)
8. Gamma-ray Spectrometry (1)
9. Liquid Scintillation Counting (1)
10. Safe Handling or Radiation and Radioisotopes (1)
11. Control of Radiation Exposure (2)
12. Radiation Monitoring (1)
13. Decontamination and Waste Management (1)
14. Application of Radioisotope and Radiation to Agriculture and Biology (1)
15. Application of Radioisotope and Radiation to Medicine (1)
16. Application of Radioisotope and Radiation to Industry and Environmental Study (1)
17. Radiation Protection Law (2)

Curriculum of the Radiation Basic Course (cont.)

Exercise (7 units)

1. Physics (1)
2. Chemistry (1)
3. Biology (1)
4. Law (1)
5. Radiation Monitoring Techniques (2)
6. General (1)

Experiment (32 units)

1. Guidance of Safe Handling of Unsealed Radioisotopes (1)
2. Radiation Dose Measurement (3)
3. Gamma-ray Spectrometry (5)
4. Liquid Scintillation Counting (5)
5. Compton Scattering (3)
6. Milking with $^{99}Mo/^{99m}Tc$ Generator (5)
7. Neutron Activation Analysis (5)
8. Radiation Monitoring (5)

Others (4 units)

1. Orientation (2)
2. Technical Tour (2)

Lecture

Radiation Dose Measurement

Liquid Scintillation Counting

Milking with $^{99}Mo/^{99m}Tc$ Generator

Radiation Monitoring

Neutron Activation Analysis

Gamma-ray Spectrometry

Compton Scattering

Japan Nuclear Education Network (JNEN)

Tokyo Institute of Technology

University of Fukui

Kanazawa University

Ibaraki University

Network

Okayama University

Osaka University

(Experiment at JAEA site)

NuTEC/JAEA
(Hub center)
At Tokai and Tsuruga

(JNEN started in 2007)

JNEN

-Six universities and JAEA (2009)

(Lectures are held on every Friday afternoon, basically.)

- Curriculum system:

1. Spring semester - Radiation-related subjects (15)
2. Autumn semester - Rad-waste management subjects (15)

- Special/Topical lectures (occasionally)

- Experimental courses

(for one week or less, in the summer and/or winter vacation season, on the handling of nuclear materials, radioisotopes and glove boxes, etc. using JAEA facilities.)

Summary and Future

- NuTEC/JAEA has a 50-year history on the Human Resources Development activities in the nuclear/radiation field.
- Total trainees are over 100,000 (Japanese), and about 3000 foreigners.
- Radiation Basic Course continued for 51 years since 1958, counts to 283rd in 2009.
- We put emphasis on the experiments using basic and advanced apparatuses and facilities, not only on lectures.
- We started a new distance-learning system, JNEN.
- Through JNEN, participating universities can provide a more effective and versatile curriculum and practical experiments for their students.
- We further continue the nuclear/radiation HRD activities in cooperation with domestic universities, governmental and other nuclear organizations.
- We also plan to expand our nuclear HRD activities internationally, by cooperating with Asian countries, Western countries, and international organizations such as IAEA, CEA/INSTIN, ENEN.

Thank you

for your attention.

(9 November 2009, Lisbon)