文部科学省
Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Current Status and Future Prospects of Nuclear Human Resource Development

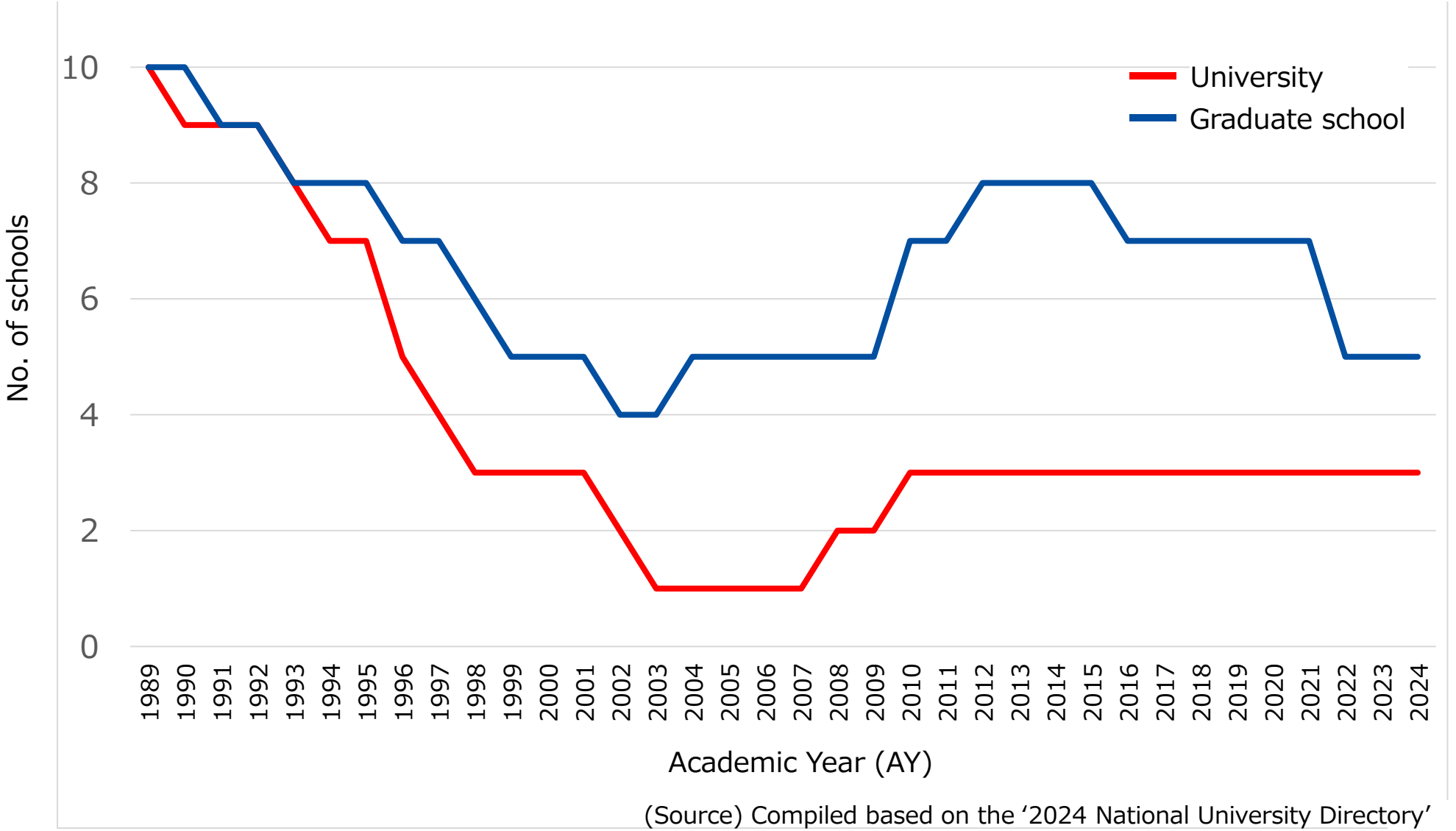
November 2026

Director, Atomic Energy Division
Koji Aribayashi

MEXT's Initiative for Nuclear-Related HRD

Trends in Number of Nuclear-Related Departments and Majors in University

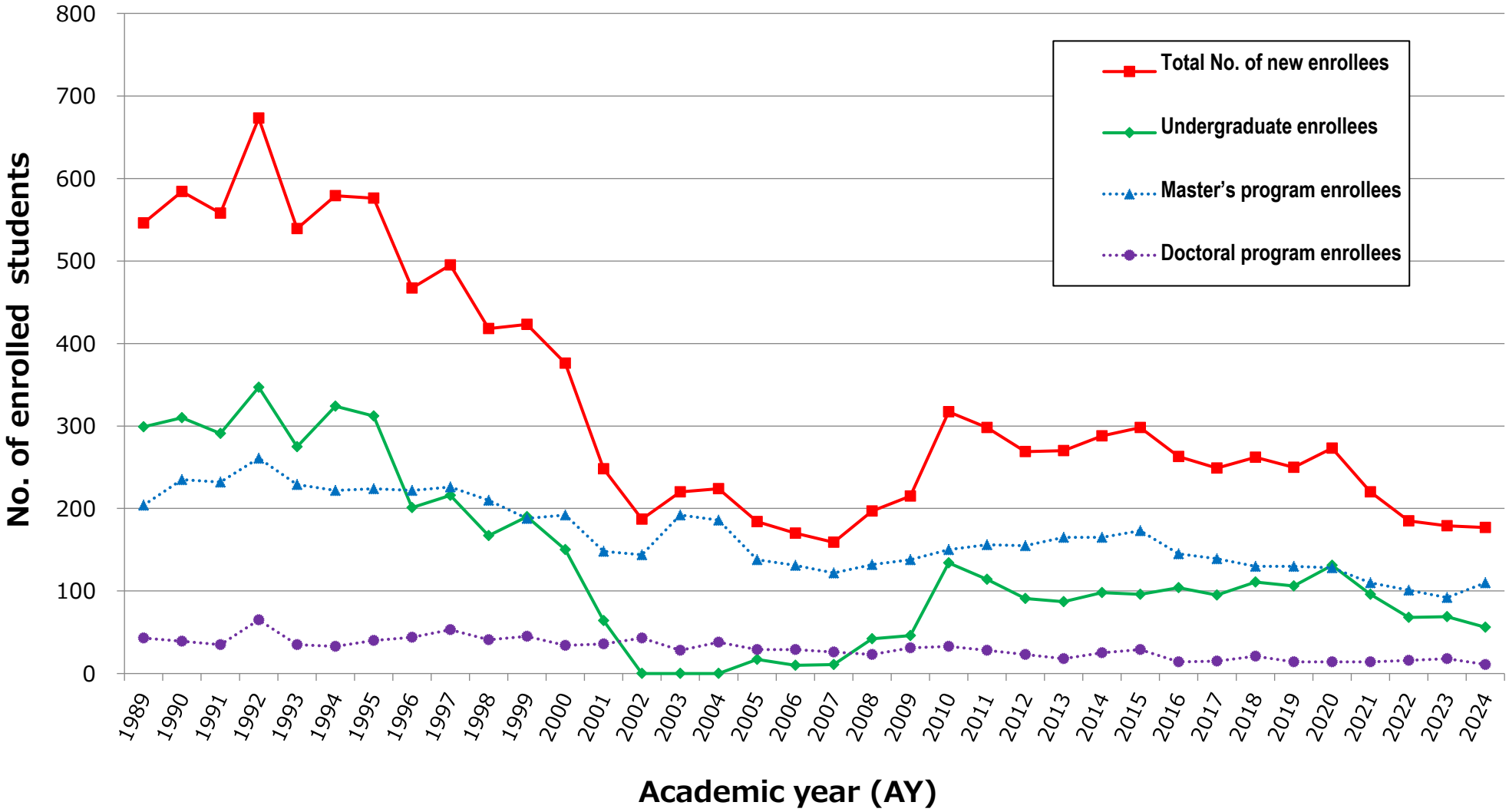
Decline in the number of Departments/Majors whose names include “Nuclear” or “Nuclear Energy” due to the consolidation of university education and research structures



(Source) Compiled based on the ‘2024 National University Directory’

Trends in Enrollment Numbers for Nuclear-Related Departments in University

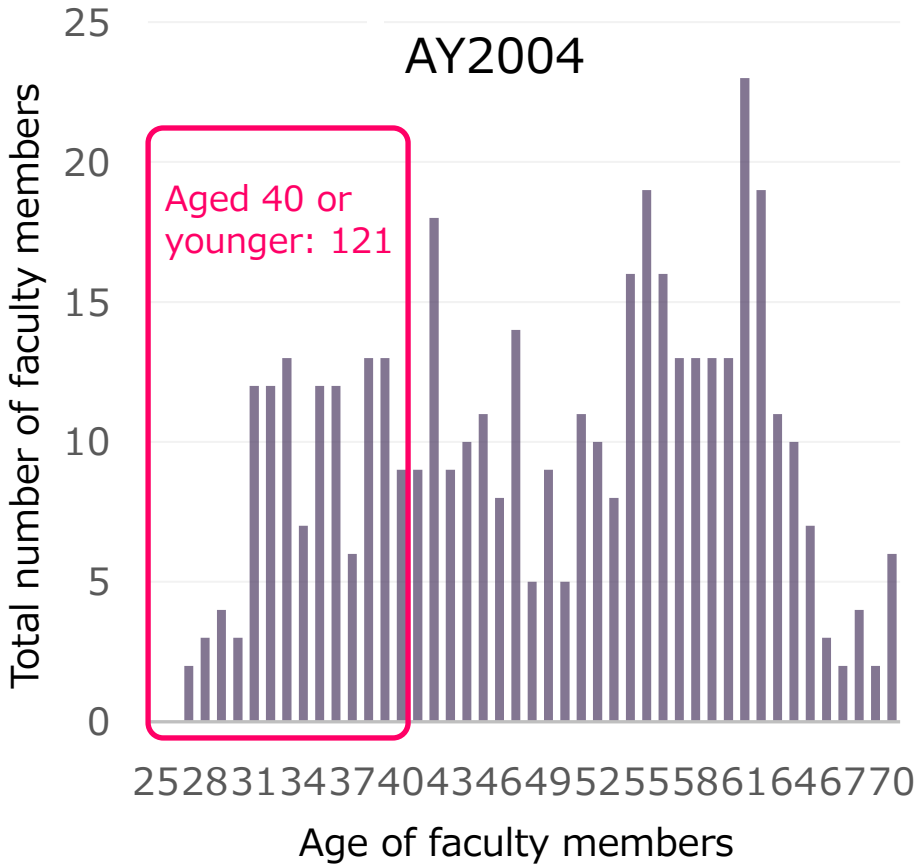
Decline in Enrollment in Nuclear-Related Departments



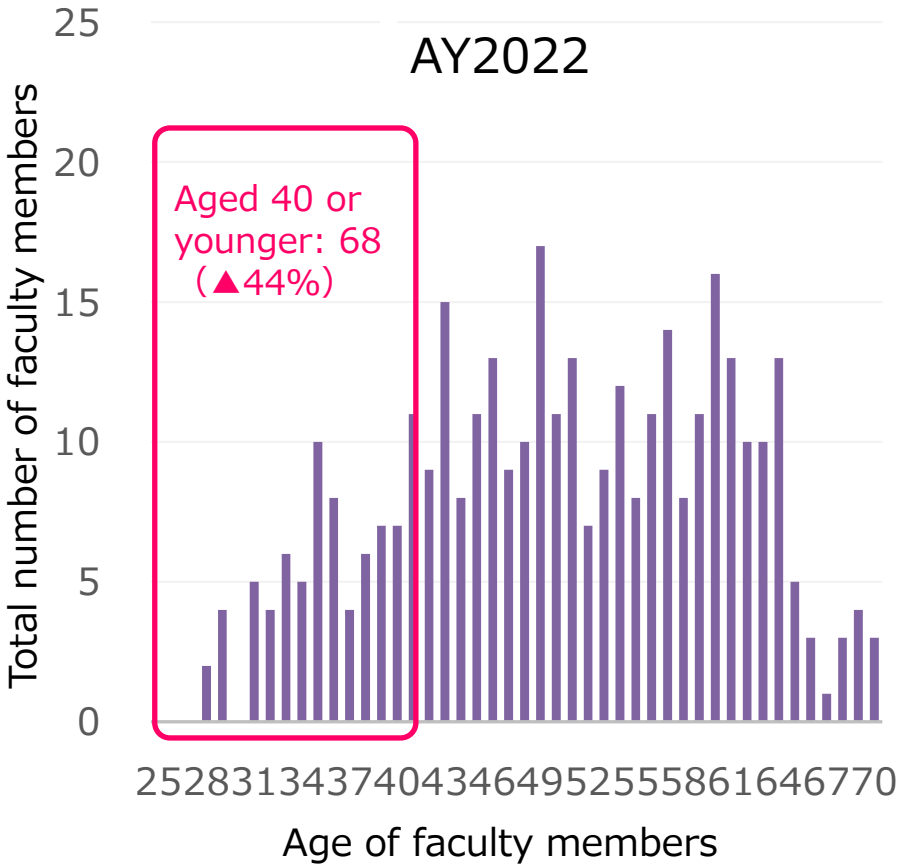
Trends in the Number of Nuclear-Related Faculty Members

Decline in the number of Nuclear-Related Faculty Members
(particularly pronounced among those aged 40 and under)

Total number of faculty members: 438



Total number of faculty members: 356 (▲19%)



Source: MEXT "Statistical Survey of School Teachers"

Trend in the Number of Experimental Research and Test Reactors

Due to aging and the need to comply with New Regulatory Standards, the majority of Experimental Research Reactors are transitioning toward decommissioning.

1995	○ In Operation	△ Out of Service	× Under decommissioning
Nuclear Research facilities	20	0	6

Decline in large-scale Experimental Research Reactors



Present	○ In Operation	△ Out of Service	× Under decommissioning
Nuclear Research facilities	4	4	11

Advanced Nuclear Education Consortium for the Future Society (ANEC)



ANEC ADVANCED NUCLEAR EDUCATION CONSORTIUM FOR THE FUTURE SOCIETY
未来社会に向けた先進的原子力教育コンソーシアム

In FY2021, **ANEC was established as a complementary and sustainable initiative through collaboration among multiple universities and institutions** (running through AY2026).

1) Sharing Structured Online Educational Materials
2) Sharing Opportunities for Experiments
3) Sharing Opportunities for International Training
4) Sharing Opportunities for Practical Experience

Total: 78 organizations

23 national universities
8 private universities
6 national institutes of technology (KOSEN)
5 research institutions
14 private companies
12 electric power companies
10 other corporations, etc.

Sharing Structured Online Educational Materials

北海道大学 HOKKAIDO UNIVERSITY

Cumulative number of items published over the 13-year period since 2013: 235
[1,312 for Hokkaido University as a whole]
(For AY2025: 34 lectures recorded, 34 lectures published)

Course materials (excerpted from the website)

Chemistry of Nuclear Fuel

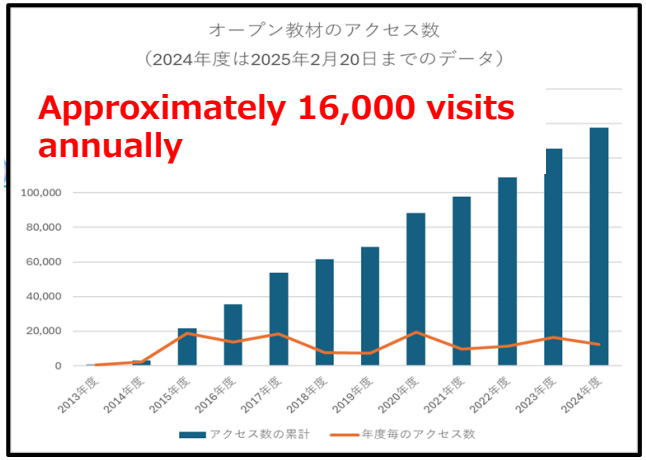
- 1st: Fundamentals of nuclear fuel (Sato)
- 2nd: Resources and refining (Sato)
- 3rd: Metal manufacture and properties (Sato)
- 4th: Oxides and fuel fabrication (Sato)
- 5th: Fluorides and their application (Sato)
- 6th: Chlorides and their application (Sato)
- 7th: Carbides, Nitrides, etc., and their Applications (Sato)
- 8th: Sulfides, etc. and their applications (Sato)
- 9th: Chemistry of spent fuel (Sato)
- 10th: Chemistry of fuel debris (Sato)

(Example) View of the “Fundamentals of Radiation” course page



Nuclear HRD Utilizing STEAM Educational Methods

- Fundamentals of radiation (Oya)
- Practical Theory of STEAM Education: For Nuclear and Radiation Education Based on Energy and Environmental Issues (Mori)
- Introduction to energy and environment (Nakajima)
- Theory of STEAM Education: Comparison with the US, trends in Japan, and the pursuit of a Japanese STEAM education model (Kumano)
- Education on radiation from the perspective of nuclear disaster prevention (Kozaki)



Sharing Opportunities for Experiments

Nuclear Reactor of Kindai University
UTR-KINKI



Collabo-
ration

Critical assembly of Kyoto University
KUCA



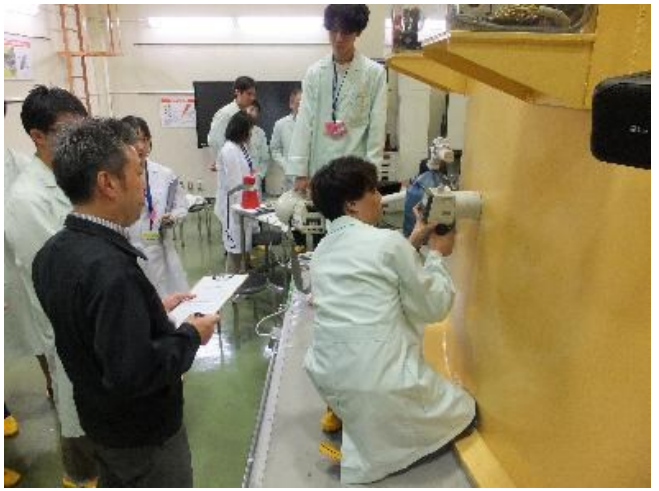


Nuclear Reactor Training: Basic Course

- 598 individuals attended from **9 universities** (Nagoya Univ., Kyushu Univ., Tokyo City Univ., Tokyo Metropolitan Univ., Univ. of Fukui, Fukui Univ. of Technology, The Univ. of Tokyo, Univ. of Osaka, and Tokai Univ.)

Nuclear Reactor Training: Intermediate Course

- 156 individuals attended from **7 universities** (Tohoku Univ., Nagaoka Univ. of Technology, Institute of Science Tokyo, Univ. of Fukui, Kyushu Univ., Kindai Univ., and Kyoto Univ.)



Nuclear Reactor Training: Advanced Course

- 55 individuals attended from **6 universities** (Nagoya Univ., Hokkaido Univ., Tohoku Univ., Univ. of Fukui, Kyoto Univ., and Tokai Univ.)

(Note) The figures represent the total number of participants from AY 2021–2025.

Sharing Venues for International Professional Development

Nuclear Innovator Training Camp

Inviting U.S. students to participate in an approximately 10-day residential seminar featuring collaborative group work with Japanese students, a study tour of the Fukushima Daiichi Nuclear Power Plant, and a group-based business plan competition.

- 78 individuals attended from **10 universities and 2 company**.

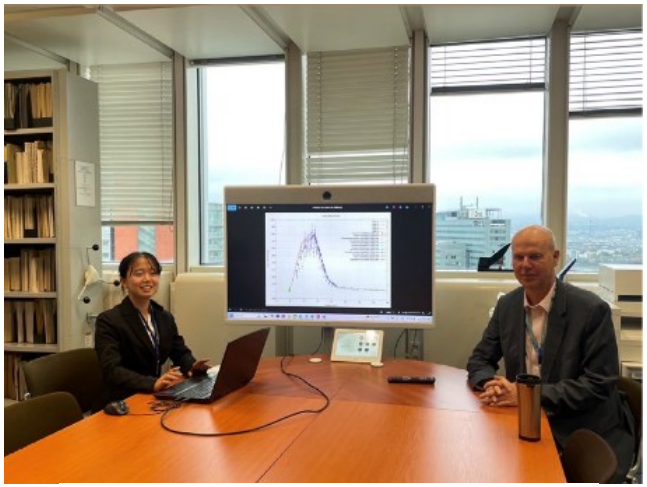


Closing ceremony
after the Nuclear Innovator
Training Camp Competition

Overseas Internship Program

Dispatching individuals to various divisions of JAEA and OECD/NEA for approximately 3 to 6 months in order to develop globally minded nuclear professionals with strong communication and information dissemination skills.

- 11 individuals attended from **7 universities**.



Scene from the Overseas
Internship Program

Nuclear Innovation Study Abroad Program

Sending Japanese doctoral students to leading U.S. universities in the nuclear energy field for approximately 4 months to conduct collaborative research.

- 6 individuals attended from **4 universities**.

(Note) The figures represent the total number of participants from AY 2021–2025.

Sharing Opportunities for Collaboration with Industry

Providing hands-on training programs that offer practical, on-site learning opportunities covering a broad range of technologies involved in nuclear power plants from construction to operation, as well as various initiatives undertaken by the industry.



Reactor vessel head mockup



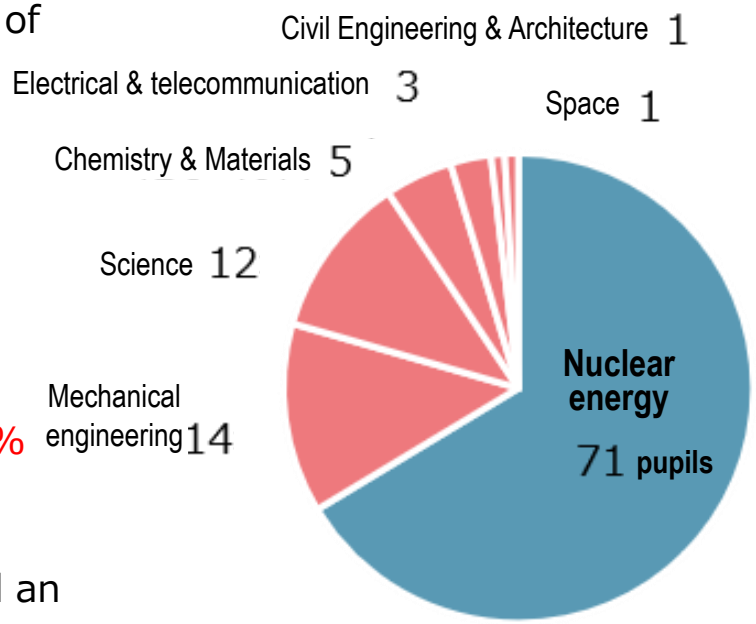
Non-destructive testing practical training



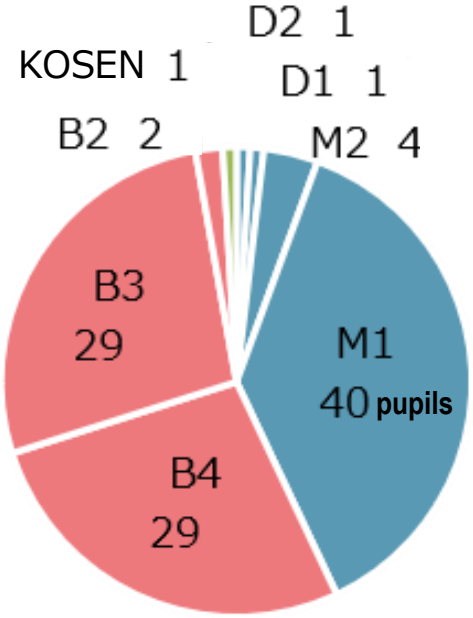
Refueling work

Over the course of 4 years (AY 2022-2025), a total of 107 students (142 in total on a cumulative basis) attended from 27 schools nationwide, representing a diverse range of academic fields and year levels.

Of these, 36 students (30%) majored in fields outside nuclear energy, such as mechanical, electrical, chemical and civil engineering.



Field of specialization



Year of study

- A post-training survey revealed a 100% student satisfaction rate.
- Over 90% of the 78 students who answered the career survey expressed an interest in pursuing employment or further studies in the nuclear industry.

Quantitative Evaluation of ANEC's Initiatives To Date

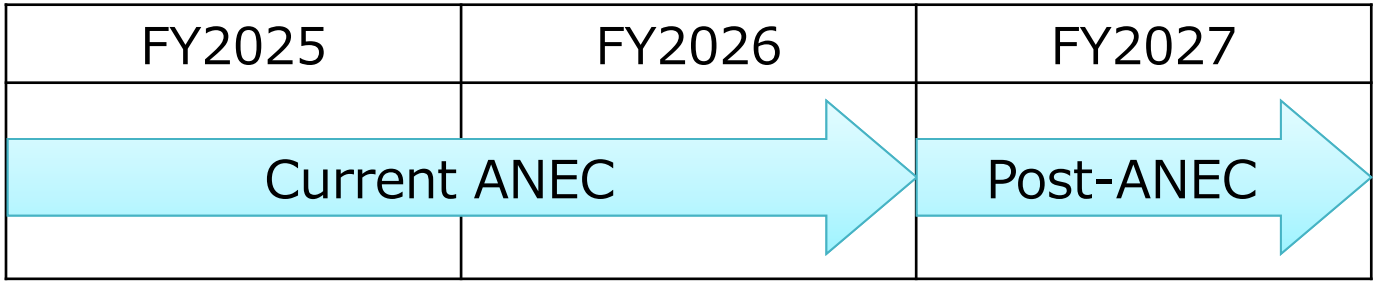
Number of students who advanced to higher education	Of these, number of students who advanced to nuclear-related fields	Share of students enrolled in nuclear-related fields
789 people	532 people	67%

Number of students who found employment	Number of students who found employment in the nuclear power sector	Share of students enrolled in nuclear-related fields
841 people	495 people	59%

Survey period : 2021–2025
Survey target year groups : B4, M2, D3 in each academic year
Explanation of the number of people : Total for 2021–2025

Considerations about Post-ANEC

Post-ANEC Implementation Schedule



To build on and develop these achievements, inter-university networks, and the educational infrastructure, Post-ANEC initiative is scheduled to launch next year.

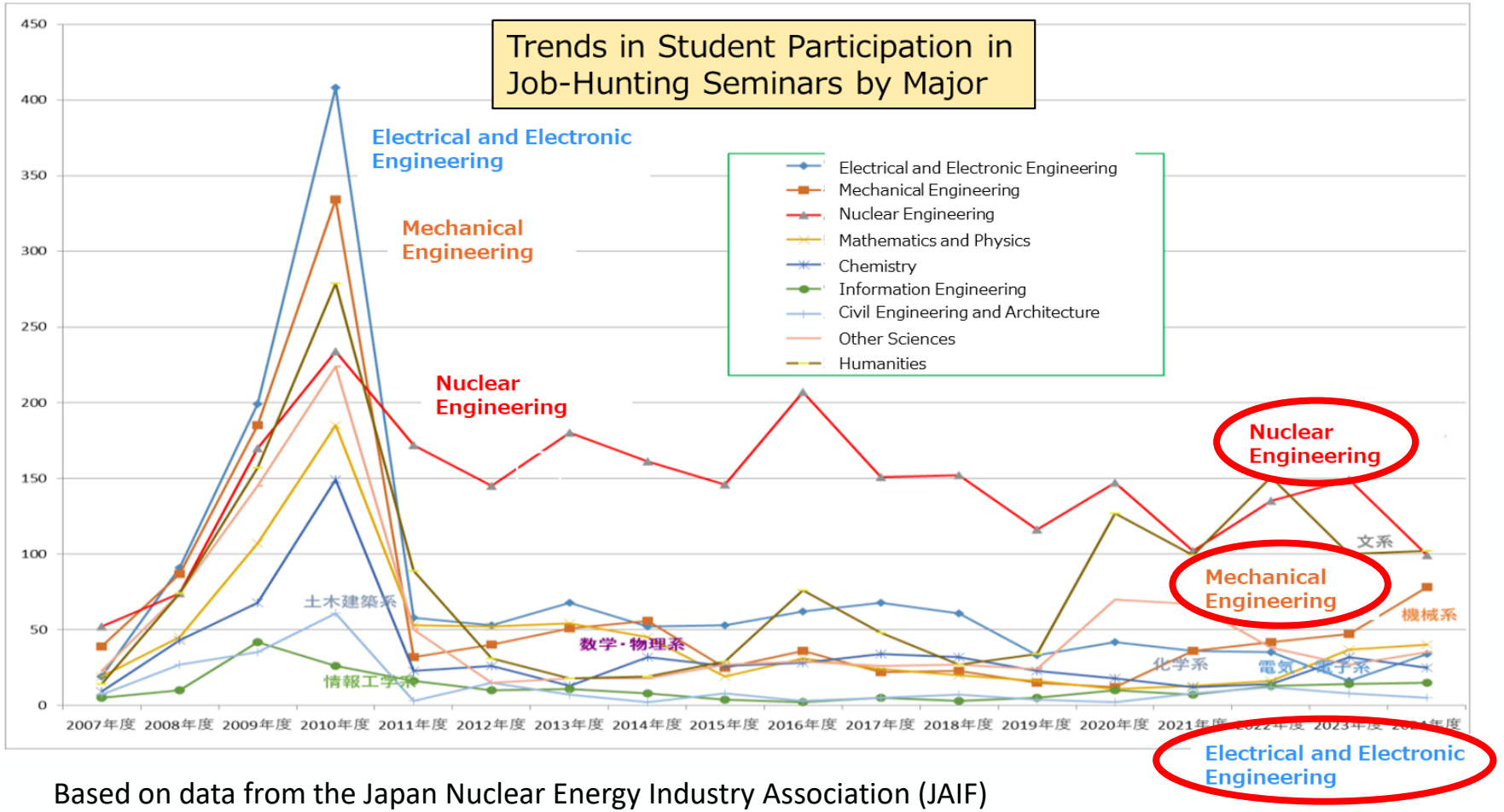
Key Priorities for Post-ANEC

1. **Expanding HRD to Non-Nuclear Engineering Fields**
   Nuclear power is a comprehensive engineering discipline requiring knowledge of mechanical and electrical engineering among other fields. Post-ANEC will actively reach out to non-nuclear students.

2. **Expanding Outreach to Young People (Elementary, Middle, and High School Students)**

Trends among students outside nuclear field

Since the Great East Japan Earthquake, the number of students majoring in nuclear engineering has remained stable, but the number of students majoring in mechanical engineering and electrical and electronic engineering has declined significantly and has not recovered.



Based on data from the Japan Nuclear Energy Industry Association (JAIF)

Government-wide Initiative for Nuclear-Related HRD

Weakening Human Resource Base Needed by the Nuclear Industry

- **Investment in new construction has nearly halved since immediately after the Great East Japan Earthquake** and, unlike before the earthquake, **skills are no longer being consistently maintained and passed on through a stable stream of repeat orders.**
- As **decommissioning is a long-term undertaking**, in order to ensure its steady progress, **it is essential to continuously secure and develop human resources from a medium- to long-term perspective.**

Investment in existing plants

Similar to those in general construction work
⇒ Low risk of skills being lost

Investment in newly constructed plants

Manufacturing and installing large equipment

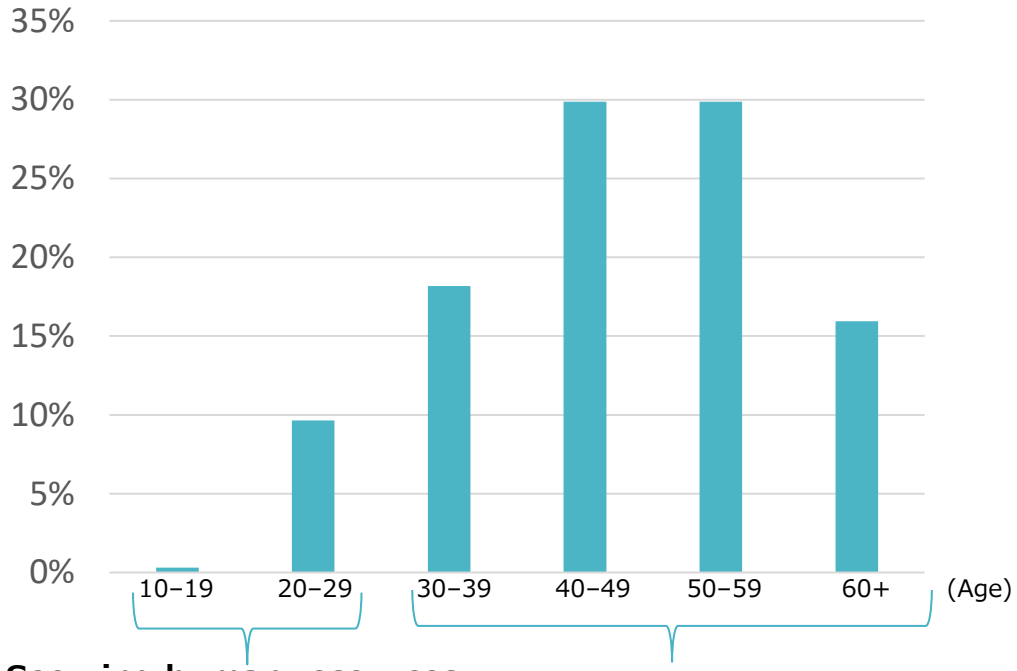


Manufacturing components with no need for replacement, such as valves



Manufacturing specific to the nuclear industry
⇒ at significant risk of losing technical skills

Figure: Age distribution of personnel in companies involved in the Fukushima Daiichi decommissioning



Securing human resources to support long-term decommissioning is crucial

Over 70% of employees are aged 40 or older

Prepared by the Agency for Natural Resources and Energy (ANRE) based on the results of TEPCO's 16th survey regarding the working environment at Fukushima Daiichi Nuclear Power Station.

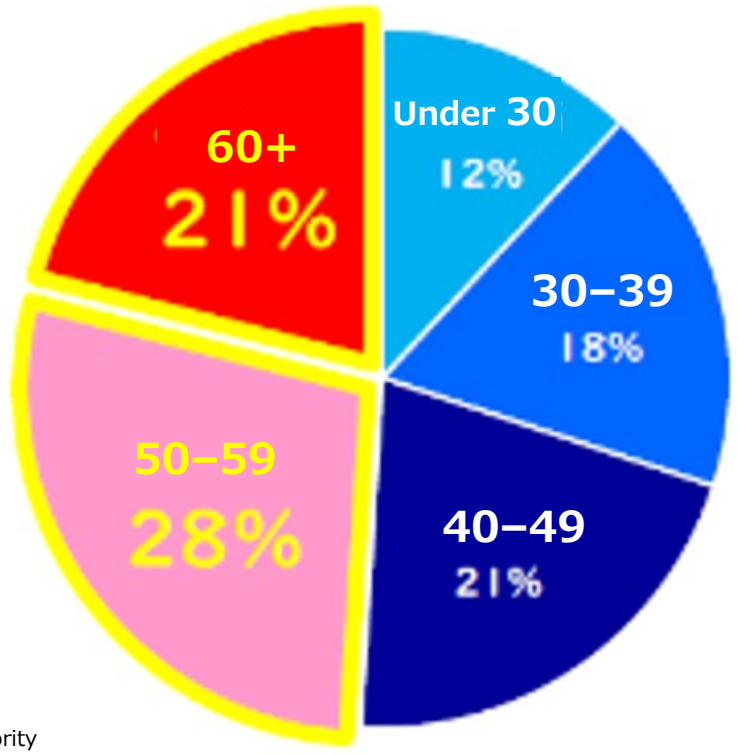
Weakening Infrastructure for Nuclear Education and Research (Regulatory aspect)

- Of all 1,080 employees of the Nuclear Regulation Agency (NRA), **approximately half are aged 50 or older**. To ensure the continuous and effective implementation of nuclear regulation, **rejuvenating the workforce's age profile and securing sufficient technical personnel are urgent priorities**.

Aging Workforce

- **Approximately half** of all employees **are aged 50 or older**.
- Although graduate recruitment is on the rise, new graduates account for only about 3% of the total workforce. To strengthen the organizational structure, further recruitment is essential, particularly **to secure technical personnel**.
- To maintain specialized expertise, it is essential to **expand the hiring of experienced professionals** with strong technical capabilities.

Age distribution of NRA staff

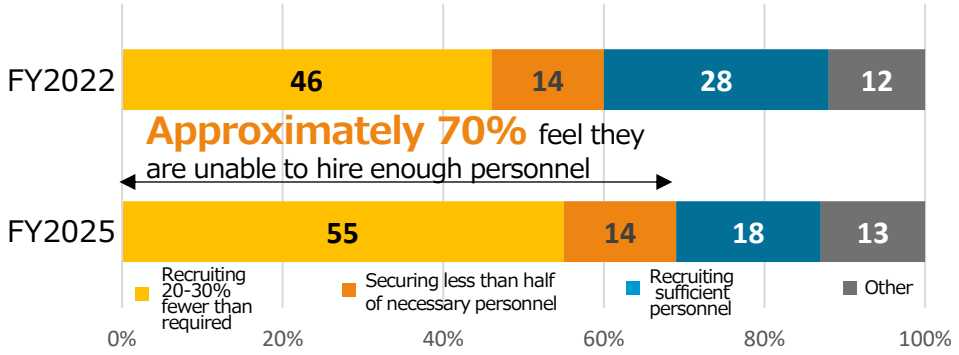


- Source: Prepared by the ANRE, based on explanatory materials from the Nuclear Regulation Authority (NRA) at the 1st and 2nd meetings of the Council for Nuclear Human Resource Development and Strengthening.

Difficulty in Securing Human Resources to Sustain the Future of Nuclear Energy

- Even now, the industry as a whole is struggling to secure a sufficient workforce. **It is particularly challenging to secure a workforce for partner companies (subcontractors at the second tier and below)**.
- While major plant manufacturers are accelerating recruitment, changes in the workforce supply structure are making it increasingly difficult to secure talent across the industry as a whole. This makes it **essential to invest proactively in human resource development.**

【Growing workforce shortage across the industry】





Power company

- Partner companies face greater difficulties than electric utilities in securing personnel
- Workforce aging is making skills transfer increasingly difficult, leading to a growing trend of companies declining to participate in bids and longer lead times for completion.

1 Japan Atomic Industrial Forum (JAIF), Survey on Trends in the Nuclear Power Industry
2 Materials from Human Resource Development Council

【Shifts in the potential candidate pool】

Accelerating recruitment by major plant manufacturers[1]

Mitsubishi Heavy Industries (MHI)

Recruited **approx. 200 staff** in FY2024 *Expecting further increase in FY2025

IHI

Increasing nuclear-related personnel from **800** to **1000** by 2030

Changing supply structure[2]

University (engineering graduate)	Technical high school
Mechanical, electrical, architecture/civil engineering/surveying 57% (1994) ⇒ **38%** (2024)	Graduates 140,000 (1994) ⇒ **60,000** (2024)

1 Nikkei Inc., Nuclear Industry Recruitment Rebounds Sharply as Skills are Passed Down for Next-Generation Reactor Development: MHI Targets Over 200 Hires, a Record High; IHI to Increase Related Workforce by 20% (September 1, 2025)
2 MEXT, "School Basic Survey"

Current Challenges and Future Direction

Current Challenges

1) Weakening human resource infrastructure required for construction

2) Weakening infrastructure for nuclear education and research

3) Difficulty in securing human resources to sustain the future of nuclear energy

4) Absence of an effective framework for industry-government-academia collaboration

A turning point in rebuilding the workforce structure underpinning Japan's nuclear industry into a sustainable model

Future Direction

1) Pass on and evolve cultivated skills and technologies

Expand opportunities to develop human resources to support construction and related sectors

Create an environment that enables sustainable construction, operation, and maintenance despite a declining population

2) Construct a world-leading research and technological foundation

Enhance and strengthen educational infrastructure

Strengthen research foundation

Secure personnel responsible for nuclear regulation

3) Strengthen mechanisms to attract future generations

Create student training opportunities that span power companies, suppliers, research institutions and regulatory bodies

Create learning opportunities for students through collaboration between educational institutions and companies

Disseminate information to future generations

4) Create a cross-sectoral coordinating body spanning industry, government, and academia and develop a medium- to long-term roadmap based on an analysis of the supply-demand gap

Build an integrated industry–government–academia framework for implementation and identify medium- to long-term gaps between workforce supply and demand

Establishment of the Japan Atomic Human Resources Consortium (J-AHRC)

The Japan Atomic Human Resources Consortium (J-AHRC) was established on October 7 by reorganizing the existing Nuclear Human Resource Development Network **to serve as a central coordinating hub for fostering nuclear human resources across industry, academia, and government**.
Through this consortium, efforts will be made to develop a roadmap and formulate and implement specific initiatives.

Overview of J-AHRC

【Founding Organization】

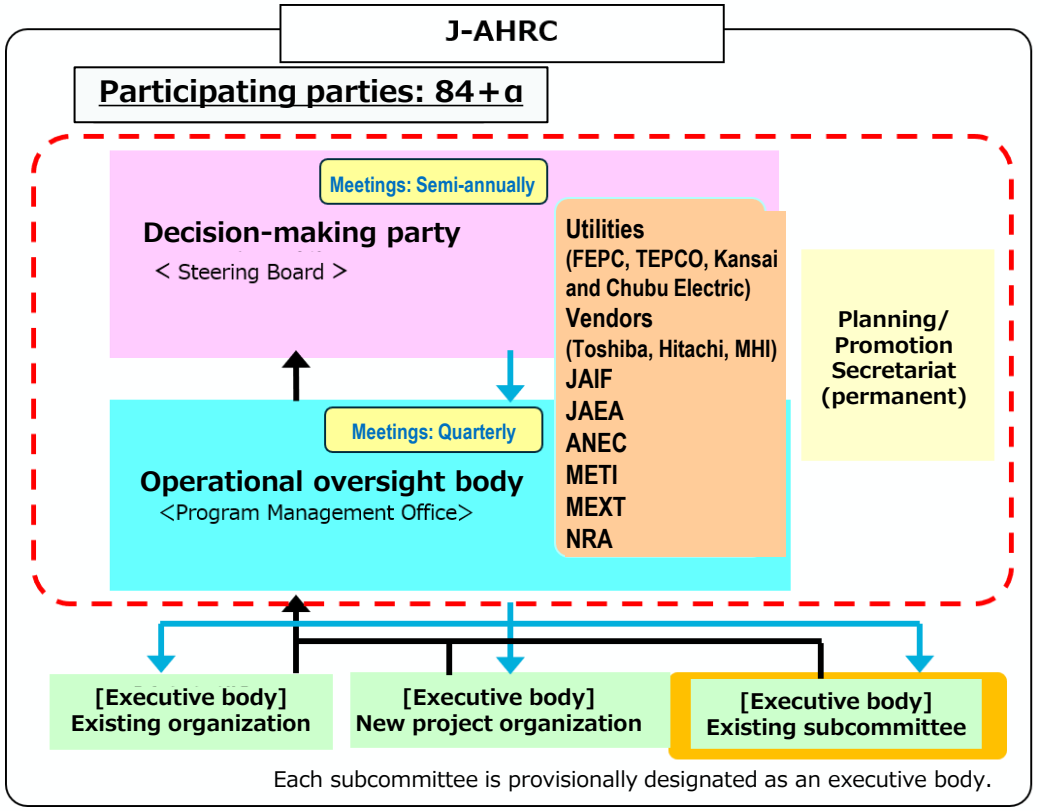
(Industry)
- JAIF
- FEPC
- Kansai Electric
- TEPCO HD
- Chubu Electric
- MHI
- Hitachi
- Toshiba

(Academia)
- JAEA
- ANEC

(Government)
- MEXT
- NRA
- METI

【Launch event on October 7】

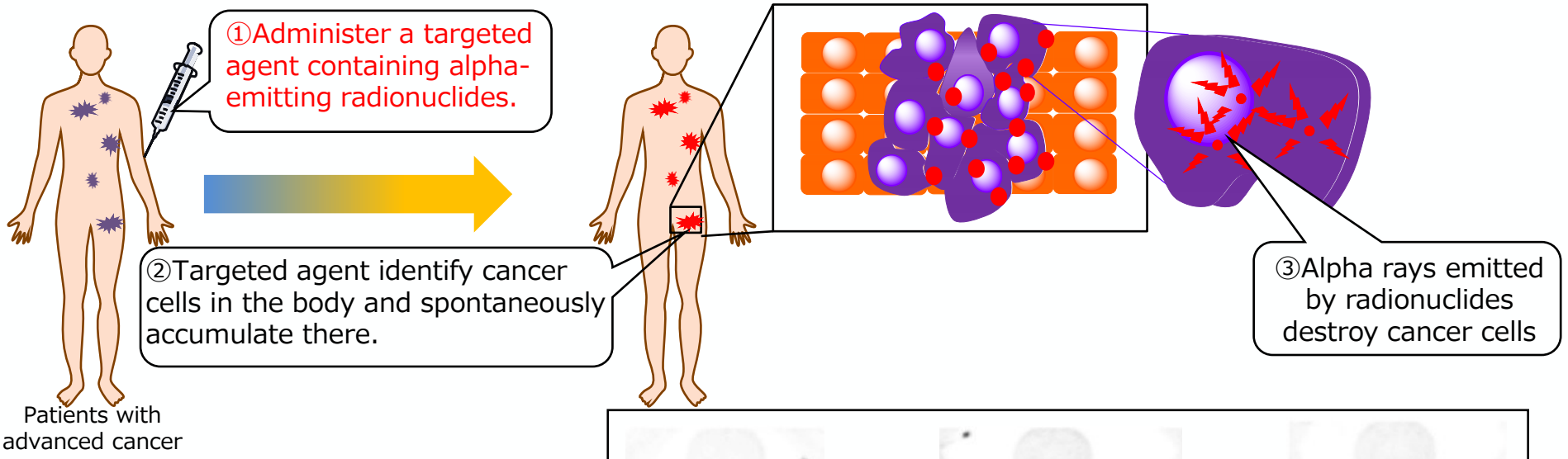




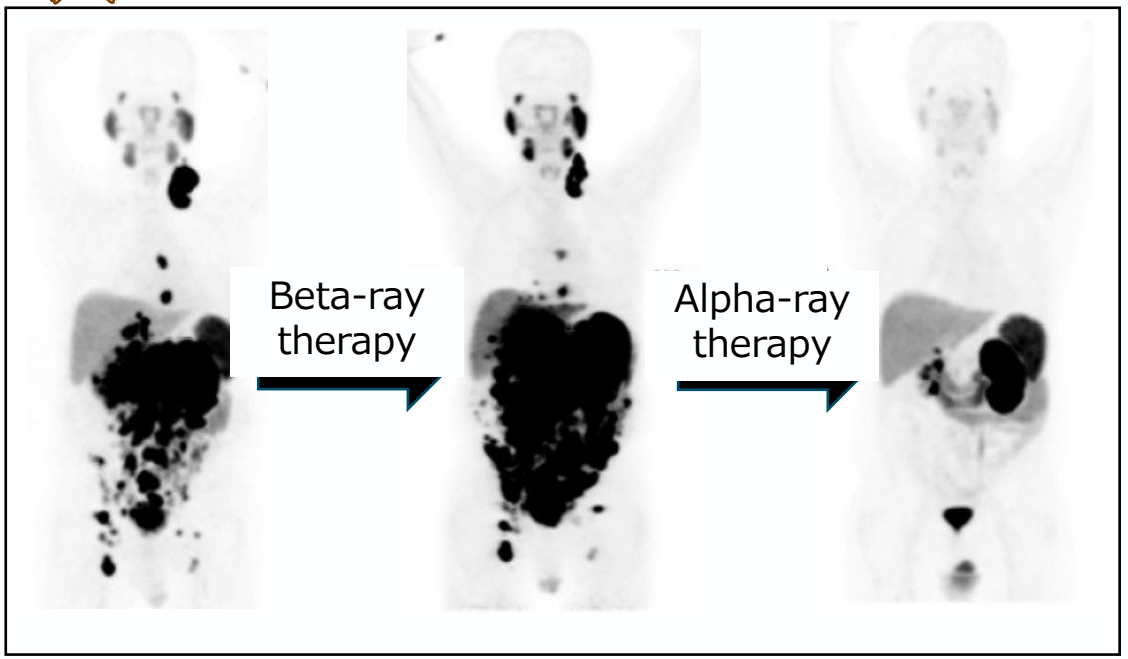
Collaborative Initiatives between Nuclear and Other Technologies

Collaborative Initiatives between Nuclear and Healthcare Technologies

Overview of Treatment with Alpha-Emitting Radionuclides



Case Report on Treatment with the Alpha-Emitting Nuclide Actinium-225 (Advanced Prostate Cancer with Bone Metastases)



Using the "Joyo" fast experimental reactor makes it possible to produce large quantities of actinium-225.

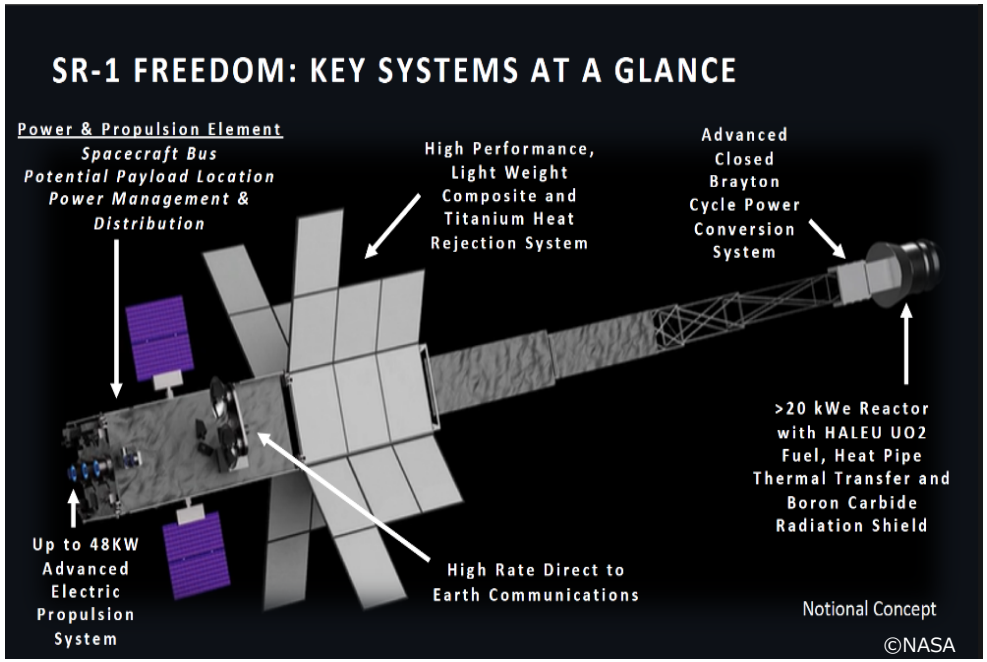
Kratochwil.C. et al. J Nucl.Med (2016)

Collaborative Initiatives between Nuclear and Space Technologies

On March 24, 2026, NASA announced transformative initiatives to implement U.S. President Trump's National Space Policy.

The construction of a lunar base and the use of space-based nuclear power were announced as top priorities.

- End of 2028: Launch of the world's First Interplanetary Probe powered by Nuclear Electric Propulsion (SR-1 FREEDOM)
- 2030: Installation of a Lunar Reactor (LR-1) on the Moon





【出典】https://www.nasa.gov/ignition/

Collaboration Between Nuclear and XXX Technologies, from Fukui

◆In 2016, Japanese government decided to decommission Monju and build a new research reactor at the site.
◆This facility is expected to serve as a foundation for the nation's research and HRD.
◆Strong academic and industrial demand for neutron applications underlines the need for the new reactor.

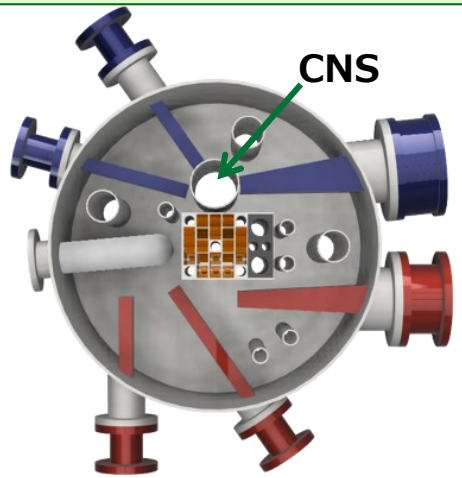
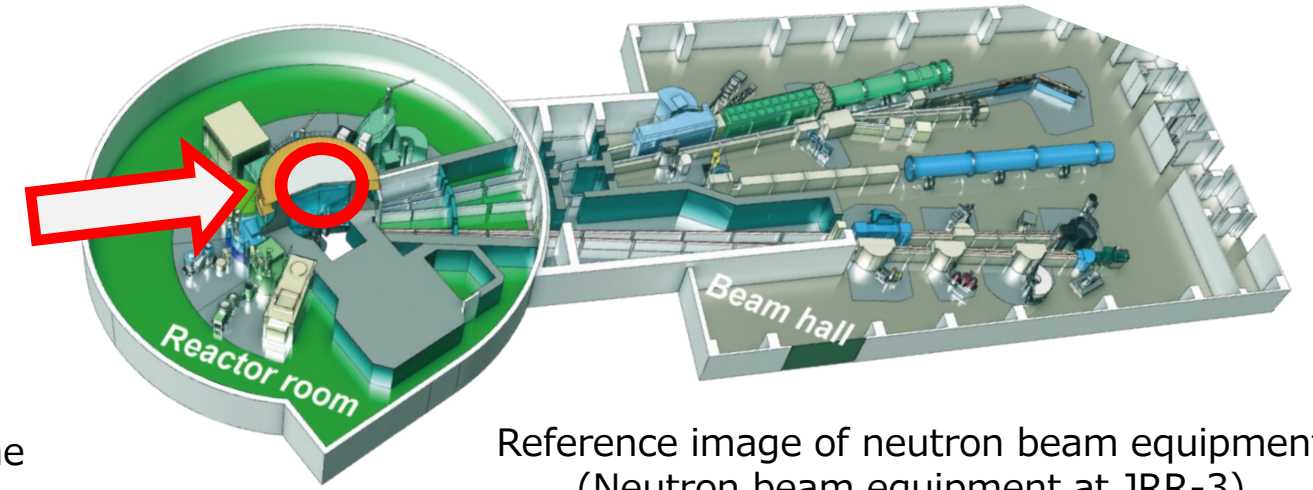
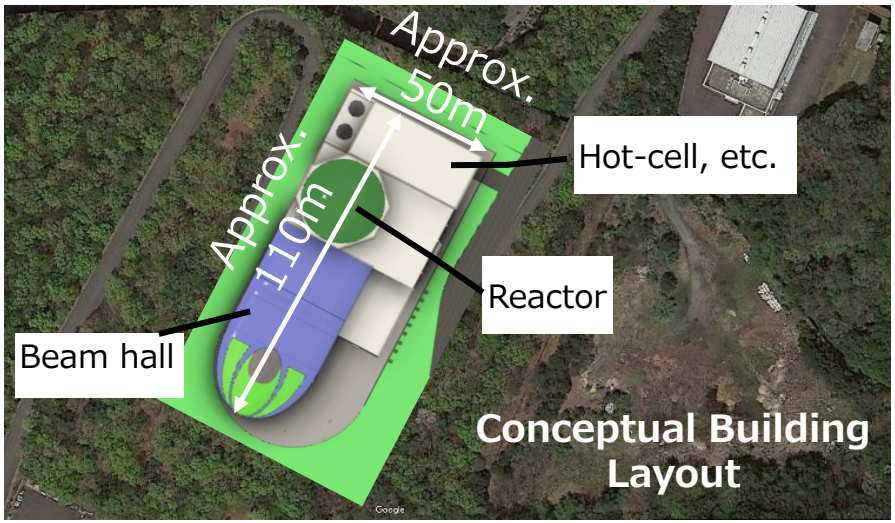


Image of the core of the new research reactor



Reference image of neutron beam equipment (Neutron beam equipment at JRR-3)





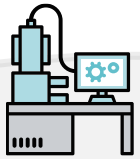
Reference image of neutron experimental equipment in the beam hall (JRR-3)



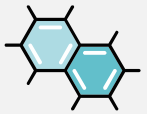
Reference image of the hot-cell (Radioisotope production building)

What can be learned from the use of neutron experimental equipment?

Clarifying the essence of the functional expression of materials
Neutron scattering and trace element analysis



→ **New material development**
High-performance polymers
High-performance magnets
Semiconductor development



Investigating the characteristics of multi-layered structures from micro to macro
Neutron scattering and neutron imaging

→ **Zero carbon**
Lithium batteries
Fuel cells
Longer infrastructure life



Clarifying the essence of life by elucidating the functions of living organisms
Neutron scattering



→ **Medicine development**



Modifying the structure of matter and life brought about by particle beams
Neutron irradiation



→ **Cancer treatment**
Nuclear safety





Radioisotope (RI) production and utilization
Neutron irradiation



→ **Diagnosis and treatment**



Materials for the 1st Consortium Meeting (November 20, 2023): https://www.jaea.go.jp/news/newsbox/2023/112001/s01.pdf