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***Overview of  
the Japan Atomic Energy Agency  
(JAEA)***

***December 2009***

***Japan Atomic Energy Agency***

⑤



# JAEA's Mission

**To**  
perform basic and applied researches related to peaceful use of atomic energy, and R&D to establish nuclear fuel cycle

**For**  
developing QOL of nation

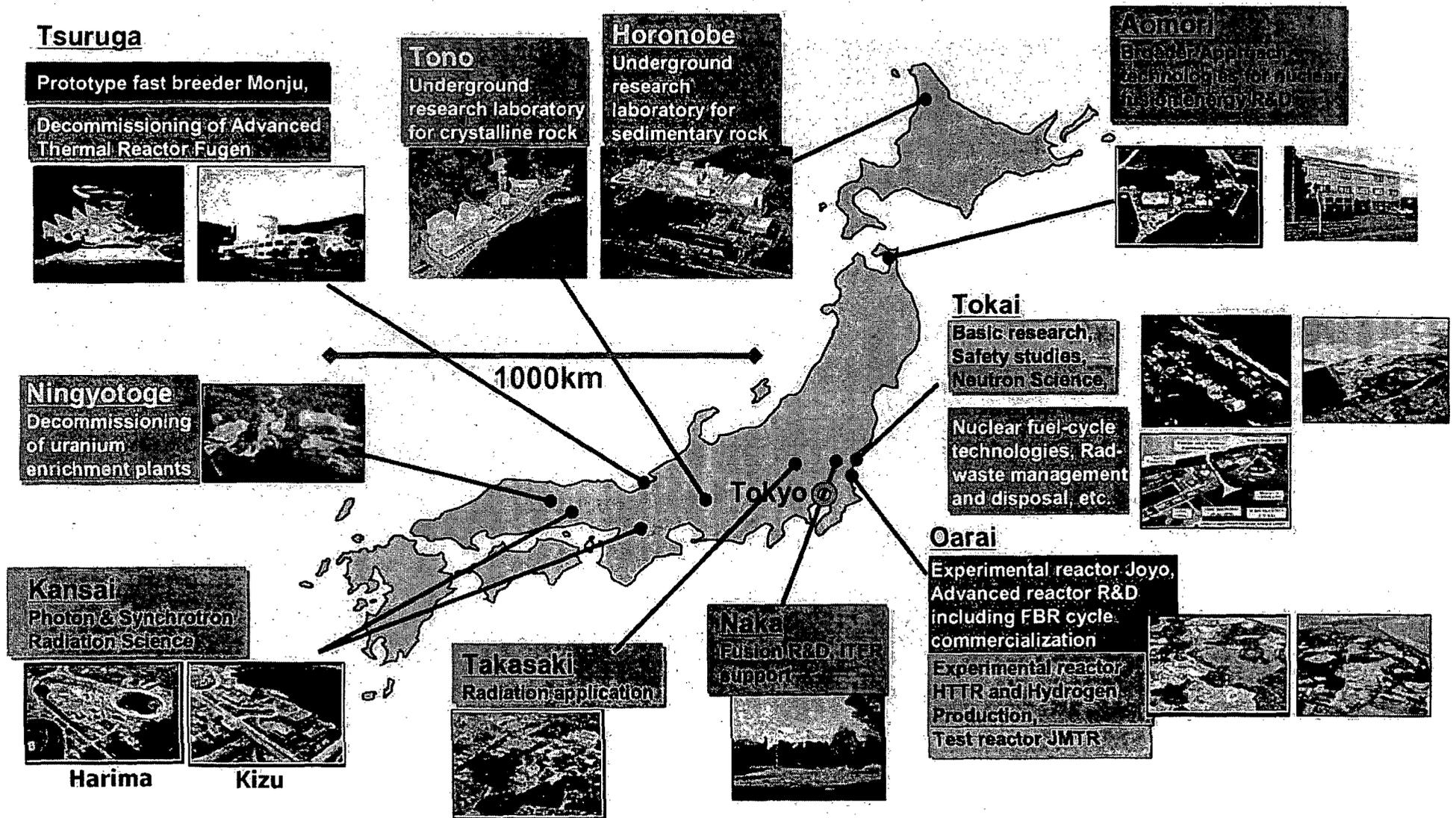
**Through**

- securing long-term energy
- solving global environmental issues
- creating innovative technology with international competency

JAEA was established on October 1, 2005, as a result of the integration of the Japan Atomic Energy Research Institute (JAERI) and the Japan Nuclear Cycle Development Institute (JNC).



# Outline of JAEA



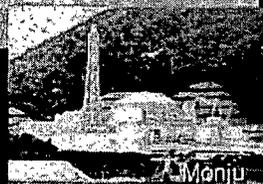
Permanent employee: ~4000      Annual budget: ~200 billion yen (~2 billion US dollars) 2



# JAEA's Activities

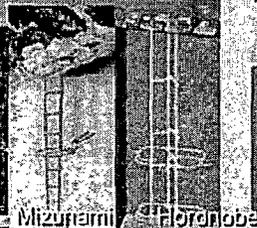
## Nuclear Fuel Cycles

1. FBR Cycle Technology



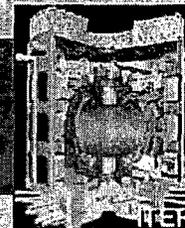
2. Disposal of HLRW

Support of LWR cycle industry



HTGR & Hydrogen production

3. Fusion research & development



4. Quantum beam technology



Photon Science Inst.

Activity to secure safe nuclear power and peaceful use

Safety research

Nuclear nonproliferation

Decommissioning & disposal of low level waste

Cooperation with academic and industries, international collaboration, human resource development ...

Universal scientific technology base

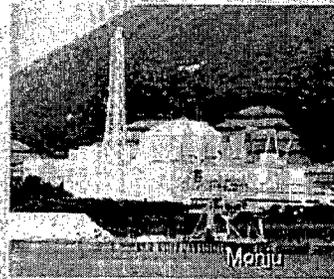
Basic nuclear power engineering research, state-of-the basic research, etc.



# Progress of JAEA's R&D Activities

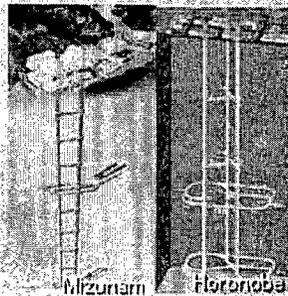
## FBR Cycle Technology

- ◆ Entire System Function Test of "Monju" underway.
- ◆ Fast reactor Cycle Technology (FaCT) development Project for conceptual designs of commercial and demonstration FR cycle facilities and key technologies toward 2015.
- ◆ Trilateral (JAEA-USDOE-CEA) cooperation for SFR prototype development and related R&D.



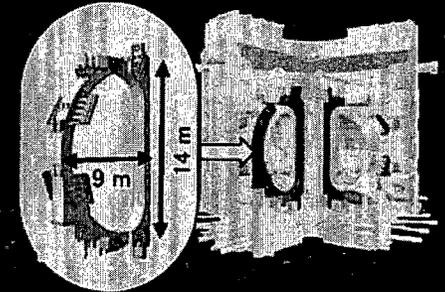
## Geological Disposal technology for HLW

- ◆ Ongoing excavation at Underground Research Laboratories (URLs)
- Current depths of shafts as of July 3
- Mizunami: ca. 378m
  - Horonobe: ca. 251m
- ◆ The URLs provide an opportunity to experience/study deep geological environment



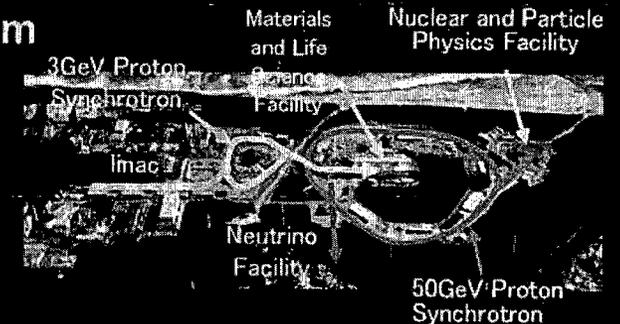
## Fusion Energy R&D

Started procurement of superconducting magnets, the first among the ITER Parties



- ◆ Activities as a Domestic Agency of the ITER Project
- ◆ Aomori R&D Center as a base of BA Activities
- ◆ JT-60 experiment completed, construction of JT-60SA started as one of BA Activities

## Quantum Beam Technology (J-PARC)

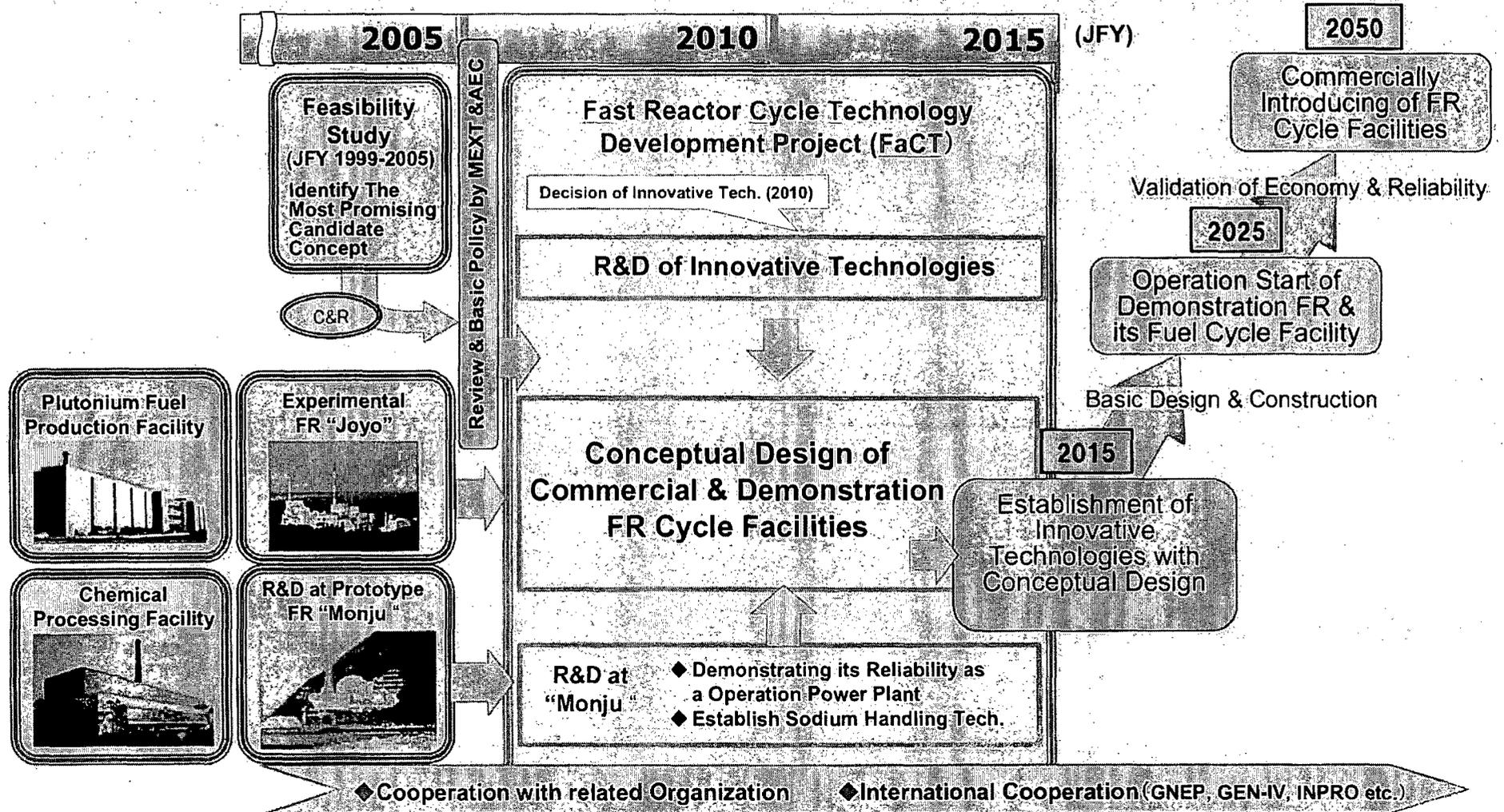


- ◆ The facility construction completed, with the experiments having started in Dec. 2008 at the Materials and Life Science Facility and in Feb. 2009 at the Nuclear and Particle Physics Facility.
- ◆ Applied the law to MLF to promote common use



# The Fast Reactor Cycle Technology Development (FaCT) Project

Fast Reactor Cycle Technology Development (FaCT) Project will present conceptual design on demonstration and commercial plants, and an R&D program toward commercialization around 2015. It is also planned to start operation of demonstration FR around 2025 in order to commercially introduce FR cycle facilities before 2050.





# High-Level Radioactive Waste Disposal

## OBJECTIVE:

- Development of technical basis for supporting the commercial geological disposal project (by NUMO) and for contributing to safety regulations

## ACTIVITIES:

- R&D for engineering technology and safety assessment methods
- Development of integrated methods and techniques for characterizing the deep geological environment and demonstrating their applicability
- Development of a technical knowledge base to develop a convincing safety case

### Tono Geoscience Center

#### Mizunami URL

- Crystalline rock
- Fresh water

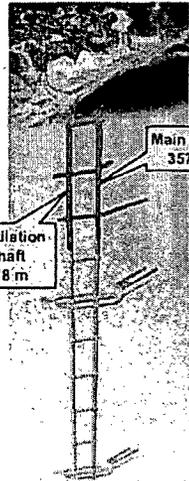


image view



View of the Construction Site

### Horonobe Underground Research Center

#### Horonobe URL

- Sedimentary rock
- Saline water

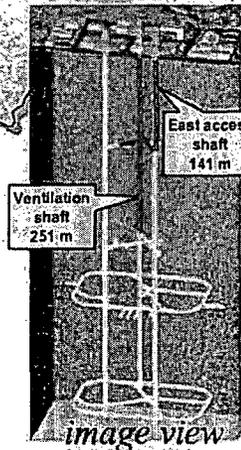
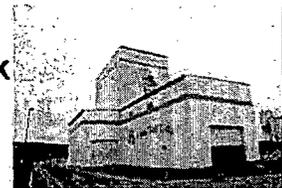


image view



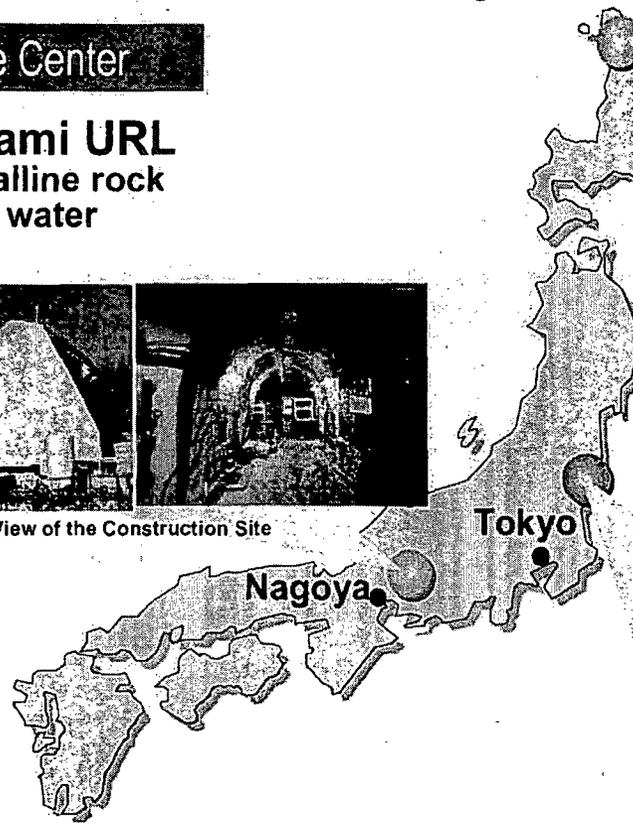
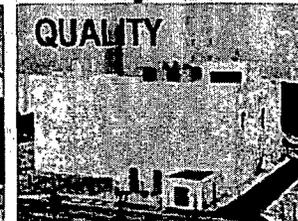
View of the construction site



Horonobe Underground Research Center

### Tokai R&D Center

- Disposal technology
- Safety assessment method, etc.





# Fusion Energy Research

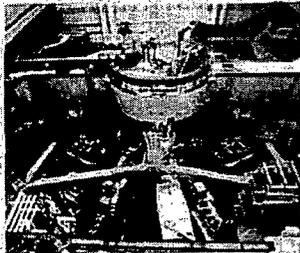
Aiming at realization of a fusion energy system by promoting overall fusion R&D.

## Fusion plasma research

For ITER and DEMO

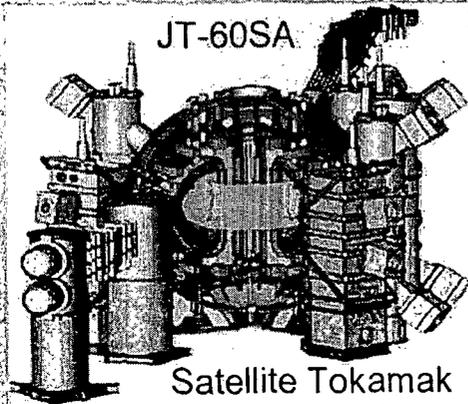
- Develop new area in core plasma physics and technologies
- Personal training for research & development

Completed JT-60 exp.  
Started construction of



JT-60SA

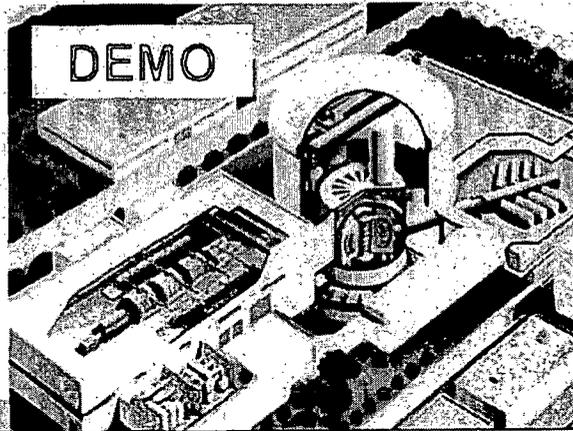
JT-60



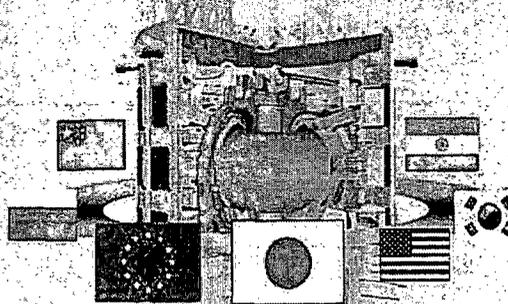
JT-60SA

Satellite Tokamak

## DEMO



**ITER Project**  
Demonstrate scientific and technological feasibility of fusion energy



Started in Dec. 2007



**Broader Approach**



Support ITER, accelerate early realization of DEMO

- International Fusion Energy Research Center
- IFMIF-EVEDA
- Satellite Tokamak JT-60SA

Started in June 2007

## DEMO Frontier

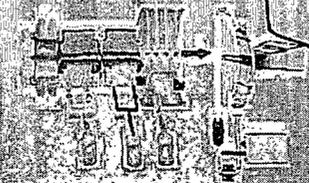
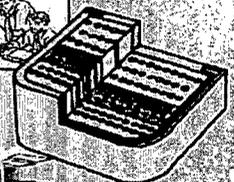
Establish technical basis for DEMO

- Breeding blanket R&D
- Demo design and R&D
- Burning plasma simulation and theoretical modeling
- Remote experiment
- Fusion material R&D and Irradiation Facility

IFERC



Blanket

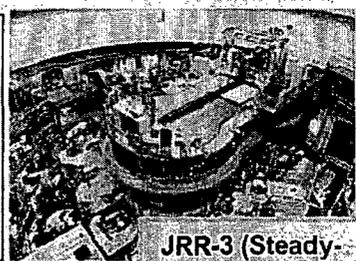
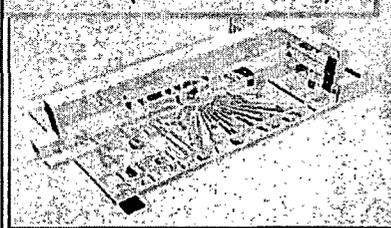


IFMIF-EVEDA



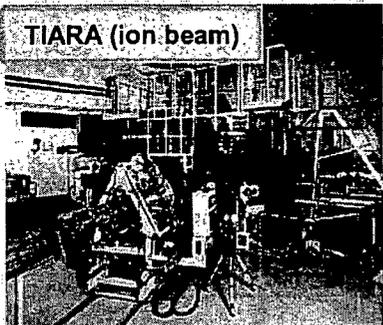
# R&D on Quantum Beam Technology

J-PARC (Pulse neutrons)

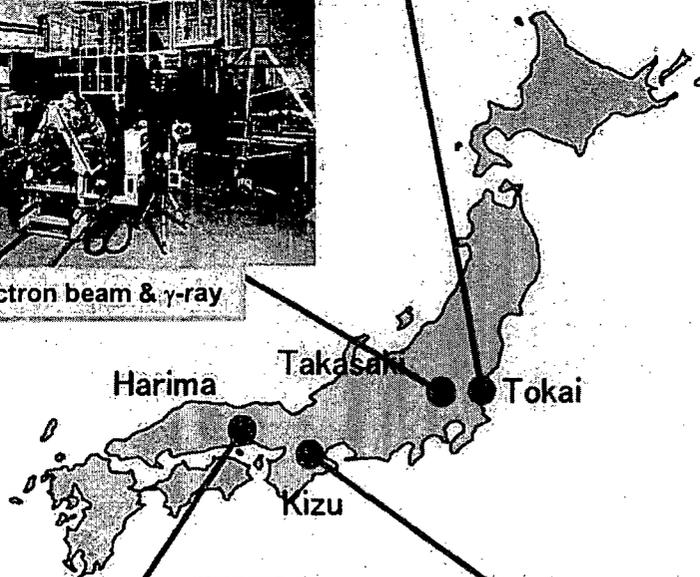


JRR-3 (Steady-state neutrons)

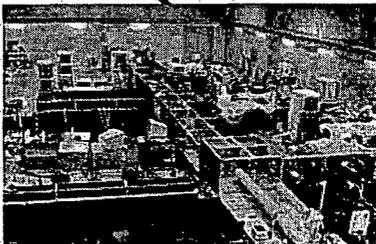
TIARA (ion beam)



Electron beam &  $\gamma$ -ray



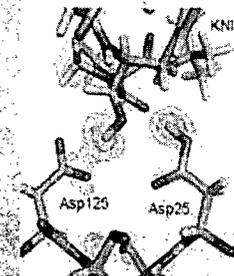
Beamline of Spring-8 (synchrotron radiation)



High-intensity lasers

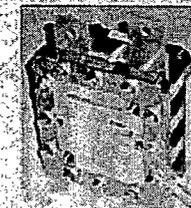
## Tokai Neutron science with reactor and J-PARC

- Success in determination of whole atom positions in HIV-protease-Towards developing more effective anti-HIV drugs-



## Takasaki Application of ion, electron and $\gamma$ -ray beams for material- and bio-technology

- Development of highly durable polymer electrolyte membranes most appropriating to residential fuel cell system using radiation-grafting technique.



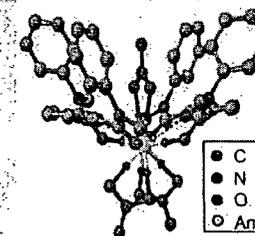
## Kansai (Kizu) High field science with ultrashort pulse lasers

- Generation of MeV-class protons with high-intensity lasers
- ⇒ Development of compact ion-beam cancer therapy instrument



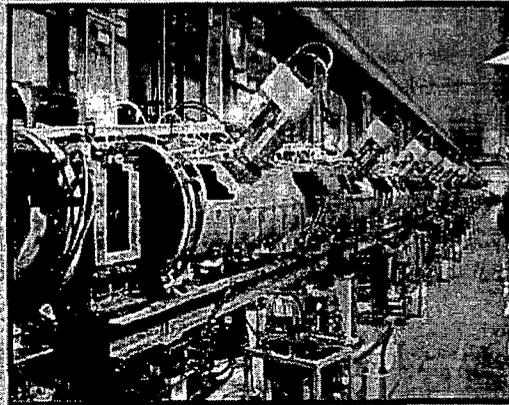
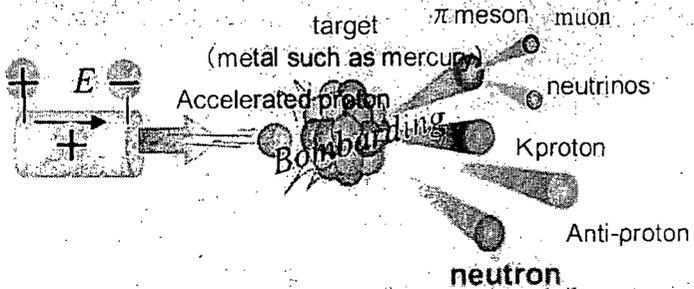
## Kansai (Harima) X-ray science with Spring-8

- Development of new separation molecules for simplification of reprocessing of nuclear spent fuel

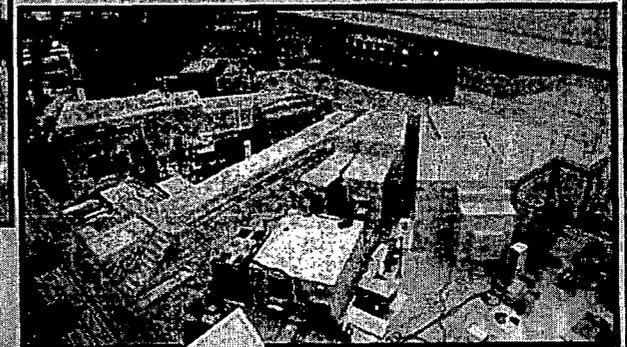




# J-PARC Project (high-intensity proton accelerator)

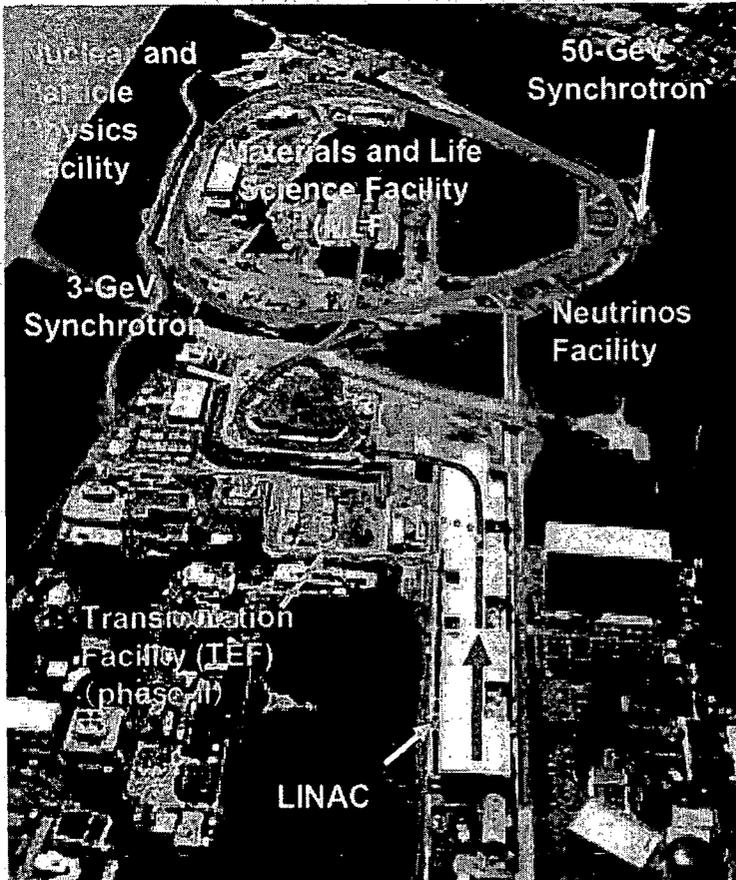
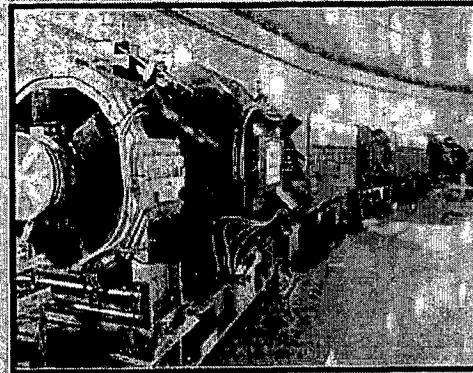


Linac energy of 181 MeV was achieved successfully in January 2007.

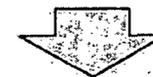


The 8 neutron beam-lines are available for experiments.

The 3-GeV synchrotron successfully operated in October 2007.



Open and available to domestic and foreign researchers as an international user facility. Estimated annual users over 4,000



MLF has started in common use in Dec. 2008.

- Joint project of JAEA and KEK.
- J-PARC has been completed in 2008.



# Disposal of Low-level Radioactive Waste

JAEA is promoting the disposal of LLW generated from the R&D of the nuclear energy / medical and industrial use of radioisotope in Japan.

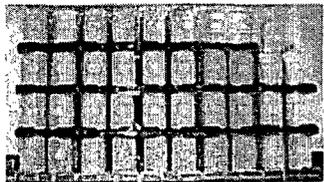
## Background

### Accumulation of the wastes

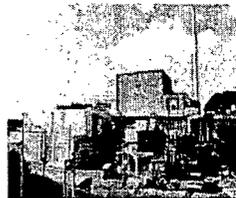
- A total of 550,000 drums (200-liter drum equiv.) from 2,400 different sources since the 1950s.
- JAEA has more than 80% of them.

### Issues on backend activities

- No organization had been assigned a role of waste disposal and repository operation.
- Many waste storage facilities are approaching their limit.
- The issues will affect R&D facility operations.
- It is difficult to promote nuclear facility decommissioning.



Many wastes have been stored in storage facilities.



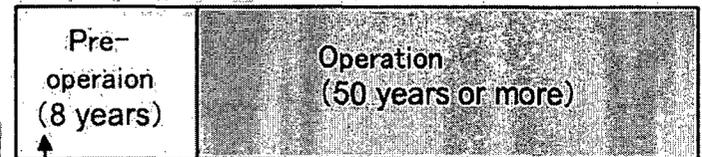
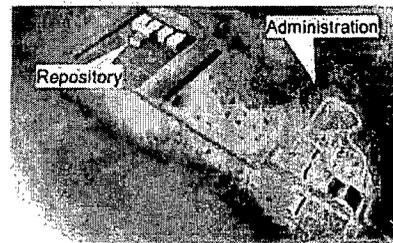
Aged facilities cannot be decommissioned.

## Disposal of LLW

- JAEA was assigned an implementing organization for the disposal with the amendment of JAEA Act in 2008.
- JAEA is now responsible for siting and constructing a repository.
- JAEA is also asked to dispose of the waste from other organizations.
- Fund reservation was initiated (43 M\$ in 2008).

### [Rough schedule of waste disposal]

### [Image of repository]



- Siting
- Envir. exam.
- Licensing
- Construction

A total of 520,000 waste forms for disposal (200-liter drum equivalent) estimated to be generated by 2048.

Early implementation of the disposal is demanded in order to promote nuclear R&D and radioisotope utilization.