



Refurbishment Status and Future Program of Japan Materials Testing Reactor (JMTR)

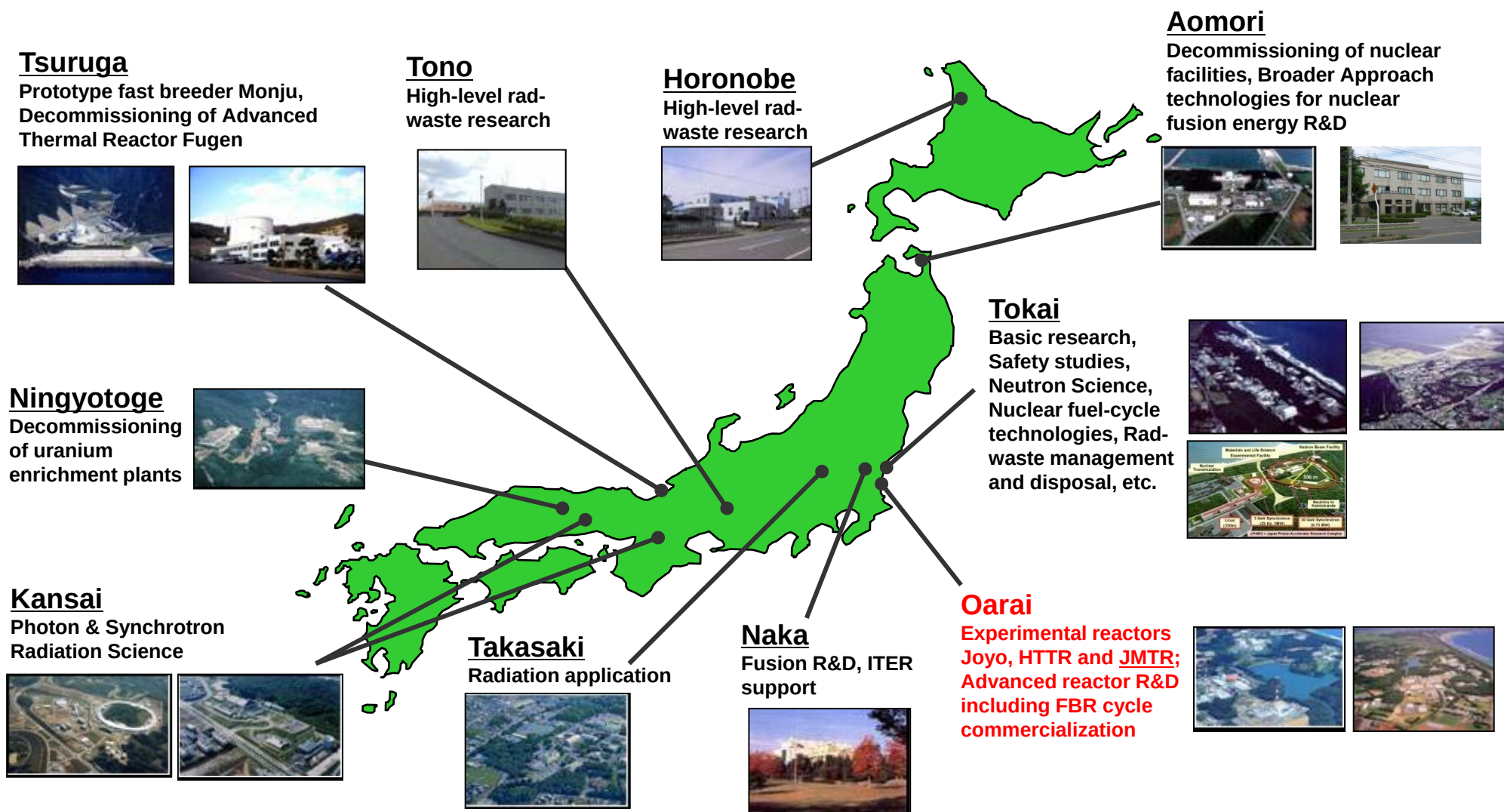
M. Ishihara, H. Kawamura, M. Niimi, M. Kaminaga,
N. Hori and Y. Nagao

Neutron Irradiation and Testing Reactor Center
Oarai Research and Development Center
Japan Atomic Energy Agency

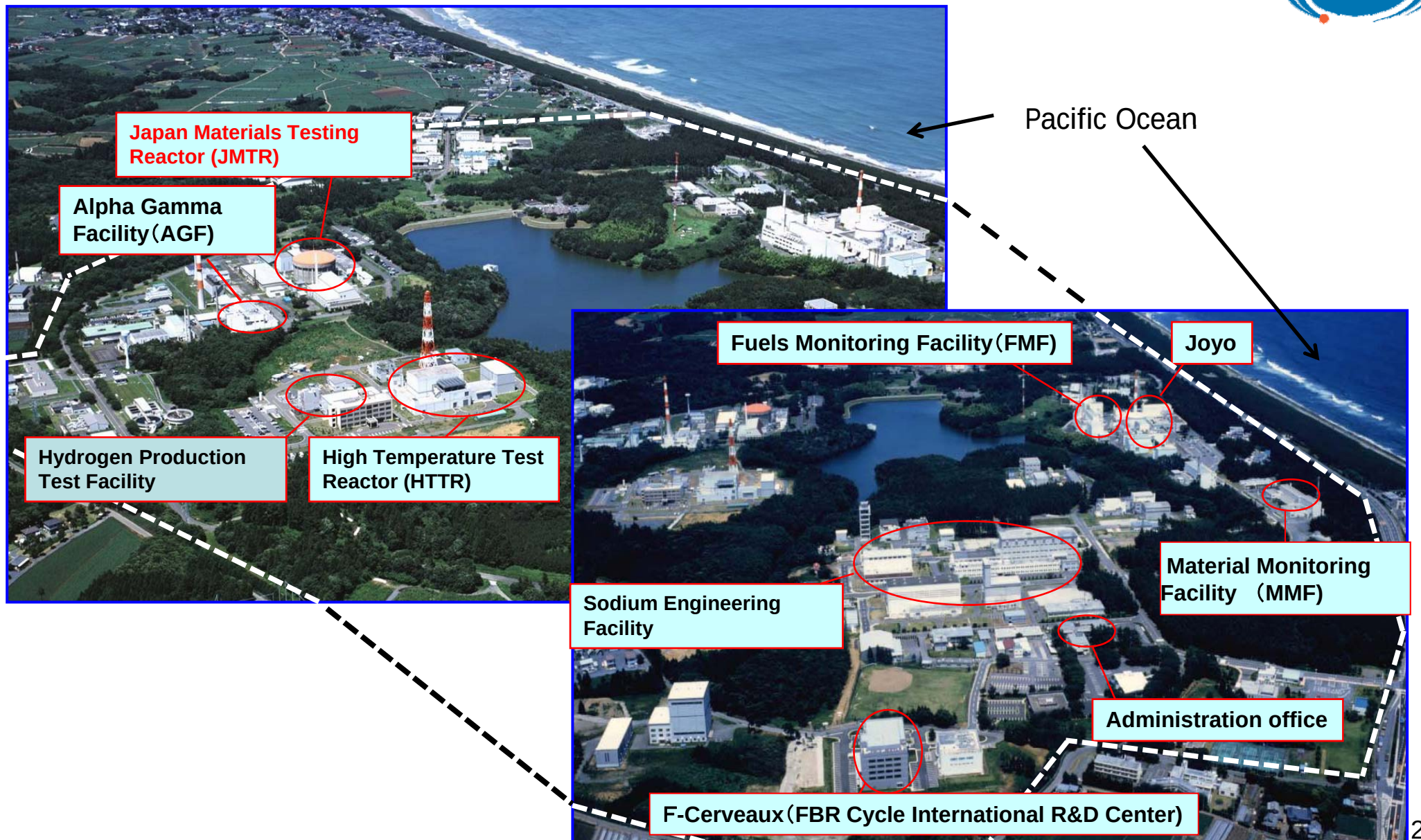
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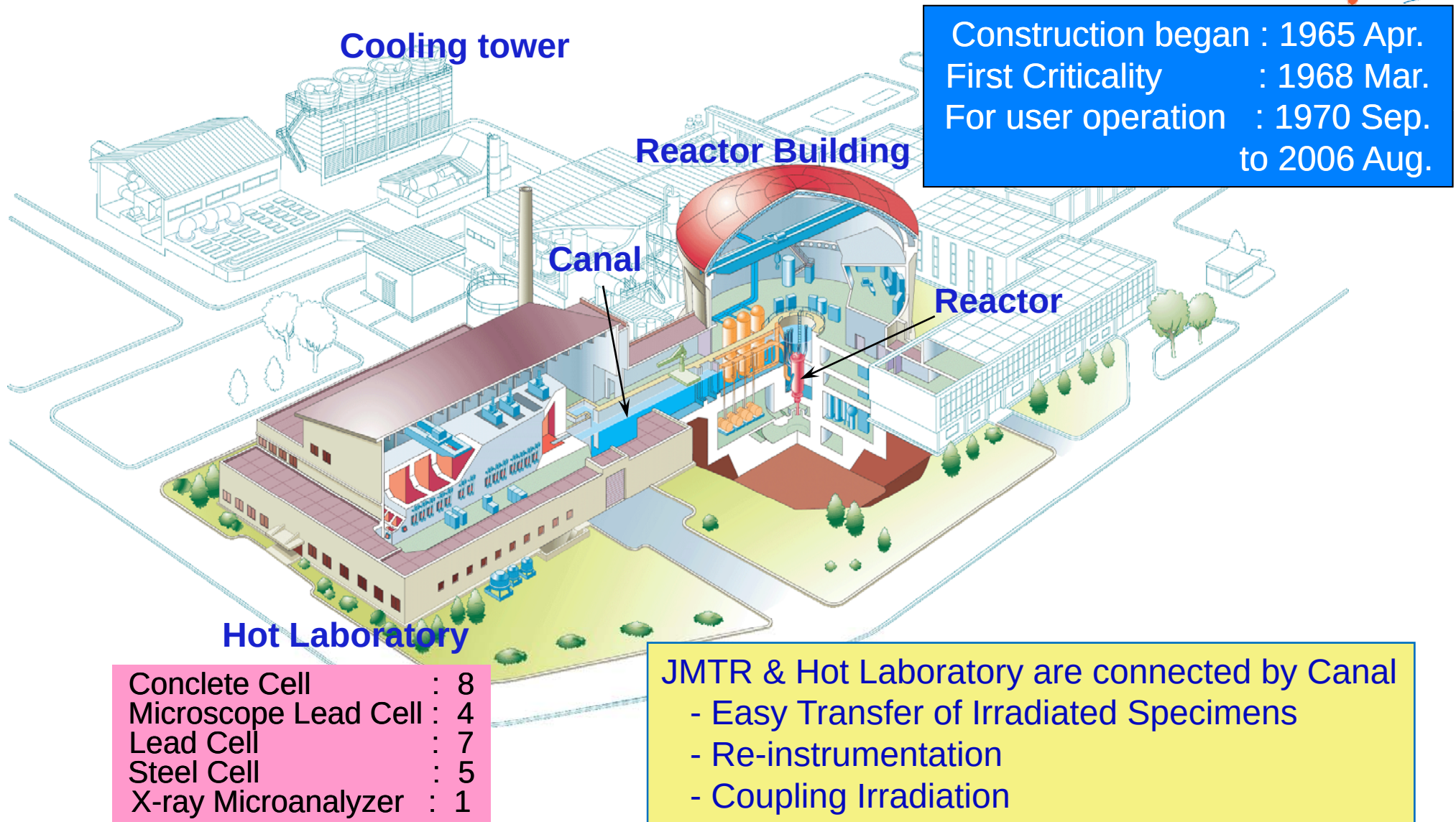
Location Map of Research Centers of JAEA



Over-view of Oarai Research Center



Facilities of JMTR



Outline of JMTR

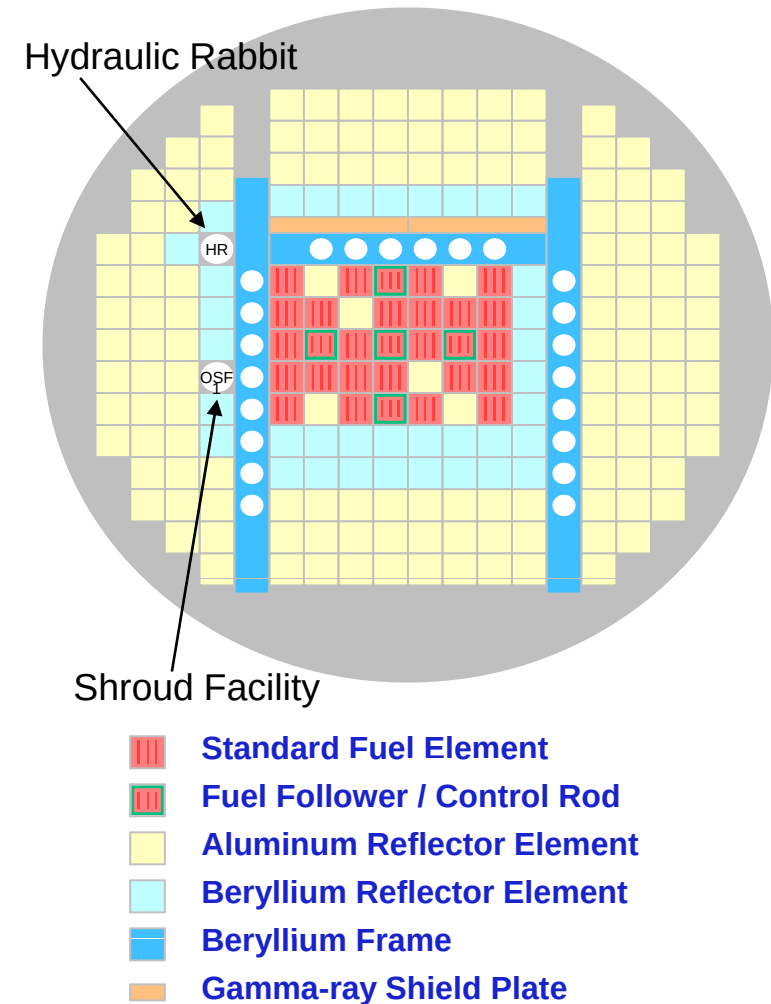


Specifications of JMTR

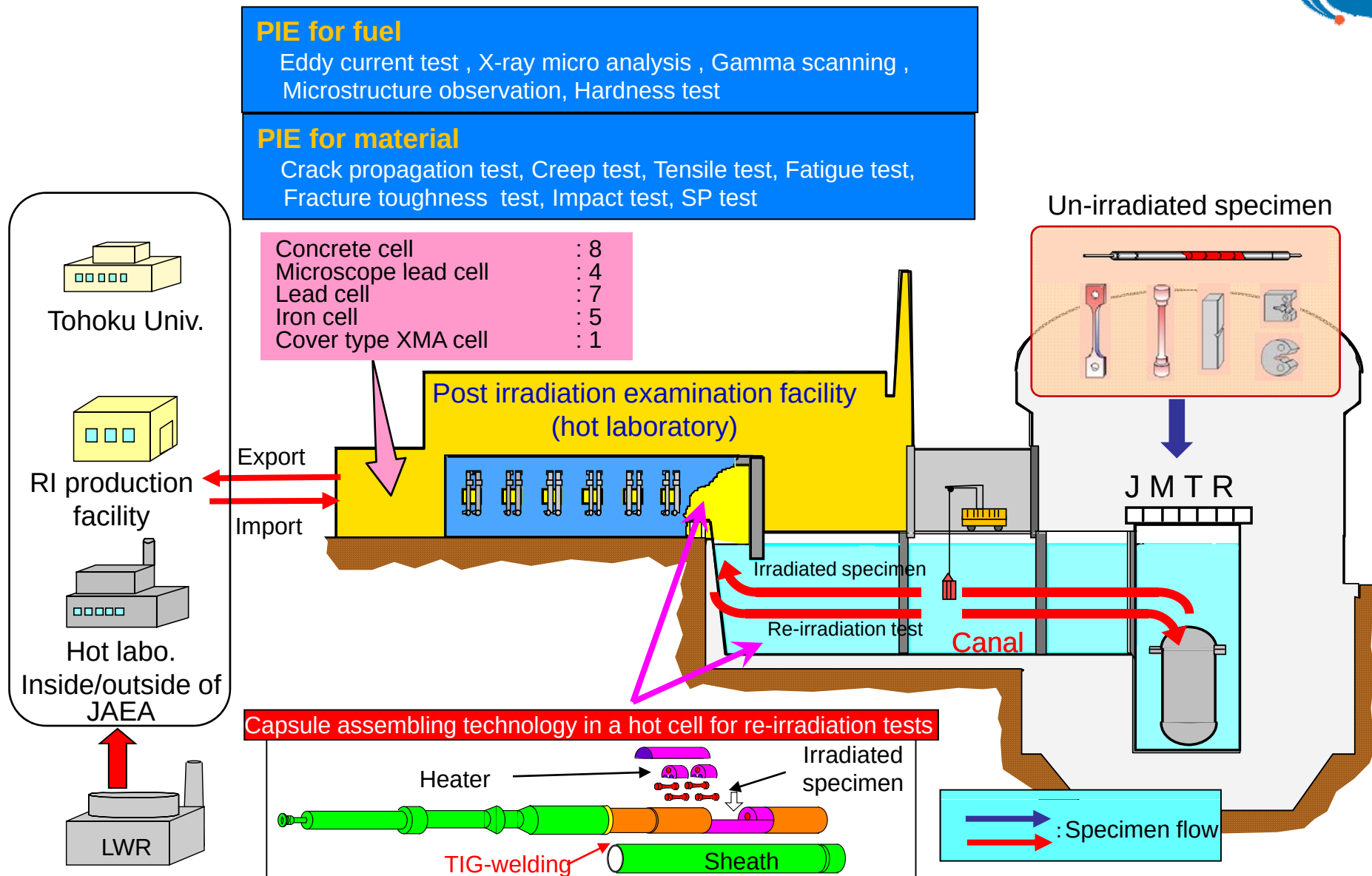
Reactor Power	50 MWt
Fast Neutron Flux (Max)	$4 \times 10^{18} \text{ n/m}^2 \cdot \text{s}$
Thermal Neutron Flux (Max)	$4 \times 10^{18} \text{ n/m}^2 \cdot \text{s}$
Flow of Primary Coolant	$6000 \text{ m}^3/\text{h}$
Coolant Temperature	$49^\circ\text{C}/56^\circ\text{C}$
Core Height	750mm
Fuel	Plate type, 19.8% ^{235}U
Irradiation Capability (Max)	60 (20*) capsules
Fluence/y (Max)	$3 \times 10^{25} \text{ n/m}^2 \cdot \text{y}$
dpa of Stainless Steel (Max)	4 dpa
Diameter of Capsule	30 - 65mm
Temp. Control (Max)	2000°C

* : capsule with in-situ measurement

Core Configuration



Outline of JMTR hot laboratory



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C & R for JMTR Reoperation



◆ October 1st, 2005 Establishment of JAEA

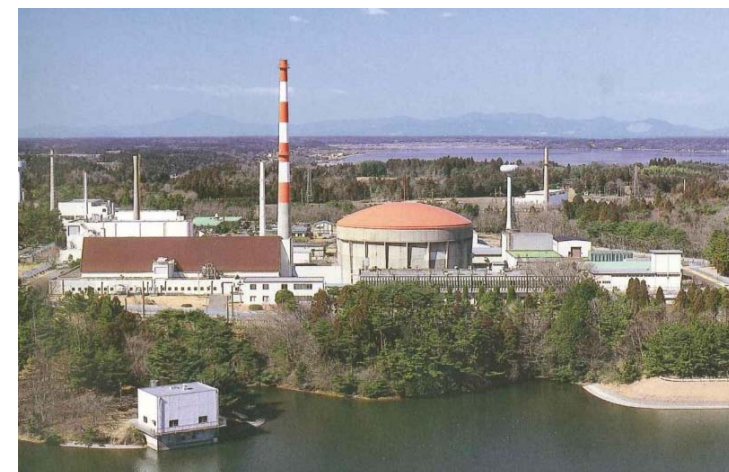
- JAEA decided that JMTR was one of decommissioning facilities



Users requested strongly to reoperation of JMTR

◆ November, 2005 – December, 2006

- C & R on JMTR reoperation by JAEA/MEXT (Government)
JAEA internal C & R (from November, 2005 to March, 2006)
Government C & R (from April, 2006 to October, 2006)
- After the 2007 F.Y. budget was approved by the Ministry of Finance, JAEA finally decided to restart of the JMTR.



◆ April 1st, 2007

JAEA organized "Neutron Irradiation and Testing Reactor Center" to conduct refurbishment of JMTR facilities and to promote the usability considering user opinion.

Reactor facilities are refurbished during four years from the beginning of FY2007, and operation of the new JMTR will start in FY2011.

Neutron Irradiation and Testing Reactor Center



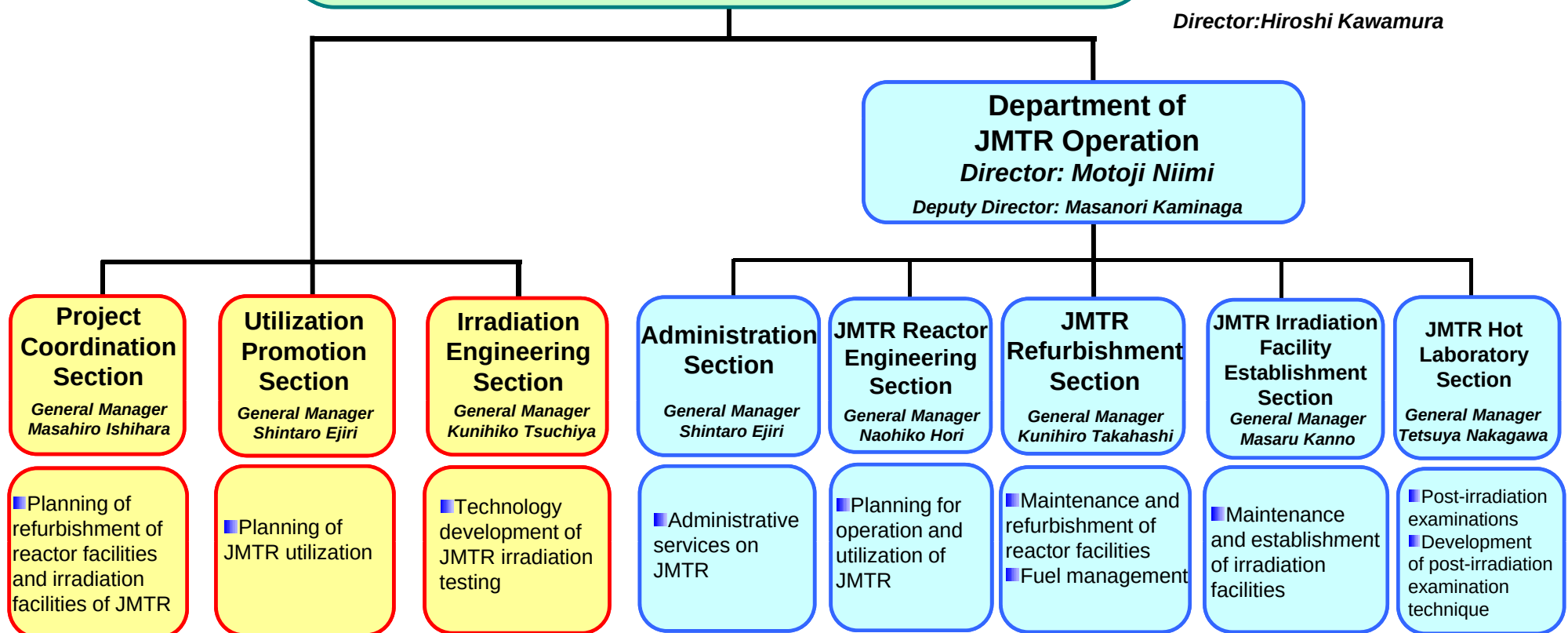
Neutron Irradiation and Testing Reactor Center

Director: Hiroshi Kawamura

Deputy Director: Masahiro Ishihara



Director: Hiroshi Kawamura



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JMTR Refurbishment Project

JMTR operation was **stopped** after completion of the **165th cycle in August 2006**, and repairing and **replacement** work for the re-operation from FY2011, was **started** in FY2007.

Investigation of Aged Components

An investigation of aged components was performed in order to identify integrity of facilities and components to be used for re-operation of JMTR.

Replacement of reactor related components

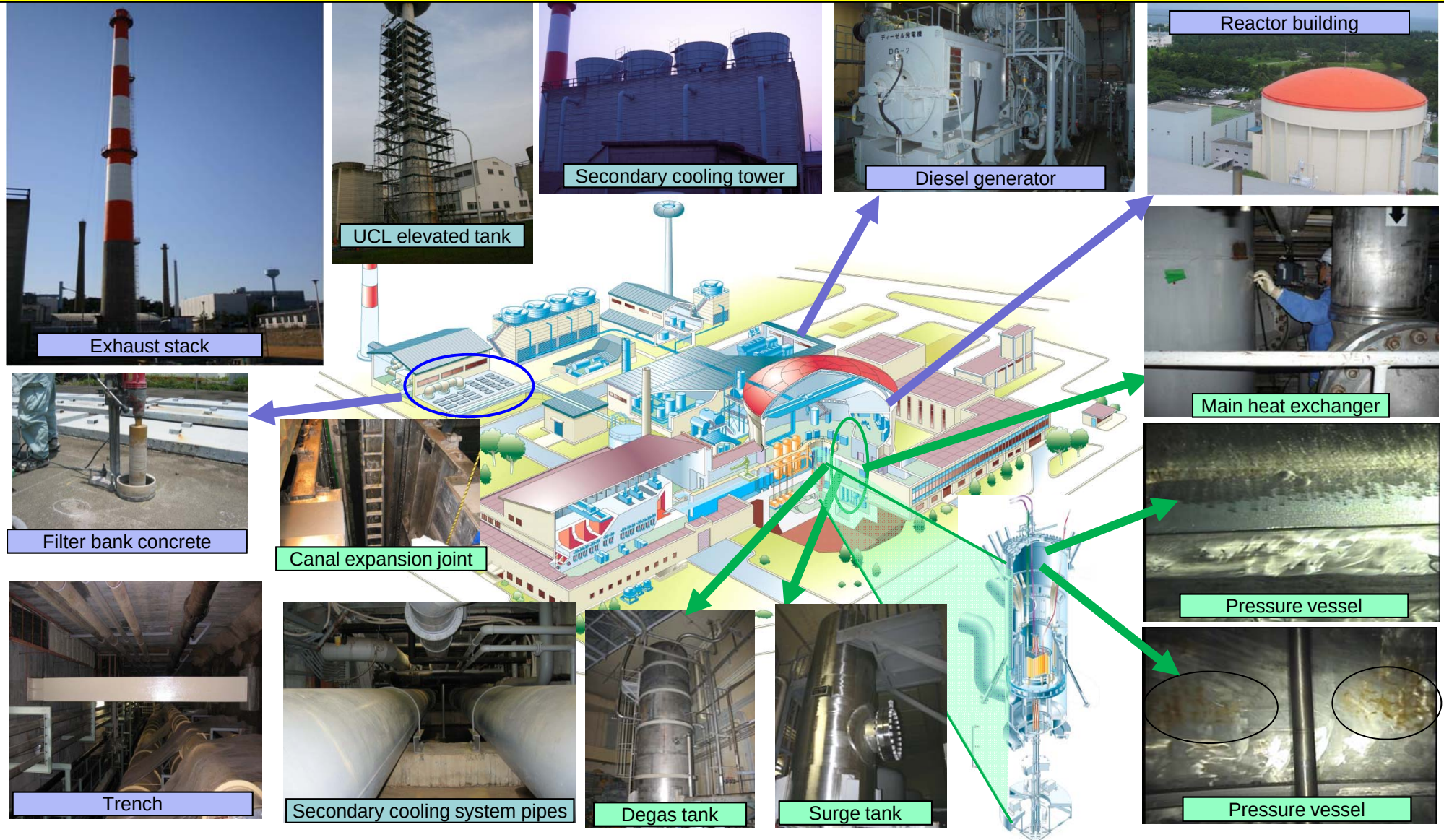
- Replacement is carried out within the range of licensing permission of the JMTR.
- At present, boiler system, refrigerator for air conditioning system, power supply system, air supply and exhaust system for reactor building have been replaced.

Installation of new irradiation facilities

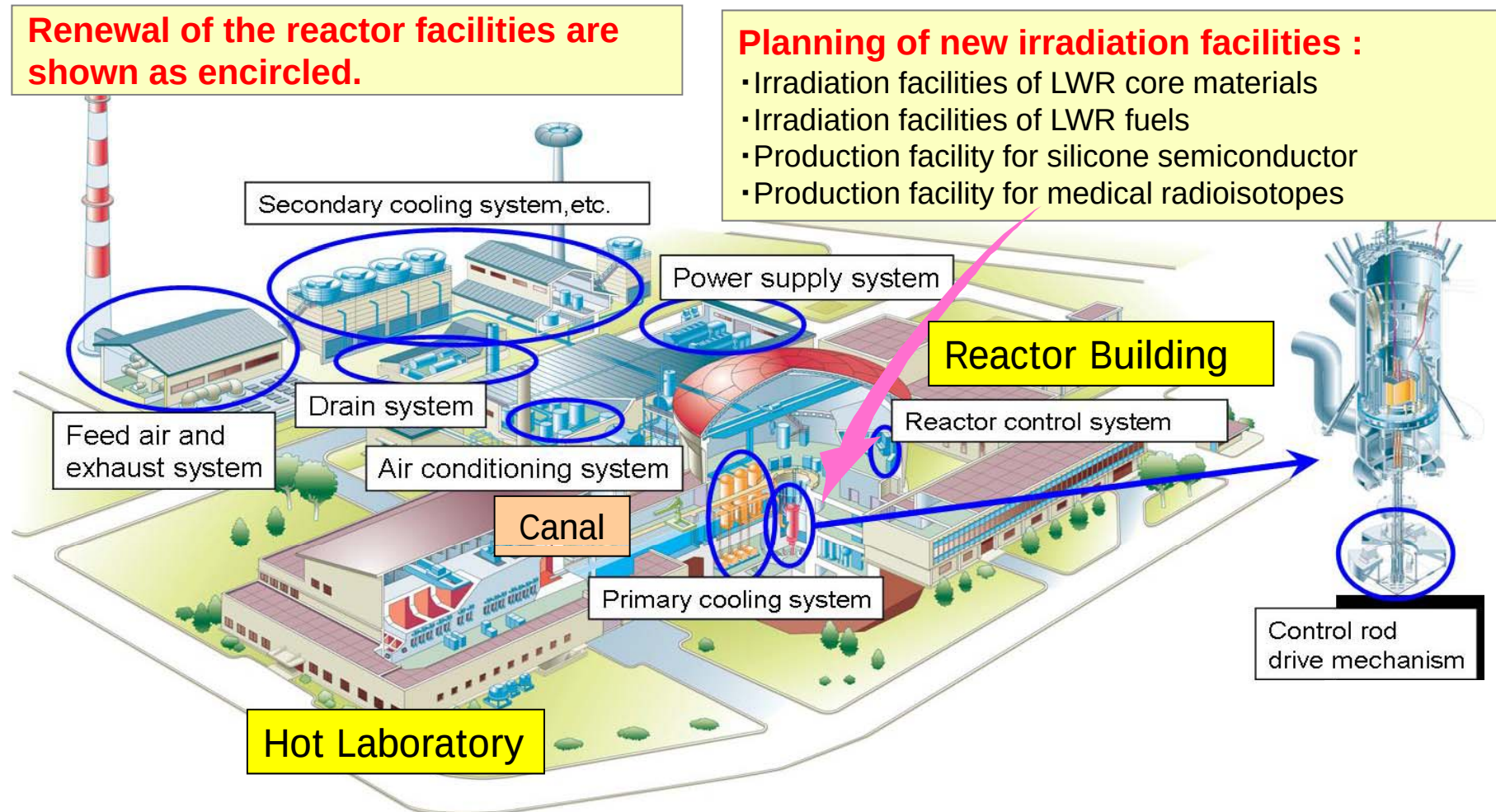
- Corresponding to the user's requests, new irradiation facilities, such as irradiation test facilities for materials/fuels, production facility for medical isotopes etc. will be planned to install.

Investigation on Aged Components

It was concluded that the **integrity of the components was maintained** properly, based on the JMTR annual maintenance. Therefore, those components are **not replaced**.



Refurbishment of the JMTR



The renewed and upgraded JMTR will be operated for a period of about 20 years (until around FY 2030).

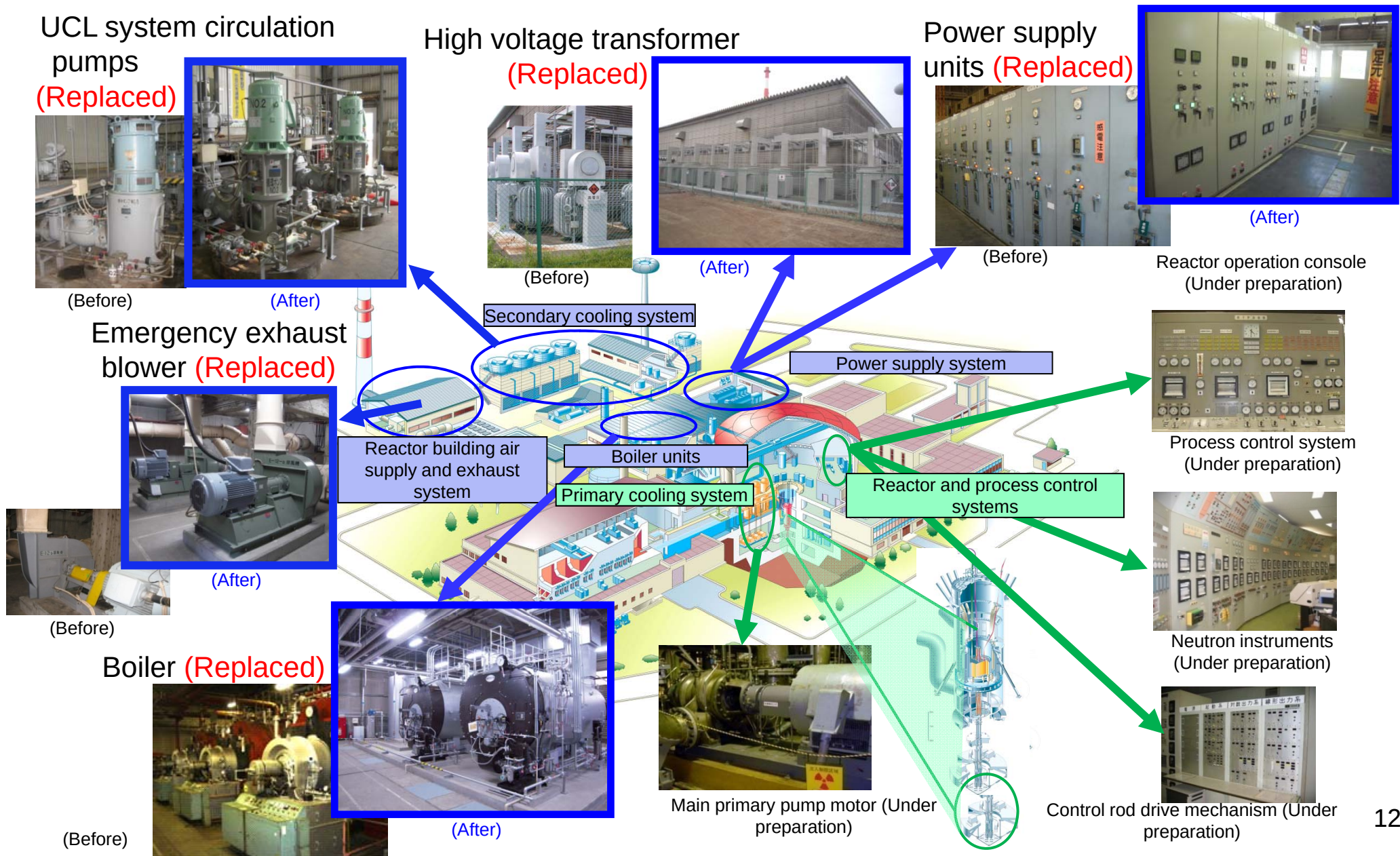
Refurbishment schedule of reactor facilities



FY System	2007 (H19)	2008 (H20)	2009 (H21)	2010 (H22)	2011 (H23)
Reactor control system					
Cooling system					
Exhaust system					
Power supply system					Restart
Boiler system					
Purification system					

 : Specification design, fabrication and replace works, inspections etc.

Status of components replacement



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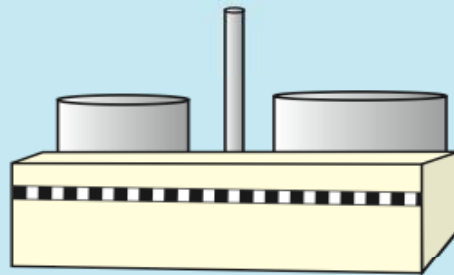
Schedule will be changed by user's requests.

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Expected roll of new JMTR



Lifetime extension of LWRs



- Aging management of LWRs
- Development of next generation LWRs

Progress of science and technology

- Development of fusion reactor materials and components
- Development of HTGR fuels and materials
- Basic research on nuclear energy, etc.



Expansion of industry use

- Production of silicone semiconductor for hybrid car



- Production of ^{99m}Tc for medical diagnosis medicine



Education and training of nuclear scientists and engineers



User-friendly management after reoperation



The reactor facilities are refurbished during four years from the beginning in FY 2007, and the operation of new JMTR will start in FY2011.

The usability improvement of the JMTR

We aim at the testing reactor which is attractive to the users.

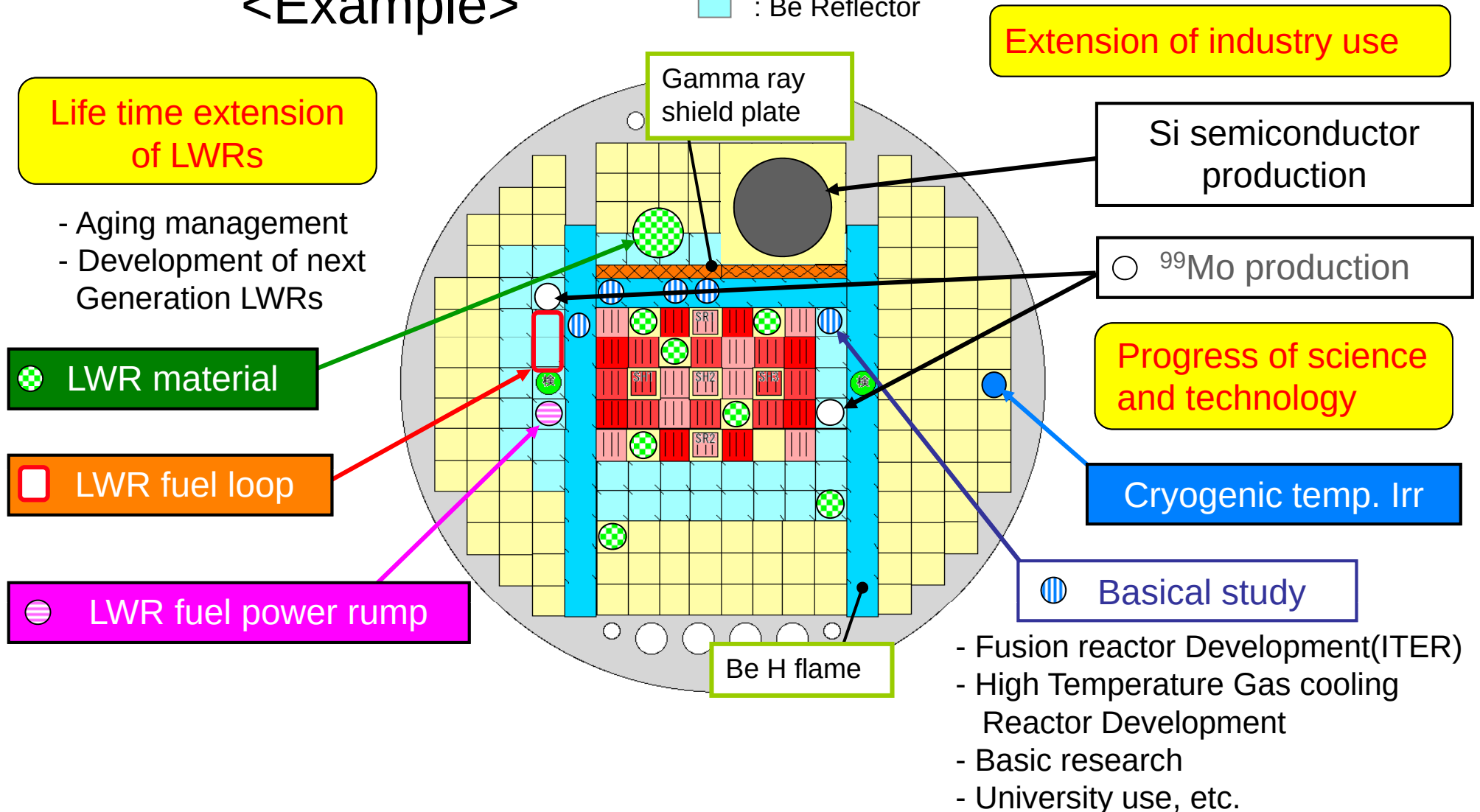
- Testing reactor operation at the reactor-operating rate of 50% - 70%
- Shortening of turnaround time to get irradiation results earlier
- Realization of more attractive irradiation cost in comparison with other testing reactors of the world
- Establishment of more simple irradiation procedure and more satisfied technological support system to use more easily
- Guard of the business confidence by perfect information control, etc.

Planning of new irradiation facilities



<Example>

□ : Al Reflector
□ : Be Reflector



New facilities for aging management study



1) Fuel irradiation tests for LWRs (2011-2016)

- Transient tests under power ramping conditions
- Irradiation tests under high duty conditions, such as high rod internal pressure, upgraded power and high burn-up

2) Material irradiation tests for LWRs (2011-2016)

- Stress Corrosion Cracking (SCC) tests under irradiation conditions
- Material irradiation tests of hafnium under high temperature water condition for corrosion
- Fracture toughness tests of reactor pressure vessel materials with 1T-CT specimens

HRD program using JMTR



1. On-Job Training Program by the refurbishment of reactor facilities and the installation of new irradiation facilities

2. Education and Training Program by the development of advanced irradiation technology

- Development of advanced [in-situ instrumentation technology](#)
[ex] [In-situ Observation](#) Technology of Reactor Core under reactor operation,
[Remote Sensing](#) Technology of Irradiation Behavior without Cable,
Elemental technology (High temperature multi-paired thermocouple,
Uniformly irradiation, sensor of oxygen and hydrogen)
- [⁹⁹Mo production](#) technology development by new Mo solution irradiation method
- Development of [recycling technology](#) on used beryllium reflector irradiated by neutron (recycling technology aiming at production of beryllium pebbles as a neutron multiplier for ITER blanket test module)

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Conclusion



- The JAEA placed that the JMTR is a testing reactor which supports the basic technology of the nuclear energy, and decided the refurbishment of the reactor facilities during four years from FY 2007; operation of the new JMTR will be started from FY 2011.
- New irradiation facilities are planned to install in the JMTR; LWR fuels/materials irradiation facilities, Industrial use for Si-semiconductor production, for Mo-99 production to medical use and so on are under.
- Human resource development (HRD) program using JMTR is carrying out by both On-Job-Training and Education and Training.

Appendix

Renewal of Reactor Facilities (1)



Power Supply System (Control panel)



Before renewal



After renewal

Renewal of Reactor Facilities (2)



Power Supply System (Transformer)



Before renewal



After renewal

Renewal of Reactor Facilities (3)



Boiler System



Before renewal



After renewal

Renewal of Reactor Facilities (4)



Centrifugal Chiller



Before renewal



After renewal

Renewal of Reactor Facilities (5)



Water Purification System



Before renewal



After renewal