

*International Conference on Fast Reactors and Related Fuel Cycles (FR09)
- Challenges and Opportunities -
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Research and Development Policy on FBR Cycle Technology in Japan

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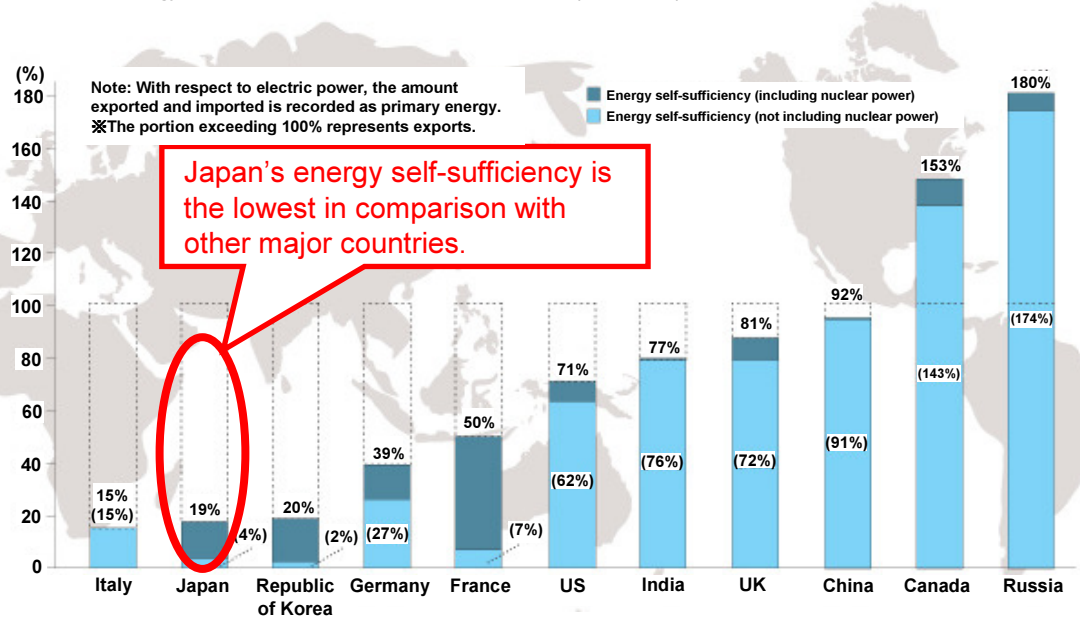
Ministry of Education, Culture, Sports, Science and Technology (MEXT),

Japan

Japan's Energy Consumption and Supply

- Japan's energy self-sufficiency is the lowest in comparison with other major countries.
- On the other hand, it is expected that energy demand will continue to increase along with economic growth in developing countries.

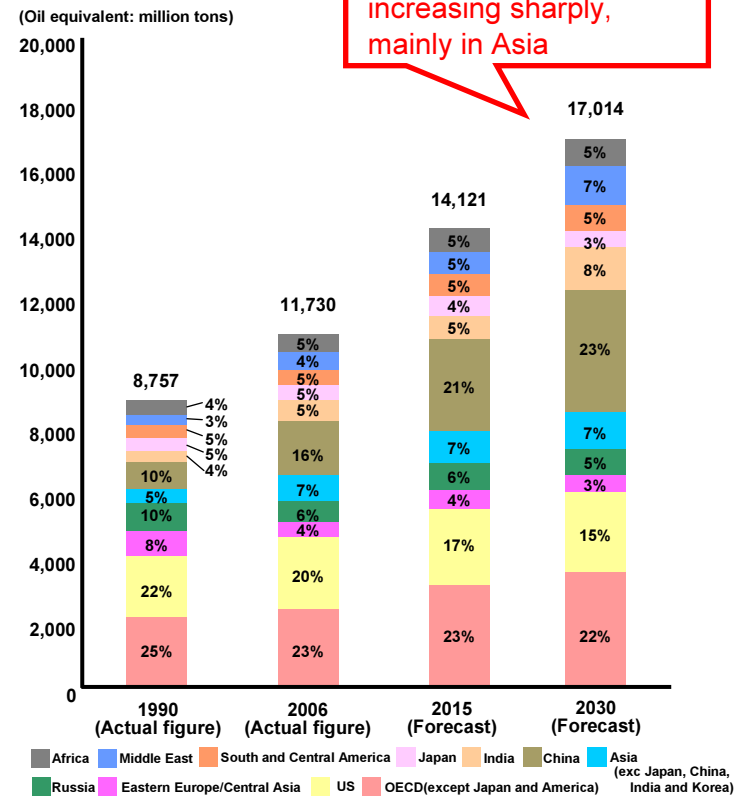
Source: IEA/Energy Balances of OECD/Non-OECD Countries 2005-2006 (2008 Edition)



Japan's energy self-sufficiency is the lowest in comparison with other major countries.

■ Energy self-sufficiency ratio of major countries (2006)

Source: IEA/World Energy Outlook 2008



2006→2030: 1.6 times. Energy demand increasing sharply, mainly in Asia

■ Anticipated global energy demand by region (2008)

(Source: "Energy in Japan 2009," METI)

The Nuclear Fuel Cycle in Japan

○Rokkasho Enrichment Plant ...

Started operation in 1992 with independent technology.

○Pu thermal Use Plan ...

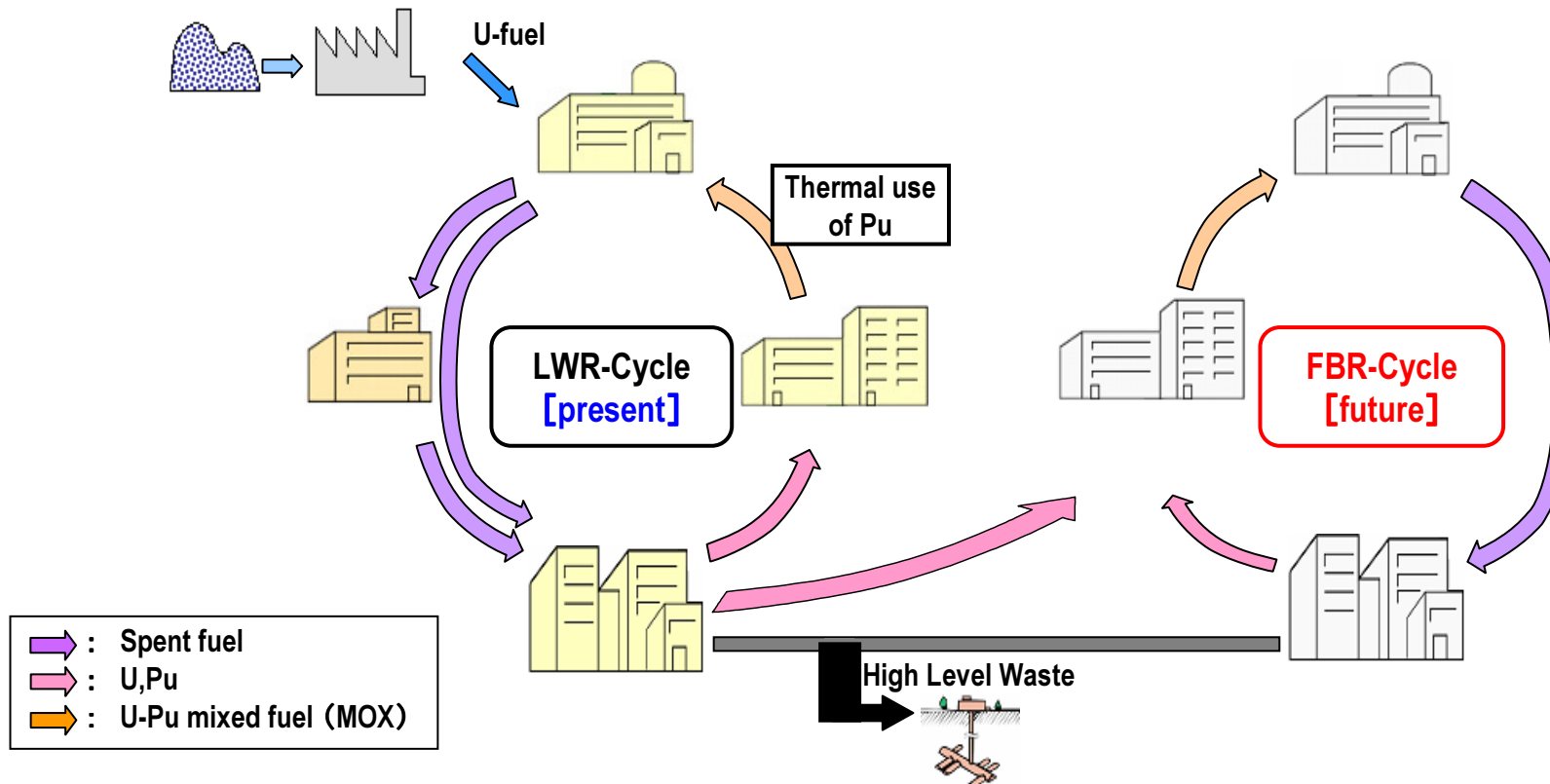
Adopt in 16-18 reactors by March 2016. First Japanese Pu thermal use will start from Dec. 2009.

○Rokkasho Reprocessing Plant ...

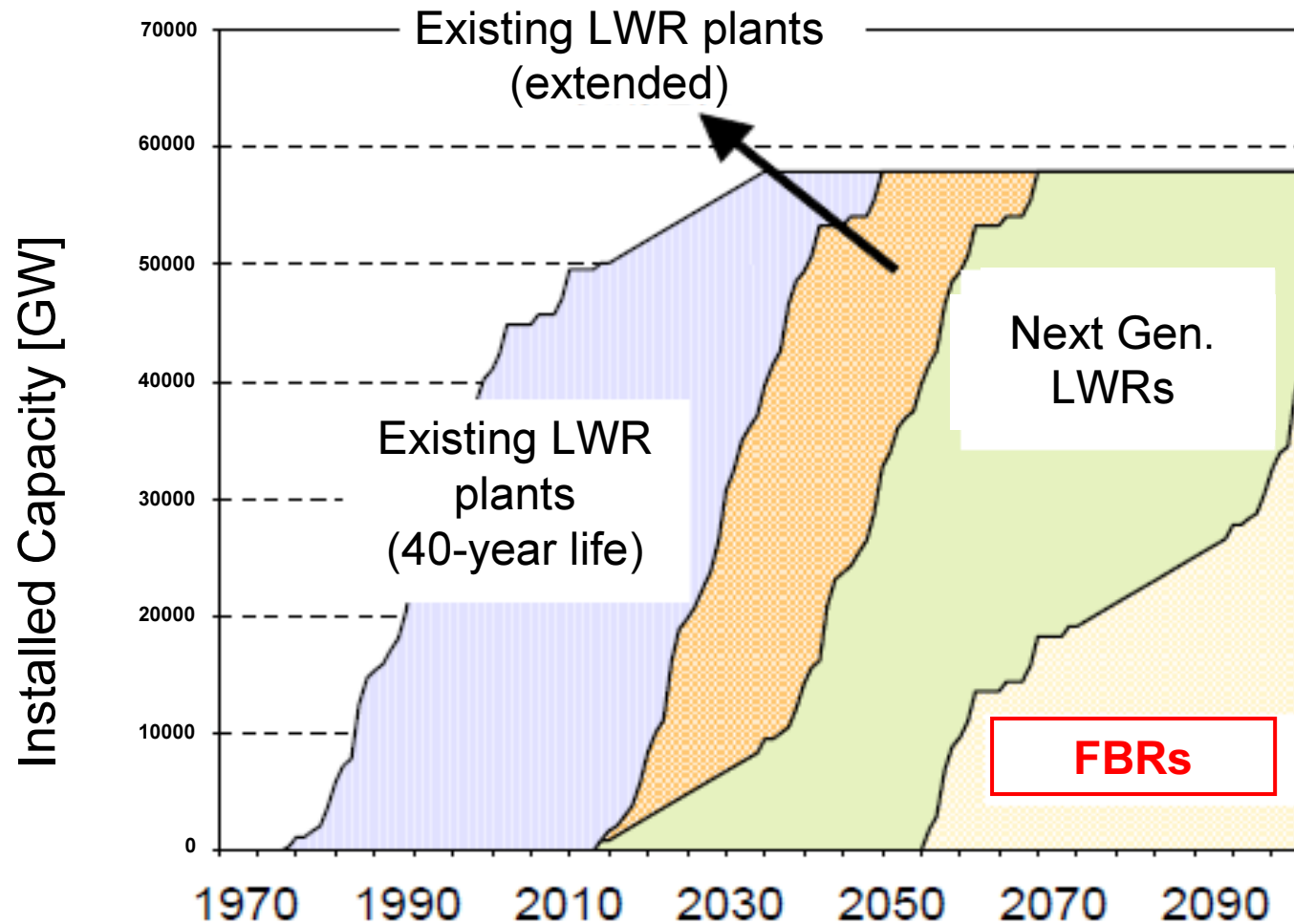
Currently in the final stage of Active Tests. Construction will be completed by October 2010.

○Selection of the Candidate Site for the HLW Permanent Disposal Facility ...

NUMO (Nuclear Waste Management Organization of Japan) is in charge of the selection.



Long-term Perspective for Nuclear Energy



Source: "Japan's Nuclear Energy National Plan," METI, 2006

FBR Cycle Development Policy in Japan

- [“Framework for Nuclear Energy Policy” by the Atomic Energy Commission \(AEC\) of Japan \(Oct. 2005\)](#)
 - It is necessary to promote R&D for the commercialization of FBR cycle technology, which can enable long-term energy security and reduction in radio-toxicity of radioactive waste.
 - The Feasibility Study on Commercialized FBR Cycle Systems aims to establish the FBR cycle technological scheme by around 2015.
 - Development of FBR cycle aims at commercial introduction around 2050.
- [“Japan’s Nuclear Energy National Plan” by METI \(Aug. 2006\)](#)
 - FBR cycle technology should be widely promoted for early commercialization.
 - Necessary demonstration process will be undertaken in order to build a demonstration FBR and related cycle facilities by around 2025.
 - The commercial FBR cycle system will be deployed by around 2050, and thereafter, existing LWRs at the end of their useful lives will be replaced by FBRs one by one.
- [Manifesto of the Democratic Party of Japan \(July 27, 2009\)](#)
 - Maintaining priority on safety, and steady efforts towards nuclear energy utilization will continue while obtaining public understanding and trust.
- [Minister of Education, Culture, Sports, Science and Technology](#)
 - [In an interview on his first day in MEXT \(Sep. 17, 2009\)](#)

Based on the viewpoint of maintaining a steady energy supply, the government is responsible for making efforts to promote nuclear energy utilization and its R&D, maintaining priority on safety. Nuclear fuel cycle, FBR “Monju,” and related R&D will be promoted based on this viewpoint.
 - [In an interview on Oct. 6, 2009](#)

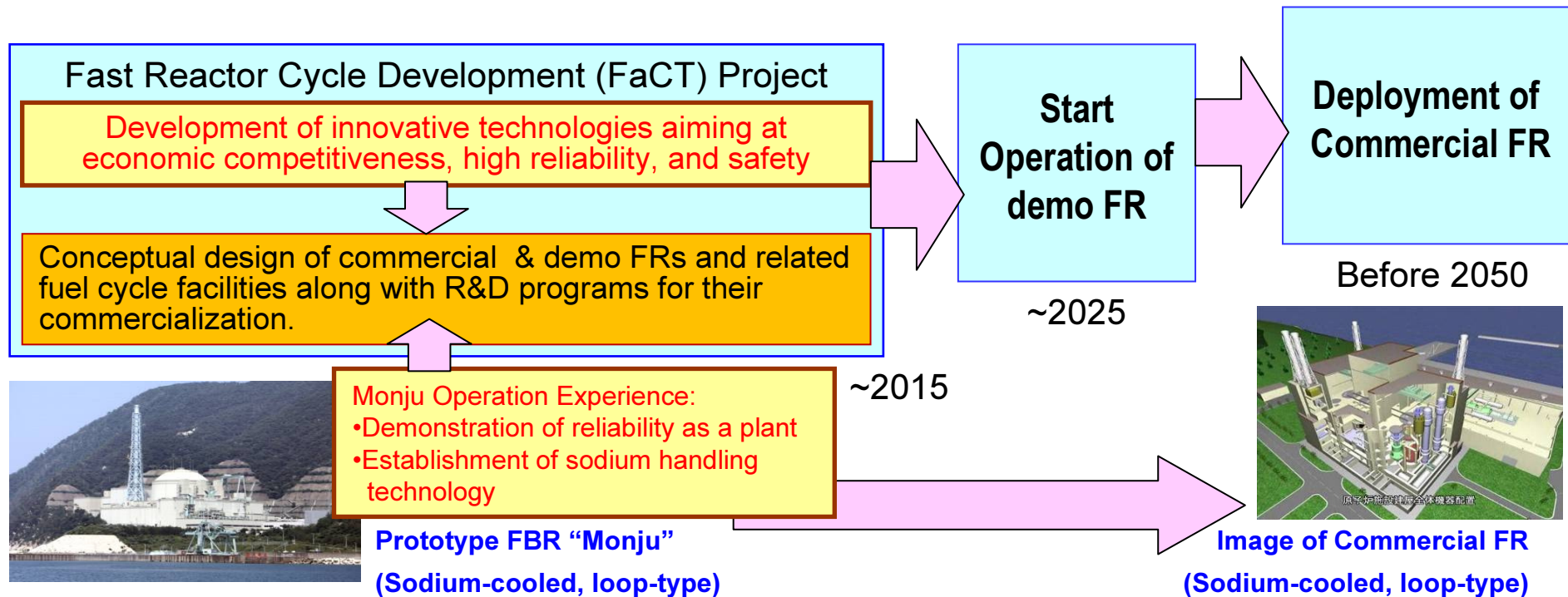
There is a considerably high that the FBR and nuclear fusion are break-through technologies that will play a role in reducing green-house gas emission by 25% compared to 1990 levels. R&D in these technologies should not be slowed down.

FBR Cycle Development Framework

Key Technology of National Importance

Deciding on R&D Promotion Policy for FBR Cycle Technology Development

Creating a Promotion Framework for FBR System Development



Toward Restarting Monju

1. Achievements

- (1) Seismic safety evaluation
- (2) Administration
- (3) Soundness check on equipment

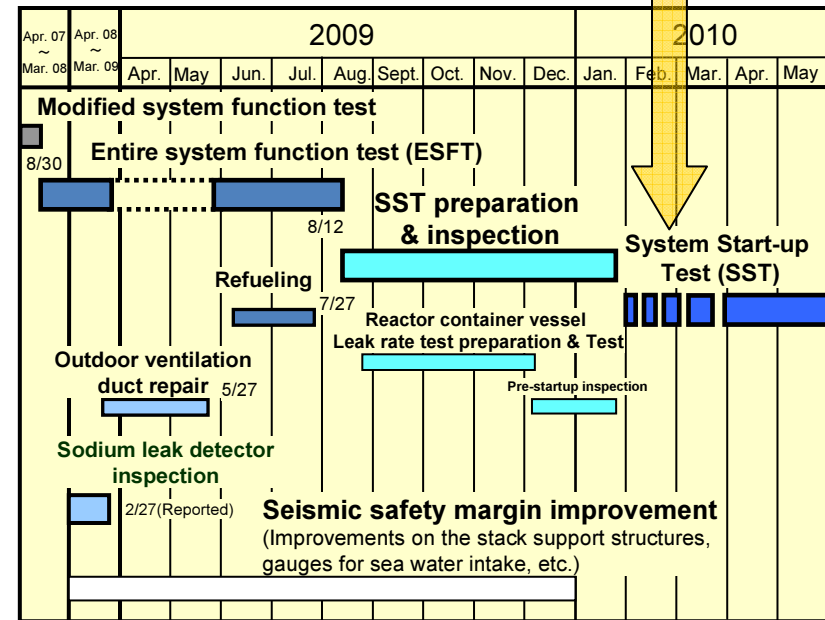


Restart by the end of
March. 2010*1

2. Schedule

<After the restart,>

- Achieves the original goals:
 - Demonstration of safe and reliable operation
 - Establishment of sodium handling technology
- Then, opens as a R&D demonstration field for propelling FBR advancement
- Contributes as an International R&D base, accepting researchers to the SST and providing facilities for joint research programs

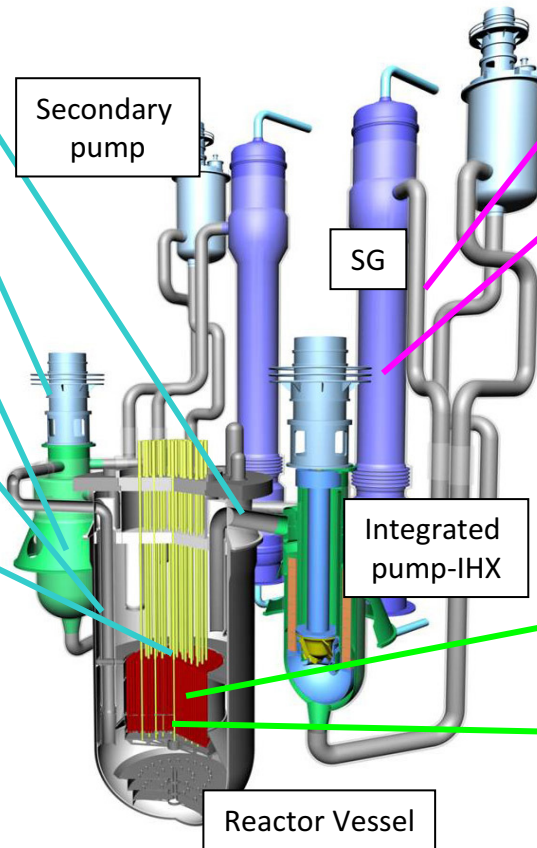


*1: Monju will restart after gaining approval from the local residents.

Innovative Elemental Technology R&Ds in the FaCT Project

Economic Competitiveness

- Reduction of Mass & Volume
 - 1) Shortened piping with high chromium steel
 - 2) Two loop cooling system
 - 3) Integrated pump-IHX component
 - 4) Compact reactor vessel
 - 5) Simplified fuel handling system
 - 6) CV with steel plate reinforced concrete building
- Long operation of high burn-up fuel
 - 7) Advanced fuel material



■ JSFR* (with MOX fuel)

Higher reliability

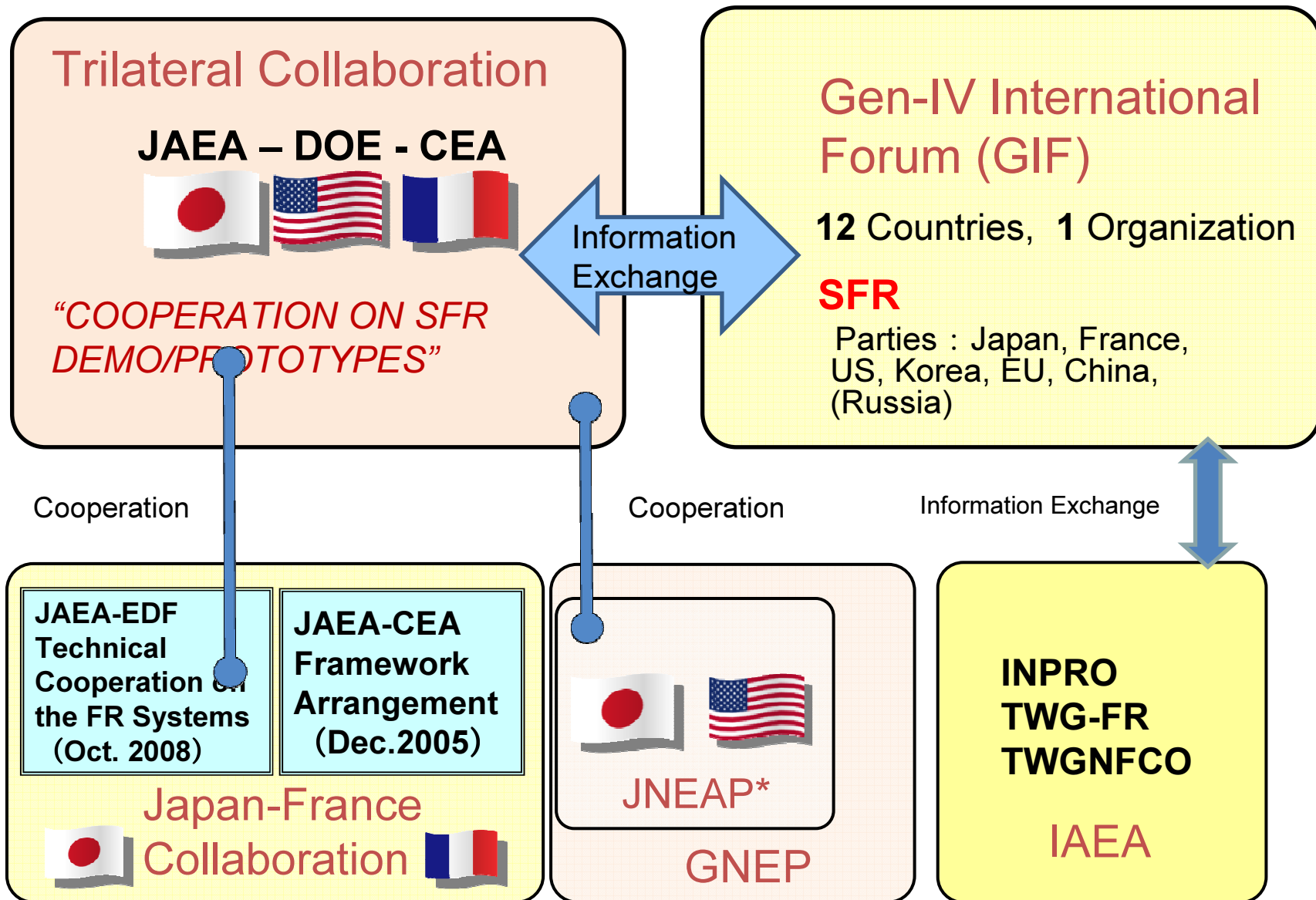
- Sodium technology
 - 1) Sodium leak tightness with double wall piping
 - 2) Higher reliable SG with double wall tube
 - 3) Higher maintenance ability inside of sodium boundary

Higher safety

- Core safety
 - 1) Passive shutdown and decay heat removal
 - 2) Re-criticality free core
- Seismic reliability
 - 3) Seismic reliability in core assemblies

* Japanese Sodium-Cooled Fast Reactor

International Collaboration



*JNEAP: US-Japan Joint Nuclear National Plan

Concluding Remarks

- The development of FBR cycle technology in Japan has advanced to a new stage of development in its main concept: Combining sodium-cooled FBR with oxide fuel and its fuel cycle system using innovative technologies.
- Preparation is in progress for “Monju” to restart by the end of March 2010. After the “Monju” restart, its operation experience will be reflected in the design study of the demonstration reactor. By conducting R&D in the “Monju” plant, the site will be promoted as an international R&D base for FBR cycle technology.
- The design study and R&D of innovative technologies are now in progress under the FaCT Project aiming at deciding the adoption of innovative technologies by evaluating their applicability in 2010, and presenting conceptual designs for commercial and demonstration facilities in 2015.
- Thereafter, the FBR cycle development project will enter the introductory stage of its first system demonstration. The demonstration FBR will start operations by around 2025.
- By around 2050, the commercial FBR cycle system will be deployed based on the experiences with the demonstration FBR cycle system.
- International collaboration plays an important role in the development of FBR cycle technology, as its development needs long-term efforts and major resources.