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Current Status of Nuclear Policy and FBR R&D in Japan

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Administrative Organizations for Nuclear Energy Policy

Cabinet Office

Atomic Energy Commission (AEC)

- Formulates the Framework of Nuclear Energy Policy
- Estimates the government budget for implementing nuclear energy policy

etc.

Nuclear Safety Commission (NSC)

- Develops guidelines for the safety of nuclear facilities
- Develops nuclear disaster countermeasures

etc.

Report

Basic policies& Guidelines

Related Governmental Organizations

Ministry of Education, Sports, Culture, Science and Technology : MEXT

•Nuclear policies on science and technology

•Nuclear Research & Development

etc.

Ministry of Economy, Trade and Industry : METI

Agency for Natural Resources and Energy : ANRI
•Nuclear policies for energy use

Nuclear and Industrial Safety Agency : NISA
•Regulation on nuclear facilities etc.

Other related ministries

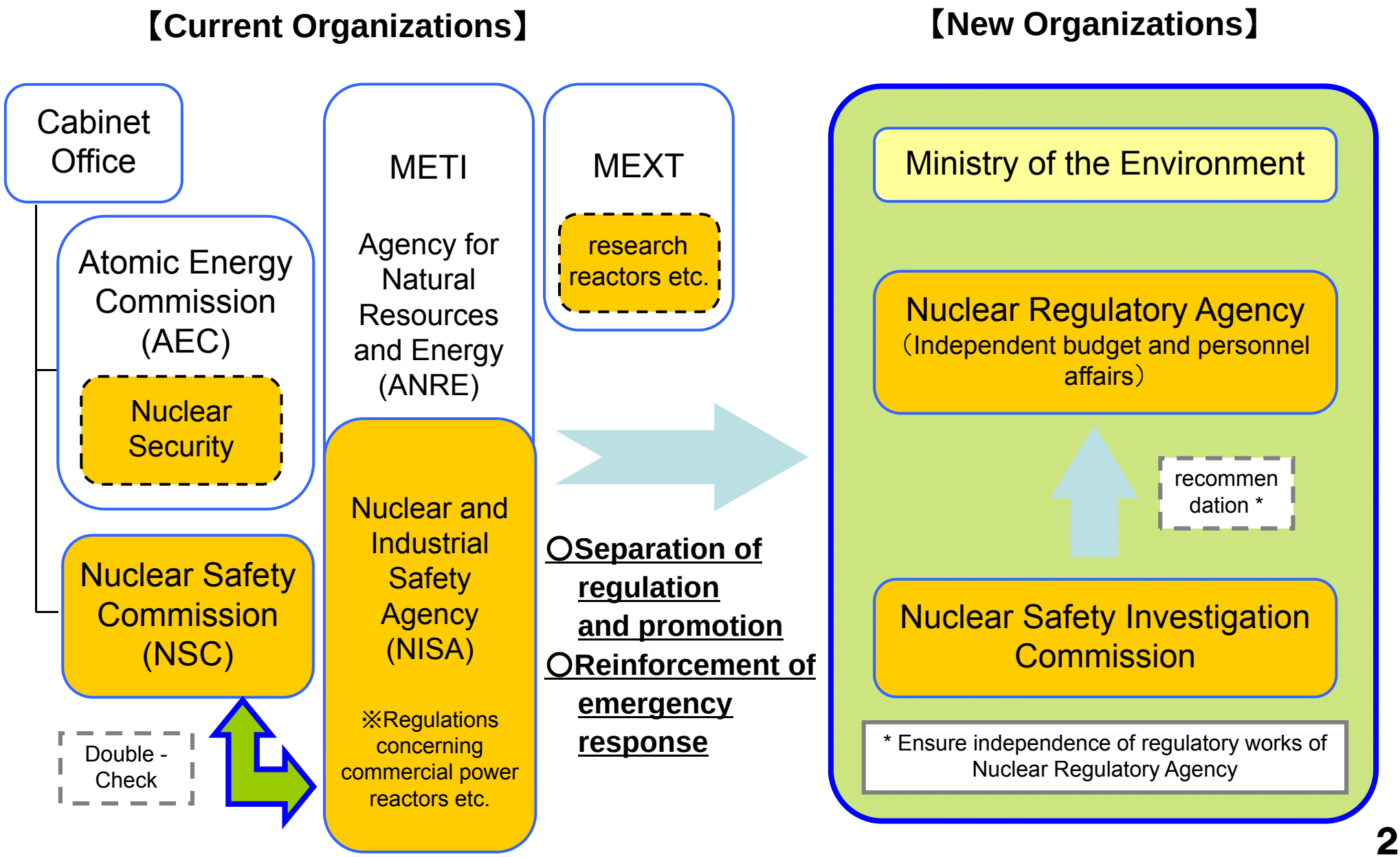
- Ministry of Internal Affairs and Communications
- Ministry of Foreign Affairs
- Ministry of Health, Labor and Welfare
- Ministry of Agriculture, Forestry and Fisheries
- Ministry of Land, Infrastructure and Transport
- Ministry of the Environment

etc.

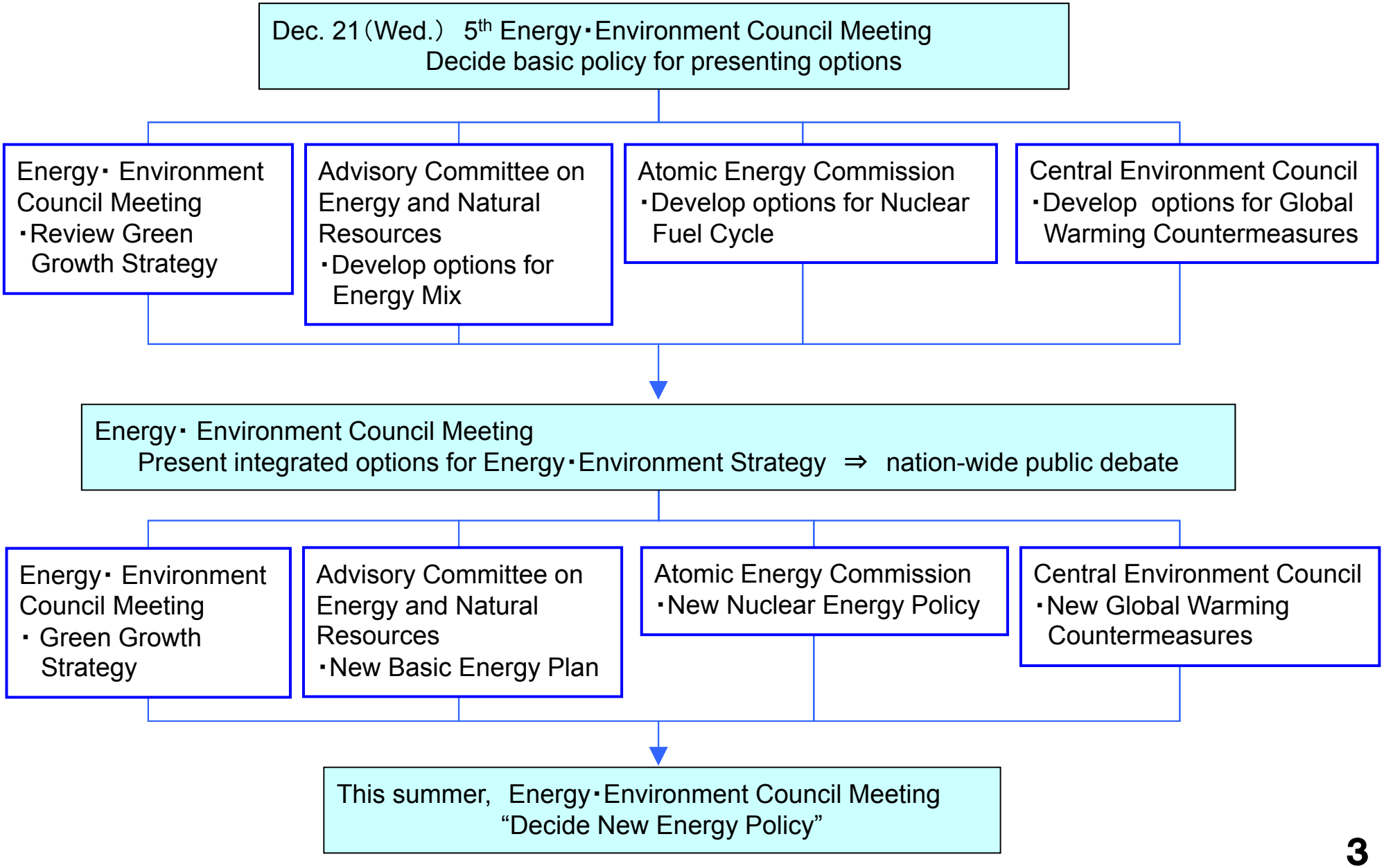
Budget

JAEA

Reform of Nuclear Safety Regulation System (Government Plan)



Reviewal of Nuclear Energy Policy

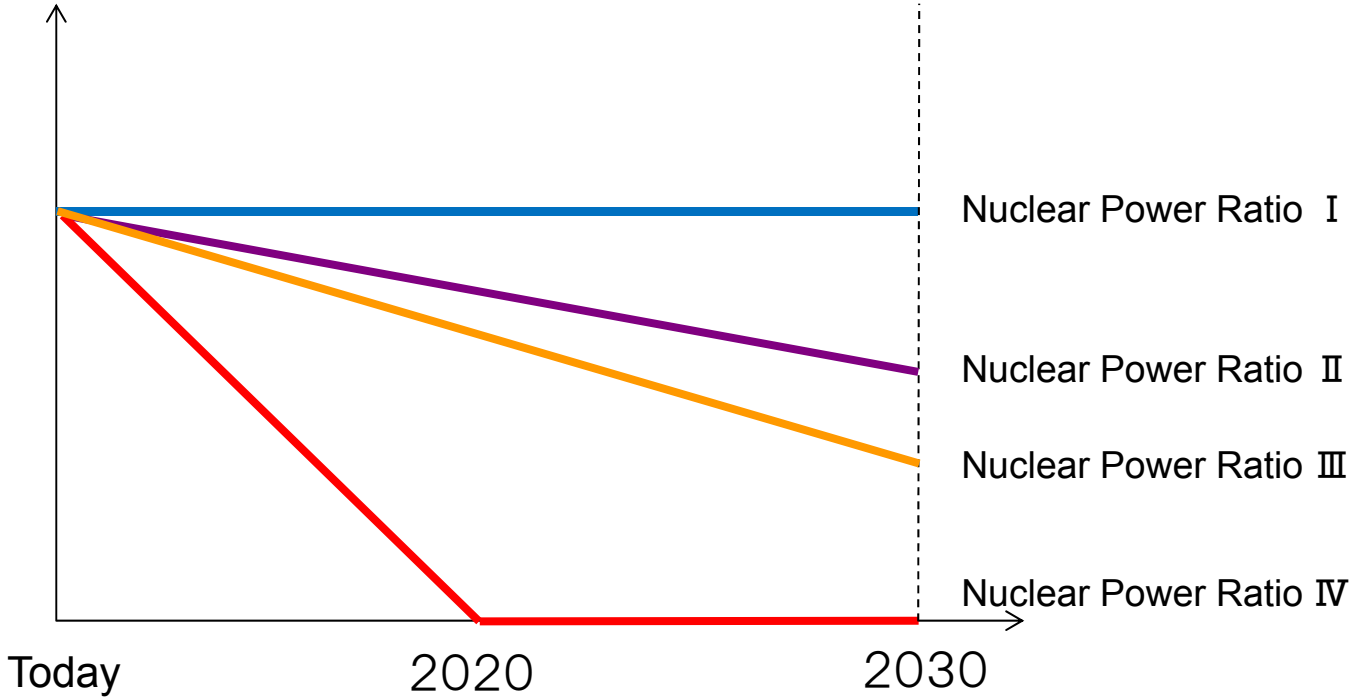


Anticipated Ratio of Nuclear Power Generation

Nuclear Power Ratio Ⅰ：Current ratio is maintained.
（Nuclear Power Ratio in 2030 is 35% →Equivalent to installed capacity 50 GW）

Nuclear Power Ratio Ⅱ,Ⅲ：Ratio is gradually reduced toward 2030.
（Nuclear Power Ratio in 2030：Ⅱ‥20%→ Equivalent to installed capacity 30 GW,
Ⅲ‥15%→ Equivalent to installed capacity 20 GW）
・Ⅱa,Ⅲa：Ratio in 2030 is maintained after 2030.
・Ⅱb,Ⅲb：Ratio is continued to be reduced after 2030.

Nuclear Power Ratio Ⅳ：Ratio is reduced to zero before 2030.
（Nuclear Power Ratio in 2030 is 0%）



Policy Option Definitions

Option 1: Full reprocessing of all nuclear spent fuels

Full reprocessing of spent nuclear fuel, which entails reprocessing all spent fuel and reusing the recovered uranium and plutonium.

Commercialization of fast breeder reactors (FBR) or fast reactors (FR) is prerequisite.

Option 2: Dual policy of reprocessing and direct disposal

Both reprocessing and direct disposal of nuclear spent fuel are kept as options.

FBRs/FRs is an option to prepare for future uncertainty.

Option 3: Full direct disposal of all nuclear spent fuels

Full direct disposal of all spent nuclear fuel, which entails direct disposal of spent nuclear fuel after a period of storage.

FBRs/FRs is not an option.

Fast Reactor Cycle R&D

< Prototype Fast Breeder Reactor "Monju" >

- Core facility in FBR cycle R&D
- R&D for the "Demonstration of the reliability as power plant" and "Establishment of sodium handling technology through the plant operation"

※This specific plan is based on the existing Basic Energy Plan and Framework for Nuclear Energy Policy

around 2025

Demonstration Plant

Commercial Plant around 2050s

Prototype "Monju"

R&D stage (National project)

Demonstration phase (private sector)

Experimental "Joyo"

FaCT project
2006~2015

< Fast Reactor Cycle Technology Development (FaCT) >

- R&D program to lay out commercialization plan and R&D roadmap until 2015 to achieve the performance goals of safety and economical feasibility as a next generation plant

< Basic research >

- Sodium handling, analytical techniques and experimental data acquisition for verification of codes, model building and database construction
- Basic research and development of advanced materials for FBR, etc.

Present candidates for FR cycle R&D plans（basic policy）

Case-1) R&D toward commercialization of FBR/FR

［Ⅰ, Ⅱa, Ⅲa+full reprocessing］

- R&D will be conducted based on existing plan.
- 10 years of Monju operation to achieve initial targets.

Case-2) Conduct R&D to judge the commercial viability of FBR/FR

［Ⅱb, Ⅲb+full reprocessing, Ⅰ～Ⅲb+ concomitant］

- Monju: Conduct 100% power operation and confirm the technical feasibility as a power plant.
- FaCT: Consider the safety measures learned from TEPCO Fukushima accident.
  Confirm the feasibility of economical and reliable FBR/FR plant by considering these safety measures.
- Judge the commercial viability of FBR/FR in accord with these two major R&D results.

Case-3) Conduct FR R&D through international collaboration, while suspending R&D for FBR/FR Commercialization

［Ⅰ～Ⅲb + full direct disposal］

- The possibilities of utilizing Monju as an international research center.

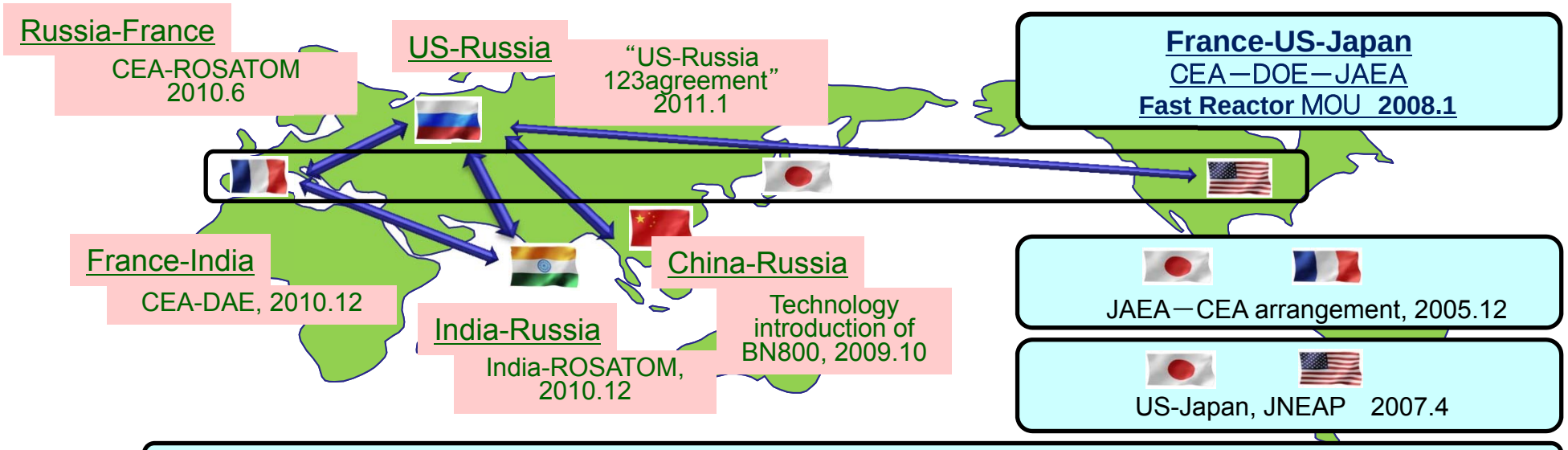
Case-4) Suspend FBR/FR R&D for commercialization

［Ⅳ+ full direct disposal］

- Suspend Monju and Fact R&D project. Continue basic research by using Joyo.
- Monju operation of a certain period might be considered in order to wrap up the project.

Status of international collaboration

- Active international collaboration aiming for the practical use of FBR/FR.
- Japan has Joyo, Monju and other R&D facilities for FBR/FR development.
- Japan is also promoting bi/tri-lateral and multilateral collaboration among the following countries.



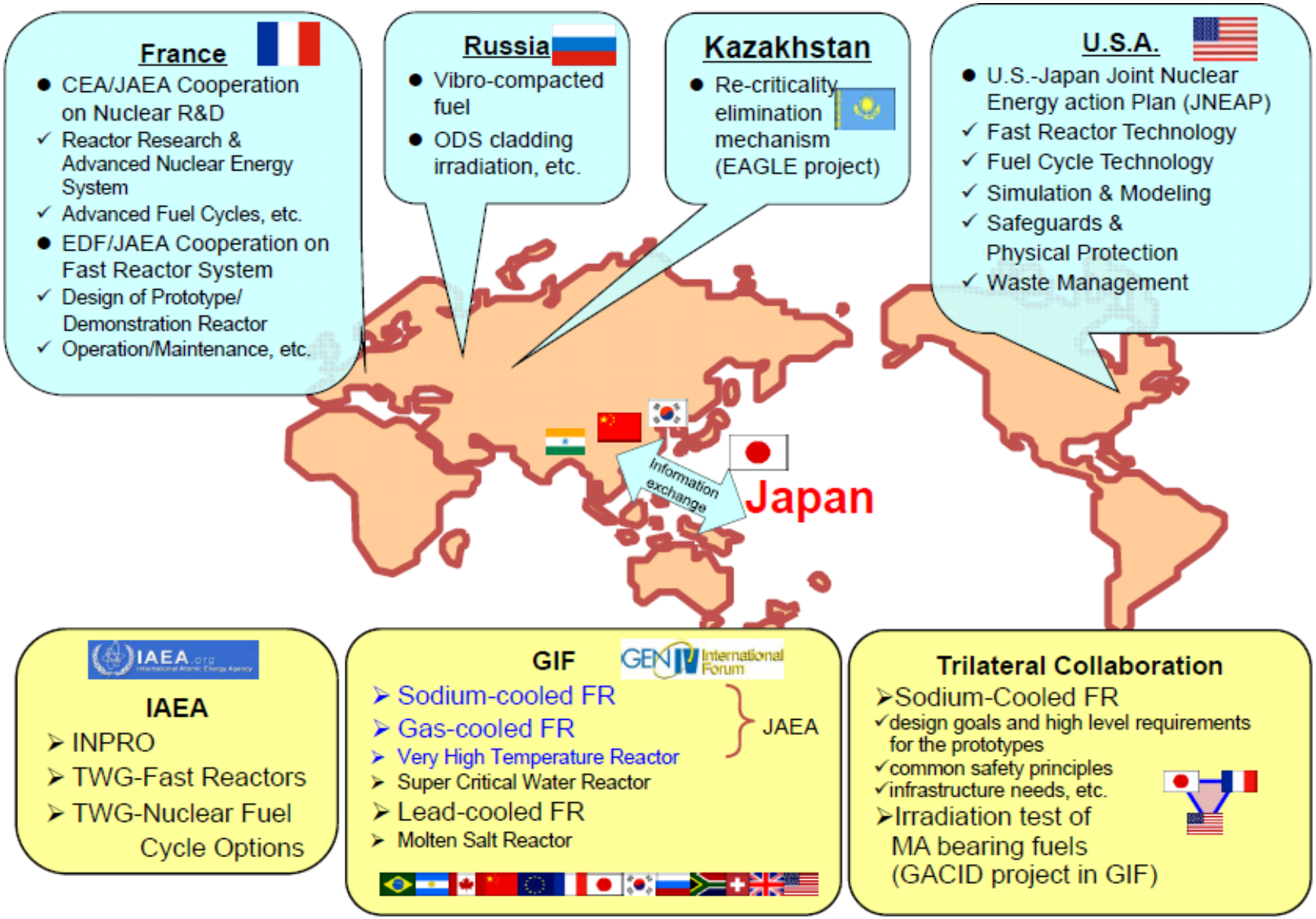
Generation-IV International Forum (GIF) "12Countries and 1 Organization"

SFR System arrangement

International Atomic Energy Agency (IAEA)

International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)
"33 countries and 1 organization"

Current international cooperation in the field of Fast Reactors

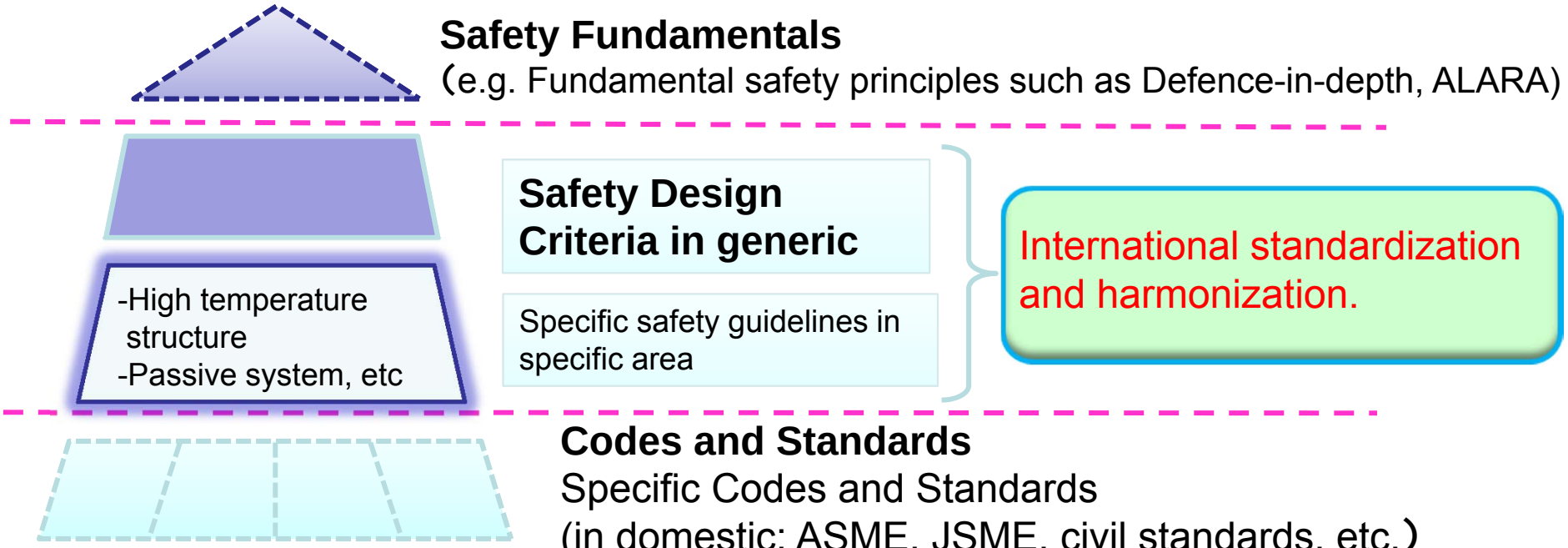


Approach toward international safety standards

■Japan proactively promotes efforts towards international standardization of the principles for ensuring safety and safety design criteria on SFRs.

■In cooperation with nations that engage in fast reactor development, Japan aims at establishing a common safety design criteria through GIF and other activities.

○ Hierarchical structure of guidelines and criteria concerning SFRs



International collaboration（Monju & ASTRID etc.）

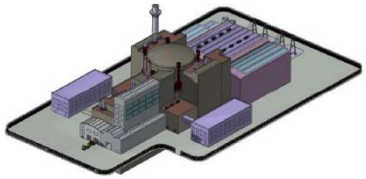
●R&D collaboration with SFR promoting countries

- Possible collaboration fields
  Information exchange, Joint research and development of equipment and systems

- Collaboration activities
  basic technologies：evaluation model, elucidation of phenomena
  element technologies：design tools, component tests
  installation：development of pump, SG, leak detector etc.
  system equipment：core, fuel, cooling system, fuel handling system
  shared use of existing facilities

e.g.） possibility of collaboration with French ASTRID program

- Collaboration by using JAEA sodium-water reaction facility and EAGLE experiments in Kazak
- Consideration of possible contribution to the element technologies and design of system equipment
- Expectation of Monju irradiation of ASTRID fuel by CEA, France.



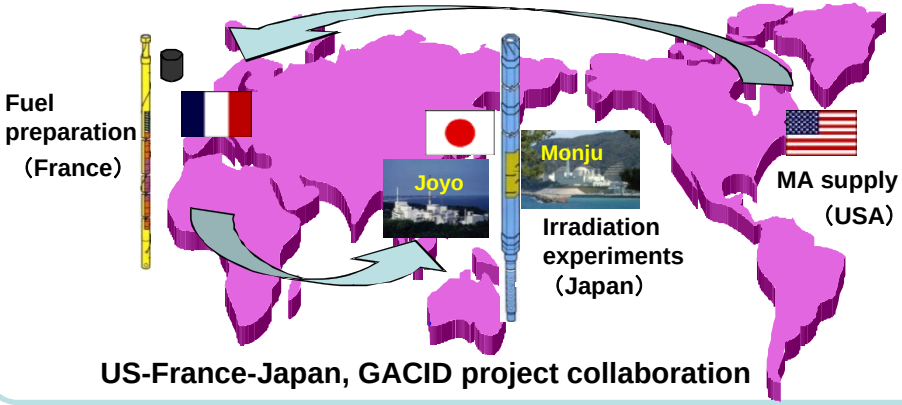
ASTRID image

Large facilities of
R&D of SFR components

e.g.）Utilization of Monju, center of excellence

GACID project, irradiation of MA fuel by US, France and Japan, (Global Actinide Cycle International Demonstration)

Recycling of Minor Actinides (MA) from HLW as FR fuels will contribute to the reduction of wastes and better strategy for the non-proliferation policy.



US-France-Japan, GACID project collaboration

e.g.）Collaboration with US and France

Wide range collaboration in the field of basic research

- ●Basic R&D field
  Safety, System arrangement, advanced materials, Instrumentation, ISI&R, operation experience, thermal hydraulics, neutronics, component design and fabrication
- ●Shared utilization of existing facilities
- ●Advanced fuels