

Promoting Nuclear Innovation

Through Multi-layered International Cooperation among Public and Private Sectors

Nuclear Energy x Innovation Promotion (NEXIP) Program

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Nuclear Energy in the 5th Strategic Energy Plan (2018)

Towards 2030 : Achievement of Optimal Energy-Mix Target

Nuclear is an important baseload power source

- Safety first. Only when approved by NRA's strict safety reviews, NPPs will restart.
 - With a principle of minimizing dependence on nuclear, achieving 20-22% nuclear by 2030.
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Towards 2050 : Challenges for Energy Transition/De-carbonization

Nuclear is one option for energy de-carbonization

- Need to strengthen human resources, technologies and the industrial base
- Pursue safe, economically efficient and flexible reactor systems and development of back-end technologies

Discussion on 6^h Strategic Energy Plan has kicked off (Oct. 2020)

Potential Needs for Nuclear Technology R&D

Safety

- Updating safety standards, e.g. against natural hazards
- Passive safety features, including those of inherent characteristics

Non-proliferation

- Strengthened security
- Responding to the demand from emerging countries

Radioactive Waste Management

- Long-term reduction in volume and toxicity-level of high-level radioactive wastes

Flexibility/Mobility

- Adaptation to a new energy market situation in which renewables constitute a majority
- Distributed/mobile power sources

Multi-purpose Use

- Various nuclear power applications; e.g. hydrogen production and heat utilization

Economic Efficiency

- Capital cost reduction innovation
- Continuous improvement of existing technologies, e.g. shortening construction periods

Japan's Initiative to Accelerate Nuclear Innovation

NEXIP : **N**uclear **E**nergy × **I**nnovation **P**romotion

Japan's initiative to help accelerate the development of innovative nuclear technologies in the private sector through funding support, access to R&D facilities and human resource development efforts.



1. Funding Support for R&D (Cost-shared Program)

- Feasibility studies of new reactor design concepts
- Associated technologies (e.g. safety, digital technologies, new types of fuels)

2. Access to R&D Facilities/Resources

- JAEA research facilities, reactors, and databases
- Collaboration with universities and the international communities

3. Human resource development

Pursuing Competition among Various Technologies

- Through **NEXIP** and other programs, METI supports various types of nuclear reactor technologies including **international cooperation projects**.
- The Japan Atomic Energy Agency (JAEA) possess **important test facilities**.

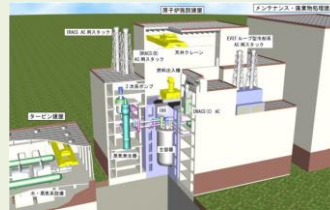
Small Modular LWR

- Smaller size, modular type
- Passive safety
- ➔ ✓ Affordable capital cost
- ✓ Smaller EPZ



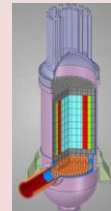
Fast Reactor

- Sodium-cooled reactor
- Fast neutrons
- ➔ ✓ Effective use of resources
- ✓ HLW management



High Temperature Gas-cooled Reactor

- Helium gas-cooled reactor (chemically stable)
- Coated particle fuel
- Very high temperature
- ➔ ✓ Heat/hydrogen use
- ✓ Smaller EPZ



France



Fast reactor R&D cooperation based on simulations and experiment

U.K.

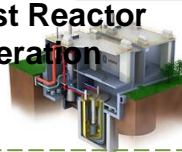


High-temperature Gas-cooled Reactor

U.S.



Versatile Test Reactor (VTR) cooperation



International Cooperation



Jojo:
Experimental Fast Reactor



HTTR:
Experimental HTGR

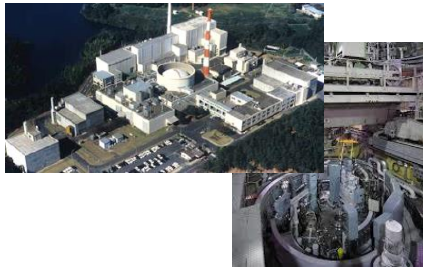
JAEA's Facilities



Japan's Contribution to VTR project

- *Versatile Test Reactor (VTR) is a unique project targeting fast reactor construction in western nuclear countries.*
 - *MOC was signed between METI/MEXT-DOE in June 2019.*
- *Japan will contribute in several key areas, based on*
 - *Expertise & technologies on sodium experiments, and*
 - *Designs, fabrications, and constructions of Joyo and Monju*

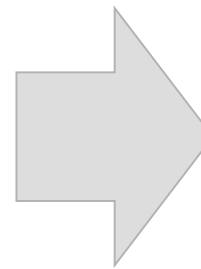
Joyo & Post-Irradiation Facility



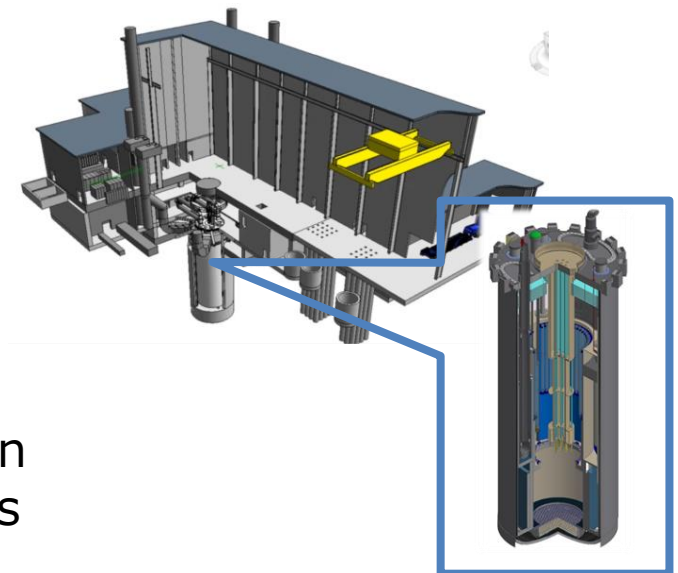
Monju & Sodium Facility



Large-scale facilities for demonstration



VTR



+ In-kind contribution on designs

Conclusions

- *Advanced reactors have the potential to address future needs besides de-carbonization such as enhanced safety, flexibility, radioactive waste management, etc.*
- *Japan, among other countries, encourages competition among various advanced nuclear technologies through its cost-shared support program.*
- *METI supports:*
 - *Joint efforts by JP-US private companies to develop innovative reactors under NEXIP program, and*
 - *R&D collaboration by JAEA-INL/ANL on the VTR project, as well as potential contributions by private companies, based on the designs, fabrications, and constructions of Joyo and Monju reactors.*

Thank you for your attention!

