METI
Ministry of Economy, Trade and Industry

Overview of Strategic Energy Plan including Nuclear Energy

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Nuclear Energy in the 6th Strategic Energy Plan (2021)

The path of the energy policy to realize carbon neutrality by 2050

Necessary amount of nuclear power will be continuously utilized on the major premise of ensuring safety and public trust

- All options will be pursued to realize carbon neutrality by 2050 with striving to maintain global competitiveness and restrain national burden by securing stable and cost-efficient energy supply

Policy responses towards 2030 looking ahead to 2050

The Government will follow NRA's judgment and will proceed with the restart of the nuclear power plants

- Restart of operation with safety as top priority
- Development of fast reactor will be steadily promoted by utilizing international cooperation
- Small modular reactor technology will be demonstrated through international cooperation
- Component technologies related to hydrogen production at high temperature gas-cooled reactor will be established
- R&D of nuclear fusion will be promoted through international collaboration such as ITER Project

6h Strategic Energy Plan was approved by the Cabinet (Oct. 2021)

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

Multi-purpose Use

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

Flexibility/Mobility

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

Economic Efficiency

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

Japan's Initiative to Accelerate Nuclear Innovation

NEXIP : Nuclear Energy × Innovation Promotion

A new initiative to help accelerate the development of innovative nuclear technologies through funding support, access to R&D facilities and human resource development efforts.

METI Ministry of Economy, Trade and Industry

MEXT Ministry of Education, Culture, Sports, Science and Technology-Japan

JAEA Japan Atomic Energy Agency

Funding Support to R&D (Cost-shared program)

- New reactor design concepts
- Accompanying technologies (e.g. safety, digital technologies, new fuels)

Access to R&D Facilities

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

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

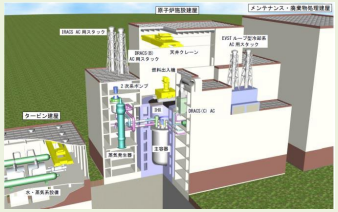
➡ ✓ Affordable capital cost
✓ Smaller EPZ*

*:Emergency Planning Zone

Fast Reactor

- Sodium-cooled reactor
- Fast neutrons

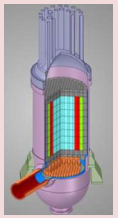
➡ ✓ Effective use of resources
✓ HLW** management



**:High-level Radioactive Waste

High Temperature Gas-cooled Reactor

- Helium gas-cooled reactor (chemically stable)
- Coated particle fuel
- Very high temperature



➡ ✓ Heat/hydrogen use
✓ Smaller EPZ

International Cooperation

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

JAEA's Facilities

Joyo:
Experimental Fast Reactor

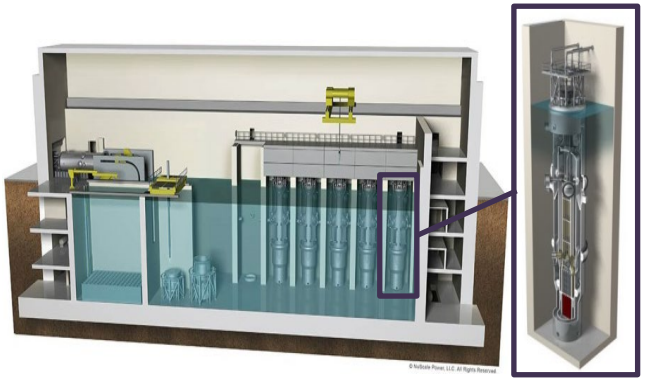
HTTR:
Experimental HTGR

Examples of Funding Support for SMRs

- US and Japan cooperate in SMR development, and NuScale SMR and BWRX-300 are going ahead, which try to start commercial operation by the end of 2020s.
- NEXIP supports initiatives in collaboration with overseas projects aiming to start operation by the end of the 2020s at the earliest including NuScale, BWRX-300.

[NuScale SMR]

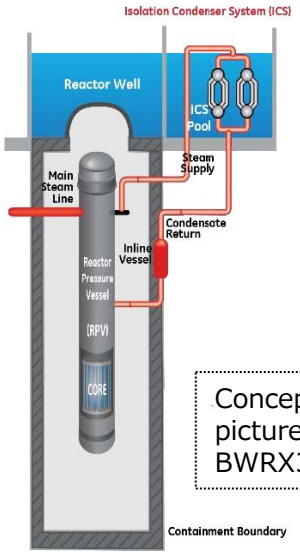
- NuScale is developing PWR based SMR.
- Japanese companies (JGC, IHI) also decided to investment in NuScale in April and May.
- Challenges related to modules, maintenance equipment, etc. will be demonstrated through Japan-U.S. cooperation.



Conceptual picture of NuScale SMR

[BWRX-300]

- Hitachi-GE is a joint-developer of GEH's BWRX-300, a BWR-type 300MWe SMR, and supports GEH for its Canadian opportunity.
- Hitachi-GE is planning to perform thermal-hydraulic tests under actual temperature and pressure conditions by using their facility to confirm natural circulation analytical models.

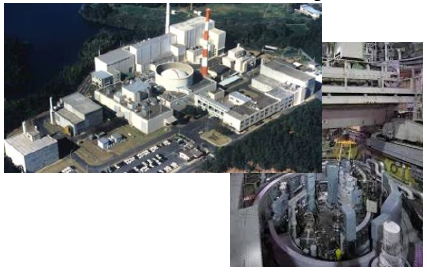


Conceptual picture of BWRX300

Japan's Contribution to U.S. Fast Reactor Development

- *Versatile Test Reactor (VTR) is an important experiment reactor which can utilize fast neutrons.*
  - *MOC was signed between METI/MEXT-DOE in June 2019.*
- *Japan is discussing cooperation with TerraPower's Natrium reactor.*
- *Japan will contribute in several key areas, based on*
  - *Expertise & technologies on sodium experiments, including Large-scale sodium experimental facility for demonstration (AtheNa), and*
  - *Designs, fabrications, and constructions of Joyo and Monju*

Joyo & Post-Irradiation Facility

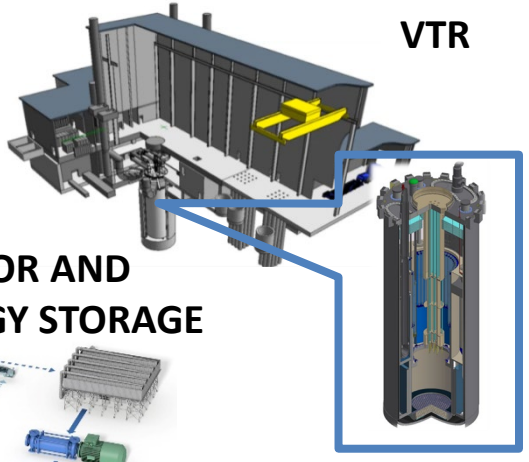


Monju & Sodium Facility

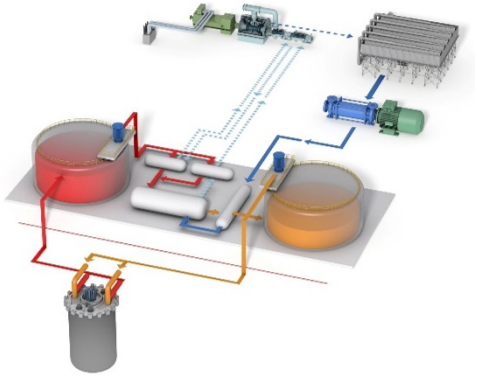
AtheNa

+ In-kind contribution on designs

VTR



NATRIUM™ REACTOR AND INTEGRATED ENERGY STORAGE



Conclusions

- *The 6th Strategic Energy Plan outlines a path for energy policy to achieve "carbon neutrality by 2050" and GHG emission reduction targets.*
- *Through NEXIP and other programs, METI supports various types of nuclear reactor technologies(SMR, Fast Reactor, HTGR) including international cooperation projects.*
- *US and Japan proceed cooperative development in SMRs which try to start commercial operation by the end of 2020s.*
- *Japan will contribute in R&D collaboration on U.S. sodium cooled Fast Reactors(VTR, Natrium reactor) based on Japan's technology.*

Thank you for your attention!