



Current Status and Safety of Monju

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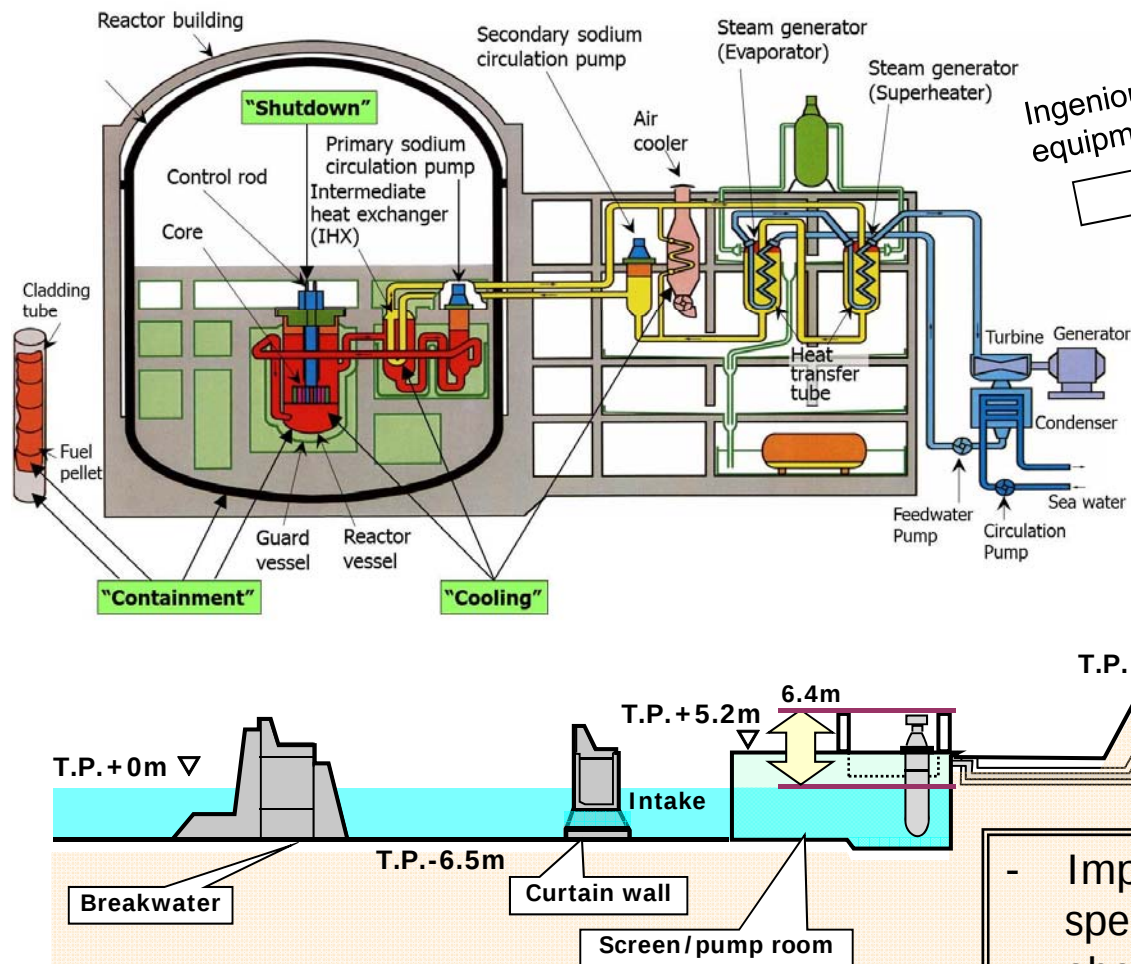
**Fast Breeder Reactor Research and
Development Center (Monju)
Japan Atomic Energy Agency**

- » *Monju re-started in May 2010, after 15-year stoppage since the sodium leak in 1995. The first-step startup tests (zero power) were completed.*
- » *Plant restoration from some troubles has been finished, including a recovery of the in-vessel transfer machine that was accidentally dropped.*
- » *The second-step startup tests (40% power) are being suspended until a decision is made on a direction of a new Framework for Nuclear Energy Policy and a new Basic Energy Plan.*
- » *Safety improvement measures, both hardware and software, have been installed, based on lessons from the accident at the Fukushima-Daiichi NPPs, similarly to LWRs in Japan.*
- » *It is important to take advantage of safety features specific to a sodium-cooled fast reactor system, such as low pressure system and good heat transfer characteristics.*



Monju Restarted on May 6, 2010

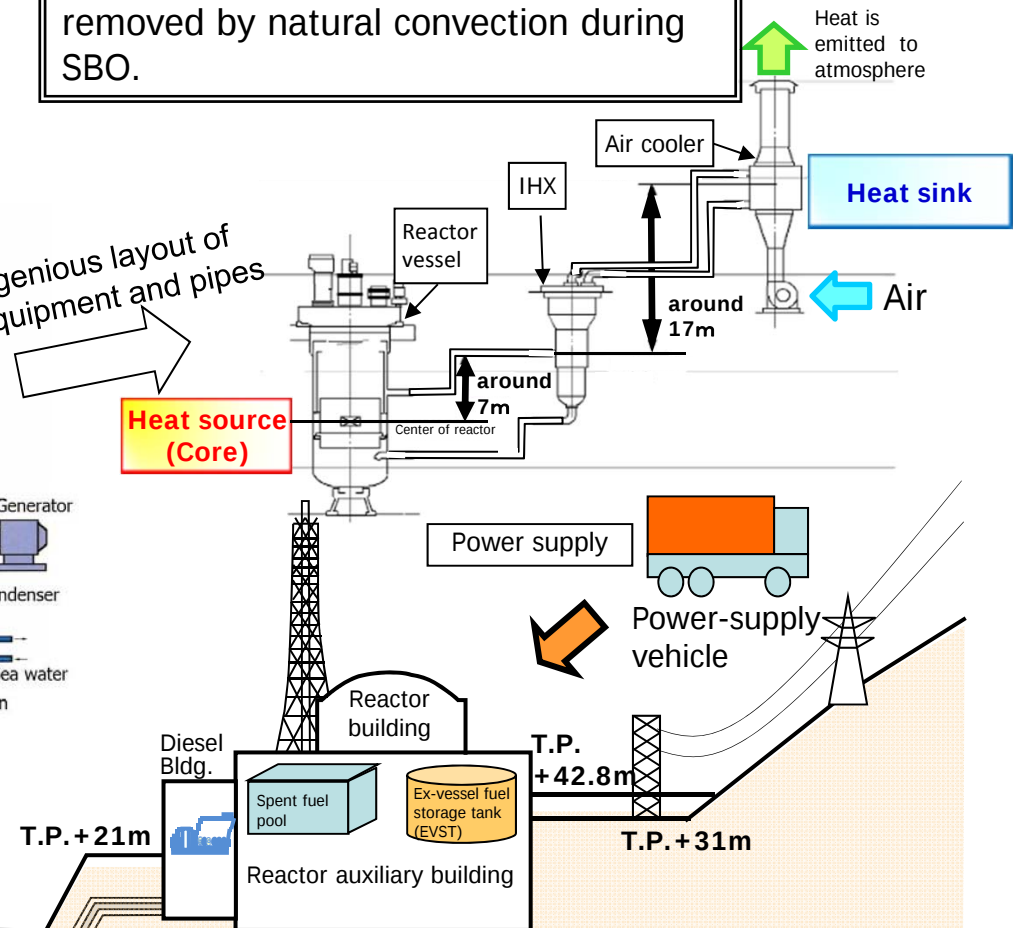
After the Fukushima-daiichi accident, additional safety measures, similar to LWRs in Japan, have been employed in Monju as well, considering the design differences.



After reactor shutdown, decay heat is removed by natural convection during SBO.

Ingenious layout of equipment and pipes

Heat source (Core)



- Important facilities, including sodium systems and spent fuel storage facility are located at 21m above sea level. .

: A current scope of license of Light Water Reactor and Monju

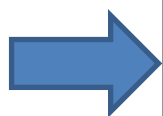
	DBE	BDBE (Severe Accidents)
LWR	Abnormal transient during operation & Accidents	PSA and Accident management (Licensees' voluntary)
Monju	Abnormal transient during operation & Accidents	PSA and Accident management (Licensees' voluntary) Subsection 5 events* ➤ ULOF ➤ UTOP PSA includes SA sequences such as PLOHS and LORL, as well.

SA sequences specific to FBRs

- Not most reactive core configuration
- Potential for recriticality and mechanical energy release
- Rapid accident progression into core melt

SA sequences similar to LWRs

- Slow accident progression under decay power heating condition
- A large margin for accident management and operator actions



*Historically these are typical (hypothetical) core disruptive accidents and have been one of the key safety issues in many of the fast reactor plants in the world. The discussions are underway in Japan to revise the laws and regulations to explicitly specify SA measures.

- Certain categories of severe accidents were considered in the design and licensing procedure of Monju. We have evaluated that the plant design has a sufficient safety margin to accommodate the accident consequences. In this context, we may be able to state the safety approach of Monju is consistent to a proposed approach of Gen-IV reactor systems.
- After 3.11 Fukushima-Daiichi accident, we have re-evaluated the plant dynamics under a long-lasting station blackout condition and confirmed that the natural-convection mechanism can effectively and stably remove the core decay heat under the various conditions, through low-pressure sodium circuits to air, which is the ultimate heat sink. This inherent safety feature commonly provided in SFR systems, together with an elevation of the site (21 m above sea level), would make Monju invulnerable to Fukushima-type tsunami-induced severe accident.
- Although Monju has taken the measures against severe accidents practically, we have to prudently take the lessons learned from Fukushima. For this reason, we have install additional safety measures, both hardware and software, especially to further improve accident management procedures and to provide diverse and redundant electric power supply, similarly to LWR plants.

- It is important to confirm the demonstrate the effectiveness of safety features designed and installed in an actual plant through its operation. We plan to conduct a natural convection heat removal experiment using Monju as a part of our future system startup tests. This means Monju can be of international interest among our SFR partners.
- Achieving a higher level of safety in future SFRs requires to reflect experiences in design and operation with SFRs that have been built. Therefore the experiences in Japan with Monju, including the post-Fukushima severe accident measures and evaluation of their effectiveness, will provide a valuable knowledge base for future SFRs.