

Thorium Energy Alliance Conference
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MSR is safe for Fukushima accident?

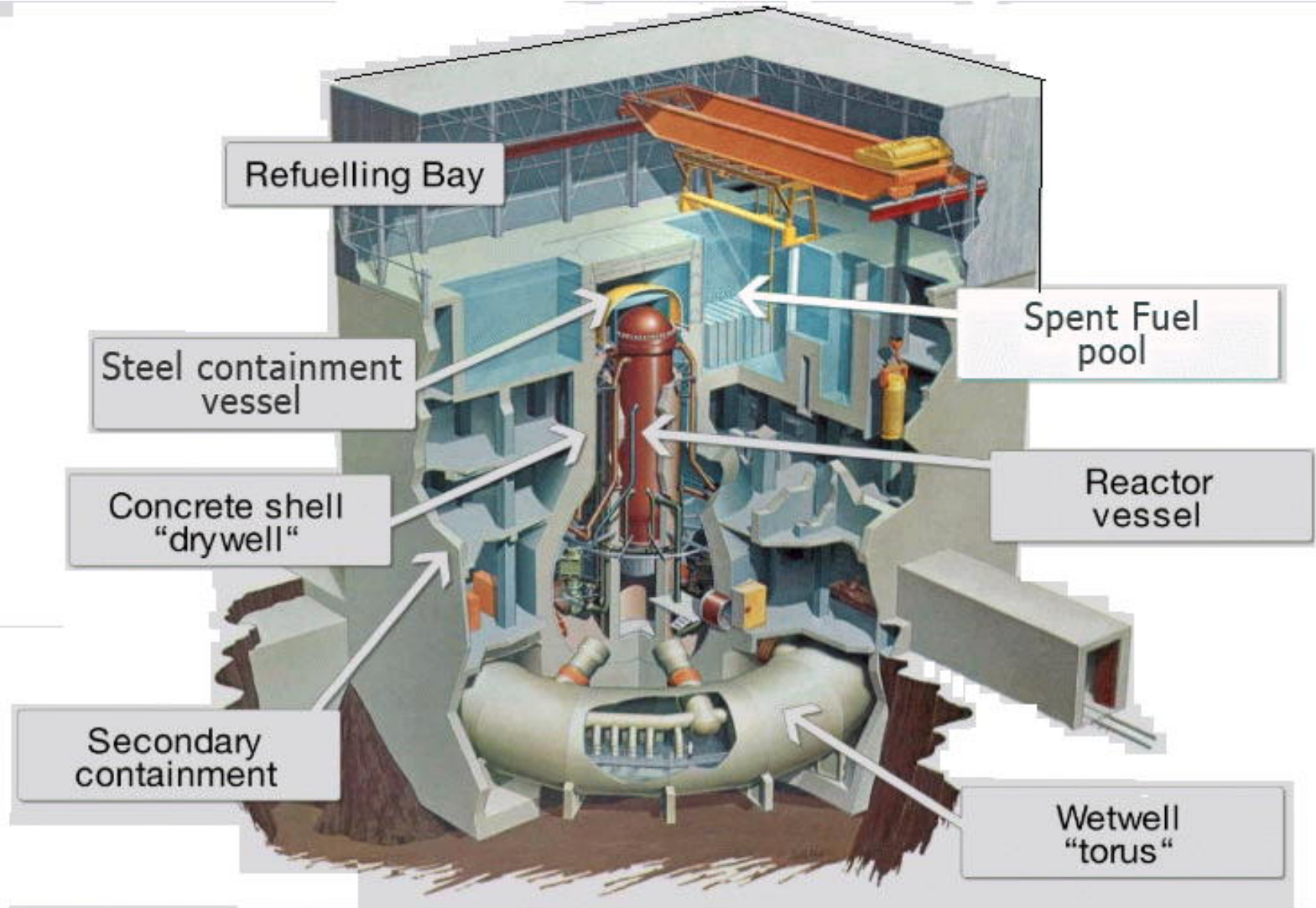
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<http://msr21.fc2web.com/English.htm>



Fukushima BWR



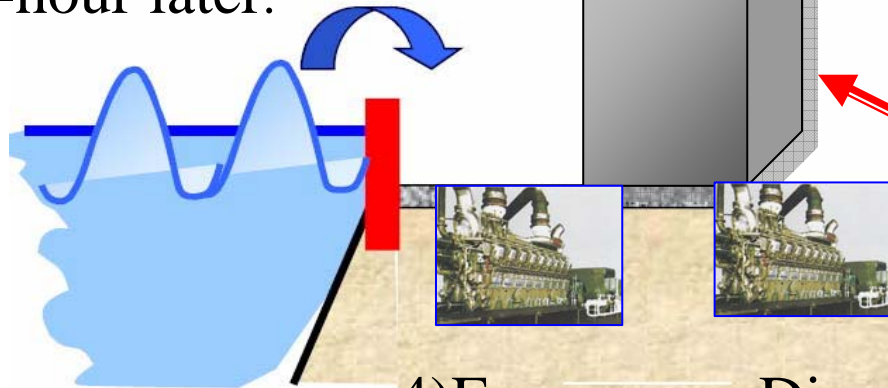
Fukushima accident



1) Huge earthquake on March 11th.



3) Tsunami attacked 1-hour later.



2) All reactors succeeded scram, but External Power Supply stopped.



4) Emergency Diesel Generator failed.

▪ **Station Black Out.**
⇒ **No Core cooling**

(ECCS was useless) 📢

What happened next

- 1) Generation of steam
- 2) Overpressure at reactor vessel
- 3) Overpressure at Containment vessel

- 1) Dry-out of core fuels
- 2) High temperature in fuels
- 3) Fuel failures
- 4) Oxidation of cladding tubes
- 5) Generation of hydrogen gas
- 6) Hydrogen gas explosion

- **Fuel failure**
- **Overpressure**
- **Hydrogen explosion**



Hydrogen explosion (photo on March 20)



Fukushima No.4	No.3	No.2	No.1
Hydrogen explosion at top floor	Hydrogen explosion at top floor	Hydrogen explosion at suppression pool (:wetwell)	Hydrogen explosion at top floor

There were no fuels at the core of No.4 plant.
But, due to the loss of cooling at spent-fuel pool, same phenomena occurred.

▪ **Spent fuel risk**



Other concerns

Other concerns	at Fukushima
Subsequent hydrogen explosion	Not occurred
Core melt-down	Not occurred
Steam explosion	Not occurred
Re-critical accident	Not occurred
Radio-activity release	Level-7 (10% of Chernobyle)



MSR is safe against Fukushima accident?(1/2)

What happened at Fukushima accident	MSR is safe?
Earthquake	Seismic design is required. Simple structure makes easier.
Tsunami	Countermeasure is required as LWRs.
Station Black Out	Long-time cooling is common issue for any plants, due to decay-heat removal difficulty.
No Core cooling	ECCS is not required.
Fuel failure	No damage for heat/irradiation etc.
Overpressure	No water in primary system
Hydrogen explosion	No water. No Zirconium
Spent fuel risk	Drain-tank is also safe as the core.



MSR is safe against Fukushima accident? (2/2)

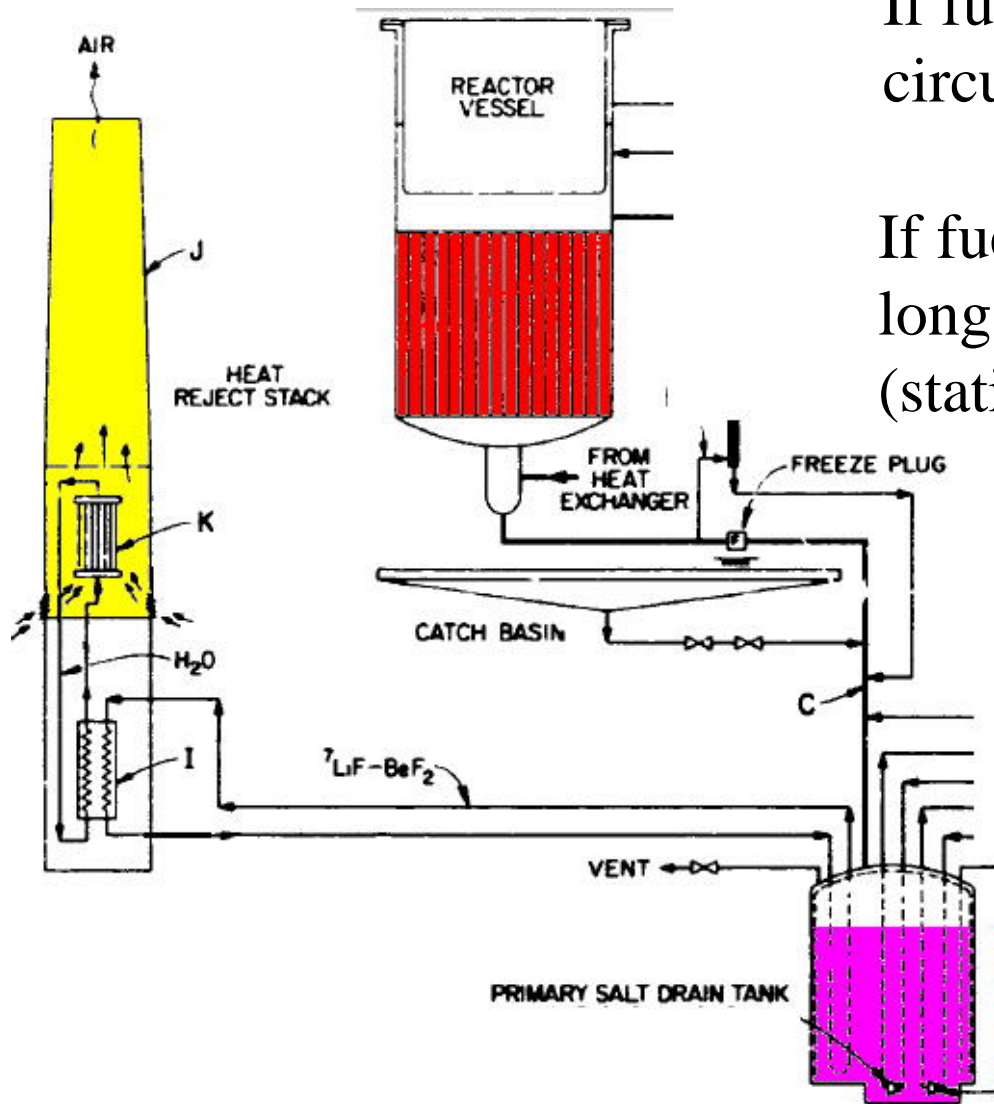
Other concerns at Fukushima accident	MSR is safe?
Subsequent hydrogen explosion	No water. No Zirconium
Core melt-down	Core can be cooled anytime.
Steam explosion	No water near the core
Re-critical accident	Impossible at drain-tank (no graphite moderator)
Radio-activity release	Fission product gas is removed. Essentially impossible, except external attack.



Countermeasure for long-time cooling

If fuel salt stays at core, natural circulation is possible.

If fuel salt is drained to the drain-tank, long-time cooling by passive system (static system) is required.



MSBR drain-tank cooling

Static heat removal by Filbe loop, and to water loop, and to the air cooling tower.



Conclusion

MSR looks safe for Fukushima accident, based on a first-glance study.

So, MSR can show the significant advantages.

But, of course, absolute safety does not exist.

For example, there are some risks on how we can establish a design for earthquake or terrorist attack.

So, we have to study more.



Thank you for the attention!

Please send questions/comments to
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