

# Nuclear Cycle issues ROK and Japan

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# Japan's nuclear power policy

- Zero Nuclear Power by the end of 2030's

- Continuation of Reprocessing

Rokkasho reprocessing plant start-up schedule: Oct 10, 2013

Capacity: 8 tons/year

# Japan's Fast Breeder Reactor Policy

- 1956 Best suited to Japan's conditions
- 1961 Indispensable if a self-reliant system is chosen
- ....

# Japan's AEC breeder goal moving away

1961	1970s	15
1967	1985-90	23
1972	1985-95	23
1978	1995-2005	27
1982	2010	28
1987	2020s-2030s	38
1994	2030	36
2000	flexibly and steadily	
2005	2050	45

# Result of reprocessing policy and FBR failure

- Accumulation of plutonium
  - Theft → Nuclear terrorism
  - An example to be used by other countries → proliferation
  - Suspicion about Japan's intention → tension in Asia

# Japan's separated plutonium

- As of the end of 2011:44 tons

Enough for **5,500** Nagasaki type bombs

Total:44, 254 kg

In Japan:9, 295kg

Overseas total:34,959kg

- UK: 17,028kg
- France:17,931kg

The plan to consume plutonium as MOX fuel in Light Water Reactors is not working.

# Result of reprocessing policy and FBR failure (2)

- No preparation for spent fuel storage
  - Dangerous dense packing at pools like Fukushima
  - Pressure for starting reprocessing at Rokkasho just to secure the destination of spent fuel

# Danger of dense-packed pools

- Fukushima made the danger of dense storage in pools clear

Pool at Fukushima Daichi #4



Tepeco

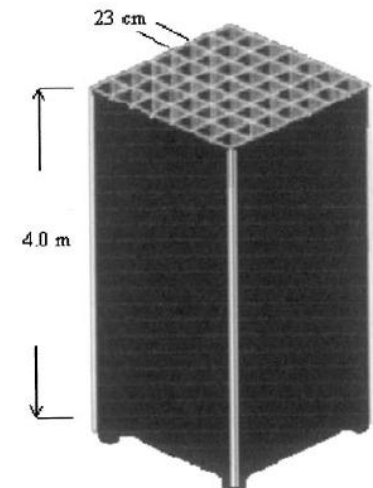
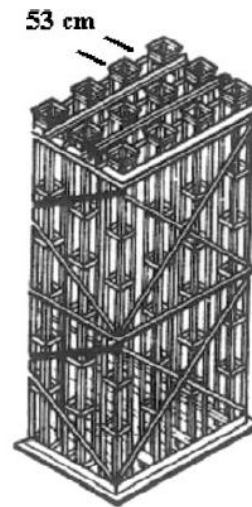


Figure 7: Open and dense-pack PWR spent-fuel racks (Sources: Left: NUREG/CR-0649, SAND77-1371, 1979; right: authors).



# Warning of 9/11 ignored

Solution: Dry storage

Nuclear Regulation Authority Chair  
Tanaka is advocating dry storage

# Most countries with nuclear power plants use dry cask storage (Frank von Hippel)



U.S. Connecticut Yankee (old picture)



Lingen NPP, Germany



Neckar-Westheim, Germany



# Fukushima dry storage

- A dry storage facility (completed in August 1995)
- 9 casks, 408 assemblies
- Permission: 20 casks, 150 tons



# Fukushima dry storage after Tsunami



# Tokai Plant #2

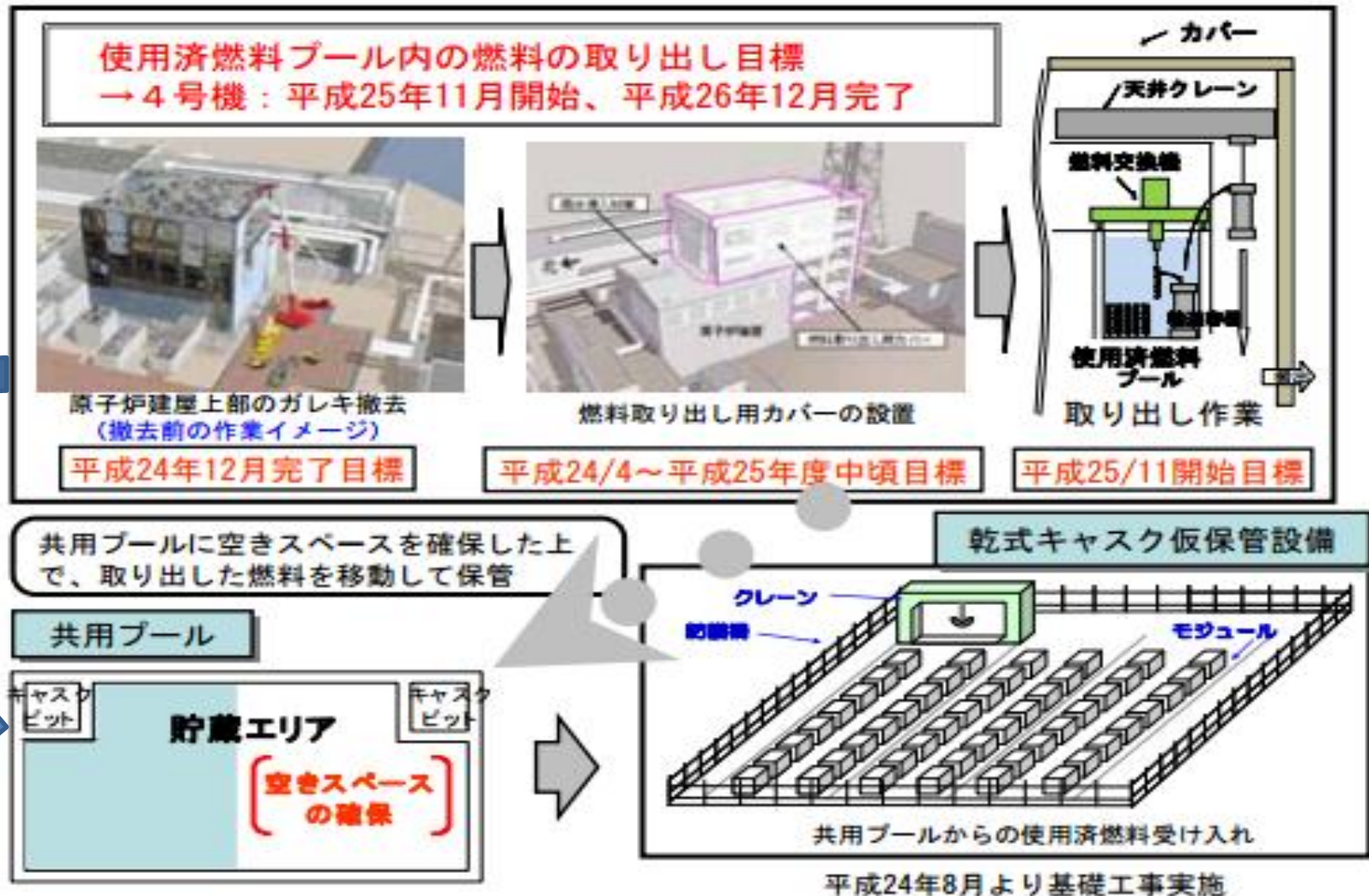
Capacity: 24 casks (61 assemblies in each) ,about 250t

Presently:17 casks (2 empty)

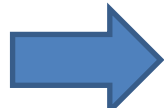


# Fukushima Diichi #4 pool plan

[http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/m121203\\_08-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/roadmap/images/m121203_08-j.pdf)



Joint use pool

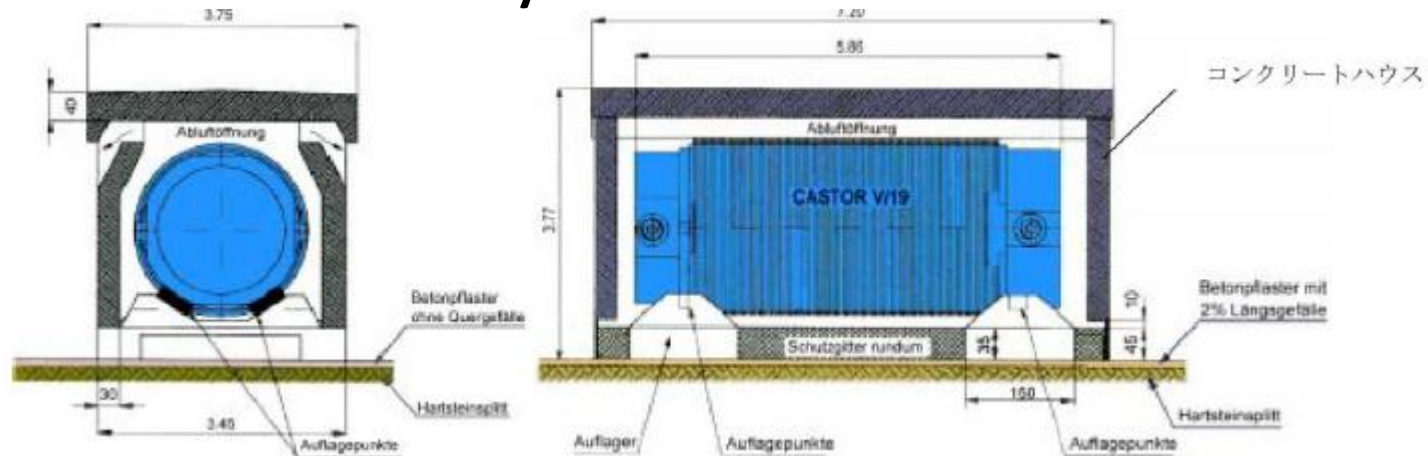


Temporary dry cask storage under construction

# Temporary storage facility in Germany built in 1-2 months

Japan Nuclear Energy Safety Organization report, 2011

- License for 5 years



# Fukushima pools are dangerous

- So are others
- Way to go: dry storage at power plant sites for safety reasons.
- This would also alleviate the pressure for starting the Rokkasho reprocessing plant



# ROK policy on reprocessing

- Rational for Korean Reprocessing: Pools will become full starting 2016
- The current agreement of nuclear cooperation with US expires on March 19, 2014
- Negotiation for a new agreement:
- Since Japan is “allowed”, ROK should also be allowed to have reprocessing (and enrichment) facilities

# Problem with ROK's position

1992 Joint Declaration of North and South Korea  
on the Denuclearization of the Korean Peninsula  
“No enrichment, no reprocessing”

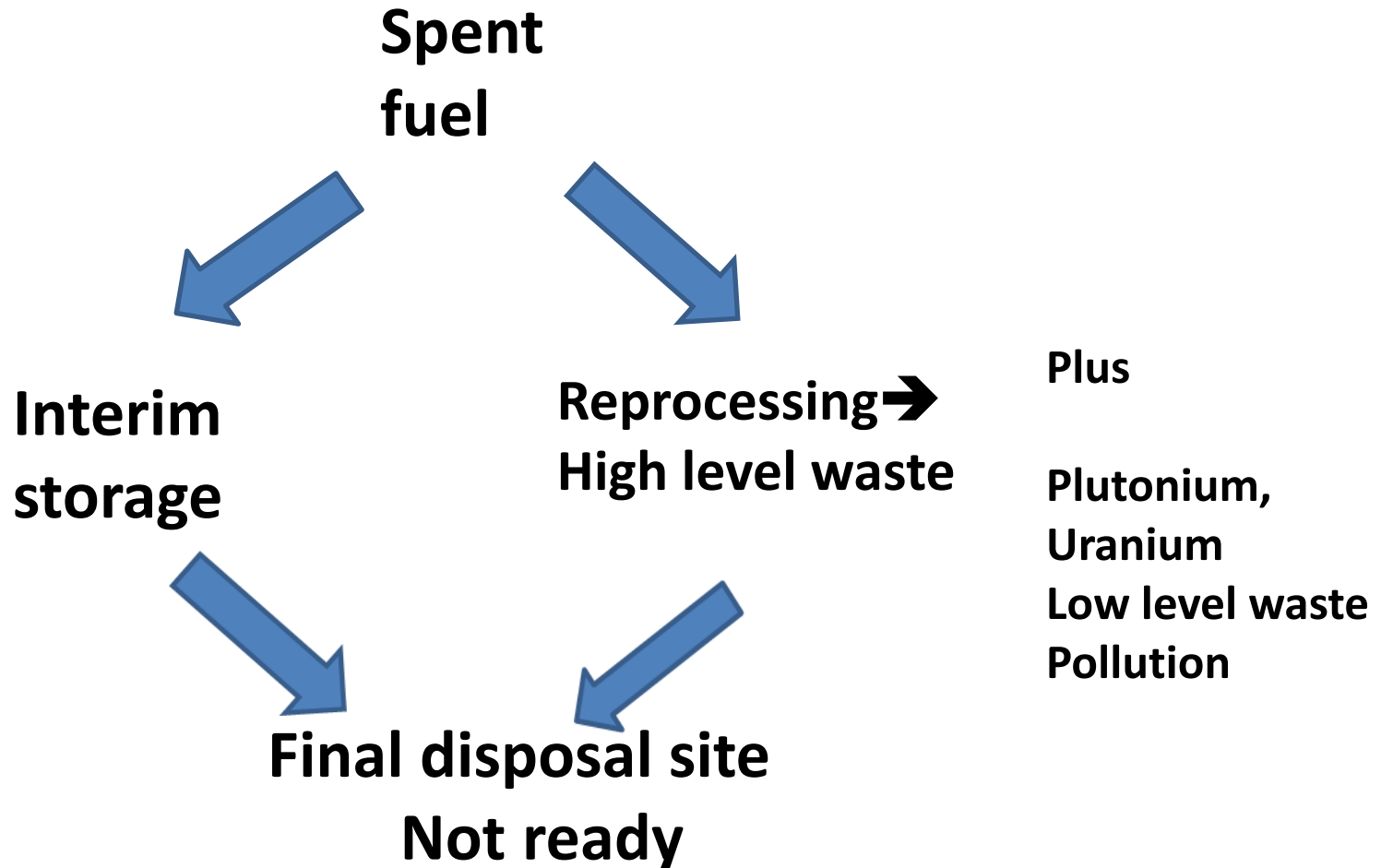
Solution?:

Pyroprocessing is NOT reprocessing,  
is “proliferation resistant”

(Japan's reprocessing is bad for non  
proliferation)

US is resisting.

# Reprocessing not solution for final disposal



**Pyroprocessing will not be ready in 2016**

# Separated civilian plutonium could threaten nuclear disarmament (IPFM)

