

**Univerza v Ljubljani
Fakulteta za matematiko in fiziko**

Jedrska tehnika in energetika

Fukushima rehabilitation

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Major steps in Fukushima clean-up

- Damage inspection
- Water treatment
- Water drainage
- Debris removal
- Securing reactor buildings
- Cleanup of neighboring areas



Damage inspection

- High concentration of hydrogen
- Preventing hydrogen explosions -> Nitrogen
- Inspecting 2. reactor containment vessel
- Inspection of suppression chambers
- Measuring temperature, radiation levels, ...

Water treatment

- Contaminated seawater
- Several filtering systems :
 - Landysh
 - AREVA/Kurion system
 - SARRY

Filtering systems

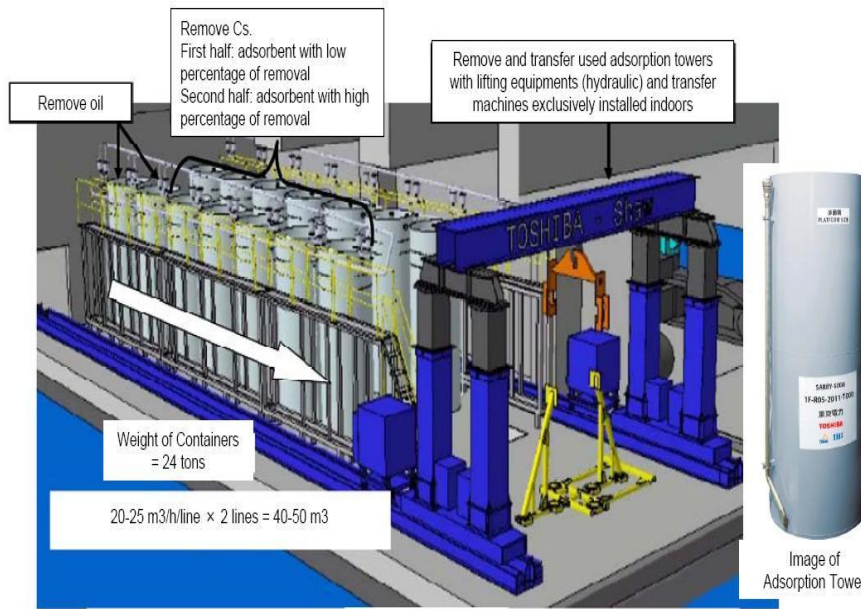
July 14, 2011

Tokyo Electric Power company

Simplified Active Water Retrieve and Recovery System (SARRY)

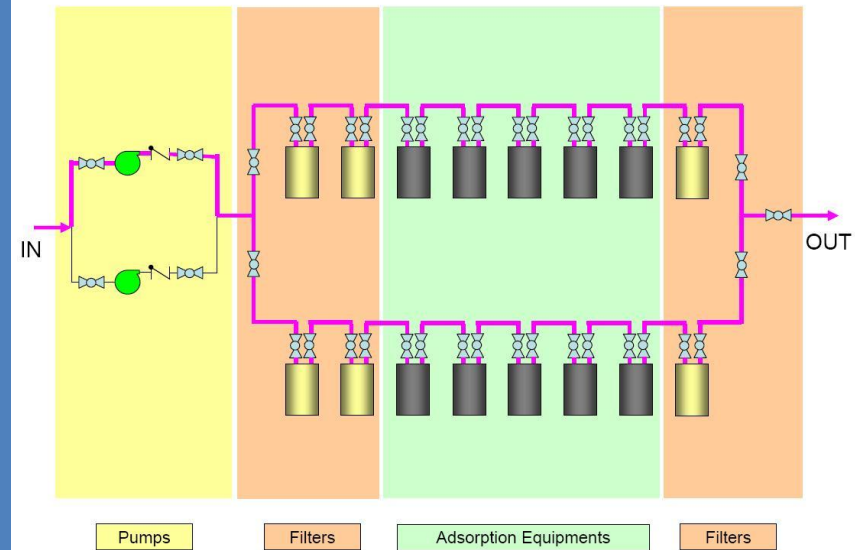
【Objective】 To improve stability and redundancy of the water treatment system

【Features】 Simplified system. Streamlined with lead shield.



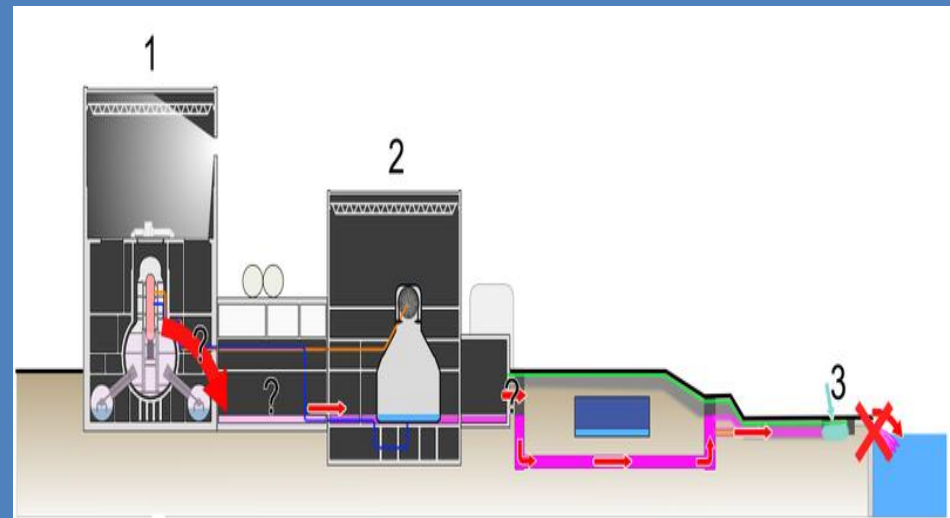
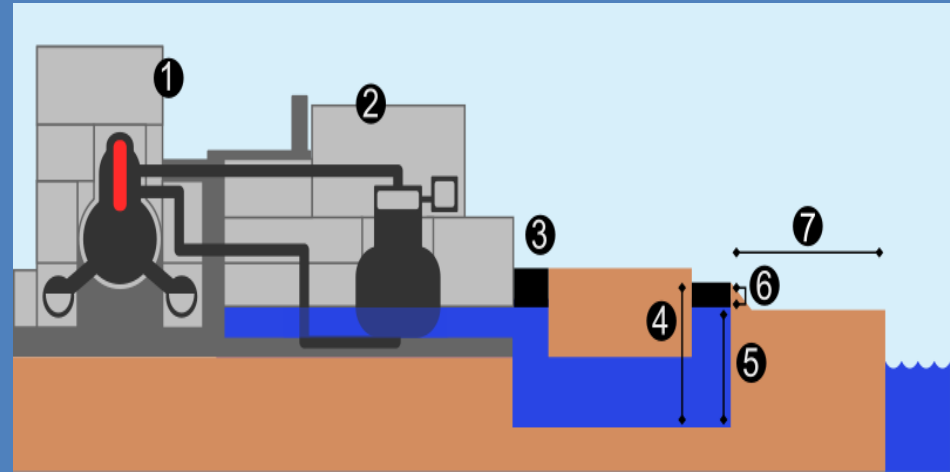
System Image

Overview of Cesium Removal System (SARRY)



Water drainage

- Water leaked from reactor buildings to basement
- Some water leaked into the sea
- Solutions :
 - pumping water
 - repairing cracks
 - underground wall



Debries removal

- Debries were removed with remote controlled vehicles

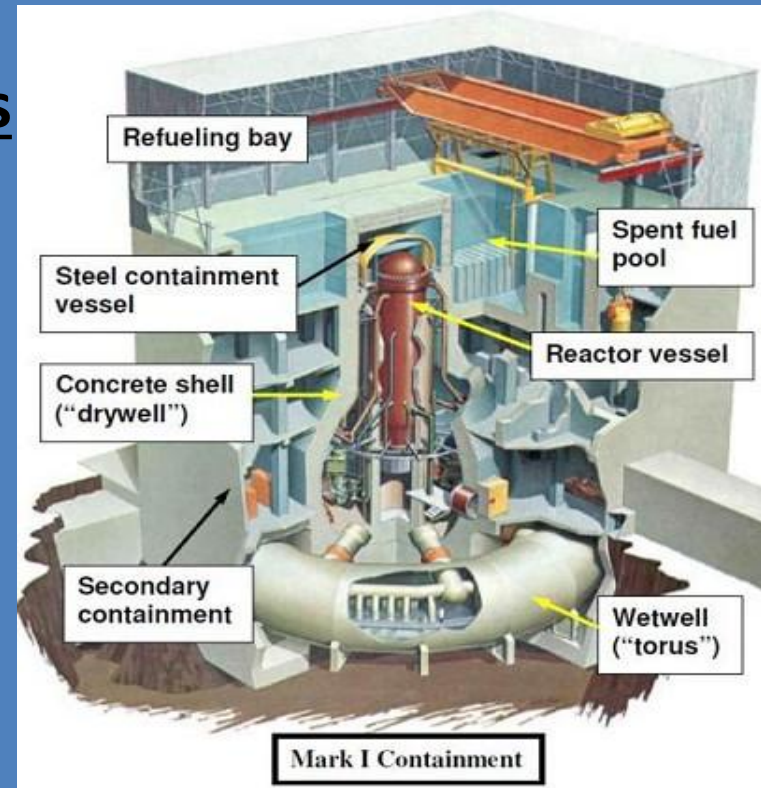


Securing reactor buildings

- Reactor will be scrapped
- At least 30 years
- Containment vessels will be repaired and filled with water
- Removal of spent fuel from reactor core
- Removal of melted fuel

Securing reactor buildings

- Fuel removal from storage pools
- **Current situation**
 - Salt water in pools of reactor buildings 2-4
 - Debris in pool of reactor building 3
 - Monitoring water quality
- **Removal work**
 - Improving water quality
 - Clearing of debris
 - Installing covers (against wind and rain)
 - Inspecting existing equipment
 - Removing undamaged fuel with existing equipment



Securing reactor buildings

- Removing damaged fuel with new equipment and placing it in new barels
- Clearing common pool
- Removing salt from fuel
- Transporting fuel from damaged pools to onsite commen pool
- Monitoring conditions in common pool
- **Possible problems**
 - Rubble scattering and posible high levels of radiation
 - Installation of covers
 - Problems with common pool
 - Damaged fuel

Securing reactor buildings

- **Fuel removal from reactors**
- **Current situation**
 - 1496 containers of fuel
 - Fuel -> fuel debries
 - Meltdown
 - Coolant is leaking
- **Removal work**
 - High levels of radiation
 - Removal of debries
 - Inspection of leaks
 - Repairing of cracks

Securing reactor buildings

- Filling lower part of reactor with water
- Monitoring conditions
- Determining composition and distribution of fuel debris
- Repairing upper part of the reactor
- Filling up entire containment building with water
- Removal of steam separators and other equipment
- Removing damaged fuel after 10 years
- Removing melted fuel 10 – 15 years
- Safe storage and processing (removing salt) of damaged fuel
- Complications with waste management

Securing reactor buildings

- **Disassembly of reactor facilities**
- Similar to known methods
- Complete plan is not yet formulated
- Estimated time for the whole process 30 -40 years

Cleanup of neighboring areas

- All surrounding areas with radiation level above 1 millisievert/year will be decontaminated
- Areas with high level radiation will be cleaned in stages
- Most areas will be cleaned by local authorities except “no-entry” zones which fall under government responsibility