

# Regarding the integrity of the spent fuel pool at unit4

July.24.2012

TEPCO Nuclear power & Plant siting division

Defueling strategy group

Masaru Oura



東京電力

---

## Regarding the integrity of the spent fuel pool at unit4

1. Confirming state of the spent fuel pool integrity
2. Integrity investigation of fresh fuel

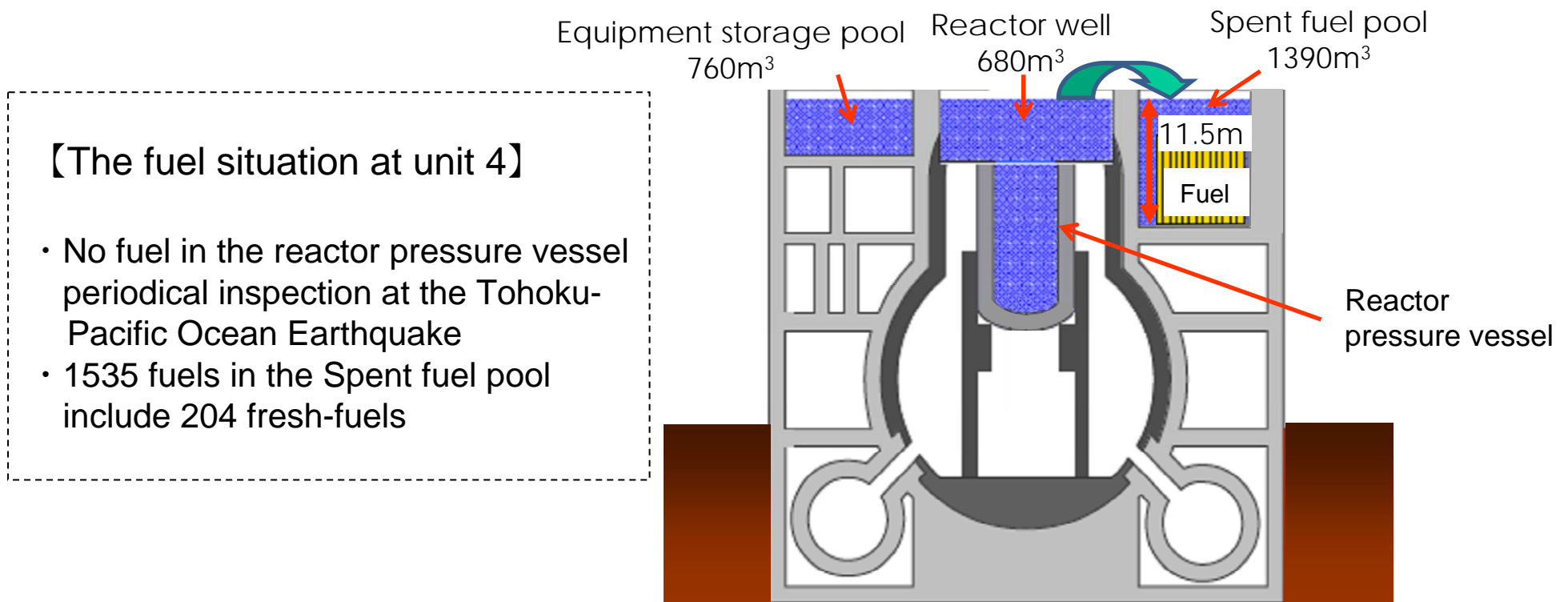


# 1. Confirming state of the spent fuel pool integrity

- (1) The spent fuel pool at unit4
- (2) The present situation of the spent fuel pool at unit4
- (3) The outline of the investigation of the spent fuel pool at unit4
- (4) The result of the investigation of the spent fuel pool at unit4
- (5) The water quality of the spent fuel pool at unit4

# (1) The spent fuel pool at unit4

- On and after Mar. 17, 2011, each unit including unit4 was supplied with water using a water-cannon vehicle, a fire engine, a concrete pump vehicle, etc..
- Since unit4 especially had been shutdown for outage, the reactor well water level was full. It is presumed that the reactor well water flowed into the spent fuel pool as a result of the lowered water level in the spent fuel pool, and that the fuel in the pool was not exposed and was not damaged according to the decay heat evaluation etc..



## (2) The present situation of the spent fuel pool at unit4

### ■ Leakage prevention monitoring at the spent fuel pool

- In order to detect leakage from the spent fuel pool rapidly, ① Water level monitoring in the skimmer surge tank, into which the water from the spent fuel pool flows continuously, are being performed , ② Pool water level monitoring by a temporary water level indicator (Remote monitoring from the seismic isolated building by the gauge set up in the pool).
- Until now, neither water leakage nor abnormal change in the pool water level has been found.

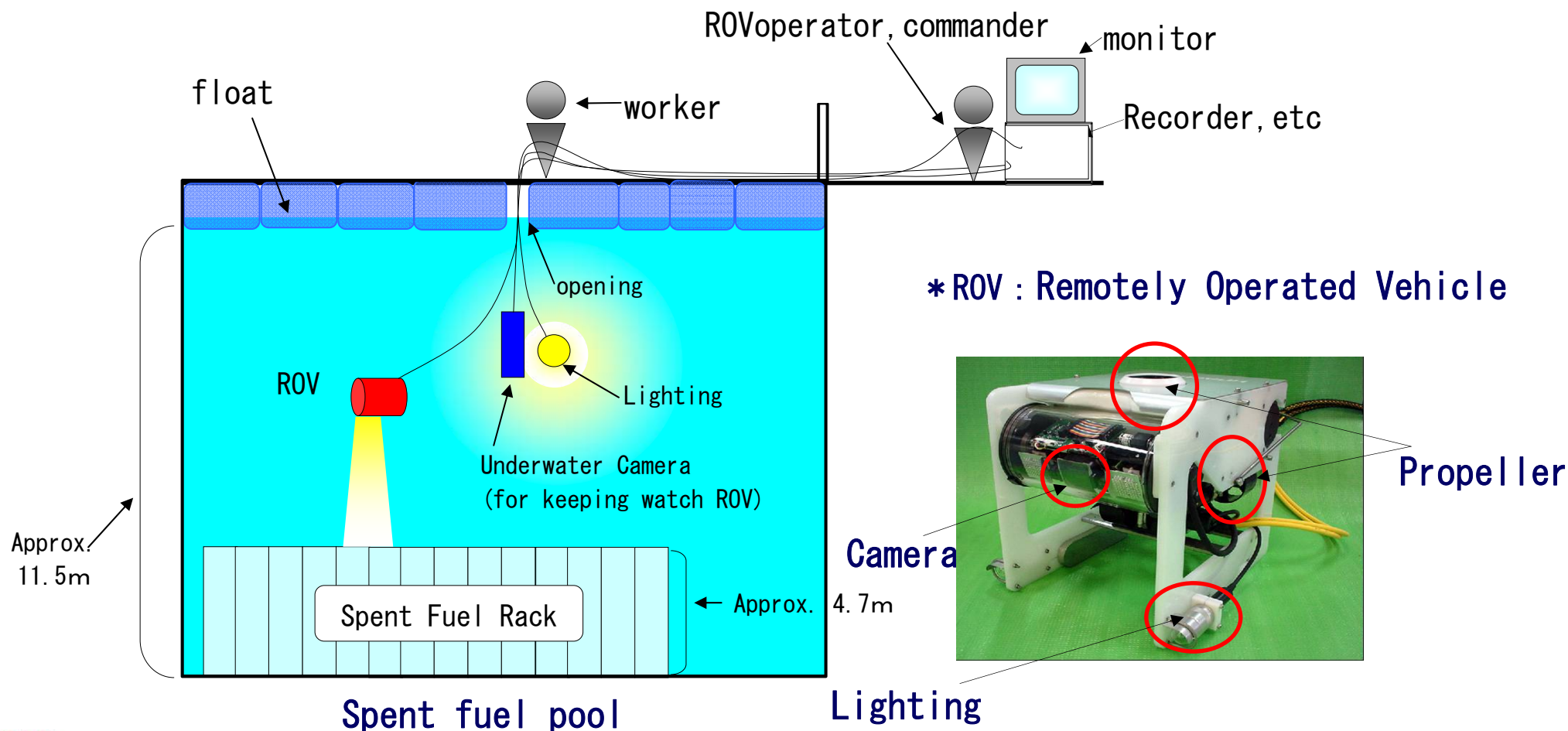
### ■ Corrosion suppression by water quality improvement

- In addition to the installation of a circulating cooling system to the spent fuel pool, hydrazine injection (since May 9, 2011) and a desalting facility installation (since Aug. 20, 2011) have been put into practice. The water quality of the spent fuel pool will be ongoingly improved by these continuous efforts as corrosion prevention.

Date	temperature (°C)	pH	Chloride concentration(ppm)
2011/5/7	approx. 80	7.2	approx. 2,500
2012/7/13	approx. 34	9.8	approx. 73

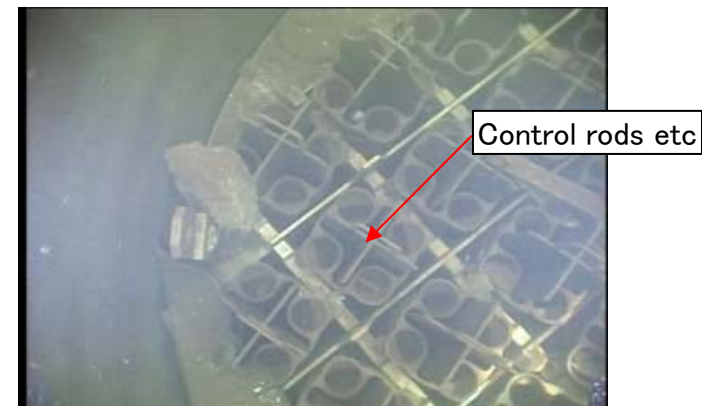
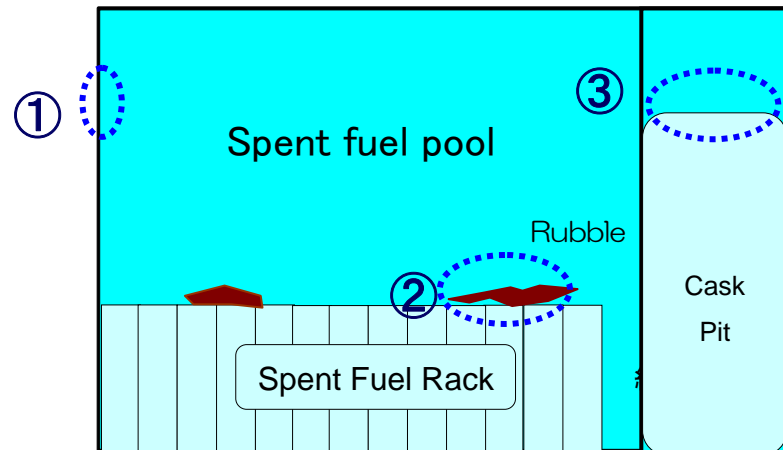
### (3) The outline of the investigation

From Mar. 19 to 21, in order to develop a plan to remove the fuels from the spent fuel pool, we investigated the rubble distribution inside the pool using an ROV.



## (4) The situation in the spent fuel pool

- The investigation of the rubble distribution conditions inside the spent fuel pool was performed.
- The results showed that no abnormalities of fuel racks were recognized.



③ Cask Pit Inside



① Southern Wall Surface



② Rubble and Upper Part of Spent Fuels

## (5) The extent of contamination in the spent fuel pool

The results of a nuclide analysis of the spent fuel pool water showed that concentration was smaller than those of Units 1–3 by more than two orders of magnitude. (It is estimated that detected nuclide is mainly entered from the reactor cores of other units.)

Unit4 spent fuel pool and skimmer surge tank water nuclide analysis results

Detected nuclide	Half-life	Concentration (Bq/cm <sup>3</sup> )					
		Unit4 spent fuel pool water					
		Apr. 12, 2011 sampling	Apr.28, 2011 sampling	May 7, 2011 sampling	Aug. 20, 2011 sampling	Jul. 13, 2012 sampling	(ref.) Mar. 4, 2011 sampling
Cs134	Approx. 2 years	88	49	56	44	1.4	Detection limit or less
Cs137	Approx. 30 years	93	55	67	61	2.8	0.13
I131	Approx. 8 days	220	27	16	Detection limit or less	Detection limit or less	Detection limit or less

It was estimated that the majority of fuel in the pool was sound, because the low level concentration of radioactive material was confirmed and no abnormalities of fuel racks were recognized.



## 2. Integrity investigation of fresh fuel

- (1) The outline of the integrity investigation
- (2) The contents of the integrity investigation
- (3) Point to focus for the integrity investigation
- (4) The safety control of the integrity investigation
- (5) The outline of the work
- (6) The situation of the work

# (1) The outline of the integrity investigation

## Objective

- The 2 fresh fuels in the unit 4 spent fuel pool will be removed and confirmed the state of corrosion.
- Reliability of the system for removing fuel from the unit4 spent fuel pool will be improved through this investigation.

## Schedule

The schedule of the integrity investigation will be following.

	Jul			Aug			Sep
	10	20	30	10	20	30	10
Removing fuel (Reactor building at unit4)							
Fuel investion (common pool)							

## (2) The contents of the integrity investigation

### ■ Fuel for the integrity investigation

- It is difficult to remove the irradiated fuels right now, because the system to transfer irradiated fuels considering heat rejection, radiation shielded, seal, subcriticality is in preparation. On the other hand, the decay heat and radioactivity of fresh fuels is so little that fresh fuels could be removed from the spent fuel pool right now.
- In case of the removing many fresh fuels right now, the work of removing all fuels from spent pool will be delayed. So as to finish to work as early as possible, it is important to limit the number of removing fresh fuel.

→ Select 2 fresh fuels (including 1 fresh fuel in reserve) for integrity investigation.

### ■ Contents of the investigation

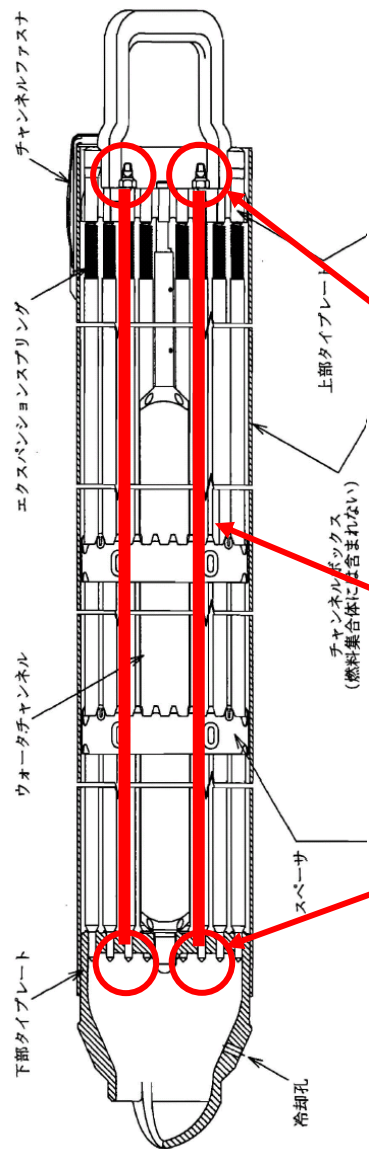
#### ● Investigation of corrosion

- Visual inspection
- In case of the sign of corrosion, examining the detail observation.

#### ● Work of removing the fuels

- Confirming the situation of rubble between fuel and rack.
- Collecting information for developing fuel – removal fuel.

### (3) Point to focus for the integrity investigation



- According to the knowledge so far accumulated, it is presumed that the structural member of the fuel is free from corrosion.
- Feasibility study of fuel removal will be performed just in case by investigating corrosion condition.

Connecting fuel rods / rock not  
(Zircaloy-2 / stainless steel  
=the connecting area of different kinds of metal)

Connecting fuel rods (Zircaloy-2)  
(2 rods on one side, Total 8 rods)

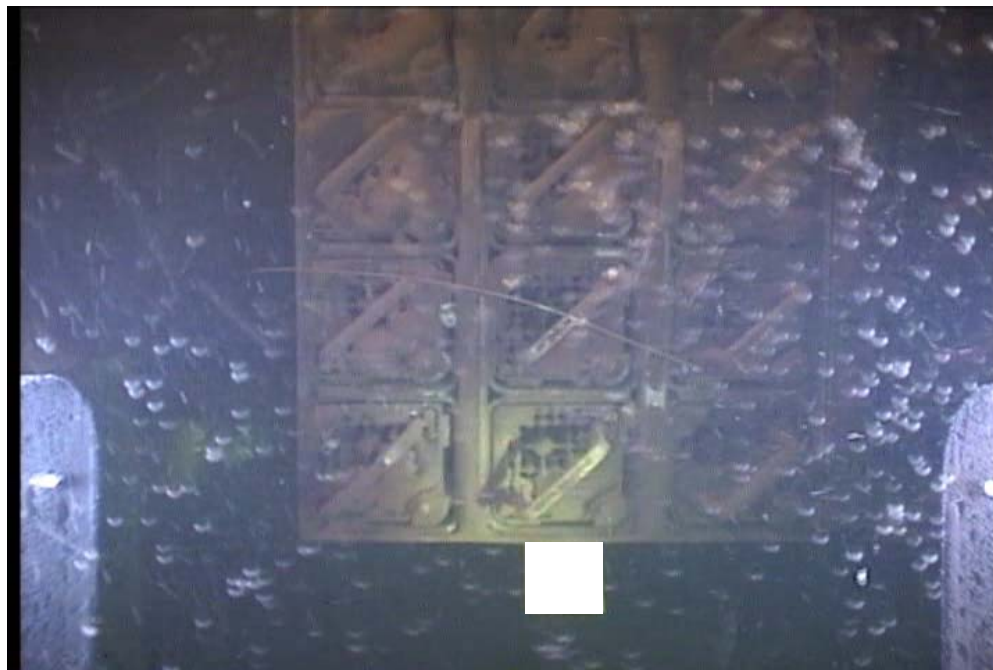
Connecting fuel rods is connected with lower tie plate by screwing  
(Zircaloy-2 / stainless steel  
=the connecting area of different kinds of metal)

- Upper tie plate and lower tie plate are connected by 8 connecting fuel rods.
- Fuel rods without 8 connecting fuel rods are not connected upper tie plate and lower tie plate. These rods are only loaded on lower tie plate and upper tie plate.

## (4) The safety control of the integrity investigation

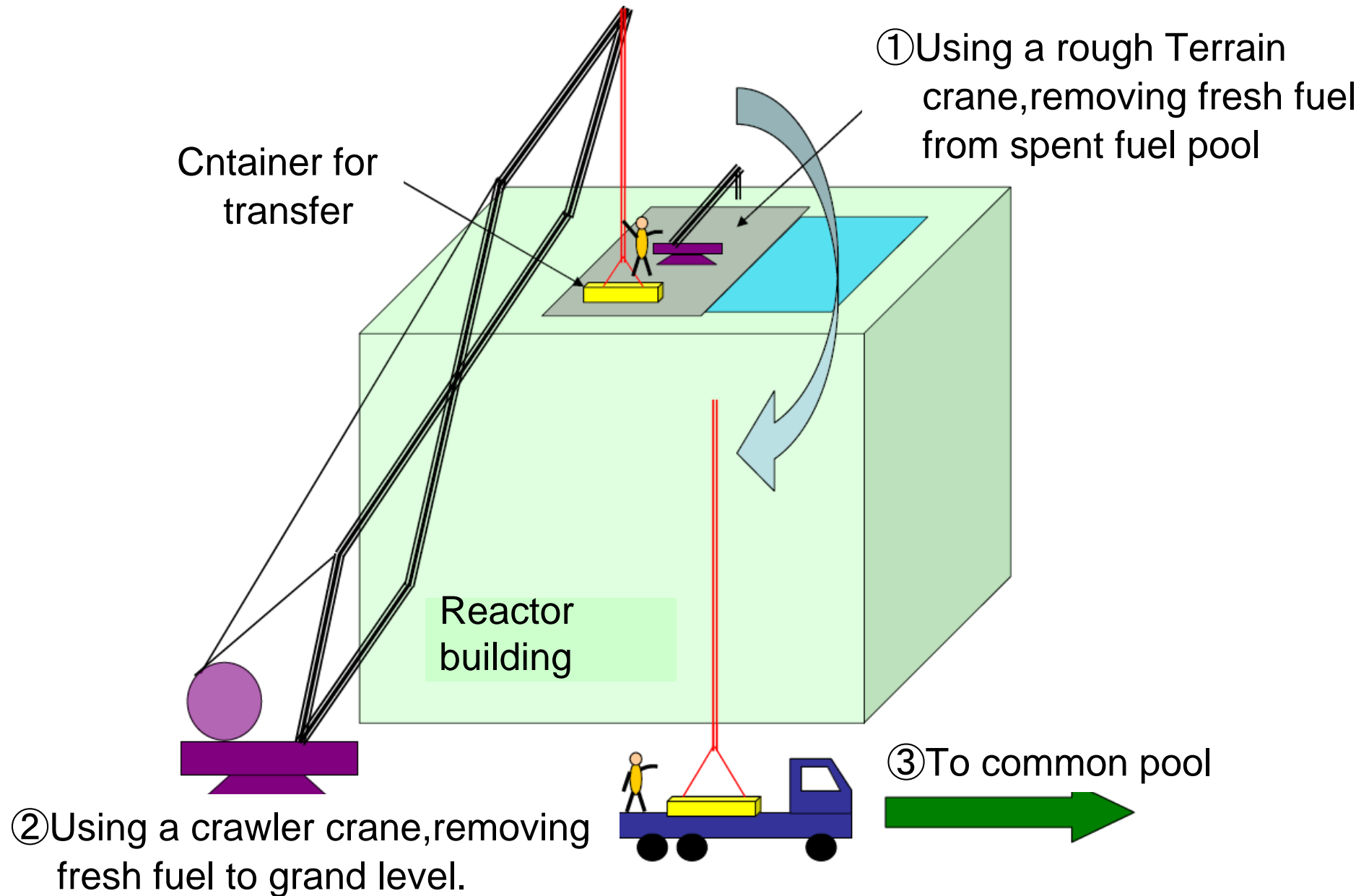
- According to the result of the investigation inside spent fuel pool in Mar.2012, no abnormalities of the target fuel were recognized.
- Handling fresh fuel outside the pool causes no problem from the viewpoint of radioactivity and residual heat.
- Since the target fresh fuels are displaced from irradiated fuels, dropping fresh fuel causes no problem of radiation exposure.

Type of the removing fuel:  
STEP3 (Type B)



Inside the spent fuel pool  
(photo on Mar.19.2012 )

## (5) The outline of the work



## (6) The situation of the work①



Photo on Jul. 18. 2012



Photo on Jul. 18. 2012



Photo on Jul. 18. 2012



Photo on Jul. 18. 2012

## (6) The situation of the work②



Photo on Jul. 18. 2012



Photo on Jul. 18. 2012



Photo on Jul. 19. 2012



Photo on Jul. 19. 2012



## (6) The situation of the work③



Photo on Jul. 19. 2012



Photo on Jul. 19. 2012



Photo on Jul. 19. 2012



Photo on Jul. 19. 2012

Fin.