

A Comprehensive Risk Review of all the possible risks which might have an impact outside the site boundary of the Fukushima Daiichi Nuclear Power Station

～ Current status of implementation ～

April 9, 2015

Tokyo Electric Power
Company



東京電力

Deciding to conduct a comprehensive risk review

<September 2013>

<December 2013>

<February 2015>

Subsequent actions taken after following incidents

- Increase of contaminated water
→ Installation of bolted-joint tanks and other equipment
- Leakage of contaminated water from tanks or elsewhere
→ Reclaiming contaminated water and contaminated soil

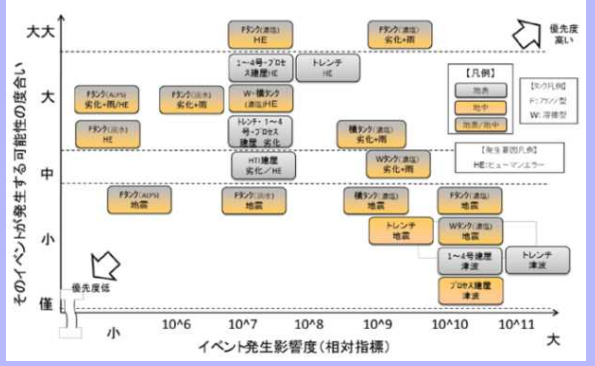
etc.

Basic policy for the Contaminated Water Issue at the TEPCO's Fukushima Daiichi Nuclear Power Station (decision by the Nuclear Emergency Response Headquarters on September 3)

『Beyond the follow up measures like in the past, the preventive and multi-layered measures will be taken through identification of any potential risks.』

A preventive and multi-layered measures

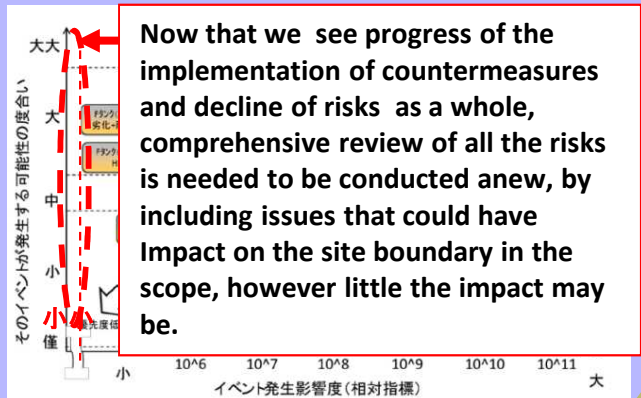
- ① Removing the contamination source
 - ◆ Treating contaminated water by ALPS (Multi-nuclide removal equipment)
 - ◆ Removing contaminated water from trench etc.
- ② Isolating groundwater from the contamination source
 - ◆ Groudwater bypassing system
 - ◆ Pumping up water from sub-drain around the reactor building
 - ◆ Land-side frozen soil impermeable walls
 - ◆ On - site soil pavement for suppressing groundwater ingress etc.
- ③ Preventing leakage of contaminated water
 - ◆ Ground solidification by water glass
 - ◆ Sea-side impermeable walls
 - ◆ Construction of welding type tanks including replacement from flange (bolt) type etc.



(Risk map)

Comprehensive risk review

- (Direction from Mr. Takagi, Senior Vice Minister of Economy, Trade and Industry)
- ✓ TEPCO should conduct anew a comprehensive risk review covering all the possible risks that could be thought of at Fukushima Daiichi at this moment. It should be done from the perspective of the affected people and the public. In addition, TEPCO should present appropriate countermeasures for the current situation of the site, and provide necessary information.
 - ✓ In conducting this comprehensive overall review, any risks that could have an impact on the environment outside the site boundary of Fukushima Daiichi NPS should be included in the scope of the review. This scope should be decided by taking into account the progress of the countermeasures.



(Risk map with broader targets)

- **TEPCO conducts a comprehensive risk review** of all the possible risks, targeting wide range of issues that could have an impact outside the site boundary of the Fukushima Daiichi NPS. (The details of the reviewing process is shown in the next slide.)
- TEPCO will listen to **opinions from experts and local residents** and will **reconsider** the way of identifying risks and of delivering explanation about the comprehensive risk review .
- Regarding the risks identified in this review, TEPCO will take appropriate measures depending on the content and severity of those risks. However, **these risks may be transformed due to environmental changes** as the decommissioning work develops. Therefore, **TEPCO will continuously manage the risks**, reflecting these transformation appropriately to the policy.

■ Methods for risk identification and evaluation

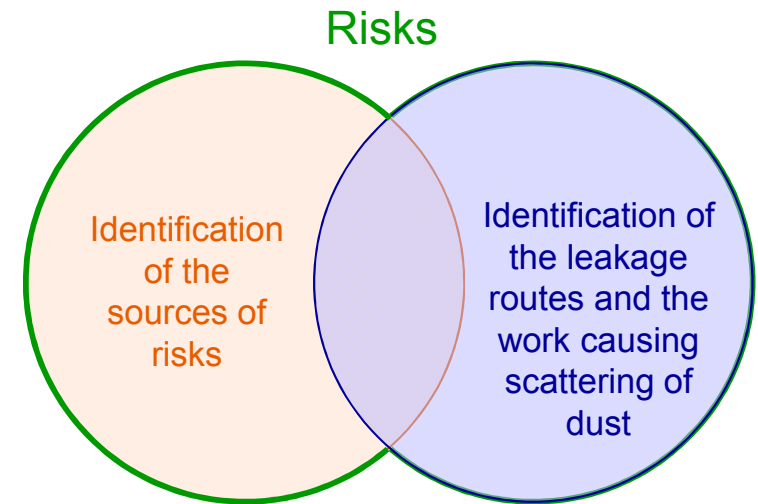
Identification of risks

- In the review, TEPCO will identify the sources of risks such as radioactive materials, regardless of the type of events occurred.
- In parallel with this action, TEPCO will also identify the routes of the leakage (of water) and the works that might involve scattering of dust.
- The issues that are identified in the process above will be defined as “risks”.

Evaluating the situation and the necessity of taking additional measures for each risk

As for the risks that have an impact outside Fukushima Daiichi NPS, in particular leakage of water and scattering of dust, TEPCO will classify those risks in to 5 categories depending on how necessary the additional measures are to address those risks;

(1) Need further examination, (2) Countermeasures necessary to be taken, (3) Countermeasures in practice, (4) Follow up observation after countermeasures in practice, (5) No need for additional measures



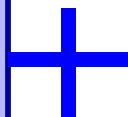
■ Identification of risks

◎ Risks that could cause radioactive materials to flow outside the site (including the sea) in the form of liquid

So far, TEPCO has put priority on taking measures for contaminated water issues whose risk is high. Besides them, TEPCO will check the contamination sources and the route of any leakage in order to identify wide range of risks that could have an impact outside the site boundary.

◎ Contaminated water with high risks for which TEPCO has been taking measures with high priority

- Accumulated water inside seawater pipe trenches in the Unit 2-4
【Measures】Removal of contaminated water and filling up of the trenches
- Accumulated water inside buildings
【Measures】Purification treatment of accumulated water, groundwater bypassing, pumping water up from sub-drain, installation of land-side frozen soil impermeable walls, etc.
- Water stored in tanks
【Measures】Purification of concentrated salt water, construction of welding type tanks, replacement from flange (bolt) type tanks, elevating the height of and doubling a dike surround each tank, etc.
- Rainwater in tank area dike
【Measures】Decontaminated water sprinkle
- Contaminated soil in the sea side of turbine buildings
【Measures】Water improvement with water glass



◎ Identifying remaining risks that could have an impact outside the site boundary

- Accumulated water inside trenches and other places other than seaside pipe trenches in the Unit 2-4
- Discharge channels
- Other accumulated water outside buildings (pits including sump, buried pipes, wells and tanks placed temporarily, etc.)
- Place where rainwater could be contaminated (temporal storage for radioactive waste, rubbles, rooftop of buildings, drainage channels and pits including oil barrier dikes)
Etc.

◎ Risks that could generate dust

So far, When conducting operations such as removing rubbles in the operating floor of the Unit 3 or dismantling Unit 1 cover, TEPCO has taken measures to prevent scattering of dust. Besides them, TEPCO will check the contamination sources and the process of operations, as dust might scatter in such operations. Wide range of risks that could have an impact outside the site boundary will be identified.

◎ Identifying risks that could have an impact outside the site boundary by the scattering of dust

- Removal of rubbles and upper section of reactor buildings
- Temporal storage of radioactive waste
- Operation for dismantling tanks etc.

■ The routes through which water could leak outside the site boundary

【 Sources of risk 】

◆ Puddle of contaminated water etc.

- Trenches (many of them are located around the Unit 1-6)
- Pits (discharge channels, sub-drain pits remain unrecovered, etc.)
- Tanks (Storage tanks for contaminated water, tanks already installed outside, temporary tanks for works, etc.)
- Accumulated water inside reactor buildings (besides the Unit 1-6, buildings which groundwater could flow into)
- Water stored in facilities (facilities installed after the accident, facilities already installed before the accident, etc.)
- Discharged water generated in the work

◆ Place where rainwater could be contaminated

- Major contamination sources of drainage channels (rooftop of buildings, rubbles, dikes and ground surface)
- Temporal storage for radioactive waste (removed tanks, logged woods storage, storage for secondary waste from water treatment)
- Contaminated soil

◆ Ports

- Contamination inside the port (sea soil, etc.)
- Degradation of the port facility function (breakwater, etc.)

【 Leakage routes 】

Ground surface (water running on the ground)

Drainage channels, etc.

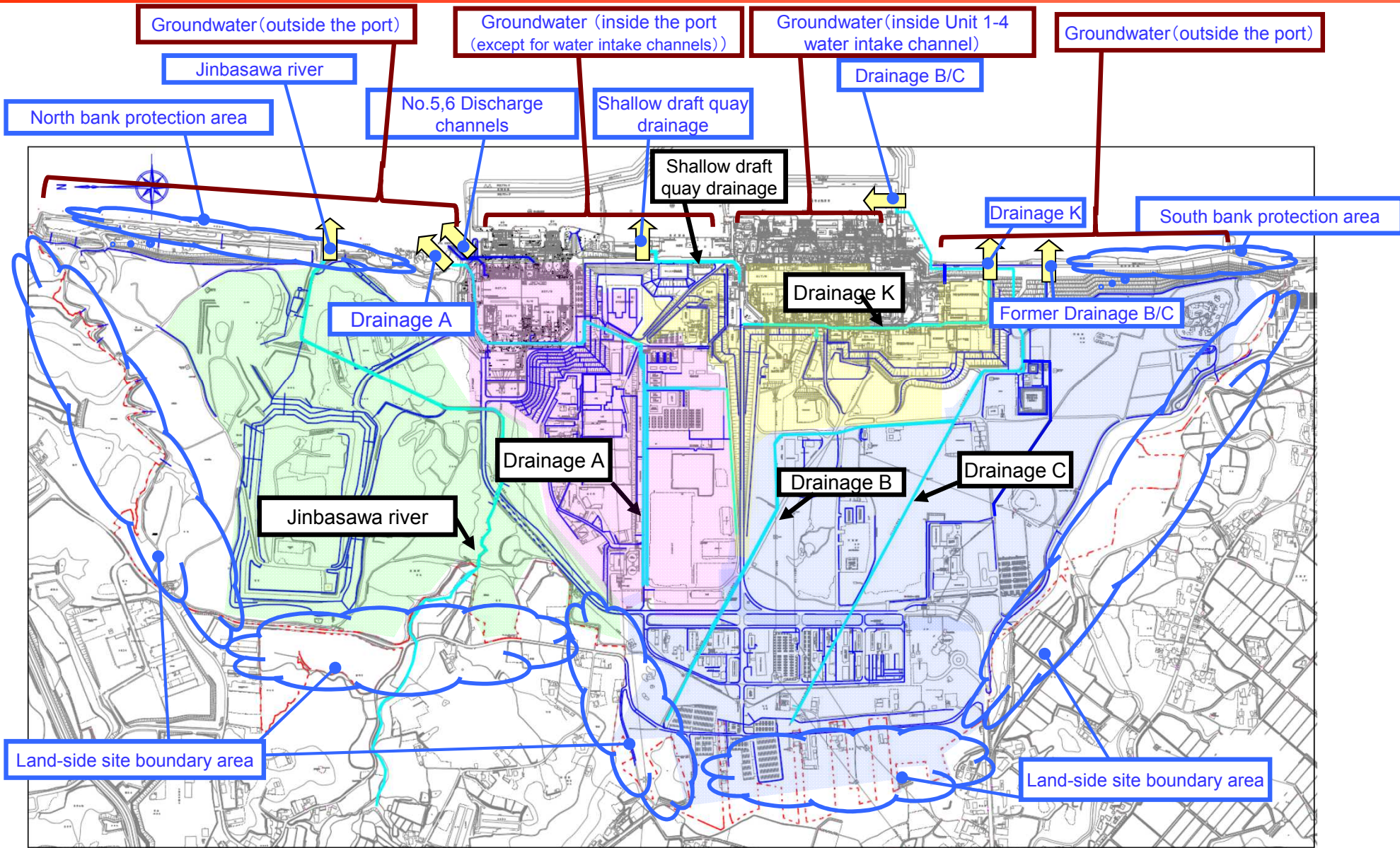
Underground (groundwater)

【 Destination of the contaminated material outside the site boundary 】

◆ **Outside the site boundary in land-side**
The north side, the west side and the south side

◆ **The sea**
○ Inside Unit 1-4 water intake channel
○ Inside the port (except for the inside of water intake channel)
○ Outside the port

The routes through which water could leak outside the site boundary



* Besides this, some liquid run on the ground surface as its routes.

■ The results of reviewing process will be put together on a list.

| Main leakage routes | Risks | Condition of water | Leakage routes in detail | Result of impact monitoring | Situation of current measures | Necessity for additional measures |
|---|-------|--|--------------------------|-----------------------------|-------------------------------|-----------------------------------|
| Drainage K | | | | | | |
| Drainage A | | | | | | |
| Drainage C | | <p>The necessity for additional measures will be classified into 5 categories as follows: ① Need further examination, ② Countermeasures necessary to be taken, ③ Countermeasures in practice, ④ Follow up observation after countermeasures in practice, ⑤ No need for additional measures</p> | | | | |
| Other drainage channels, etc. | | | | | | |
| Groundwater (inside Unit 1-4 water intake channels) | | | | | | |
| Groundwater (inside the port (outside the water intake channels)) | | | | | | |
| Groundwater (outside the port) | | | | | | |
| Water running on the ground surface | | | | | | |
| Inside the port | | | | | | |

■ The results of risk identifying process will be put together on a list.

| | Risks | Assumption on dust scattering | Result of impact monitoring | Progress of countermeasures | Necessity for additional measures |
|---|-------|-------------------------------|-----------------------------|-----------------------------|-----------------------------------|
| Scattering of dust due to the works | | | | | |
| Scattering of dust due to breakage of seats, etc. | | | | | |
| Scattering of dust due to other causes | | | | | |

The necessity for additional measures will be classified into 5 categories as follows: ① Need further examination, ② Countermeasures necessary to be taken, ③ Countermeasures in practice, ④ Follow up observation after countermeasures in practice, ⑤ No need for additional measures

Additional measures will be implemented in accordance with the priority

- Regarding risks that are classified as “Countermeasures necessary to be taken”, the details of additional measures will be considered and implemented sequentially while taking its priority into account.

The review will be conducted regularly by reflecting changes that might occur in the situation

- The change in on-site condition will be monitored and the risk will be discussed in the On-site Coordination Council for Reactor Decommissioning and Measures against Contaminated Water by taking into account the change of the situation being observed. Based on the discussion held in the council, risks will be regularly reviewed and announced.
- By identifying wide range of risks which might be transubstantiated along with the progress of the decommissioning work, TEPCO aims to reduce risks in the Fukushima Daiichi NPS as a whole.