Attachment

Overview of Report on Initiatives to Increase Seismic Safety at Hamaoka Nuclear Power Station Reactor No. 2

Following the directions of the then-Nuclear and Industrial Safety Agency (NISA) of the Ministry of Economy, Trade and Industry (METI), Chubu Electric Power has reported on its initiatives to increase seismic safety at Hamaoka Nuclear Power Station Reactor No. 2, which is currently being decommissioned. An outline of the report is provided below.

1. Initiatives policy

○ The reactor building, ground under the reactor building and fuel racks (Fig. 1) at Hamaoka Nuclear Power Station Reactor No. 2 are essential for assuring the spent fuel cooling function, sub-criticality function and containment function (including shielding), and these functions are in turn essential for ensuring the safety of spent fuel[*1] at the reactor. We evaluated the seismic safety, etc. of the reactor at standard seismic motion Ss (800 Gal in horizontal direction) and reported the results to NISA in March 2012.

○ Following an action plan adopted in response to a directive[*2] from the then-NISA of METI, Chubu Electric Power has been taking initiatives to enhance seismic safety at Reactor No. 2. This includes checking the seismic durability margin of that facility using the target ground motion (about 1,000 Gal in the horizontal direction) (Fig. 2) that was established to increase the seismic safety durability margins of Reactors No. 3-5. We are also considering margins for ensuring fuel pool water and spent fuel sub-criticality to ensure the safety of that spent fuel. In light of our findings, we will report on measures necessary to enhance the safety margins.

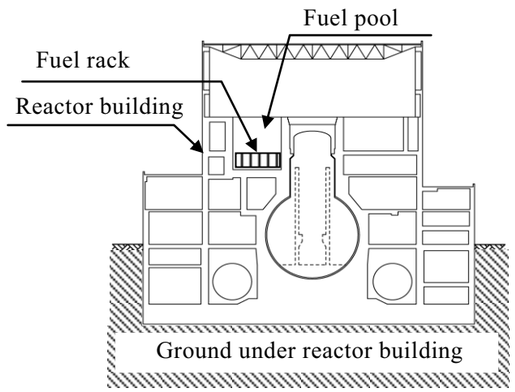

Fig. 1: Cross-section diagram of Hamaoka Reactor No. 2 reactor building

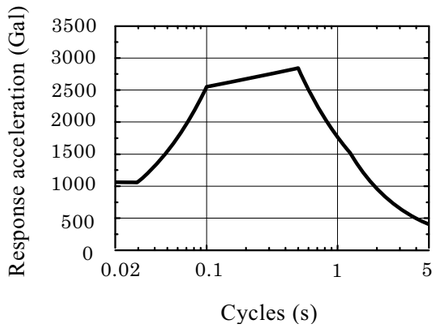

Fig. 2: Target ground motion response spectrum

2. Results of check based on initiatives policy

(1) Results of check of seismic durability based on target ground motion

We have confirmed that the reactor building, ground under the reactor building and fuel racks have sufficient seismic durability for the target ground motion (Table 1).

Table 1: Results of check of seismic durability based on target ground motion

Facility	Component evaluated	Evaluation content (unit)	Generated value	Evaluation benchmark value
Reactor building	Shear walls	Shearing strain (–)	0.46×10^{-3}	2.0×10^{-3}
Ground under reactor building	Slip safety margin	Safety margin	1.7	At least 1.5
Fuel rack	Square tubes	Stress (MPa)	297	481[*3]
	Anchor bolts	Stress (MPa)	76	756[*3]
	Support beams	Stress (MPa)	251	317[*3]

[*1] As of October 29, 2012, 1,098 assemblies of spent fuel and 148 assemblies of new fuel are being kept in fuel racks located in the fuel pool. We expect to finish shipping spent fuel from the fuel pool by the end of FY2013.

[*2] Content of directive (20120801 NISA No. 3, August 3, 2012)

Hamaoka Nuclear Power Station Reactor No. 2 (below, Reactor No. 2) is being evaluated based on the standard seismic motion established in seismic safety evaluations of Hamaoka Nuclear Power Station Reactor No. 3, Reactor No. 4 and Reactor No. 5 (below, Reactor No. 3, etc.). However, Reactor No. 3, etc. underwent facility design based on a higher standard seismic motion than was the case with Reactor No. 2, and Chubu Electric Power is doing further work on them to increase their seismic margins as a voluntary initiative.

However, although Reactor No. 2 is currently being decommissioned, there is still a large quantity of spent fuel being stored in its spent fuel pool, so this reactor's structural integrity is as important as that of Reactor No. 3, etc., which still supply power (though operations are suspended at this time).

In addition, the Cabinet Office is currently studying massive earthquakes in the Nankai Trough, making it mandatory to reevaluate the standard seismic motion of this power station hereafter.

In light of these circumstances, this agency hereby instructs Chubu Electric Power to urgently take initiatives to increase seismic safety at Reactor No. 2 without waiting for the results of the Cabinet Office's study.

[*3] We used design tensile strength Su as prescribed in Japan Society of Mechanical Engineers' Standards for Nuclear Power Generation Equipment: Design and Construction Standards (JSME S NC1-2005).

(2) Consideration of margins for ensuring the safety of spent fuel

a. Margin for ensuring fuel pool water

○ The fuel pool is made of reinforced concrete 1.6 - 1.9 m thick. The interior is lined with stainless steel to prevent leakage (Fig. 3). Because stainless steel is more ductile than reinforced concrete, the lining remains sound even if tiny cracks, etc. develop in the walls or floor of the reinforced concrete. Moreover, there are no pipes, etc. going through the sides or floor of the pool that would give pool water a place to leak out.

○ Even if the functions for cooling fuel pool water and injecting more water were lost, there is a margin of 100 days or more until fuel is left exposed by evaporation, etc. In the meantime, it would be possible to inject water into the fuel pool using portable power pumps that have been deployed as an urgent safety measure.

b. Margin for spent fuel sub-criticality

○ We confirmed that fuel sub-criticality would still be ensured even if the supporting function (support beams and anchor bolts) of the fuel racks (Fig. 4) were lost and the fuel racks came into direct contact with adjacent fuel racks (with no clearance between them).

○ We confirmed that the square tubes of the fuel racks would deform by a maximum of approximately 1 mm even if the value occurring in elastic analysis reached design tensile strength Su. This is sufficiently smaller than the space between the square tubes and fuel (approximately 6 mm), so there would be no impact on fuel soundness.

3. Study of measures in light of findings

As noted above, we have concluded that Hamaoka No. 2 has a sufficient margin of seismic durability, and that no further measures are necessary to increase that margin.

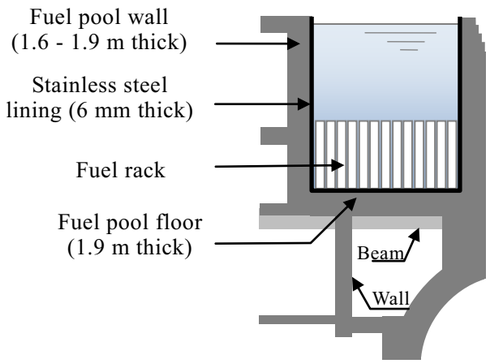

Fig. 3: Diagram of fuel pool

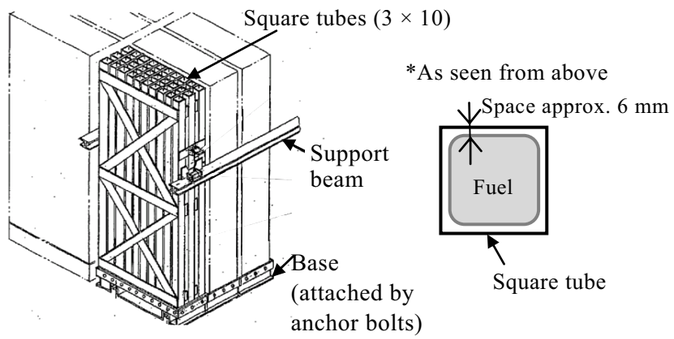

Fig. 4: Diagram of fuel rack