Outline of “Reports about the study regarding current seismic safety and reinforcement of reactor buildings at Fukushima Daiichi Nuclear Power Station (1)”

May 28, 2011
Tokyo Electric Power Company

[Orientation]
This paper is the report of the study we have implemented regarding current seismic safety and reinforcement of reactor building for Unit1 and 4 at Fukushima Daiichi Nuclear Power Station, based on the “Collection of report pursuant to Section 67.1 of Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors” (April 13, 2011). As we completed the evaluation of Unit 1 and 4 recently, we marshaled the results as this report and submitted it to Nuclear and Industrial Safety Agency, Ministry of Economy today (May 28). We will report about the other Unit to the Agency at the time of results have been marshaled.

[Outline of evaluation]
O Reactor building of Unit 1
- Regarding reactor building of unit 1, the building above the operating floor on the 5^{th} floor was destroyed by the event what is believed to be hydrogen explosion occurred on March 12, the next day of Tohoku - Pacific Ocean Earthquake. Reflecting this information to the model of mass point system, we conducted the analyses of time history response against basic earthquake ground motion “Ss”, studied whether the seismic walls reach terminative condition of shear failure (Fig1).

-As a result of the time history response analysis against basic earthquake ground motion, shear strain occurred on remaining seismic wall below 5^{th} floor was estimated $0.12*10^{-3}$ (the direction of Ss-1 and Ss-2 on 1^{st} floor) at maximum and the value fall much below 4*10-3. Therefore we evaluated that it has adequate security (Fig2).

O Reactor building of unit4
-Regarding reactor building of Unit 4, although the cause has not been identified, it is confirmed that remaining frame construction of posts and beams above 5^{th} floor, but most of the roof slabs and walls were lost and most of the walls on 4^{th} floor and a part of walls on 3^{rd} floor have been destroyed on March 15. Unlike the case of Unit 1, the walls below 5^{th} floor of Unit 4 has been also destroyed, we

reflected this information to mass point system model and decided to evaluate totally whether the seismic wall reach terminative condition of shear failure(Fig3). *Then, we decided to implement local evaluation including spent fuel pool by 3 dimension FEM analysis, and decided to implement the evaluation of combined the input maximum value which has been got from the analysis of time historical response as an earthquake load and other load such as temperature load.*

-Intended to the mass point system, as a result of the time history response analysis against basic earthquake ground motion, shear strain occurred on remaining seismic wall below 5^{th} floor was estimated $0.17*10^{-3}$ (Ss-1 and Ss-2, EW direction, 1^{st} floor) at maximum and the value fall much below $4*10^{-3}$ which is the standard value. Therefore we evaluate it has adequate security (Fig4).

-As a result of seismic safety evaluation by 3 dimension FEM analysis (Fig5), combining with earthquake load occurred by basic earthquake ground motion Ss and other load, the maximum strain of rebar is $1230*10^{-6}$, therefore we evaluate it has an adequate margin against $5000*10^{-6}$ the plastic limit strain which is the standard value. And regarding out-of-plane shear force at the minimum part was 800(N/mm) against 1150(N/mm) which is the standard value, therefore we estimate it has the adequate safety.

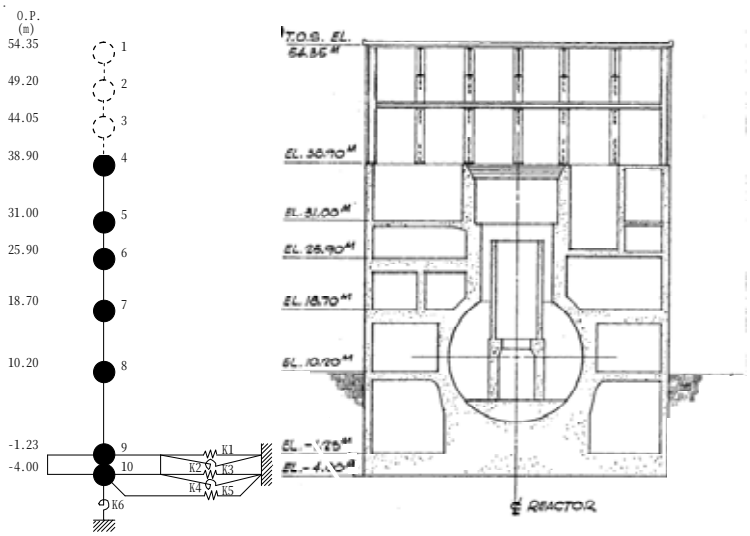

Fig 1 Reactor Building of unit 1
Earthquake analysis earthquake response (NS direction)

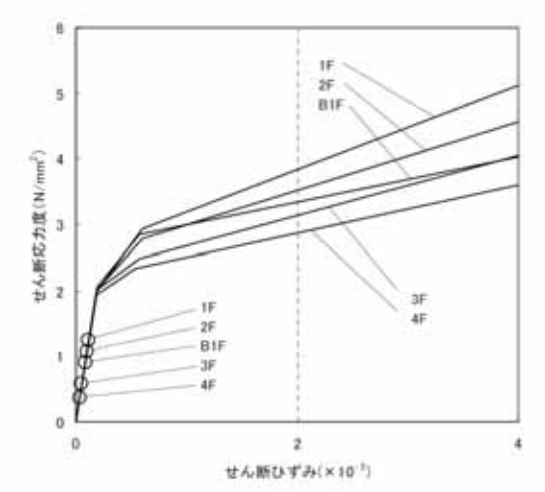

Fig 2 Maximum response values on the shear skeleton curve (Unit1, Ss-1, NS direction)

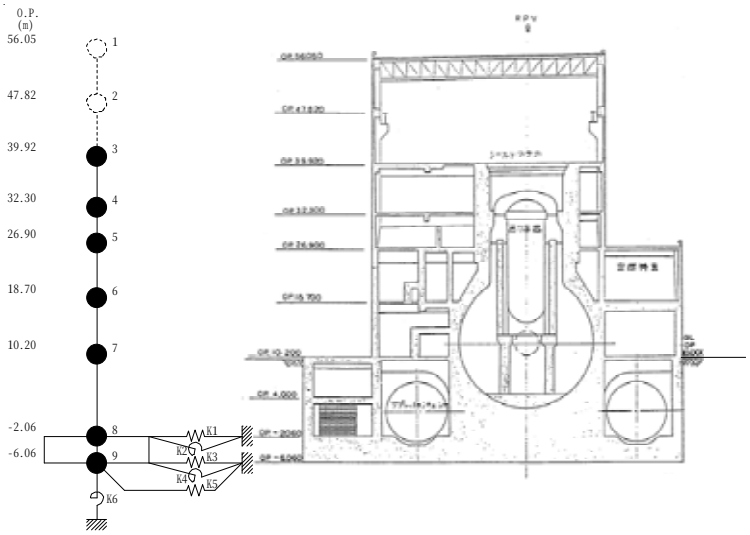

Fig 3 Reactor Building of Unit 4
Earthquake response analysis model (EW direction)

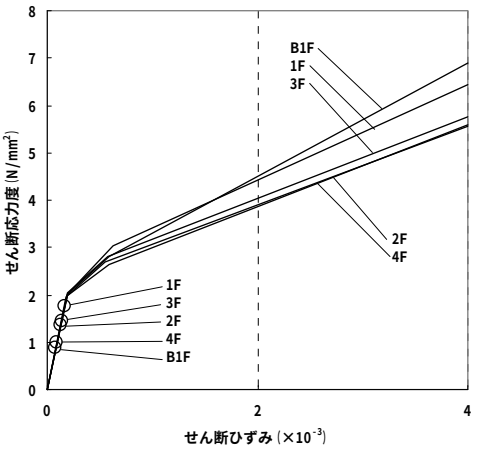

Fig 4 Maximum response values on the shear skeleton curve (Unit 4, Ss-1 EW direction)

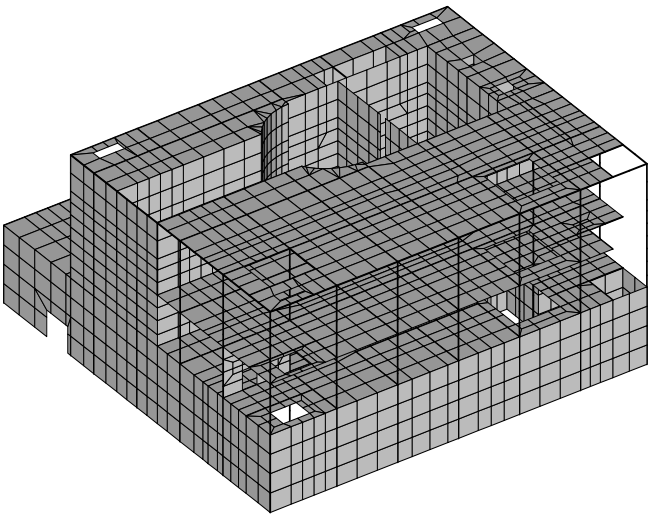

Fig 5 Local evaluation model by 3 dimension FEM
(Unit 4)