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Seismological problems in the NRA's permission for the Sendai NPS: Effects of great interplate and intraslab earthquakes

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On September 10, 2014, the NRA (Nuclear Regulation Authority, Japan) granted permission for change in reactor installation of Sendai NPS (Nuclear Power Station) Units 1 and 2 as applied by Kyusyu Electric Power Co., Inc. This was a regulatory step to grant permission for the basic design of nuclear reactors and related facilities applied from the operator. The applied design and safety features of Sendai NPS Units 1 and 2 were deemed to meet the NRA's new regulatory requirements.

According to the new regulatory requirements, the "standard seismic motion" (earthquake ground motion that rarely occurs, but may possibly occur in service period of the facilities and have a significant effect on the facility) used for the seismic design of facilities shall be formulated as the "earthquake ground motion formulated with a hypocenter specified for each site" and the "seismic motion formulated without a hypocenter."

The "earthquake ground motion formulated with a hypocenter specified for each site" shall be formulated by selecting multiple earthquakes that are predicted to have a significant effect on the site ("earthquakes for investigation") as to inland crustal earthquakes, interplate earthquakes and oceanic intraplate earthquakes, and by implementing the evaluation of ground motions for each selected earthquake for investigation.

Kyusyu Electric Power, however, by referring to the catalog of past destructive earthquakes in and around Kyushu, considered that even the largest interplate and intraplate earthquakes did not affect so much the Sendai NPS site and that earthquakes for investigation did not need to be selected for interplate and intraplate events.

NRA overlooked this judgment without question and accepted the standard seismic motion, Ss-1 (PGA 540 gals), formulated based merely on inland crustal earthquakes.

But, the judgment by Kyushu Electric Power using the past earthquake catalog only is very insufficient. Possible and probable interplate and intraplate earthquakes including the anticipated great Nankai trough earthquake and large intraslab earthquakes in southern Kyushu are inferred to have considerable effects on Sendai NPS. Therefore, these events shall be selected as earthquakes for investigation in order to formulate a proper standard seismic motion.

Keywords: Sendai nuclear power station, Nuclear Regulation Authority, permission for change in reactor installation, standard seismic motion, anticipated great Nankai trough earthquake, large intraslab earthquakes