

## Design Basis Ground Motion reduces seismic safety of NPP: Proposal of *Earthquake Ground Motion for Defense in Depth*

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DBEGM (Design Basis Earthquake Ground Motion) prescribed in Japan's NRA's (Nuclear Regulation Authority) New Regulatory Requirements is insufficient to accomplish seismic safety of NPPs (nuclear power plants). This is because, in terms of the IAEA's (International Atomic Energy Agency) concept of Defense in Depth in nuclear safety, DBEGM is used merely for seismic design of NPP facilities in Level 1 (prevention of abnormal operation and failures), Level 2 (control of abnormal operation and detection of failures) and Level 3 (control of accidents within the design basis), not having any responsibility for Level 4 (control of severe plant conditions, including prevention of accident progression and mitigation of the consequences of severe accidents). As an example, in case of Sendai NPP's Units 1 and 2 operated by Kyusyu Electric Power Co., Inc., DBEGM Ss-1 (maximum horizontal acceleration 540 Gal) and Ss-2 (maximum horizontal acceleration 620 Gal) are only short-period and short-duration with small CAV (Cumulative Absolute Velocity), which is considered important in the United States, and probably very insufficient to defend additional emergent facilities and human activities of Level 4 against large ground accelerations, velocities and displacements of short to long periods and long duration times due to, for example, the anticipated  $M$  9-class giant Nankai trough earthquake, which is ignored by Kyushu Electric and NRA. Therefore, I propose to establish a new earthquake ground motion, say, EGMDD (Earthquake Ground Motion for Defense in Depth), which important facilities and infrastructures of NPPs should withstand from Level 1 through Level 4. EGMDD should be formulated by taking into account both large earthquakes just beneath NPPs and great earthquakes distant from plants having annual exceedance probabilities of  $10^{-4}$  to  $10^{-6}$ , and should have broad-band spectrum from short-period to long-period and long duration times. Formulating a proper EGMDD for a certain NPP is a trans-scientific problem. So, it should be decided through exhaustive discussions in such an organization as CLI (Commission Locale d'Information) in France, in which a nuclear utility concerned, municipalities with and without the plant, inhabitants, earthquake scientists and engineers, plant makers, regulation authority, etc, will participate.

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