

Challenges to Seismic Safety of Nuclear Power Plants

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Risk of nuclear power plants under threat of earthquake is not only a function of seismic hazard but also a function of a complex socio-technology system related to nuclear power plants.

Characteristics of seismic hazard can be summarized as follows:

- Strong ground motion is a phenomenon which is spatially distributed and affects simultaneously in space
- We cannot identify a worst-case ground motion because of inherent variability of earthquake (aleatory uncertainty),
- Uncertainty due to our limitation of knowledge is another source of reason why we cannot identify worst-case ground motion (epistemic uncertainty),
- There exists large uncertainty in prediction of rare (usually large) earthquake because of large epistemic uncertainty. Large epistemic uncertainty can be observed as different judgements among experts on the same issue.

A complex socio-technology system related to nuclear power plants is composed both of physical subsystems and of human and organizational subsystems. This means that not only the capacity of physical systems but also organizational resourcefulness and framework to prepare for and deal with such events should be carefully examined, when we discuss the capacity of nuclear power plants under extreme earthquake.

When organizational resourcefulness and framework is discussed, a sensitivity and adaptation to social preferences is important. For example, safety requirements to nuclear power plants shifted and will shift over time.

What is equally important is that recognition that uncertainty related to seismic hazards are shared among stakeholders and framework to deal with it should be prepared. One of good practices is considered to be an introduction of a process like SSHAC process ^[1], where representing the center, body and range of technically defensible interpretation is an aim. It is also important to recognize that scientific knowledge on natural hazards like earthquake also grows and sometimes shifts over time. Integrated decision making

process on nuclear safety issues which helps to ensure consistent and transparent decision should be a key to deal with these issues.

Referrence

[1] USNRC: Updated Implementation Guidelines for SSHAC Hazard Studies (NUREG-2213), 2018.

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