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# NUCLEAR PLANTS SAFETY IN THE WAKE OF FUKUSHIMA DAIICHI

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**SUMMARY**

Once again, the whole world became increasingly alarmed by the devastation caused by the recent 9.0 magnitude earthquake in Japan that struck on March 11 at about 12:50 (14:56 JST Thursday) to the east of Sendai, Honshu Island. Centered at a depth of about 32 km below the ocean floor, it triggered a huge tsunami, resulting in the deaths of 15,719 people, with another 4,616 still unaccounted for.1 In addition, when the Fukushima Daiichi nuclear plant cooling supply system was damaged by the earthquake, it fractured the structure and water supply system to the reactor core leaving the reactor without cooling water followed by a series of explosions due to dry reactor operation, sending high levels of radioactive gases into the air. Furthermore, on March 16, 2011, a fire broke out in the number 4 reactor when workers could not sufficiently cool the reactor core, and sensors gauging radiation levels inside failed to detect the dry operation of the reactor.

Therefore, innovative concepts in performance-based design must be developed by the structural engineering community to better design structures to address the danger of collapse. Simulation is essential for predicting realistic scenarios by mimicking natural disasters. Computing power technology is advancing, and the recent K-computer is nearly the fastest computer operating system in the world, now operating at 8.2 petaflops per second. This system can accomplish the task of simulation to provide us better warning, protection, and disaster reduction.

Japan is rebuilding from deadly March 11 earthquake and tsunami. With the experience gained from this disaster, planning teams can now design highly resistant nuclear reactor structures, water supply systems with backups to withstand major earthquakes and aftershocks, as well as install early warning systems on the ocean surface, so that, with a better coordination of Japanese government agencies and engineers, the effect of such double catastrophes can be minimized and human life and property can be saved.

We believe that a new generation of disaster simulation technology is necessary, and will emerge from the DS'11 Kobe Symposium. The symposium will further provide a deep understanding how disaster simulation can be modeled, by taking into account 3-D material structures and behaviors from the macro to micro level.

In this paper, we will examine what measures Japanese Government agencies should take in the future to redesign structural safety, structural response control for nuclear power plants, and simulation benefits, so that future natural disasters can be minimized, and greater security against natural disasters can save human lives, properties, and the environment.

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1 National Police Agency, August 21, 2011.