

The Diverse and Flexible Coping Strategies Simulation for Maanshan Nuclear Power Plant

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Abstract : In this research, a Fukushima-like conditions is simulated with TRACE and RELAP5. Fukushima Daiichi Nuclear Power Plant (NPP) occurred the disaster which caused by the earthquake and tsunami. This disaster caused extended loss of all AC power (ELAP). Hence, loss of ultimate heat sink (LUHS) happened finally. In order to handle Fukushima-like conditions, Taiwan Atomic Energy Council (AEC) commanded that Taiwan Power Company should propose strategies to ensure the nuclear power plant safety. One of the diverse and flexible coping strategies (FLEX) is a different water injection strategy. It can execute core injection at 20 Kg/cm² without depressurization. In this study, TRACE and RELAP5 were used to simulate Maanshan nuclear power plant, which is a three loops PWR in Taiwan, under Fukushima-like conditions and make sure the success criteria of FLEX. Reducing core cooling ability is due to failure of emergency core cooling system (ECCS) in extended loss of all AC power situation. The core water level continues to decline because of the seal leakage, and then FLEX is used to save the core water level and make fuel rods covered by water. The result shows that this mitigation strategy can cool the reactor pressure vessel (RPV) as soon as possible under Fukushima-like conditions, and keep the core water level higher than Top of Active Fuel (TAF). The FLEX can ensure the peak cladding temperature (PCT) below than the criteria 1088.7 K. Finally, the FLEX can provide protection for nuclear power plant and make plant safety.

Keywords : TRACE, RELAP5/MOD3.3, ELAP, FLEX

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