

Process Safety Evaluation of a Nuclear Power Plant through Virtual Process Hazard Analysis Using Hazard and Operability Technique

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Abstract : The energy demand in the country is increasing; thus, nuclear energy is recently mandated to add to the energy mix. The Philippines has the Bataan Nuclear Power Plant (BNPP), which can be a source of nuclear energy; however, it has not been operated since the completion of its construction. Thus, evaluating the safety of BNPP is vital. This study explored the possible deviations that may occur in the operation of a nuclear power plant with a pressurized water reactor, which is similar to BNPP, through a virtual process hazard analysis (PHA) using the hazard and operability (HAZOP) technique. Temperature, pressure, and flow were used as parameters. A total of 86 causes of various deviations were identified, wherein the primary system and line from reactor coolant pump to reactor vessel are the most critical system and node, respectively. A total of 348 scenarios were determined. The critical events are radioactive leaks due to nuclear meltdown and sump overflow that could lead to multiple worker fatalities, one or more public fatalities, and environmental remediation. There were existing safeguards identified; however, further recommendations were provided to have additional and supplemental barriers to reduce the risk.

Keywords : PSM, PHA, HAZOP, nuclear power plant

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