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Analysis of Accident Scenarios of a Water-Cooled Tokamak DEMO

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Safety of tokamak DEMO cooled by pressurized water has been studied for the first time. We have quantitatively assessed consequences of two types of accidents: ex-vessel and in-vessel loss-of-coolant accidents (LOCAs) of the first wall/blanket cooling channels. As for the former case, we have analyzed ex-vessel double-ended break of the cooling channel. The analysis result suggests that the reactor building has a mitigation function of tritium release to the environment against the ex-vessel LOCA. As for the latter case, we have analyzed multiple, double-ended outboard first wall cooling pipe break in the vacuum vessel of the whole perimeter in the toroidal direction. The analysis result suggests that the pressure in the vacuum vessel reaches the design value even though the pressure suppression system is in operation. Possible safety provision for such a major in-vessel LOCA is proposed.

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