Abstract Submitted
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Simulation of direct contact condensation of steam jets based on interfacial instability theories[1] DAVID HEINZE, Karlsruhe Institute of Technology / Kernkraftwerk Gundremmingen GmbH, THOMAS SCHULENBERG, ANDREAS CLASS, Karlsruhe Institute of Technology, LARS BEHNKE, Kernkraftwerk Gundremmingen GmbH — A simulation model[2] for the direct contact condensation of steam in subcooled water is presented that allows to determine major parameters of the process such as the jet penetration length. Entrainment of water by the steam jet is modeled based on the Kelvin-Helmholtz and Rayleigh-Taylor instability theories. Primary atomization due to acceleration of interfacial waves and secondary atomization due to aerodynamic forces account for the initial size of entrained droplets. The resulting steam-water two-phase flow is simulated based on a one-dimensional two-fluid model. An interfacial area transport equation is used to track changes of the interfacial area density due to droplet entrainment and steam condensation. Interfacial heat and mass transfer rates during condensation are calculated using the two-resistance model. The resulting two-phase flow equations constitute a system of ordinary differential equations which is discretized by means of an explicit Runge-Kutta method. The simulation results are in good agreement with published experimental data over a wide range of pool temperatures and mass flow rates.

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[2]Heinze et al. A Physically Based, One-Dimensional Simulation Model of Direct Contact Condensation of Steam Jets, submitted to ASME Journal of Nuclear Engineering

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