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Autonomous Reactivity Control

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The Autonomous Reactivity Control (ARC) system was developed to ensure inherent safety of fast reactors while having a minimal impact on reactor performance and economic viability. The ARC system is a modification to a standard fast reactor fuel assembly, in which two liquid-filled reservoirs, one above and one below the core, are connected by a tube which replaces one of the fuel rods in the assembly. The system has a near-negligible impact on core operation and performance during standard conditions, but will act to passively introduce negative reactivity if temperatures rise above a pre-determined set point. Properly designed, the ARC-system can act as a thermostat in the core, autonomously controlling temperature without the need for any operator action, electrical systems or any moving mechanical parts. This actuation responds to temperature and relies solely on the laws of physics, and is therefore an inherent feedback mechanism. The ARC system is in active development at the University of California Berkeley & Argonne National Laboratory in the US and at Uppsala University in Sweden. This paper summarizes the state-of-the-art of these development efforts of the system itself as well as the results of full transient analysis of ARC-system equipped fast reactor cores.

Country/Int. Organization

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