

International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17)



Contribution ID: 318

Type: ORAL

Design modifications of Instrumentation & Control System of future FBRs

Wednesday, June 28, 2017 2:50 PM (20 minutes)

Abstract: The purposes of Instrumentation and Control systems are to assist the operator in controlling the plant at the specified power level, monitor the plant and warn of deviations from normal conditions, prevent accidents by carrying out independent automatic safety and control actions, and mitigate consequences of an accident automatically. Design of I&C for PFBR is done in line with 'AERB Safety Criteria for design of Fast Reactors' and to suit operational and environmental conditions.

I & C of PFBR uses hybrid system consisting of computer based control system and hard wired system. Safety critical systems are built using triple redundant computer systems and / or hardwired systems. Safety related systems use dual redundant VME based real time computers and non safety class I & C systems are built using pre-developed systems. Sensors used are either indigenously developed or imported. The core temperature monitoring probe uses dual thermocouples for monitoring the temperature of each sub-assembly.

For future FBR designs, thrust is given to align with Gen IV requirements and our experiences with safety review and commissioning also demands design enhancements. Indigenisation along with design enhancements has resulted in enhanced safety and economic benefits.

The paper details the design enhancements in the architecture of computer based systems, computer hardware, Human-Machine Interface and sensors like core temperature probe, neutron detectors, sodium instruments etc.

The core temperature monitoring probe is indigenously designed and manufactured with three thermocouples for each fuel sub-assembly. Also the thermocouple channels will have indigenously developed diverse hardware. Triple redundant computer systems will have diverse computers running software developed by different agencies. The non-safety systems will use wireless interface for signal and command transfer.

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Session Classification: 2.2 Commissioning and Operating Experience of Fast Reactors II

Track Classification: Track 2. Fast Reactor Operation and Decommissioning