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Electrical Power System Design and Station Blackout (SBO) Management in Indian Fast Breeder Reactors

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In the nuclear new builds and projects in design stage SBO management measures have significant role. Depending on the onsite and offsite power supply configurations, deterministic SBO duration is established. Design of systems with adequately sized battery capacities for SBO duration, special SBO Diesel Generator Sets, structured load shedding strategy to conserve battery availability to cope with SBO and to monitor the plant safety beyond SBO duration are considered as part of electrical system design now.

In the design of PFBR, SBO is given due importance right from conceptual design stage. Both deterministic SBO duration and probabilistic SBO duration versus frequency were established by detailed analysis. Dedicated DC power supply systems and additional SBO DG back-up systems are in place to cope with normal and extended SBO. After the Fukushima event, there is greater requirement to demonstrate plant safety during SBO for a long duration extended over several days. In light of this accident, thermal hydraulic synthesis of PFBR has been carried out to ascertain the capability of the plant to manage a prolonged station blackout event. This has brought out the robustness of the design. Safety design features of PFBR ensure comfortable management of extended SBO.

In the design of future FBR projects, current trends in the new nuclear builds and recommendations of international bodies considering Fukushima are duly considered. SBO measures by means of alternate AC power sources, redundant emergency power supply sources with less dependence on other auxiliary systems and dedicated DC power systems are considered to cope with normal and extended SBO beyond design basis. Right from the conceptual design, the system robustness to manage normal and extended SBO will be taken care with the related thermal hydraulic and associated analysis.

The paper highlights these SBO management strategies in PFBR and future FBRs

Country or International Organization

India

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