Operational Sharing 01: Control Scheme Strategies for SEU-Induced Protection Relay Failures

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Abstract:

Over an 18-month period, more than ten operational incidents were recorded on floating production storage and offloading (FPSO) units within the SBM Offshore fleet, all associated with intelligent protection relays rebooting due to Single Event Upsets (SEUs). These transient faults, originating from high-energy particle interactions with microprocessor-based electronics, resulted in unintended opening of breakers and contactors, causing several thousand barrels of oil production loss and significant operational disruption.

This paper explains the physical mechanisms behind SEUs and their implications for protection devices deployed in offshore environments. It describes mitigation approaches implemented by relay manufacturers to reduce susceptibility and details strategies applied at the control scheme level to minimize the impact of relay malfunctions on critical processes. Design adaptations are discussed, focusing on control scheme modifications that enhance fault tolerance, improve system resilience, and maintain continuity of operations in complex installations.