Availability Challenges and Solutions Associated with the High Voltage Converter Modulator at the Spallation Neutron Source

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Fifteen operational High Voltage Converter Modulators (HVCM) at the Spallation Neutron Source are utilized to provide power to seven 2.5 MW, four 5.0 MW and eighty-one 550 kW klystrons required to accelerate the H- beam through the linear accelerator. Any HVCM downtime results in an outage in neutron production. Early reliability of the HVCM systems prohibited the facility from achieving >90% availability and hence an extensive effort was undertaken to improve the system reliability and mean time to repair. This paper will discuss early reliability challenges and vulnerabilities, major hardware upgrades that significantly improved system reliability, changes in operational procedures and additional fault protection designed to optimize availability, status and motivation related to in-process upgrades, improvements scheduled for upcoming shutdowns and longer-term development activities for the HVCM systems. This paper will review performance metrics related to system availability, compare HVCM statistics with other major equipment classes within the facility and document the reliability gains that have occurred as various upgrades have been installed. Finally, this paper will examine proposed future upgrades and discuss the anticipated impact not only on system availability but also on overall RF system performance.

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