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Operational Results and Troubleshooting in Current Feeder System for SST-1

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Current Feeder System (CFS) plays vital role in Superconducting (SC) fusion device, SST-1 (Steady state superconducting Tokamak). As, long pulse operation of the Tokamak and fusion reactors require high magnetic field to confine and shape the plasma, which is fulfilled through the superconducting magnets operating at high current ratings. CFS serves as an interface between the power supply bus bars exposed at room temperature and SC magnets at 4.5 K temperature. This complex system has been designed to energize all the superconducting coils namely toroidal field (TF) and poloidal field (PF) of SST-1 maximum up to 10 kA rated current. An optimal design of its sub-systems may significantly reduce the operational cryogenic cost in long term steady state operation of these coils. Further, reliable operations of Vapor Cooled Current Leads (VCCLs), 80 K thermal radiation shield systems, SC (Nb-Ti/Cu) bus bar feeders, high vacuum systems and associated cryogenic circuits etc. contribute towards successful and stable operations of CFS during the SST-1 plasma experiments. However, it has performed to excite the total 16 number of TF coils for longer duration in the total twenty-one campaigns so far. The operational performances in terms of cryogenic stability, current carrying capability have been validated in the excitation mode under long duration of steady state as well as in transient states such as current ramp up, ramp down and quench. This paper highlights the recent operational results with major milestone achieved as well as troubleshooting experiences since its successful commissioning in 2012.

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