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A look toward ARC: Lifetime conditions for REBCO in compact fusion power plants

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Commonwealth Fusion Systems (CFS) is building the world's first compact net energy fusion device, SPARC, by utilizing recent advances in the commercial production of 2G REBCO coated conductors. SPARC's delivery and operation will inform the design of ARC, the world's first fusion power plant, scheduled to come online in the early 2030s. The design, safe operation, and quench protection of high field fusion magnets requires the detailed characterization of the field (B), angle (Θ), and temperature (T) dependence of the critical current (I_c) of these tapes at the operational range for each magnet system, which is in the range of 20K, 20T. However, in a fusion power plant, the superconducting tapes will be subjected to neutron irradiation over the plant lifetime. Therefore, the impact of the neutron irradiation on the electromagnetic and mechanical properties of the coated conductors during operation must also be well understood and designed for. This talk focuses on summarizing the relevant conditions expected in ARC that the tapes will see to guide future studies on irradiation of coated conductors for compact fusion applications.

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