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Characterization of Sustained Series dc Arc Duration for Advanced Detection Schemes

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Series arcs in dc power systems can occur if energized wires split, or load connections are physically interrupted. Compared to their parallel counterparts, series dc arcs decrease load current, making detection more challenging. Series dc arc models, along with accompanying detection methods have been studied in the past . However, few studies link load and source impedance to the timing of series dc arcs. In this paper, using a broad set of data taken at different RC loads with a fixed loop impedance, the minimum required time for a sustained series dc arc to occur was determined. Analytic models describing the transient behavior of series dc arcs are used to link the load and line impedance to this necessary timing condition. The findings in this paper can guide the design of future dc power systems, ensuring that detection and protection schemes operate within the minimum time window.

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