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5P71 - Pulsed Power Systems Developed for the Lockheed Martin Compact Fusion Reactor

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The Lockheed Martin Compact Fusion Reactor (CFR) Program endeavors to quickly develop a compact, 100 MWe-class fusion power plant using a high-beta, linear encapsulated ring-cusp magnetic confinement scheme. Plasma sources, heating elements, and confinement coils incorporated into CFR prototypes require significant power and have motivated the development of several MW-class, medium- and high-voltage pulsed power systems with pulse lengths in the range of tens to hundreds of milliseconds. Topologies utilized on CFR include simultaneously-triggered and independent module-triggered pulse forming networks; ultracapacitor-driven DC/DC converters; resonant LC voltage amplifiers; ultracapacitor-driven buck converters; and stiff, variable-load capacitor banks. The performances of several of these pulsed power sources are analyzed for efficiency, stability of output pulses, and magnitude of noise generation. Existing, in-process, and planned integrations of pulsed power machines on CFR prototypes are presented, and the compatibility of pulsed power drivers with nearby plasma diagnostics is discussed.

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