Pulsed power ICF driver science, technology and development efforts on the path towards high yield fusion

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Pulsed power technology has proven to be an effective and economical way to compress energy in both space and time to produce short, high power electrical pulses that are useful for a wide range of applications. Pulsed power fusion approaches are a strong candidate for a future next-generation High Energy Density (NGHED) facility, a future high yield (>200MJ) fusion investment in the National Nuclear Security Administration's Enterprise Blueprint, due to their high driver to target coupling efficiency, demonstrated high Lawson criteria performance, and strong target scaling characteristics. Detailed simulations and well-established scaling predictions suggest high fusion yield is obtainable with pulsed power drivers that deliver 5-10X the power and energy as Sandia's Z machine today.

This presentation will give a broad overview of the science and technology behind pulsed power drivers for ICF research including how pulsed power can been used to efficiency implode ICF targets across a wide range of Lawson parameters space, key differences compared to laser driven targets, methods to mitigate instabilities and advances in implosion control, and recent theoretical and experimental progress in the understanding of powerflow physics and scaling of electrical current losses to a fusion target. We will also discuss research and development efforts in pulsed power driver technology that will enable smaller, lower cost and more capable machines for driving fusion targets.

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