

A POWER PLANT UTILIZING Z-PINCH FUSION TECHNOLOGY*

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The Z-Pinch Power Plant concept is being developed to utilize z-pinch driven inertial confinement technology developed at Sandia National Laboratories in a power plant application. Utilizing high yield fusion pulses of 3 or greater gigajoules per pulse, a unique thick liquid wall shock and energy absorbing system is being evaluated to absorb the energy. The concept under investigation eliminates the need for system standoff from the fusion reaction by utilizing a replaceable transmission line that is manufactured into a cartridge and recycled in an on-site factory. System and basic science studies are in progress to design an integrated blanket and chamber design for absorbing and containing the fusion energy, cartridge manufacture of all the recycled materials, and cartridge installation/replacement to maintain a pulse rate of 0.1 Hz. An effective system design for the power plant concept requires an integrated blanket that can shield the permanent structures from the high-energy neutron flux and the strong shock wave, breed tritium, and in the process absorb the released fusion energy. The generation of this energy requires a fusion fuel cartridge to couple the repetitive pulsed power to a disposable load using a Recyclable Transmission Line (RTL). Initial analytical and experimental studies have shown the feasibility of the RTL from a physics standpoint. Innovative engineering is underway to economically manufacture the required cartridge. This project is working to combine viable economics with innovative engineering and blanket designs to produce a complete and consistent power plant concept to support a research program leading to practical fusion energy for future generations. The Z-IFE Power Plant represents a 5th generation nuclear power source without the burden of long-lived radioactive waste or nuclear proliferation. This paper will review the progress on the definition of the power plant highlighting the current design of the concept and the needs for additional research.

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