

Z-Pinch Power Plant a Pulsed Power Driven System for Fusion Energy*

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The Z-Pinch Power Plant (ZP-3) is the first concept to use the potential of the results obtained on Sandia National Laboratories Z machine in a power plant application. While the initial concepts and calculations applying high yield fusion look very promising, there are significant systems issues to be addressed. At this time, the highest priority issues are System Studies for creating a definition of the system, an integrated blanket design for absorbing the fusion energy, cartridge manufacture of all the recycled materials, and cartridge installation/replacement to maintain a reasonable duty cycle. An effective system design for ZP-3 requires an integrated blanket which 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. Through this technique, we intend to minimize the shock propagation by dispersing the energy absorption over the volume of the blanket structure. The generation of this energy requires a fusion fuel cartridge to couple the repetitive pulsed power to a replaceable load using a Recyclable Transmission Line. Analytical and experimental studies in FY00 have shown the feasibility of the RTL from a physics standpoint. Innovative engineering will be required to economically manufacture the required cartridge. The ZP-3 represents a 5th generation nuclear power source without the burden of long-lived radioactive waste or nuclear proliferation. As such, this system description will provide a cornerstone for launching a concept exploration initiative in the Inertial Fusion Energy Program and potentially lead to large experimental and pilot facilities. This paper will discuss the initial systems concepts for such a facility.

References:

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