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PROGRAMMABLE COIL POWER SYSTEMS FOR PEGASUS EXPERIMENT*

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The Pegasus Toroidal Experiment is a near-unity aspect ratio spherical torus. Pegasus has recently undergone a major upgrade to all of its coil power systems allowing >200 MW of preprogrammed waveform control. 6 MJ of capacitor energy storage feeds up to 40 independent H-bridges. The capacitor bank is modular in construction to allow each bridge system to act independently. Individual H-Bridges can be ganged together and are controlled via linear PWM (Pulse Width Modulation) to supply individual coil sets. All poloidal and toroidal power systems utilize two or four quadrant H-bridges with 1700 V-2400 A IGBTs (Insulated Gate Bipolar Transistor) while the ohmic heating system utilizes four quadrant H-bridges with 2700 V-3800 A IGCT (Integrated Gate Commutated Thyristor) technology. H-Bridge semiconductor transient suppression utilizes simple RC or RCD shunt snubbers. The IGCT H-bridges are to be upgraded to an Undeland type snubber for full power operations. A Plasma Control System (PCS) is to be implemented allowing non-linear real-time feedback control and eventual direct digital control of H-bridge systems. These developments provide the Pegasus experiment with state-of-the-art control capabilities typically only available to large national facilities.

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