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Magnetics and Power System Upgrades for the Pegasus-U Experiment[1] R.C. PRESTON, M.W. BONGARD, R.J. FONCK, B.T. LEWICKI, University of Wisconsin-Madison — To support the missions of developing local helicity injection startup and exploiting advanced tokamak physics studies at near unity aspect ratio, the proposed Pegasus-U will include expanded magnetic systems and associated power supplies. A new centerstack increases the toroidal field seven times to 1 T and the volt-seconds by a factor of six while maintaining operation at an aspect ratio of 1.2. The poloidal field magnet system is expanded to support improved shape control and robust double or single null divertor operation at the full plasma current of 0.3 MA. An integrated digital control system based on Field Programmable Gate Arrays (FPGAs) provides active feedback control of all magnet currents. Implementation of the FPGAs is achieved with modular noise reducing electronics. The digital feedback controllers replace the existing analog systems and switch multiplexing technology. This will reduce noise sensitivity and allow the operational Ohmic power supply voltage to increase from 2100 V to its maximum capacity of 2400 V. The feedback controller replacement also allows frequency control for "freewheeling"—stopping the switching for a short interval and allowing the current to coast. The FPGAs assist in optimizing pulse length by having programmable switching events to minimize energy losses. They also allow for more efficient switching topologies that provide improved stored energy utilization, and support increasing the pulse length from 25 ms to 50–100 ms.

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M.W. Bongard
University of Wisconsin-Madison

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