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A fast 5kV 5kA power supply for Active Electrodes of Fusion Generator C2-W (Norman).

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TAE Technologies field-reversed configuration (FRC) type, C2-W (Norman), fusion experiment is operating since April 2017. The Active Electrodes are the main mechanism of plasma edge active stabilization. They are located in the Inner and Outer Diverters of C2-W (Norman).

To provide a current to plasma via these Active Electrodes, two 5kV 5kA pulsed Electrode Power Supplies (EPSU) with a deep voltage regulation capability have been designed and manufactured. The energy required for a long pulse of tens of milliseconds is stored in distributed film capacitor banks.

As the Active Electrodes are in contact with the plasma the Power Supply load is rarely predictable and fast changing during a pulse. To manage this stochastic and highly dynamic load, a high frequency switching technique combined with a multi-level hysteresis control has been implemented in EPSU control system. The EPSU is a voltage controlled system, but a pseudo current control mode loop is included to limit the Active Electrodes current.

The EPSU is very flexible system as it can feed either the Inner or Outer Active Electrodes in both “ground referenced” and “floating” mode and switch between electrodes either during a pulse or between operations. A cabinet with fast thyristor and motorized switches provide all the required configurations.

A fast protection system by means of a thyristor crowbar is included in EPSU.

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