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P2.093 Models for the power grid load at JET

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The JET tokamak is connected to the United Kingdom 400kV National Grid by three Super Grid Transformers (SGTs) through a 36kV power network. The 36kV system supplies power to the toroidal (TF) and poloidal (PF) field coils, heating systems and their auxiliaries. The voltage drop on the system is limited. Dropping below 30kV will first trip the heating systems followed by a total loss of power below 29kV requiring 8 hours of recovery time.
The JET power supply system can handle large loads with full neutral beam power (up to 35MW) and high toroidal fields (up to 4T) in its standard configuration with three SGTs connected and the toroidal field supplied by both a flywheel generator and static units. In 2016 a flashover in one of the SGTs, reduced the operational space to two super grid transformers and required precise power load profile predictions and pre-pulse checks to stay above the power supply trip levels.
This contribution describes the theoretical and statistical models of measurements that were used in the power load predictor. The study was based on 86 dry runs (magnetic test pulses) in 2012-13 (#83499-85001) and 4302 pulses (#86495-90796) in the C33-C36 JET campaigns. Power load models were obtained using statistical model selection methods both on the total apparent and reactive power as well as on each power supply individually. The power load predictor was extensively used in 2016 until the repair of the third super grid transformer. It enabled the optimisation of plasma discharges and full exploitation of the limited operational space available at the time.

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