

RELIABILITY ESTIMATES FOR POWER SUPPLIES*

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Failure rates for large power supplies at a fusion facility are critical knowledge needed to estimate availability of the facility or to set priorities for repairs and spare components. A study of the "failure to operate on demand" and "failure to continue to operate" failure rates has been performed for the large power supplies at DIII-D, which provide power to the magnet coils, the neutral beam injectors, the electron cyclotron heating systems, and the fast wave systems. When one of the power supplies fails to operate, the research program has to be either temporarily changed or halted. If one of the power supplies for the toroidal or ohmic heating coils fails, the operations have to be suspended or the research is continued at de-rated parameters until a repair is completed. If one of the power supplies used in the auxiliary plasma heating systems fails the research is often temporarily changed until a repair is completed. The power supplies are operated remotely and repairs are only performed when the power supplies are off line, so that failure of a power supply does not cause any risk to personnel. The DIII-D Trouble Report database was used to determine the number of power supply faults (over 1,700 reports), and tokamak annual operations data supplied the number of shots, operating times, and power supply usage for the DIII-D operating campaigns between mid-1987 and 2004. Where possible, these power supply failure rates from DIII-D will be compared to similar work that has been performed for the Joint European Torus equipment. These independent data sets support validation of the fusion-specific failure rate values.

*This work was prepared for the US Department of Energy (DOE), Office of Fusion Energy Sciences, under the DOE Idaho Field Office contract number DE-AC07-05ID14517 and US DOE contract DE-AC03-99ER54463 with General Atomics.