

The JET Programme in Support of ITER
L.D. Horton^{1,2} and JET EFDA Contributors*

JET-EFDA, Culham Science Centre, Abingdon, OX14 3DB, U.K.

¹European Commission, B-1048 Brussels, Belgium

²EFDA-CSU, Culham Science Centre, Abingdon, OX14 3DB, U.K.

As part of its mission to prepare the operation of ITER, a major programme of enhancements has just been completed on the JET tokamak. These enhancements include a complete replacement of the plasma-facing components in JET, from carbon-based to the combination of beryllium and tungsten foreseen for ITER, an upgrade of the neutral beam heating available on JET from 24 MW, 10 s to 34 MW, 20s, the installation of a high frequency pellet injection system for plasma fuelling and ELM control studies, an upgrade to the JET vertical stability system and a suite of new diagnostics.

The combination of beryllium and tungsten to be used in ITER is predicted to reduce the trapping of tritium in re-deposited layers to an acceptable level and to provide an acceptably low level of core plasma contamination while meeting ITER's strict power handling requirements. This material combination, though, has never been tested in a tokamak. The future JET programme is foreseen to proceed progressively from a test of fuel retention in the standard regimes of ITER operation towards more aggressive, high performance experiments that will demonstrate the operating space limits with the new wall. Depending on the results of the earlier experiments, the exploitation of the enhancements is foreseen to be completed with a deuterium-tritium experiment. This would represent the most integrated test of ITER operational scenarios possible before ITER itself. The recent enhancements to JET will be described as will the forward programme and its role in mitigating risks to ITER operation.

JET is a cooperative programme funded and exploited in collaboration by all of the European fusion laboratories. As such, JET is a test bed for multi-national use of a single fusion facility, as is foreseen for ITER. Opportunities for broadening the participation in JET to other ITER Parties are presently being explored. If these opportunities can be implemented, JET would provide not only an integrated test of ITER regimes of operation but also a demonstration of how ITER will be operated, even to the extent of including significant numbers of the same team who will eventually operate ITER.

*See the Appendix of F. Romanelli et al., Proceedings of the 23rd IAEA Fusion Energy Conference 2010, Daejeon, Korea