

AVAILABILITY OF THE PRESENT FUSION DEVICES

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Availability is a top level parameter vital for the efficient management of complex plants, like fusion devices, for decision making and to judge the quality of design and operation. Present tokamaks are prototypical, nevertheless the availability of systems and the optimization of operation to maximize the number of plasma pulses play an increasingly important role. Operating experience with fusion devices accumulated all over the world has now reached several hundred device-years and analysis of their operating experience gives useful indications for the devices themselves and for those under design or construction. In fact the availability of present fusion machines has been maintained constant and in some case improved over the years in spite of the age of the systems and components and more demanding and complex plasma scenarios.

The ultimate in availability improvements are due to design choices, reliability of components and budget constraints. Within these boundaries, the main factors influencing availability are design changes, procedures, maintenance and spares holding, skill of personnel and preparation and management of experimental sessions.

Some peculiarities, from availability point of view, of existing fusion devices are highlighted like the presence or not of specific components as a superconducting magnet with a long time-constant cryogenic system or water actively cooled plasma facing components, the duty cycle, the pulse rating, the operational targets, the trouble and delays collection and the relevant analysis.

There is no standard way to analyze the operating experience among the fusion devices: different techniques are adopted, various degrees of depth are reached and also the kind of analysis and corrective actions are different. Nevertheless most of the results can be expressed in terms of delays and operational session lost and the relevant main causes will be discussed, as well as the corrective actions in terms of design changes, strategy for maintenance and spares holding, human factors (training and operational management), documentation and quality assurance. Finally A few general considerations and recommendations can be suggested.