

ENEA Fusion Components Failure Rate Database, status and evolution

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Nuclear fusion is expected to be available as energy technology source of energy from mid-50s of present century. One key aspect for the success of such technology will be the reliability growth implemented in the design since the early phases. In fact, nuclear fusion plants are expected to exploit many fusion specific components with relatively low technology readiness level, or in some cases exploit components with mature technology from fission plants but within different and poorly explored operating domain window (e.g., in terms of loads, operation regimes, etc.). An important source of uncertainty in reliability assessment then resides in the failure and repair model definition for fusion plant components.

In order to limit such uncertainty, ENEA Fusion Components Failure Rate Database was developed to collect failure and repair screening data suitable for fusion systems reliability analyses. The records of the database were validated by field expert collaborative effort in the context of International Energy Agency program and mainly consist of two categories: i) nuclear fission data recommended values to use for fusion applications ii) data estimated from nuclear fusion research facility operating experience.

First a review of available data, database organization status is presented. Then database evolution is described in terms of recently added failure and repair data records derived from engineering selection, specific component selection datasheet or failure modeling.

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