

Fusion Technology in Petten

For the Next Step in the European fusion development, ITER, the neutron wall loads are orders of magnitude higher than in the present devices. The vessel and the in-vessel components have to cope, not only with significant levels of radioactivity, but also with degradation of functionality and with a reduction of reliability.

NRG contributes to the ITER design with data of neutron irradiation effects on material properties. This comprises e.g. stainless steel for structural applications and high strength alloys for bolts. A specific topic is the reweldability of components in case repair or maintenance requires the joining of irradiated material.

The demonstration of a fusion power plant, FPP, is the 'Next Step beyond ITER'. In an FPP the neutron wall loads are orders of magnitude higher than in ITER. Several blanket concepts are being explored for their viability and attractiveness, answering the societal needs for a environmental friendly and enduring technology. The testing of prototypical blanket modules in ITER ports will allow improving the designs and validate tools.

Today no materials exist that would perform with the required irradiation resistance for reactor application. This requires a focused R&D programme in parallel to ITER and integrated with its test blanket programme.

NRG contributes to the long term goal by co-developing irradiation resistant materials in an international co-operation agreement. This comprises reduced activation steels and advanced structural materials. Fusion specific functional materials are lithium ceramics, lithium-lead eutectic and beryllium. The High Flux Reactor at Petten is a main tool in the fusion materials R&D. Current projects, including in-pile tests of blanket sub-assemblies, are highlighted.

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