EUROFER 97 is a reduced activation ferritic martensitic (RAFM) steel and a promising candidate as structure materials for first wall components of future fusion power plants. During an operation period of 2 years the material shall be subjected to irradiation dose of 100 dpa yielding remarkable irradiation induced embrittlement and changes in its mechanical behavior. Considering these changes correctly in the design assessment procedure of the components is a precondition for a reliable operation. Therefore models describing the deformation and damage behavior of EUROFER 97 in the irradiated state under operation loadings are required.

In this paper a coupled viscoplastic deformation damage model will be presented which has been developed for EUROFER 97 in the reference un-irradiated state and modified taking into account irradiation influence. The modification has been done mainly by adding irradiation driven terms in the hardening laws. With this approach the majority of the material and temperature dependent model parameters are no longer dependent on the irradiation dose and only few parameters need to be determined when applying the model to EUROFER 97 in the irradiated state. The modified model has been then applied to describe the behavior of EUROFER 97 observed in the post irradiation examinations, tensile and low cycle fatigue tests, of the irradiation programs ARBOR 1 and SPICE. The application results will be presented and discussed in addition.