

Use of systems code to estimate equilibrium tritium inventory in fusion DT machines, such as ARIES-AT and components testing facilities

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Abstract

ITER is under construction and will begin operation in 2020. This is the first 500 MW_{fusion} class DT device, and since it is not going to breed tritium, it will consume most of the limited supply of tritium resources in the world. Yet, in parallel, DT fusion nuclear component testing machines will be needed to provide technical data for the design of DEMO. It becomes necessary to estimate the tritium burn-up fraction and corresponding initial tritium inventory and the doubling time of these machines for the planning of future utilization of tritium. With the use of a systems code, tritium burn-up fraction and initial tritium inventory for steady state DT machines can be estimated. Estimated tritium burn-up fractions of FNSF-AT, CFETR and ARIES-AT are in the range of 1 to 2.8%. Corresponding total equilibrium tritium inventories of the plasma flow and tritium processing systems, and with the DCLL blanket option are 9.36 kg, 10.1 kg, and 16.6 kg for FNSF-AT, CFETR and ARIES-AT, respectively.