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Analyses Of DEMO Tritium Self-sufficiency

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DEMO tritium self-sufficiency will be one of the remaining challenges after ITER before achieving commercial fusion energy. Though ITER has not been set the tritium self-sufficiency target, tritium self-sufficiency related fusion science and technology are the maximum attainable level right now.

In this study, the dynamic tritium cycle was simulated both for steady and pulsed DEMO using the system dynamics platform to explain the dynamic tritium inventory and start-up inventory in different systems. Meanwhile, sensitivity analysis of tritium self-sufficiency was performed on the basis of ITER design parameters so as to explain the key factors and reachability of DEMO tritium self-sufficiency. After performing the evaluation, the key influencing factors of tritium self-sufficiency are not only blanket tritium breeding ratio (TBR), but also tritium burn-up fraction, tritium retention amount in the materials and detritiation efficiency of retired components materials. For a typical DEMO, a 50% burn availability and ITER related fusion physical and technological values (e.g. 1% of burn-up fraction, 1h of tritium cycle time, waste management strategy) can be predictive. Under the condition, the required blanket tritium breeding ratio (TBR) is less than the achievable TBR designed in recent years.

Eligible for student paper award?

Yes

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