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Myth of Initial Loading Tritium-2 : Practical commissioning strategy of DEMO-Japan without external source

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The authors have pointed out that initial tritium needed for starting operation of fusion reactor can be made by DD and low T discharges with self sufficient blankets. Practical commissioning plan of Japanese DEMO was recently planned as a part of DEMO design activity. The early campaigns will require longer than a year of repeated low power pulses for operational purposes as the “power ascension tests”. Breeding blankets with TBR well above unity is designed based on a water cooled ceramic pebble concept. Complete tritium plants should be continuously operated with torus exhaust and blanket recovery for safety reasons. In the phase 0 of commissioning, DD pulses with small flux neutron followed by relatively long dwell periods are used to confirm all the nuclear functions of DEMO plant including the Balance of Plant and ancillary systems. This study analyzed dynamic tritium behavior in the plant. After the each discharges, produced tritium from DD reaction in the plasma, bred in the blanket, and fed to the vacuum vessel are all collected by the tritium plant and recovered from the isotope separation during the discharge during the dwell periods. After the DD phase, small amount of tritium is added to the fuel, however the required amount if gram level, that is available from the storage in the tritium plant. In the later operation, tritium concentration will gradually increase and the pulse length will longer, however for each shots, sufficient tritium can be prepared prior to the burning. It was found that in this commissioning scenario, no external tritium or additional DD shots for tritium production is required for DEMO program in Japan.

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