A FAST-TRACK PATH TO DEMO ENABLED BY ITER AND FNSF-AT

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Abstract. A Fusion Nuclear Science Facility based on the Advanced Tokamak concept (FNSF-AT) [V.S. Chan, et al., Fusion Sci. Technol. **57**, 66 (2010)] is a key element of a fast track plan to a commercially attractive fusion DEMO. Such a next step facility will complement ITER in addressing the community identified science and technology gaps to a commercially attractive DEMO, and enable a DEMO construction decision triggered by the achievement of Q=10 in ITER. A FNSF-AT will show fusion can make its own fuel, and provide a materials and components irradiation facility. In order to accomplish these goals, the FNSF has to produce significant fusion power operating steady-state and with significant duty cycle, so to yield a neutron fluence more than ten times what can be accumulated in ITER over ten years. Physics based integrated modeling of FNSF-AT has found a steady-state baseline equilibrium with good stability and controllability properties. 2-D divertor analysis predicts manageable peak heat flux can be obtained even with SOL power width ~1 mm. Using this baseline scenario, high fidelity and high-resolution 3-D neutronics calculations show acceptable cumulative end-of-life organic insulator dose levels in all the device coils, and TBR>1 for two blanket concepts considered. This FNSF-AT baseline scenario has significant margin to meet the FNSF nuclear science mission. Moreover, the facility allows the development of more advanced scenarios to close the physics gaps to DEMO.