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FTP/P7-29: Benchmarking Reactor Systems Studies by Comparison of EU and Japanese System Code Results for Different DEMO Concepts

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Recent systems studies work within the Broader Approach framework has focussed on bench-marking the EU systems code PROCESS against the Japanese code TPC for conceptual DEMO designs. This paper describes benchmarking work for a conservative, pulsed DEMO and an advanced, steady-state, high-bootstrap fraction DEMO. The resulting former machine is an $R_0 = 10$ m, $a = 2.5$ m, $\beta_N < 2.0$ device with no enhancement in energy confinement over IPB98. The latter machine is smaller ($R_0 = 8$ m, $a = 2.7$ m), with $\beta_N = 3.0$, enhanced confinement, and high bootstrap fraction $f_{bs} = 0.8$. These options were chosen to test the codes across a wide range of parameter space. While generally in good agreement, some of the code outputs differ. In particular, differences have been identified in the impurity radiation models and flux swing calculations. The global effects of these differences are described and approaches to identifying the best models, including future experiments, are discussed. Results of varying some of the assumptions underlying the modelling are also presented, demonstrating the sensitivity of the solutions to technological limitations and providing guidance for where further research could be focussed.

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Collaboration (if applicable, e.g., International Tokamak Physics Activities)

Broader Approach

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