

# HOW TO REALISE A FAST TRACK TO FUSION ENERGY PRODUCTION

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A Fast Track means to have electricity production by fusion in the 30<sup>th</sup> and commercial fusion power in the 40<sup>th</sup> of this century. However, this will only be realised if several essential physics and technology issues are solved in due time and thus the basis for the construction of a DEMO reactor exists around 2025. This paper describes what has to be done to arrive there.

*Physics development:* The fusion physics needs to be developed towards a reactor relevant plasma, which means to achieve in ITER significantly better performance than the ITER goals. Beside ITER existing machines such as JET and possibly JT60-SC, as well as others will be essential contributors. In addition we will also need an ITER simulator (a combined physics - control system - engineering software tool) which will be validated on existing machines and on ITER and will eventually become the physics design tool for a demo reactor.

*Technology development:* The technologies which are already needed for ITER (SC magnets, HHF components, shielding Blanket, Remote Handling, CW heating and CD systems (N-NBI, ECRH, ICRH, LH ?)) will be available, but will need further development towards better economy for DEMO (e.g. development of high temperature super conducting magnets). He and liquid metal cooled breeding blankets and a He cooled divertor, which will be tested in ITER, need an intensive development program and dedicated test facilities. In case of a very successful ITER physics programme during the first 10 years of operation an extended performance phase with a water cooled breeding blanket (pebble bed) could be envisaged.

*Material development:* A reactor needs structural materials (Steel, W alloys, SIC Composites, etc.) which can withstand very large neutron doses (up to 150 dpa combined with a significant He production). In addition these materials should be low activation (i.e. recyclable within 100 to 200 years). The planned "International Fusion Materials Irradiation Facility" IFMIF must be constructed in due time (until 2016) in order to validate the structural materials for a DEMO machine until 2025.

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