The new ITER Baseline, Research Plan and open R&D issues

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A new baseline has been proposed by the ITER Project to ensure a robust achievement of the Projects' goals, in view of past challenges including delays incurred due to the Covid-19 pandemic, technical challenges in completing first-of-a-kind components and in nuclear licensing. The new baseline includes modifications to the configuration of the ITER device and its ancillaries (e.g. change from beryllium to tungsten as first wall material, modification of the heating and current drive mix, etc.) as well as additional testing of components (e.g. toroidal field coils) or phased installation (start with inertially cooled first wall before later installation of the final actively water-cooled components) to minimize operational risks.

In the new baseline, the ITER Research Plan (IRP) will be divided into three main phases: a) Augmented First Plasma (AFP), with 40 MW of ECH and 10 MW of ICH, which will focus on the demonstration of 15 MA operation in L-mode, commissioning of all required systems, including disruption mitigation, and the demonstration of H-mode plasma operation in deuterium; b) DT-1, with 67 MW of ECH, 33 MW of NBI and up to 20 MW of ICH, which will demonstrate robust operation in high confinement H-mode plasmas in DT up to Q = 10 and for burn durations for 300-500s within an accumulated neutron fluence of ~ 1% of the ITER machine's lifetime total, and: c) DT-2, with 67 MW of ECH, up to 50 MW of NBI and up to 20 MW of ICH, with the ITER tokamak and ancillaries in their final configuration to demonstrate routine operation in DT plasmas at high Q and the Q = 5 long-pulse and steady-state scenarios to the final neutron fluence.

The logic, physics basis and the modelling and experimental evaluations carried out to support the new baseline and the associated IRP will be described in the paper. These include the impact of the tungsten wall on plasma scenarios and associated risk mitigation measures, as well as the optimization of the tokamak components and ancillaries to minimize Project risks. Open R&D issues related to these evaluations and mitigation measures will also be described together with experimental, modelling and modelling validation activities required to address them.