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Overview of the Design Development, Prototype Manufacturing and Procurement of the ITER In-Vessel Coils

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ITER is incorporating two types of In-Vessel Coils (IVCs): ELM Coils to mitigate Edge Localized Modes and VS Coils to provide Vertical Stabilization of the plasma. Strong coupling with the plasma is required in order that the ELM and VS Coils can meet their performance requirements. Accordingly, the IVCs are mounted on the Vacuum Vessel (VV) inner wall, in close proximity to the plasma, just behind the Blanket Shield Modules (BSM). Fitting the coil systems in between the BSM and the VV leads to difficult integration with diagnostics and cooling water manifolds. This location results in a radiation and temperature environment that is severe necessitating new solutions for material selection, as well as challenging thermo-mechanical analyses and design solutions. Due to high radiation environment, mineral insulated copper conductors enclosed in a steel conduit have been selected.

The project is being led and managed by the ITER Organization in close collaboration with the Chinese Academy of Sciences (ASIPP) in Hefei, China, and with the Princeton Plasma Physics Laboratory (PPPL) in Princeton NJ, USA. Prototype manufacturing has been completed by ASIPP. The aim was to develop suitable manufacturing procedures and techniques necessary to fabricate the ELM and VS Coils, and to qualify electrical and mechanical test procedures to meet the acceptance criteria. An extensive set of analyses to evaluate the effects of the high temperatures and electromagnetic loads on the In-Vessel Coils has been carried out at PPPL. The design of the IVCs has been finalized, and it takes into account the results from the prototype manufacturing.

The procurement of the IVCs and their conductors will be done via direct call-for-tenders from the ITER Organization and preparation has already started.

It is expected that the first call-for-tender will be launched in mid-2014 and the contract signed in early 2015.

This paper will give an overview of the detailed design and prototype manufacturing, procurement and schedule for the In-Vessel Coils.

Country or International Organisation

ITER IO

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