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Status of the ITER In-vessel Coils System and Progress on the Qualification of the In-Vessel Coil Conductor

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Following a decision made at the ITER Council in November 2013, two types of In-Vessel Coils (IVCs), namely ELM Coils to mitigate Edge Localized Modes and VS Coils to provide Vertical Stabilization, have been incorporated in the ITER design. Strong coupling with the plasma is required so that the ELM and VS Coils can meet their performance requirements. Accordingly, the IVCs are in close proximity to the plasma, mounted just behind the Blanket Shield Modules. This location results in a radiation and temperature environment that is severe necessitating new solutions for material selection as well as challenging analysis and design solutions. Due to high radiation environment, mineral insulated copper conductors enclosed in a steel jacket have been selected. A key component of the MIC is the mineral insulation which will consist of compressed MgO powder. The insulation provides three main functions, namely structural support of the copper conductor, thermal conduction between the jacket and the copper conductor, and electrical insulation between the jacket and copper conductor. A major advantage of the coil design is the long conductor length which eliminates the need for any internal joints. In-situ winding of the VS coils is asking for a development of a creative solution for the unspooling, straightening, precise winding tools, bending, and metrology processes in a tight and congested environment. The contract for the procurement of the IVC Conductor has been signed with two suppliers for phase 1: Development, Qualification of all processes, final tests and one full conductor length. Phase 2 includes series manufacturing, storage and delivery of all required conductor lengths. The procurement strategy aimed to select multiple contractors for Phase 1 of the project to mitigate the risk on qualification, cost and schedule and to keep the cost within acceptable limits thus maintaining competition for Phase 2.

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