

ELECTRIFYING MONTHS AT CHINESE DOMESTIC AGENCY AND ITER'S ELECTRICAL ENGINEERING DIVISION

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Finalizing the signature of a Procurement Arrangement (PA) and, at the same time, organizing Preliminary Design Reviews (PDR) for two major systems is a very demanding task that the Chinese Domestic Agency (CN-DA) and ITER's Electrical Engineering Division performed between April and July 2012.

Assembly of documentation for the materials of the PA for the Pulsed Power Electrical Network (PPEN) worth 21.9 kIUA, was finalized between January and June 2012 and signed at the last [ITER Council in Washington, D.C.](#)

During the same period, the Preliminary Design Reviews for two other major power supply PAs had to be organized; these took place last week in Beijing for both the Poloidal Field AC/DC Power Converters (worth 61.1 kIUA) and for the Reactive Power Compensators and Harmonic Filtering System (worth 16.5 kIUA).

Together these three PAs exceed 35% of the CN-DA's total in-kind contribution to ITER.



Participants to the meetings

The key facts and figures of the Pulsed Power Electrical Network (PPEN) system are extremely impressive, as they are normally only found in very large industrial plants. In ITER this system includes a relatively high quantity of power switchgear, cables at three different voltage levels (400 kV, 66 kV and 22 kV) and three grid power step-down transformers equipped with two secondary windings and rated at 300 MVA each.

The detailed system engineering design of the PPEN is the scope of a PA signed by EU-DA on [26 October 2009](#). The scope of the PA signed with the CN-DA in Washington, D.C includes the manufacturing, type testing, routine factory testing and transport of the components that later will be assembled and installed on the ITER site by the EU-DA. Electrical engineers from major European Power Plants and Transmission System Operators are following the news of this Procurement Package with great interest as it will be the first time that such a large quantity of high power and high voltage components are fabricated in China and then installed in Europe. For this reason, the CN-DA is currently selecting China's premier domestic suppliers to ensure high quality and punctual delivery of all the components.



The test facility for ITER RPC&HF in RXPE

The Preliminary Design Review for the ITER Poloidal Field (PF) AC/DC Power Converters (Beijing, 16-18 July 2012) included more than 60 attendees from China, Korea and the ITER Organization, including Review Panel experts from industries and institutes. This PA includes preliminary design, final design, manufacturing, factory tests, inspections, delivery, installation, assembly, integration and site tests of the power converters and dummy load, and was signed on [27 April 2011](#). CN-DA issued its contract with its domestic supplier,

Institute of Plasma Physics Chinese Academy of Sciences (ASIPP), on [21 December 2011](#) . The CN-DA and ASIPP have demonstrated great progress on their preliminary design which was reflected in their documentation and presentations. The proposed solution met most of the IO requirements, and resulted in just three Category 1 Chits which will be solved in collaboration with the IO before the Preliminary Design Review approval date scheduled in September 2012.

The second Preliminary Design Review was held on 19 and 20 July 2012, also in Beijing, for the ITER Reactive Power Compensation and Harmonic Filtering (RPC&HF) System. This system will have one of the largest installed capacities (750 Mvar at 66 kV, 50 Hz) in the world, based on state-of-the-art SVC technology and expected to include a multivariable control system facilitating RPC system response in less than 20 ms, which is critical for the ITER power systems in the event of faults or transients.

The supplier, Rongxin Power Electronic Company (RXPE), very effectively presented and justified its design solution for the system. Progress made since the 2010 [Conceptual Design Review](#) was clearly visible and the review meeting paves the way forward to proceed to the final design and prototype development.

The CN-DA and its suppliers worked extremely hard to prepare both meetings. The Review Panel duly recognized the efforts made, the quality of work performed, and compliance with design procedures. It also discussed and acknowledged the complexity involved in the design development, the performance requirements and, in particular, the control system design for operation.

Hard work was the key “recipe” which ensured good quality of the documentation presented at these meetings. Furthermore, just one month earlier the CN-DA had organized the [Domestic Preliminary Design Reviews](#) (DPDR) for both of these PAs following the same ITER design review procedure including creation of Chits, their categorization and resolution as in the ITER PDRs meetings.

We must also acknowledge the valuable contribution and effort of colleagues responsible for the meeting logistics, and the mandatory Review Panel members from Safety, QA and CIE along with other members of the Coil Power Supply Section who, to contain travel costs, attended the meetings remotely from ITER Headquarters overnight.

After a very intense working week in Beijing, the meeting participants then moved on to Hefei for a technical visit to the testing facility in ASIPP, and further discussions on detailed interface issues. In particular, a full day was dedicated to reviewing the system design and interfaces of the so-called Master Control System (MCS) following a workshop on the same subject in [February 2012](#). The MCS is required to integrate and supervise the operation of the Coil Power Supply System components that includes a PA with Russia. This review meeting also included remote participation from ITER Headquarters during the night.