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Technical Support for the EC system final design Technical Specifications

	Version 1.2	*Date: 10/06/2013*
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1 Abstract

This document describes technical needs of an expert specialist for "Technical Support for the Electron Cyclotron system final design".

2 Background and Objectives

The EC system is to inject up to 20MW of microwave power at 170GHz into the ITER device for localized heating and current drive applications. The system consists of 12 high voltage power supply sets, 24 high power microwave sources (or gyrotrons), 24 transmission lines (TL) and two types of launching antennas (or launchers). The system is being designed and procured in collaboration between the ITER Organization (IO) and five Domestic Agencies (DAs): Europe, India, Japan, Russia and United States. In general, the EC section's responsibility is to define the functional requirements, develop the conceptual design, oversee the development of the final designs, ensure compliance with ITER required standards, manage sub-systems integration and associated documentation.

3 Scope of Work

The objective of this contract is to support the Heating & Current Drive / Electron Cyclotron team in the EC system final design.

4 Estimated Duration

The duration shall be for 2 years (440 working days) from the starting date of the contract and will be carried out 100% at the Cadarache site.

5 Work Description

This technical support scope includes:

- Provide support in cooling design and development for piping and manifolds in RF building.
- Provide support in optimization of the layout of the EC system in RF building and port cells.
- Development and management of all associated EC system diagrams (PFDs, functional, electrical, PIDs, etc.).
- Provide support for codes and standards referenced in EC subsystems.
- Provide support in PCR management: draft any new PCR, management of PCR follow-up.
- Provide support in EC system assembly study.
- Assist in any necessary technical meeting with DA's, either on ITER site or DA site; typically a trip to one DA (Europe, India, Japan, Russia, US) per quarter.
- Assist in the organization and management of the various EC system and sub-system level design reviews;
- Provide support in updating technical documentation and EC database associated with the final design of the EC system; this includes baseline documentation, technical report

and engineering analysis for the whole EC system and EC subsystems and interfaces with other ITER subsystems.
- Provide support in CAD tasks including contract development and oversight for CAD support, design, analysis and prototype & tests;
- Provide support in installation and assembly studies for the whole EC system.
- Cross check compliance of DA's designs, diagrams and models with the ITER requirements.
- Provide support in engineering analysis.

6 Responsibilities (including customs and other logistics)

When applicable.

7 List of deliverables and due dates (proposed or required by ITER)

The task deliverables will be in two forms:

- Weekly Summary of Activities: A document of approximately one page in length summarizing the previous week activities of the contracted Engineer. This is an informal document that is then integrated into the weekly EC activity summary, which is loaded on IDM;
- Monthly progress reports: A document that lists the contracted Engineer's month objectives, those that have been accomplished, those carried over to the following month and any additional activities accomplished or performed. This report is to be loaded on IDM and reviewed by the EC section leader.

In addition, the Contracted Engineer will provide several documents, engineering analysis, technical documents, drawings and diagrams within the work scope described in section 2. Each of these documents will be described in the monthly progress reports.

8 Acceptance Criteria (including rules and criteria)

This criteria shall be the basis of acceptance by IO following the successful completion of the services. These will be in the form of monthly progress reports as indicated in section 6, table of deliverables and further detailed below:

Report and Document Review criteria.
Reports as deliverables shall be stored in the ITER Organization's document management system, IDM by the Contractor for acceptance. A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered documents.
The Approver can name one or more Reviewers(s) in the area of the report's expertise.
The Reviewer(s) can ask modifications to the report in which case the Contractor must submit a new version.
The acceptance of the document by the Approver is the acceptance criterion.

9 Specific requirements and conditions

The required resource is one mechanical engineer (or equivalent) at least 5 years of working experience in mechanical and or applicable R&D development activities.

The contracted Engineer shall have experience in the following activities:

- Knowledge of EC system.
- Experience working at the ITER organization: knowledge of ITER procedures and environment.
- Hydraulic analysis and piping design.
- Thermo mechanical analysis (knowledge of ANSYS 11 is an advantage).
- Catia V5 (mechanical design software used in ITER),
- Written of technical reports, specifications etc…
- English fluent (written and spoken).
- French fluent (useful for French codes and standards).

10 Work Monitoring / Meeting Schedule

The work will be coordinated by the EC section leader and technical responsible officers of the sub-systems forming the EC system. The contracted Engineer will be provided with a revised work scope on a weekly and/or monthly basis, following the general work plan of the EC system development. The contracted Engineer will provide the informal weekly summary of activities and the monthly formal report as outlined in section 3 of this task description.
The contracted Engineer will be asked to participate in the weekly EC section meetings as well as the relevant divisional and technical meetings. Progress reports will be in the form of the weekly and monthly reports as described in section 3 of this task description.
In addition to the monthly Progress Meetings, if necessary, the ITER Organization and/or the Contractor may request specific Progress Meetings associated with this support contract to address specific issues to be resolved. In such a case, the contracted Engineer, the Contractor manager, the EC section leader and HCD division head will be asked to attend.
Experts from the Domestic Agencies may be invited by ITER Organization to participate in the technical meetings.
The contracted Engineer will report to the EC section leader.

11 Payment schedule / Cost and delivery time breakdown

Interim payments will be made monthly upon satisfactory completion and IO approval of monthly progress reports and upon submission of a valid invoice.

12 Quality Assurance (QA) requirement

The organisation conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.
The general requirements are detailed in ITER document ITER Procurement Quality Requirements (22MFG4)
Prior to commencement of the task, a Quality Plan Quality Plan (22MFMW) must be submitted for IO approval giving evidence of the above and describing the organisation for this task; the skill of workers involved in the study; any anticipated sub-contractors; and giving details of who will be the independent checker of the activities.

Prior to commencement of any manufacturing, a Manufacturing & Inspection Plan Manufacturing and Inspection Plan (22MDZD) must be approved by ITER who will mark up any planned interventions.
Deviations and Non-conformities will follow the procedure detailed in IO document MQP Deviations and Non Conformities (22F53X)
Prior to delivery of any manufactured items to the IO Site, a Release Note must be signed MQP Contractors Release Note (22F52F).
Documentation developed as the result of this task shall be retained by the performer of the task or the DA organization for a minimum of 5 years and then may be discarded at the direction of the IO. The use of computer software to perform a safety basis task activity such as analysis and/or modelling, etc shall be reviewed and approved by the IO prior to its use, it should fulfil IO document on Quality Assurance for ITER Safety Codes Quality Assurance for ITER Safety Codes (258LKL).

13 References / Terminology and Acronyms

PCR: Project Change Request
PID: Process and Instrumentation Diagram
PFD: Process Flow Diagram
IDM: ITER Document Management