

CONTRACT TECHNICAL SPECIFICATION

**Technical Support and Preparation of
Documentation for the ITER Magnet Feeder
System**

**Technical Specification
Rev. 1.1**

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Table of Contents

1	Abstract	3
2	Background and Objectives	3
3	Work Description	3
4	Duration	4
5	Deliverables and Time Schedule.....	4
6	Acceptance Criteria (including rules and criteria).....	5
7	Payment schedule / Cost and delivery time breakdown.....	5
8	Experience	5
9	Work conditions.....	5
10	Timetable	6
11	Candidature.....	6

Revision history

Date	Rev.	Note
29 Nov 2010	1.0	First issue
01 Dec 2010	1.1	Change of title, minor change in scope (add baseline docs)

1 Abstract

This technical specification describes engineering support and documentation preparation in relation to the Feeders of the ITER Magnets System.

The superconducting magnets inside the ITER Tokamak are supplied in current and cryogenics by the so called feeders. There are 31 feeder systems, 9 for the toroidal field (TF) magnet system, 6 for the central solenoid (CS) and the poloidal field (PF) magnet system, respectively, 5 for the correction coil (CC) system, 2 for the cooling of the structures, and 2 for special instrumentation. The ITER magnet feeders are being designed by ITER IO in a collaboration with the Chinese Institute of Plasma Physics (ASIPP) in Hefei/China, as well external contractors, under a Procurement Arrangement (PA) with the China Domestic Agency (CN DA)

The scope of this contract is to provide services on documentation preparation and technical support related the Magnet Feeders, and more specifically in the design completion of the HTS current leads.

2 Background and Objectives

ITER superconducting magnet system consists of 18 TF coils, 6 PF coils, a Center Solenoid (CS), 18 Correction Coils (CC) and a Feeder System.

Feeder System provides not only electric current to the coils, but also Supercritical Helium (SHE), instrumentation, etc. Flexibility is required to accommodate the relative displacement during and after cool down, and of course mechanical and dielectric strengths are required against electromagnetic forces and high voltages, respectively. The Feeders (31 in total) are an integral part of the Magnet System and represent a challenge in terms of design, fabrication, and assembly. As they represent the bridge between the Magnet System and its ancillary and supply systems, the Feeders also constitute a major portion of all interface definitions between Magnets (PBS 11) and the rest of the machine.

An important design feature of the Feeders is how to accomplish the transition from 4.2K to room temperature (300 K) along the electric current path. This transition takes place in what are called HTS (High-Temperature Superconducting) current leads. The HTS current leads are a fully modular component at the end of the Feeders, connecting the superconducting busbars with the room-temperature aluminum busbars and the power supply.

An HTS design review took place in China at the beginning of September 2010. The Feeder PA will be agreed with Chinese Domestic Agency (CNDA) in the coming weeks. The HTS current leads are designed by the IO and manufactured by The Institute of Plasma Physics of the Chinese Academy of Sciences (ASIPP) in Hefei, China, under a build-to-print PA. An HTS current lead design exists, but finalization of certain details, and model/drawing preparation, are still ongoing.

The objective of this contract is support the engineering activities needed to finalize the design of the HTS current leads for the Feeders. Further, the objective of the contract is to provide technical support in the review, preparation, update, and maintenance of feeder-related documentation, including the final design package for the HTS current leads.

3 Work Description

The work required in this technical specification includes engineering support activities for the completion of the HTS current leads design. Additionally, it includes document preparation activities for the completion of the HTS current leads final design package, as well as document review, preparation, and maintenance for the Feeders in general.

The scope of work described below is expected to entail a time commitment of 50% over the contract duration on the part of the expert.

Work is organized over a one-year period, with specific tasks and deliverables defined on a quarterly basis.

The reference documents are appended at the end of this specification and their references listed hereafter.

Scope of work:

This section describes the scope of work to be performed under the present contract.

Since the contract is for engineering services, technical support, and provision of expertise in the procurement activities related to the Feeders, the exact tasks will be agreed upon between IO and the expert (or company providing the expertise) on a quarterly basis. At the beginning of each three-month period, and based on the priorities of IO and the Feeder procurement, a work plan will be agreed upon, including deliverables for the period.

The overall scope includes:

- 1) Technical support and expertise for the design of the HTS current leads and the Feeders**
 - a) Review existing design concepts/solution for the many components of the ITER coil feeders, including the HTS current leads.
 - b) Develop and defend proposals for designs of these components (proposals need to be documented thoroughly).
 - c) Participate in design reviews (internal and external) as well as regular meetings if related to the feeder design.
 - d) Provide guidance on the use of design and manufacturing standards to be implemented in the feeder and current lead designs.
- 2) Review, maintenance, and preparation of HTS current lead and feeder documentation**
 - a) Review ~50 documents provided by various collaborators (from ASIPP/China, Altair/India, IO, etc.) describing the detailed design, assembly and supporting analysis of the 31 ITER magnet feeder systems.
 - b) Ensure homogeneity across the reports and enforce documentation quality standards through editing and re-formulation of such documents.
 - c) Participate in review of feeder drawings (3D and 2D).
 - d) Participate and support the production of updates to the feeder baseline documentation
- 3) Preparation of HTS current lead design documentation in support of the PA**
 - a) Preparation of the design reports of the three different current lead designs being developed by the IO.
 - b) Participate in preparation of HTSCL drawings (3D and 2D).

4 Duration

The framework contract duration shall be one year. The IO may exercise the option to terminate the contract during the one year based on performance and results. The IO may exercise the option to extend these services for a maximum of one additional period of one year beyond the original contract. ITER Organization shall establish the request for services on ad hoc basis and relative to the respective annual work plan, with specific tasks and deliverables defined on a quarterly basis.

5 Deliverables and Time Schedule

The specific work to be carried out as part of the scope given above is to be established quarterly (every three months). The IO will, in mutual agreement with the expert, establish tasks and priorities,

along with the written reports to be produced, documentation to be reviewed, or travel needed. These will be part of a work plan for the three-month period. Specific deliverables are:

- Attendance to design reviews or other technical interface meetings as required to complete the design of the HTS current leads
- Final design reports or other design documents related to the HTS current leads and the feeders, reports on reviewed documents, interface documentation, or any other written report as specified in the work plan.
- Monthly reports with a summary of activities during the reporting period, including approximate time spent on each activity

6 Acceptance Criteria (including rules and criteria)

The acceptance of the work is based on completion of the tasks and goals set on the work plan for each trimester, as well as on the completion of reports and documents specified in the work plan.

7 Payment schedule / Cost and delivery time breakdown

The payments shall be granted on a monthly basis following invoicing for actual work performed.

8 Experience

The staff proposed by the bidder to carry out the work described in Section 3 must have proven experience in the following areas:

- At least 25 years of experience in the areas of superconductivity, vacuum and cryogenics with an emphasis on the design and manufacturing of superconducting magnets and devices
- Specific experience in the design, manufacturing, and test of HTS current leads is required
- Proven experience in the construction of large-scale projects involving superconducting magnets devices is desirable
- Ability to work in a team, yet be able to carry out tasks independently if needed
- Ability to communicate fluently and write reports in English
- Able to travel to follow up some of the HTS current lead-related activities (China)

Curriculum Vitae, CV showing evidence above is required.

9 Work conditions

- Work plan for every three months is established and agreed by IO. Travelling and missions shall be only upon an agreement with IO.
- This contract shall be executed by one staff. Split it into parts for sharing is not acceptable.
- The contractor shall have its own office and computer resources. The contractor will be given access to the necessary data and documents either in paper or in computer files form at Cadarache ITER site. The contractor will also be allowed accessing to the necessary folders in the computer server at Cadarache ITER site via internet. The contractor shall be given temporary office space in the premises of the Magnet Division for the purposes of working onsite and hold meetings with Magnet Division personnel.

10 Timetable

The tentative timetable is as follows:

Call for Expertise	December 2010
Tender submission	January 2011
Start of Contract	February 2011

11 Candidature

Participation is open to all individuals, companies or consortia which are legally registered in one or more of the ITER Member States. A consortium may be either a permanent, legally-established grouping or a grouping which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

The consortium groupings shall be presented at the tender submission stage. The consortium cannot be modified later without the approval of the ITER Organization.