SUMMARY

Call For Nomination IO/12/70000026/BGD
Framework Contract for Fast ICS
Architecture Study and Performance Analysis

Purpose

The Interlock Control System or ICS is the ITER control system in charge of implementing the investment protection functions. It is composed of the Central Interlock System or CIS (PBS-46) and around fifty Plant Interlock Systems (PIS). Among these, a maximum of ten PIS will interface the CIS through the fast architecture.

The purpose of the requested services is to provide technical support for the validation, analysis and improvement of the solutions selected during the preliminary design phase of the ITER fast interlock system, as well as to complete the development of the fast interlock architecture.

Background

The investment protection at ITER is provided by the Interlock Control Systems. These are the systems in charge of implementing all the instrumented protection functions of the tokamak and its associated plant systems. These functions are divided into:

- Local interlock functions, which are limited to one plant system and have no effect on the rest of the machine. The interlock event and the mitigation action are performed within the same plant system.
- Central interlock functions, which involve two or more plant systems.

The local functions are implemented by the different Plant Interlock Systems (PIS) while the central actions are implemented by the Central Interlock System (CIS) via the PIS of each plant system involved.

The ITER Interlock Control System is therefore formed by:

- One Central Interlock System (CIS).
- One or more Plant Interlock System (PIS) for each plant system involved in one or more investment protection functions (around 50 PIS expected at the final ITER configuration)
- The interlock networks:
- Central Interlock Network (CIN) connects the different PIS with the CIN.
- Plant Interlock Networks (PIN) connects the PIS with the different elements of its plant system (i.e. sensors, actuators and other controllers)

During the past two years, an R&D campaign has been carried out to develop the design of the slow and fast architectures for the Central and Plant Interlock Systems.

**Scope of work**

The scope of the work covers the proposal of integrated solutions for the fast interlock architecture (CIS and PIS), including an analysis of the performance, possibilities and limitations of the selected solutions, and the demonstration of their capability to implement real functions required by the ITER project.

The contractor will be also required to, based on the current project development, answer to the different technical questions which will be encountered during the preliminary design phase of the Central Interlock System.

The services requested herein can be categorized as follow:

- **Study of the development of a generic PIS fast controller:** the contractor will study the real performance, limitations, constraints and potential improvements for the controller.
- **Redundant solution for PIS fast controller:** A dependability study will be carried out, including an estimation of the reliability and availability of the system, and the identification of the most critical elements. This study should propose technical solutions to achieve the necessary redundancy on the system to reach the given integrity requisites.
- **Interface with slow interlock architecture:** development of the interface with the Siemens S7-400FH through Profinet.
- **Interface with Plasma Control System:** integration of the solutions provided by CODAC for the PCS fast controllers within the fast central interlock architecture.
- **Software tools for configuration and monitoring:** The final system should have a certain degree of adaptability (change of thresholds, acceptance of user inputs). System main parameters should also be available for the operator. Software tools should be proposed to tackle this requisite.
- **Integrated fast Interlock Control System architecture:** An integrated solution for the fast architecture of the ICS will be proposed. This solution will include a proposal for the fast CIN (safe communications between all fast controllers through the CIS fast controllers), and a global integrated solution including slow-CIS and slow-PIS.

All tasks defined in the different task orders shall be executed in close collaboration with the CODAC ITER Organization team and take into account other activities, internal and external, with any relevance to this contract (i.e. CIS prototyping, machine protection functions identification, preparation of the CIS preliminary design, etc.).

**Duration of services**

The Contract is scheduled to come into force in the third quarter of 2012 for a duration of two (2) years.
**Procurement Time table**

A tentative time table is outlined as follows:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Call for Nomination release</td>
<td>15 May 2012</td>
</tr>
<tr>
<td>Receipt of nominations</td>
<td>11 June 2012</td>
</tr>
<tr>
<td>Issuance of Call for Tender</td>
<td>Mid-June 2012</td>
</tr>
<tr>
<td><strong>Tender Proposals Due Date:</strong></td>
<td><strong>Mid-July 2012</strong></td>
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<tr>
<td>Estimated Contract Award Date:</td>
<td>August 2012</td>
</tr>
<tr>
<td>Estimated Contract Start Date:</td>
<td>September 2012</td>
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</tbody>
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**Experience**

The acceptance criteria for the selection of the tender cover a broad range as listed below.

- A solid experience working with research institutions and facilities especially with ITER and/or other tokamak projects.
- Capability to understand the processes involved in the protection of the ITER machine.
- Experience in hardware integration of conventional industrial control systems (> 5,000 inputs/outputs);
- Experience in the field of instrumentation and signal interfacing;
- Experience in EMI effects on I&C components and EMC rules to apply in harsh environment.
- Experience in development under NI cRIO and flexRIO technologies.
- Experience in FPGA based data acquisition systems and their signal interfacing;
- Knowledge of interfacing Siemens Step 7-400FH series PLCs and their input/output modules;
- Experience working with CODAC and EPICS.

**Candidature**

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be 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 cannot be modified later without the approval of the ITER Organization.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Bidders’ (individual or consortium) must comply with the selection criteria. IO reserves the right to
disregard duplicated references and may exclude such legal entities from the tender procedure.

Reference

Further information on the ITER Organization procurement can be found at: HTTP://WWW.ITER.ORG/ORG/TEAM/ADM/PROC