

Technical Specifications (In-Cash Procurement)

Diagnostic Instrumentation & Control Activities

The Framework Contract will be used to complete all Instrument & Control (I&C) design lifecycle activities for the Diagnostic systems: Plant system I&C design activities (Preliminary Design Review (PDR) and Final Design Review (FDR)) Detailed I&C design activities (for Manufacturing Readiness Review (MRR)) Cubicle Manufacturing Software development Plant I&C testing (Factory Acceptance Test (FAT)) Support for Commissioning and Operation

Technical summary

Framework Contract for Diagnostic Instrumentation & Control Activities

CFT-70000873-GDK

1. Purpose

The Framework Contract will be used to complete all Instrument & Control (I&C) design lifecycle activities for the Diagnostic systems:

- Plant system I&C design activities (Preliminary Design Review (PDR) and Final Design Review (FDR))
- Detailed I&C design activities (for Manufacturing Readiness Review (MRR))
- Cubicle Manufacturing
- Software development
- Plant I&C testing (Factory Acceptance Test (FAT))
- Support for Commissioning and Operation

The Framework Contract will mostly focus on IO based systems but will also include activities to follow-up and review Domestic Agencies (DA) related I&C activities. All I&C development services rendered by the awarded Contractor are within the guidelines of the Plant Control Design Handbook (PCDH), satellite documents and specific Diagnostic I&C guidelines. This Framework Contract is intended to be executed with separate Task Orders.

2. Background

ITER I&C System comprise the complete control, interlock and safety systems required to operate the ITER device. ITER I&C system has two layers, central coordination and local plant systems. The central systems are “in-fund”, i.e. procured by ITER Organization (IO), while plant systems are “in-kind”, i.e. procured by the seven ITER Domestic Agencies or by IO directly. It is expected there will be more than 170 plant systems. In order to ensure integration and maintainability, the instrumentation and control of plant systems are subject for standardization. The IO has published a set of documents to help the design of the I&C, called the Plant Control Design Handbook (PCDH). It defines mandatory rules for the system interconnect while providing guidelines and catalogues for the choice of the plant system I&C fast controllers.

ITER requires extensive diagnostics to meet the requirements for machine operation, protection, plasma control and physics studies. The realization of these systems is a considerable challenge, not only because of the harsh environment and the nuclear requirements but also with respect to plant system Instrumentation and Control (I&C). Most of the diagnostics plant I&C systems will require a large number of high performance fast controllers.

A common approach for the development for diagnostics plant I&C is documented in a guideline, which is based on the ITER standards and methodologies.

3. Scope of work

For IO based Plant I&C systems:

- 1) Plant system I&C design activities (CDR, PDR and FDR)
 - a. Develop fully the Plant systems I&C design following Diagnostic guideline and according to the inputs provided by IO.
 - b. Present the I&C design status to the various Gate reviews (CDR, PDR, FDR)
 - c. Advise IO System TRO on CODAC integrity of their system.
 - d. Perform the necessary I&C prototype activities .
- 2) Detailed I&C design activities (for MRR)
 - a. Develop the detail design activities required for MRR .
 - b. Coordinate the cubicle wiring diagrams editing with SEE electrical Expert tool.
- 3) Cubicle Manufacturing
 - a. Prepare the cubicle assembly.
 - b. Support IO to procure all HW equipment to be installed in the I&C cubicles.
 - c. Mount and connect all components in the I&C cubicle according to the international guidelines and French standard NFC-15-100.
 - d. Perform and execute the necessary component tests.
- 4) Software development
 - a. Prepare the Software development plan.
 - b. Implement all software and Firmware according to the CODAC guidelines.
 - c. Debug all Software.
- 5) Plant I&C testing (FAT)
 - a. Develop the System test plan with all associated test procedures.
 - b. Run all test required for FAT.
 - c. Debug and upgrade the Design following the results of the tests.
- 6) Support for Commissioning and Operation
 - a. Assist IO team to execute Commissioning tests.
 - b. Debug and upgrade the Design following the results of the tests
 - c. Assist IO team to operate the systems

For DA systems :

- 1) Review of DA based I&C documentation (including participation as chairman or I&C expert during I&C design review)
- 2) Implement common solutions for the DA on IO request
- 3) Assist IO for the inspection of DA based I&C Cubicle (Hardware & Software)
- 4) Assist IO team for Operation and commissioning

General Support :

- 1) Develop the D1 CBS level functionalities
- 2) Develop common solutions to be used by several diagnostic
- 3) Assist IO teams with the integration of Diagnostic system into CODAC

IO based systems that will be developed with this Framework contract are:

IO system	Current maturity	Number of Cubicle
55.A8 - FOCS	CDR	2
55.B9 - Lost Alpha Monitor	Pre-CDR	3
55.BE: Tangential Neutron Spectrometer	Pre-CDR	3

55.BV - In Vessel Neutron Calibration	CDR	1
55.E6 - Visible Spectroscopy Reference System (VSRS)	PDR	5
55.EE - Hard X-ray Monitor	FDR	1
55.FA - Density Interferometer Polarimeter (DIP)	FDR	5
55.G2 - Target Thermocouples	PDR	3
55.G3.50 – Pressure Gauges Temporary	PDR	2
55.G8 - Erosion Monitor	CDR	3
55.G9 - Dust Monitor	CDR	4
55.GC - Tritium Monitor	CDR	2
55.GE - Divertor Flow Monitor	CDR	2
55.GG:Calorimetry	Pre-CDR	tbd

French nuclear regulations such as INB-174 apply to the ITER facility. ITER require the awarded contractor to perform the work on :

- contractor's usual place of business for all design activities and some prototype activities
- ITER Corbieres Building for most prototype activities, cubicle assembly and testing
- ITER Worksite for commissioning and operation support.

4. Timetable

The tentative timetable is as follows:

Call for Nomination	Q3-2022
Release of Prequalification	November 2022
Release of Call for Tender	February 2023
Indicative award date	August 2023
Indicative Contract signature	September 2023
Indicative Contract start date	September 2023

5. Required Experience

The candidates should have proven experience in the following areas:

- The candidates shall have experience in design, formal system engineering methodology of large or complex instrumentation and control projects using formal system engineering methodologies
- The candidate shall have experience in manufacturing, testing, and validation of those systems including debugging SW.
- The candidate shall have experience in commissioning and integration activities of those systems.

- The candidate will have to be able to provide recent reference projects demonstrating the above.

The candidates should have the technical capability in the below fields of expertise

- Computer programming language, e.g. C/C++, Python, Java, aso...
- Linux-based instrumentation and control systems.
- EPICS /CODAC software tools and applications.
- Electrical engineering (EMC, radiation and magnetic field protection and related international standards)

6. Duration of services

The Contract will be carried out over an initial firm period of four (4) years and an optional period of two (2) years. The Contract is scheduled to come into force in September 2023.

7. 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.

Bidders will have to hold an active Ariba Network account and be registered with IO I-PROC digital system to be able to participate to the tender.

8. Reference

Further information on the ITER Organization procurement and link to registration to Ariba Network and I-PROC can be found at:

<http://www.iter.org/org/team/adm/proc/overview>