Technical Specifications (In-Cash Procurement)

2023-01 - Expert Support for Diagnostics I&C Integration

Expert Support for Diagnostics I&C Integration

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1 PURPOSE

This document provides the technical specification for the work to be performed for diagnostics plant I&C production and reference system aiming at the integration of these systems with central CODAC. Each of the 55+ ITER Diagnostic Systems are operated from the main control room through an instrumentation and control system (I&C) with one plant I&C for each diagnostics. The diagnostics plant I&C systems are developed by the IO-CT team and the domestics agencies according to their responsibilities for the supply of the various diagnostics. The integration of these plant I&C with central CODAC is essential for the success of ITER operation. The work described in this technical specification is focused on the integration aspects and covers the integration relevant topics for each life-cycle phase from design, manufacturing, testing, integration, operation, and maintenance.

2 SCOPE

In support of the Controls and Diagnostics Division objectives provide the following services and resulting deliverables related to diagnostics plant I&C production and reference systems located at the Corbiéres Lab and the CODAC technical rooms :

1. Perform receiving inspection and inventory management (CLM)
    a. Receive I&C components and document reception
    b. Perform receiving inspection and power-up tests as required
    c. Document HW items received in inventory management system (CLM)
    d. Verify system documentation in IDM and source code in SVN
2. Manufacturing, assembly and installation, and cabling
    a. Support the manufacturing of diagnostics plant I&C
        i. Hardware components including Integration kits, fast controllers, slow controller, COTS controllers, signal conditioning and local control networks
        ii. Software components including all plant I&C software, device support, and functionality extending to central CODAC.
    b. Support the assembly and installation of diagnostics plant I&C
        i. Cubicle rails and accessories
        ii. Chassis in Cubicles
        iii. Boards in Chassis
        iv. Electrical power in cubicles
    c. Cabling support
        i. Install pre-manufactures cables and cabling looms
        ii. Perform connectivity test
        iii. Prepare and apply cable labels
        iv. Terminate cables as required
3. Execute Test Plans, reproduce previous test report results and report issues
    a. Perform tests and document results in the Test Report (STR)
    b. Report Issues observed during testing and issue JIRA tickets
    c. Support in FAT testing of diagnostics plant I&C
4. Operation, Maintenance, Issue tracking
    a. Operate plant I&C systems and document any issues observed
    b. Document availability and reliability of plant I&C systems
    c. Review latest issue/bug list and maintenance report

     d.   Coordinate bug fixes and witness acceptance testing

     e.   Report remaining issues/bugs

5. Coordination of Lab Activities related to central CODAC installation, operation and maintenance

     a.   Coordinate installation of central CODAC infrastructure at the Corbiéres Lab

     b.   Coordinate testing and maintenance of central CODAC systems

     c.   Provide operation support for central CODAC infrastructure

     d.   Support in testing the interfaces of plant I&C with central CODAC system

6. I&C Quality Inspection (Design, Implementation, Documentation)

     a.   Perform regular quality inspections of the plant I&C systems

     b.   Verify that design documentation matches the implementation

     c.   Verify the quality of documentation in IDM and other repositories

     d.   Perform failure assessment (FMEA) and propose strategy for process control by coordinating with plant I&C manufacturers

     e.   Document any change, deviation or non-conformity in the plant I&C

     f.   Review quality control plans developed by diagnostic plant I&C manufacturers

7. CODAC Integration of production and reference systems. I&C Methodology application and improvement

     a.   Participate in CODAC integration activities

     b.   Document lessons learned and provide input for additional CODAC requirements

     c.   Apply and improve diagnostics I&C methodology for all life-cycle phases including requirements, design, manufacturing, acceptance testing, integration wit central CODAC, operation and maintenance.

3 DEFINITIONS

API	Application Programming Interface
CODAC	Control, Data Access and Communications
DAN	Data Archiving Network
DAQ	Data Acquisition
DNFM	Divertor Neutron Flux Monitor
EPICS	Experimental Physics and Industrial Control System
MTCA	MicroTCA Computing Architecture
NDS	Nominal Device Support
NDUC	Neutron Diagnostic Use Case
OMM	I&C Operation and Maintenance Manual
PDM	Pulse Discrimination Module
SRS	System Requirements Specification
SDS	System Design Specification
SMS	System Manufacturing Specification
STR	System Test Report
STP	System Test Plan
TCN	Time Critical Network

4 REFERENCES

[RD1] Diagnostic plant I&C system engineering methodology (JQLRRK)

[RD2] Enterprise Architect User Manual (Q77FFP)

[RD3] SEQA-45 - Software Engineering and Quality Assurance for CODAC (2NRS2K)

[RD4] Requirements Management Guideline for Diagnostics Plant I&C (UNL5VW)

[RD5] Diagnostics plant I&C Implementation process (MPF9QZ)

[RD6] Diagnostics I&C SharePoint (Link)

[RD7] CODAC Application documentation (6FAM25)

5 ESTIMATED DURATION

The contract duration is 12 month

6 WORK DESCRIPTION

Overall IO Technical Responsible Officer for this contract: **Stefan Simrock**.

The sub-tasks of this task order together with the deliverables are described in chapters 6.1 – 6.7. Each subtask consists of

- Subtask title.
- Short introduction
- Actual task description
- Inputs provided by IO and
- Deliverables including Milestones

The deliverables must be compliant with the PCDH and the work will be executed according to the diagnostics plant I&C system engineering methodology and the manuals and guidelines provided by CODAC and the CCI section [RD1] … [RD7]. All the tasks will have besides the deliverables in addition a focus on the main outcomes and quality aspects.

Delivery milestones are monthly activity reports A#01 … A#12, and quarterly summary reports with references to all additional documents and other references (such as test reports or JIRA tickets) produced in that period - Q#01, Q#02, Q#03, Q#04. The activity reports and quarterly summary report will cover each subtask in a separate section.

6.1 Sub-Task-1: Perform receiving inspection and inventory management (CLM)

The scope of this subtask is described in section 2 (Scope) under point 1.

Liaison and Resource Tracking Officer

IO-RO: Stefan Simrock

Task Description

All plant I&C deliverables and I&C components shipped to IO must be inspected and documented.

1. Perform receiving inspection
    a. Receive I&C components and document reception
    b. Perform receiving inspection and power-up tests as required
2. Inventory management (CLM)
    a. Document HW items received in inventory management system (CLM)
    b. Verify system documentation in IDM and source code in SVN

Inputs to be provided by IO:

1. List of plant I&C under development
2. Purchase requests for I&C components
3. Inventory documentation system (CLM)
4. Deliver inspection checklist
5. CLM documentation

Deliverables from the Contractor

Deliverable	Description	Milestones
D1.1 Receiving Inspection Reports	Receiving inspection report for each plant I&C or component delivery	ALL
D1.2 Inventory documentation in CLM	Test plan including test procedures of all delivered software components	ALL

6.2 Sub-Task-2: Manufacturing, assembly and installation, and cabling

The scope of this subtask is described in section 2 (Scope) under point 2.

Liaison and Resource Tracking Officer

IO-RO: Stefan Simrock

Task Description

The quality of manufacturing, assembly and installation, and cabling are an essential pre-requisite for plant I&C integration.

1. Support the manufacturing of diagnostics plant I&C
    a. Hardware components including Integration kits, fast controllers, slow controller, COTS controllers, signal conditioning and local control networks
    b. Software components including all plant I&C software, device support, and functionality extending to central CODAC.
2. Support the assembly and installation of diagnostics plant I&C
    a. Cubicle rails and accessories
    b. Chassis in Cubicles
    c. Boards in Chassis
    d. Electrical power in cubicles
3. Cabling support
    a. Install pre-manufactures cables and cabling looms
    b. Perform connectivity test
    c. Prepare and apply cable labels
    d. Terminate cables as required

Inputs to be provided by IO:

1. Schedule for Manufacturing, assembly and installation activities
2. Manufacturing and assembly specifications
3. Installation instructions
4. Cabling plans
5. Cubicles, components and parts as required

Deliverables from the Contractor

Deliverable	Description	Milestone
D2.1 Manufacturing reports	Activity report on manufacturing and assembly	ALL
D2.2 Installation and cabling reports	Activity report for installation and cabling	ALL

6.3 Sub-Task-3: Execute Test Plans, reproduce previous test report results and report issues

The scope of this subtask is described in section 2 (Scope) under point 3.

Liaison and Resource Tracking Officer

IO-RO: Stefan Simrock

Task Description

Execute Test Plans, reproduce previous test report results and report issues. Test plans provided with the delivery of a plant I&C or I&C components must be repeated and verified on IO site to ensure that they can be executed and reproduced in the IO environment in which they are installed. Issues have to be documented and must be followed-up until they are resolved.

1. Perform tests and document results in the Test Report (STR)
2. Report Issues observed during testing and issue JIRA tickets
3. Support in FAT testing of diagnostics plant I&C

Inputs to be provided by IO:

1. Test Plans delivered by I&C suppliers
2. Test Report delivered by I&C suppliers

Deliverables from the Contractor

Deliverable	Description	Milestone
D3.1 Testing Activity report	Activity report on test performed	ALL
D3.2 Test Reports	Test reports with documentation of issues found	ALL

6.4 Sub-Task-4: Operation, Maintenance, Issue tracking

The scope of this subtask is described in section 2 (Scope) under point 4.

Liaison and Resource Tracking Officer

IO-RO: Stefan Simrock

Task Description

Operation, Maintenance, Issue tracking. Accepted plant I&C systems must be maintained which include their regular operation, detection of potential problem, and documentation and follow-up on issues. Regular operation allows to collect information about availability and reliability of the plant I&C systems

1. Operate plant I&C systems and document any issues observed
2. Document availability and reliability of plant I&C systems
3. Review latest issue/bug list and maintenance report
4. Coordinate bug fixes and witness acceptance testing
5. Report remaining issues/bugs

Inputs to be provided by IO:

1. Operation Manual
2. Maintenance Manual

Deliverables from the Contractor

Deliverable	Description	Milestone
D4.1 Operation report	Report of operation activities including observations on operability and reliability	ALL
D4.2 Maintenance Report	Report of maintenance activities	ALL
D4.3 Issue tracking	Issue reporting and tracking in JIRA	ALL

6.5 Sub-Task-5: Coordination of Lab Activities related to central CODAC installation, operation and maintenance

The scope of this subtask is described in section 2 (Scope) under point 5.

Liaison and Resource Tracking Officer

IO-RO: Stefan Simrock

Task Description

Coordination of Lab Activities related to central CODAC installation, operation and maintenance

1. Coordinate installation of central CODAC infrastructure at the Corbiéres Lab
2. Coordinate testing and maintenance of central CODAC systems
3. Provide operation support for central CODAC infrastructure
4. Support in testing the interfaces of plant I&C with central CODAC

Inputs to be provided by IO:

1. Schedule of Corbiéres Lab activities
2. Architecture of the Corbiéres Lab infrastructure
3. Description of the Central CODAC installations at the Corbiéres Lab
4. Test Plan for Central CODAC infrastructure

Deliverables from the Contractor

Deliverable	Description	Milestone
D5.1 Coordination Report	Report of the central CODAC coordination activities.	ALL
D5.2 Test and Maintenance reports	Test reports and maintenance reports for Central CODAC infrastructure	ALL
D5.3 Operation and Maintenance report	Report on operation and maintenance activities of the Central CODAC infrastructure.	ALL

6.6 Sub-Task-6: I&C Quality Inspection (Design, Implementation, Documentation)

The scope of this subtask is described in section 2 (Scope) under point 6.

Liaison and Resource Tracking Officer

IO-RO: Stefan Simrock

Task Description

I&C Quality Inspection (Design, Implementation, Documentation)

1. Perform regular quality inspections of the plant I&C systems (Compliance with PCDH).
2. Verify that design documentation matches the implementation
3. Verify the quality of documentation in IDM and other repositories
4. Perform failure assessment (FMEA) and propose strategy for process control by coordinating with plant I&C manufacturers
5. Document any change, deviation or non-conformity in the plant I&C
6. Review quality control plans developed by diagnostic plant I&C manufacturers

Inputs to be provided by IO:

1. Plant I&C Documentation (SRS, SDS, SMS, STP, STR, OMM as applicable)
2. Data Visualization and Analysis Tools

Deliverables from the Contractor

Deliverable	Description	Milestone
D6.1 Quality inspection plan	Procedures for quality inspection including evaluation criteria for quality	ALL
D6.2 Inspection Reports	Quality Inspection Reports	ALL

6.7 Sub-Task-7: CODAC Integration of production and reference systems, I&C Methodology

The scope of this subtask is described in section 2 (Scope) under point 7.

Liaison and Resource Tracking Officer

IO-RO: Stefan Simrock

Task Description

CODAC Integration of production and reference systems, I&C Methodology

1. Participate in CODAC integration activities
2. Document lessons learned and provide input for additional CODAC requirements
3. Apply and improve diagnostics I&C methodology for all life-cycle phases including requirements, design, manufacturing, acceptance testing, integration wit central CODAC, operation and maintenance.

Inputs to be provided by IO:

1. Integration tools and applications (documentation)
2. Integration procedures
3. Support from I&C integration team (from CODAC and Diagnostics)

Deliverables from the Contractor

Deliverable	Description	Milestone
D7.1 Integration activity plan	Resource loaded work plan of integration activities	ALL
D7.2 Integration activity report	Reports of integration activities	ALL
D7.3 Lessons learned	Lessons learned report. Proposal for improvement of integration procedures.	ALL
D7.4 CODAC requirements	Requirements for CODAC tools and applications updated.	ALL

7 RESPONSIBILITIES

The contractor will provide specialist resources on a long-term permanent basis for the duration and at the location as required under this scope of work. The contractor undertakes that:

- The personnel will possess the qualifications, professional competence and experience to carry out such services in accordance with best practice within the industry
- The personnel will be bound by the rules and regulations governing ITER safety and security
- The required safety clearance deliverables will be provided and maintained accurate during period of execution of the services.

7.1 Specific Skills

Execution of the service requires personnel with appropriate accreditation for Low Voltage (LV) electrical operation according to NFC 18 510. High Voltage (HV) electrical work is not required.

7.2 Milestones

The table below shows the allocation of the deliverables of this task order with the 7 main milestones.

Milestone	Deliverable	Est Due date
A#01 A#02 A#03 Q#01	D1.x D2.x D3.x D4.x D5.x D6.x D7.x	T0+1 month T0+2 month T0+3 month T0+3 month
A#04 A#05 A#06 Q#02	D1.x D2.x D3.x D4.x D5.x D6.x D7.x	T0+4 month T0+5 month T0+6 month T0+6 month
A#07 A#08 A#09	D1.x D2.x D3.x D4.x D5.x D6.x D7.x	T0+7 month T0+8 month T0+9 month T0+9 month

Q#03		
A#10	D1.x D2.x	T0+10 month
A#11	D3.x D4.x	T0+11 month
A#12	D5.x	T0+12 month
Q#04	D6.x D7.x	T0+12 month

8 ACCEPTANCE CRITERIA

The following criteria shall be the basis of the acceptance of the successful accomplishment of the Work.

8.1 Delivery date criteria

On-time delivery of deliverables according to the milestone dates defined in Section 7.

8.2 Report and Document Review criteria

Reports and design documentation 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 an acceptance criterion.

8.3 Software delivery criteria

Software source code shall be delivered in the ITER Organizations software repository (SVN) by the Contractor for acceptance. A named ITER Organization's Contract Technical Responsible Officer is the Approver of the delivered software source code. The acceptance is based on successful execution of test plans and approved test reports and includes a source code inspection and analysis.

9 SPECIFIC REQUIREMENTS AND CONDITIONS

The recommendations that are described in the CODAC Software Engineering and Quality Assurance document [RD3] shall apply to the deliverables.

10 WORK MONITORING / MEETING SCHEDULE

The work will be managed by means of weekly planning and progress meeting and/or formal and informal exchange of documents which provide detailed information. Planning meetings will be orhanized by the ITER Organization to plan the upcoming activities, review the progress of the work and discuss and resolve the technical problems.

The main purpose of the weekly meetings is to allow the ITER Organization and the contractor to:

1. Allow early detection and correction of issues that may cause delays;
2. Review the completed and planned activities and asses the progress made;
3. Permit fast and consensual resolution of unexpected problems;
4. Clarify doubts and prevent misinterpretations of the specifications.

On every monthly milestone, the contractor shall submit to ITER Organization an activity report and on a quarterly basis a summary report with references to additional documentation produced during that period.

On request and by agreement, additional special subject meetings will be organized.

11 QUALITY ASSURANCE (QA) REQUIREMENT

The organization conducting these activities should have an ITER approved QA Program or an ISO 9001 accredited quality system.

The general requirements are detailed in ITER_D_22MFG4 - ITER Procurement Quality Requirements

Prior to commencement of the contract, a Quality Plan (QP) must be submitted for IO approval in accordance with Procurement ITER_D_22MFMW - Requirements for Producing a Quality Plan. The QP should describe the organization for the contract; 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.

Manufacturing and Inspection Plan (or Inspection Plan) should be implemented to monitor quality control and acceptance test. The contractor are subject to Requirements for Producing an Inspection Plan (ITER_D_22MDZD).

All requirements of this Technical Specification and subsequent changes proposed by the Contractor during the execution of the Contract are subject to the Deviation Request process described in ITER_D_2LZJHB - Procedure for the management of Deviation Request. When a non-conformance is identified, the contractor are subject to the Non-conformance Report process describe in ITER_D_22F53X - Procedure for Management of Nonconformities.

Documentation developed as the result of the contract should be retained by the performer for a minimum of 5 years and then may be discarded at the direction of the IO.

12 SAFETY REQUIREMENTS

ITER is a Nuclear Facility identified in France by the number-INB-174 ("Installation Nucléaire de Base").

For Protection Important Components and in particular Safety Important Class components (SIC), the French Nuclear Regulation must be observed, in application of the Article 14 of the ITER Agreement.

In such case the External Contractors (Suppliers and Subcontractors, and their Subcontractors) must be informed that:

- The Order 7th February 2012 applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-order must be demonstrated in the chain of external contractors.
- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.