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Technical Specifications (In-Cash Procurement)

TS - Magnetic Diagnostics Integration Support

Technical specification and statement of work to be performed related to the design and development of Magnetic Diagnostics (55A0) archiver and SUP component for configuration as part of the activities to support the plant integration.

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1 PURPOSE

This document provides the statement of work and required expertise for the work to support the Central Control Integration Section with design and implementation of the archiving component of the ITER Magnetics Diagnostics (PBS 55.A0) and SUP application for plant configuration.

2 BACKGROUND

2.1 Archiving Proxy of Magnetics Diagnostics Data

The magnetics diagnostic plant system is critical to the successful operation of ITER plasma pulses. It produces large volumes of sensor data that is used to calculate critical plasma parameters in real time. In addition to being used for real-time plasma diagnostic and control, the data must also be archived.

The design of the system includes an archiver proxy for the magnetics diagnostic that needs to manage continuous data streams at 36 GB/s and is assumed to require deployment on multiple datacenter-grade servers.

2.2 SUP application for Plant Configuration

The magnetics diagnostics is the primary source for measuring plasma current, which is used by a number of fundamental protection functions. Therefore, the configuration of the system needs to be coordinated with the Central Interlock System Supervisor Module (CIS-SM). This implies a three-way relation between the CODAC Supervision and Automation (SUP), in charge of providing the configuration parameters; the CIS-SM, in charge of approving and recording the configuration change; and the PSH, in charge of applying the configuration to the system.

3 SCOPE

This work specification aims at securing access to additional relevant technical competences to participate in the construction of the ITER by contributing to the development of identified plant system software components and code/configuration generation tools.

4 DEFINITIONS

CGT	Code Generation Tool
CIS	Central Interlock System
CIS-SM	CIS Supervisor Module
CODAC	Control, Data Access and Communications
CVVF	Configuration Verification and Validation Framework
CWS	Cooling Water System
EPICS	Experimental Physics and Industrial Control System

IO	ITER Organization
KoM	Kick-off Meeting
PLC	Programmable Logic Controller
PSH	Plant System Host
SRS	System Requirements Specification
SDS	System Design Specification
SMS	System Manufacturing Specification
STR	System Test Report
STP	System Test Plan
SUP	Supervision and Automation component

5 REFERENCES

[RD1] SEQA-45 - Software Engineering and Quality Assurance for CODAC (2NRS2K)

[RD2] ITER_D_BHUMA6 - Supervision and Automation - Software Requirements Specification

[RD3] ITER_D_28NSQS - Supervision and Automation - Configuration - Software Architecture and Design Description

5.1 Inputs to be provided at the start of activities

[RD4] 55.A0 Design Description Document (2K9Y6N v1.1)

[RD5] 55.A0 Enterprise Architect Model (2KA8RL v1.1)

6 ESTIMATED DURATION

The contract duration is 12 month

7 WORK DESCRIPTION

The work is partitioned into two tasks as follows:

- To design and implement the data archiving proxy component for magnetics diagnostics, including the calculation and reporting of appropriate data quality metrics.
- To design and implement the SUP application for interfacing CIS-SM and magnetic diagnostics PSH allowing the system configuration.

The development process for the two features is similar:

- Review of the current proposed design.
- Examination of stakeholder concerns.

- Proposal of a detailed design.
- Implementation of the actual design, leveraging already existing components.
- Continuous testing and validation of the development.
- Production of user-documentation.

These activities are expected to be executed following an *agile* approach, with weekly technical meetings involving all the key actors, with additional support from the CODAC SUP TRO and development team, when necessary.

The development work will be broken down into chunks of activities that allow for a fast release cycle (e.g. 3 weeks). The components will be unit-tested and assessed against relevant software quality assurance metrics through Continuous Integration (CI).

7.1 Activity breakdown

The expected dates for deliverable submissions are presented in the following table, considering T_0 as the KoM date.

Title	Deliverable	End Date
1.1 Archiver Proxy Design	55A0 Archiver Proxy Design approved in Confluence/IDM	T_0 + 6w
2.1 SUP Design	55A0 SUP application Design approved in Confluence/IDM	T_0 + 12w
1.2 Archiver Proxy Implementation 1	55.A0 Archiver Proxy implementation (rel. 1) approved in GIT/SVN	T_0 + 21w
2.2 SUP Implementation 1	55A0 SUP implementation (rel. 1) approved in GIT/SVN	T_0 + 30w
1.3 Archiver Proxy Implementation 2	55.A0 Archiver Proxy implementation (rel. 2) approved in GIT/SVN	T_0 + 36w
2.3 SUP Implementation 2	55A0 SUP implementation (rel. 2) approved in GIT/SVN	T_0 + 42w
3 Documentation	User documentation with use-cases approved in Confluence/IDM	T_0 + 48w

The corresponding proposed milestone/payment plan is as follows:

Reference	Deliverable	End Date
M1	D1.1	TO + 30w
	D1.2	
	D2.1	
	D2.2	
M2	D1.3	TO + 48w
	D2.3	
	D3	

8 RESPONSIBILITIES

IO will nominate a Responsible Officer for this contract and one Technical Responsible Officer for each activity.

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 when present at ITER premises;
- The required safety clearance deliverables will be provided and maintained accurate during period of execution of the services.

8.1 Experience and Specific Skills

Education:

- Master degree or equivalent in Physics, Control Engineering or Computer Science.

Professional experience:

- At least 10 years' experience working as Control Software Engineer in designing, installing, commissioning or operation of large-scale scientific control systems;
- Familiarity with fusion machines, plasma physics and tokamak diagnostics is considered most advantageous.

Technical Competencies and demonstrated experience in:

- Using, designing, implementing and verifying control system distributed automation software frameworks and applications;
- Executing integration and commissioning of heterogeneous I&C systems, including identifying and resolving issues;

- Using Linux, virtualization environments, real-time operating systems and application frameworks;
- Using C++, Matlab and python programming languages and environments;
- Applying high-integrity software quality assurance processes;
- Following agile software development processes;
- Delivering high quality technical reports and documentation in English;
- Using EPICS7 Channel Access and pvAccess communication protocols and EPICS7 ecosystem tools;
- Use of OPC-UA framework for service implementation.
- Familiarity with the ITER integrated control system architecture, I&C data models, code generation tools and techniques is considered most advantageous given the tight schedule.

Behavioural competencies:

- Ability to create and sustain a mutually supportive team work environment;
- Ability to analyse multiple and diverse sources of information to understand problems accurately before moving to proposals.

9 ACCEPTANCE CRITERIA

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

9.1 Delivery date criteria

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

9.2 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. The IO Technical Responsible Officer for this contract 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.

9.3 Software delivery criteria

Software source code shall be delivered in the ITER Organizations software repository (GIT) by the Contractor for acceptance. The IO Technical Responsible Officer for this contract is the Approver of the delivered software source code.

The acceptance is based on CI reports, source code and quality peer reviews performed with each GIT pull requests, and when technically achievable, release verification reports pertaining to the magnetics plant controller I&C development project.

10 SPECIFIC REQUIREMENTS AND CONDITIONS

None identified.

11 WORK MONITORING / MEETING SCHEDULE

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

The main purpose of the biweekly 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 a quarterly basis, the contractor shall submit to ITER Organization an activity report with references to software deliveries and documentation produced during that period.

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

12 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 addressed in ITER Procurement Quality Requirements (ITER_D_22MFG4).

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

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 Procedure for the management of Deviation Request (ITER_D_2LZJHB). When a non-conformance is identified, the contractor are subject to the Non-conformance Report process describe in Procedure for management of Nonconformities (ITER_D_22F53X).

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.

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 Working Instruction for the Qualification of ITER safety codes (ITER_D_ 258LKL).

13 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.