

ITER-India
(INSTITUTE FOR PLASMA RESEARCH)
A-29, SECTOR-25, GIDC
GANDHINAGAR – 382 025
GUJARAT STATE, INDIA

TENDER NOTICE No. II/TN/PUR/002/08-09 DATED 28-1-2009

Sealed tenders are invited in **TWO PARTS** from reputed and eligible parties for the following services.

Sr. No	Item	Quantity	Due Date & time of opening	Tender Fee (Rs.)	EMD (Rs.)
1.	Phase-wise Designing and Implementing Plant System Host and Prototype mini Control, Data Access and Communication (CODAC) based on given Hardware and software spanning over three years.	As per tender documents	24-2-2009 2.30 p.m.	1000.00	8 lakhs

Tender documents are available on ITER-India website (<http://www.iter-india.res.in>) and IPR website (www.ipr.res.in). Tenderers meeting the eligibility criteria mentioned in the tender documents may, at their option, download the tender documents from the website and submit their offer along with prescribed **Tender Fee (non refundable) and EMD** in the form of Demand Draft from any nationalized/scheduled bank drawn in favour of **Institute for Plasma Research A/c ITER-India** and payable at **Ahmedabad** as per the details given in the tender documents. In case party desires to collect the tender documents by post, they may contact the Project Purchase Officer at the above address along with prescribed tender fee. Tender documents will be issued upto **9-2-2009**.

Critical Eligibility Criteria

- I. Party must have designed and implemented Hardware based software projects for Mission Critical Control and Automation with more than 2000 I/Os
- II. Party should have well equipped laboratory with PLCs and instrumentation for testing and integration for providing such engineering services.
- III. Party must be CMM level 5 certified.
- IV. Party should be a member of OPC foundation and certified vendor of Control System Integrators Association(CSIA) or equivalent
- V. Party should have experience of working with National/International scientific experiments
- VI. Party's average yearly turnover for the last three years should be more than Rs. 10 Crores.
- VII. Party should provide all the information asked in the "Requirements of the bidder" section mentioned in the technical part of this tender.

Note: Proof of fulfilling the above criteria **must be** attached with the bid document.

CONTENTS

- I. INSTRUCTIONS TO BIDDERS AND TERMS AND CONDITIONS.**
- II. TECHNICAL SPECIFICATIONS.**
- III. PRICE BID FORMAT.**

I. Instruction To Bidders And Terms And Conditions:

International Thermonuclear Experimental Reactor (www.iter.org) is a multinational project being constructed at Cadarache, France to demonstrate controlled energy production by thermonuclear fusion of deuterium and tritium, the two isotopes of hydrogen. India is one of the seven participating nations and is responsible to supply systems and equipments for ITER. Institute for Plasma Research is a nodal agency to interact with ITER International Organization and Indian Domestic Agency. IPR shall carry out this task through ITER-India.

1. The quotation and any order resulting from this tender/enquiry shall be governed by the conditions of the contract and supplier quoting this enquiry shall be deemed to have read and understood the same in complete.
2. Where counter terms and conditions have been offered by the vendor, the same shall not be deemed to have been accepted by ITER-India, unless our specific written acceptance thereof is obtained.
3. Clarifications: Any technical and commercial questions, information, clarifications, etc. that may be required pertaining to this enquiry can be obtained from the Project Purchase Officer, ITER-India before submitting the quotation.
4. Bids shall be complete in all respects and shall include properly filled in prices, other specifications, schedules, relevant drawings and catalogues as necessary along with the bid covering letter, all in duplicate.
5. Full details and specifications of the items and general instructions to be followed regarding submission of quotation is indicated in this enquiry.
6. This is a two-part tender and offer should be submitted in the following manner.
 - a. **Part-A:** Commercial terms and conditions, Supporting documents for critical eligibility criteria, technical bid, Demand Draft for tender fee and EMD will be put in one sealed envelope, along with the technical bid. This envelope should be super scribed as “**Technical Bid**”.
 - b. **Part B:** Price bid will be put in second sealed envelope. This envelope should be super scribed as “**Price Bid**”.
 - c. Place both these bids (a & b) in one single sealed envelope (clothbound or plastic), super scribing the envelope with tender number, due date and title of the tender.
7. **Proof for fulfillment of eligibility criteria mentioned in this document should be submitted along with the tender.** If the offer is submitted without valid documents, it may not be considered for further evaluation. **Offer received without proof of eligibility criteria will be rejected.**
8. Tender documents can also be obtained by submitting a written request to the Project Purchase Officer, ITER-India, together with prescribed tender fee, provided that the eligibility criteria are fulfilled. Last date for issue of Tender documents is Feb 9, 2009
9. While requesting for tender documents, such request shall indicate the “**REQUEST FOR TENDER DOCUMENTS AGAINST TENDER NOTICE NO.II/TN/PUR/002/08-09 DATED Jan 28, 2009**”
10. The tender fee (non refundable) of Rs. 1000.00 (Rs. One thousand only) should be made in the form of DEMAND DRAFT from any nationalized/commercial bank drawn in favour of Institute for Plasma Research, A/c ITER-India and payable at Ahmedabad. Vendor’s name and tender number shall be indicated on the reverse side of the Demand Draft. The date of DD should not be prior to the

date of advertisement. Those who use downloaded tender documents, the prescribed tender fee may be kept in a separate envelope (PART-A) along with the tender. Tender received without the prescribed tender fee will be rejected.

11. **QUOTATION:** Quotation should be submitted in two parts, Part-A and Part-B as mentioned in point –(6). Quotations received without Tender fee & EMD will be rejected.
12. In the event of any date indicated above is a declared holiday, the next working day shall become operative for the respective purpose mentioned herein.
13. Late and delayed quotations will not be considered. ITER-India will not be responsible for postal delays or any other delays in receipt of quotation. Envelopes received without Quotation number, date, due date and short description of item may be rejected.
14. Offer should be valid for a period of 180 days from the date of opening of the tender. ITER-India reserves the right to place order on one or more parties irrespective of whether it is lowest or not.
15. No request for the extension of due date will be considered.
16. ITER-India will not be responsible for any delay/loss of documents in transit.
17. **Contract Period:** Contract will be placed for three years and may be extended for further period of two years at the same rate, terms and conditions.
18. **Terms of prices:** The quoted price should not be subject to price escalation for whatsoever reasons. The quoted price shall be firm, fixed and non-revisable during the validity/extended validity of purchase order/contract. Quoted price should be valid during entire contract period.
19. Prices are required to be quoted according to the units indicated in the tender form.
20. The contractor has to attend the meeting / technical discussion (as and when required) at IPR/ITER-India at their own expenses.
21. It is expected that some engineers are required to participate in the scheduled meetings, as and when required, to discuss the scope of task and to interact with the ITER-IO staff at ITER-Site (France).
22. No payment other than set out in the contract will be paid to the contractor for completing the entire scope of work covered in the contract for whatsoever reasons.
23. Quotation should be free from Correction and Erasures. Corrections, if any, must be attested. All amounts shall be indicated both in words as well as in figures. Where there is difference between amounts quoted in words and figures, amount quoted in words shall prevail.
24. ITER-India shall be under no obligation to accept the lowest or any quotation and reserves the right of acceptance of the whole or any part of the tender.
25. **Taxes and Duties:** All applicable government taxes and duties to execute this contract will be paid by the vendor.
26. **Completion Period:** The contract is for Three years which may be extended for two more years for different engineering services to be provided by the vendor. However, as this is the rate contract, delivery for actual job will be mutually agreed by the vendor and ITER-India.

27. **Payment:** As this is a rate contract, payment will be made on monthly/quarterly basis within 30 days from the date of acceptance of a job completed and accepted by ITER-India & ITER-IO. The amount will be calculated from actual man months utilized for a particular job. **All payment shall be made in Rupees only.**
28. **Security Deposit:** The successful Bidder/Bidders will have to furnish to the Purchaser an interest free security deposit for 10% (Ten percent) of the order value in the form of Bank Guarantee from a nationalised/scheduled bank within 15 days from the date of Contract/Purchase order and the said Guarantee should be valid for three years from date of the contract.
29. **Termination of the contract:** Contract will be terminated on recommendation of Contract Steering Committee.
30. **Sub-Contract:** All sub-contractors are required to be appraised and approved by the Purchaser before placement of orders by the Vendor.
31. **Jurisdiction:** The contract shall be governed by the Laws of India for the time being in force. The Courts of Ahmedabad only shall have jurisdiction to deal with and decide any legal or dispute arising out of this contract.
32. **Settlement of disputes:** Any disputes or difference arising out of or in connection with the Contract/Purchase order shall be to the extent possible, settled amicably between the parties. If amicable settlement cannot be reached then all disputed issues shall be settled by arbitration.
33. **Arbitration:** In the event of any dispute or difference arising under this Contract, the matter shall be referred to the Arbitrators, one each nominated by the Purchaser and Contractor from their respective organizations. In case the said Arbitrators are not able to settle the dispute by themselves, the matter shall be referred to the Arbitrator mutually nominated by the Purchaser and the Contractor and whose decision will be final and binding on both the parties. The venue of arbitration will be ITER-India/IPR. Subject to as aforesaid, the Arbitration Act 1996 and the rules there under and any statutory modification thereof for the time being in force shall be deemed to apply to the Arbitration proceedings under this Contract.
34. **Force Majeure:** In the event of any unforeseen event directly interfering with the work arising during the currency of the contract, such as war, hostilities, act of the public enemy, civil commotion, sabotage, fires, floods, explosion, epidemics, quarantine restrictions, strikes, lockouts or acts of God, the Tenderers shall, within a week from the commencement thereof; notify the same in writing to ITER-India with reasonable evidence thereof. If the force majeure condition(s) mentioned above be in force for a period of 90 days or more at any time, ITER-India shall have the option to terminate the contract on expiry of 90 days of commencement of such force majeure by giving 14 days notice to the Tenderer in writing. In case of such termination, no damages shall be claimed by either party against the other, save and except those which had occurred under any other clause of this contract prior to such termination.
35. **Intellectual Property Rights :** The contractor shall adhere to Intellectual Property Rights conditions to be put in the Contract.
36. **Confidentiality :** The contractor shall take necessary steps to ensure that all persons employed on any work awarded to him shall execute the same confidentially. No information or details shall be leaked out by the employees of the contractor.
37. **Acceptance :** Jointly by ITER-India and ITER Organizations(IO) The decision of ITER-India and IO in this regard shall be binding on the contractor.

38. **Result of the tenders:** Unsuccessful tenderers will not be informed of the result of their tenders.
39. The Project Director, ITER-India reserves the right to accept or reject any quotation fully or partly without assigning any reason.
40. The scope covered in this document will be awarded to one or more than one contractor at the sole discretion of the Project Director, ITER-India.
41. Successful Bidder/Bidders will have to enter into a contract with ITER-India
42. ITER-India reserves the right to cancel the tender in full or part without assigning any reasons.
43. ITER-India may empanel suitable vendors from the ones shortlisted

We agree to the above terms and conditions.

Place:

Signature of Bidder with seal

Date:

Note: A copy of our these terms and conditions duly signed should accompany your quotation.

II. Technical Specification and Statement of Work for designing and implementing the Plant System Host and a prototype Mini CODAC

ABSTRACT

Control, Data Access and Communication (CODAC) is the integrated and distributed system responsible for operating the ITER (www.iter.org) device. ITER comprises around one hundred Plant Systems with associated sensors and actuators (Instrumentation & Control or I&C). CODAC provides an entity, the Plant System Host, to be integrated in every Plant System and to provide the interface between CODAC and Plant Systems I&C. Mini CODAC is a subset of CODAC implementing the necessary functionality to perform Factory Acceptance Test of Plant Systems as well as proving integration tests of CODAC and Plant Systems.

This task aims at designing and implementing the Plant System Host and a prototype Mini CODAC.

The reference material for CODAC, if required can be accessed from www.iter-india.org or by email to: pujara@ipr.res.in with a copy to kgvnair@ipr.res.in

1. Introduction: Purpose and Scope of the Document

This document specifies the task to design and implement the Plant System Host and a prototype of Mini CODAC.

Plant System Host and Mini CODAC are the most central components of CODAC, with dependencies on all other activities and products. A very close interaction with activities of the central CODAC IO team is essential and therefore the bidder is expected to have one or two technical experts, including the team leader, permanently on site for the duration of the task if necessary.

1.1 Requirements of the bidder

The bidder is expected to have executed few projects in developing control systems for large scientific experiments at national or international level. A versatile experience in interfacing and integrating Plant Systems should have been demonstrated. The bidder should have well equipped laboratory with PLCs and instrumentation for testing and integration. The bidder should have provided end-to-end solution for mission critical plant integration, synchronization, automation by using COTS and tailor made solution based on embedded system, SCADA, OPC UA and a certified vendor like CSIA (Control System Integrators Association) or equivalent. The bidder should have experience in design, development and commissioning of hardware (VME/VXI/PXI, PLC, DCS based) and software with around 2000 or more input/output points for mission critical control systems. The bidder shall not be bound to any commercial PLC, SCADA or embedded technology supplier. Experience in the use of common open source software frameworks like EPICS and Tango as well as Modeling language SysML and tools Rhapsody is expected. Further, the bid shall include references to projects using technologies to interface PLC and embedded technologies to the software frameworks/SCADA as well as the use of programming languages C, C++ and Java on Windows, RTOS and Linux.

The bidder should be ready to provide one or two staff permanently, who are likely to be placed on-site to collaborate closely with members of CODAC IO team for execution of this task.

Bidder must provide Project planning, Organization, Management and detailed work schedules, proposed system and preliminary design concept for PSH and Mini CODAC, implementation approach and methodology, Risk Management and Mitigation Plans, Detailed Phase wise activity, activity wise table of resource loading indicating duration and staff working at France and Indian site, activity wise table of financial projections needs to be provided. For this, the bidder must use the activity breakup table given in the technical-part of this document. Bidder must have well defined Quality Policy and Program. Profiles and reference of projects, Membership certifications, Resume of participating seniors and junior engineers with educational certificate (**the relevant experience should not be less than 9 years in case of senior engineers and not less than 4 years in case of junior engineers**), references of handled projects etc. should be provided. Bidder must provide the documents to justify their capabilities and experience certificates along with their bid.

2. Technical Specification

2.1 Overview

ITER CODAC is the integrated Control, Data Access and Communication system for the ITER machine. CODAC is responsible for coordinating all ITER Plant Systems, orchestrating the operation and gathering all data produced by ITER. Plant Systems are procured in-kind from the seven Domestic Agencies and are not part of CODAC. CODAC provides an entity, the Plant System Host (PSH), in every Plant System, to facilitate a standard interface enabling integration. Figure 2.1 illustrates the concept and Figure 2.2 gives more details on the interfaces.

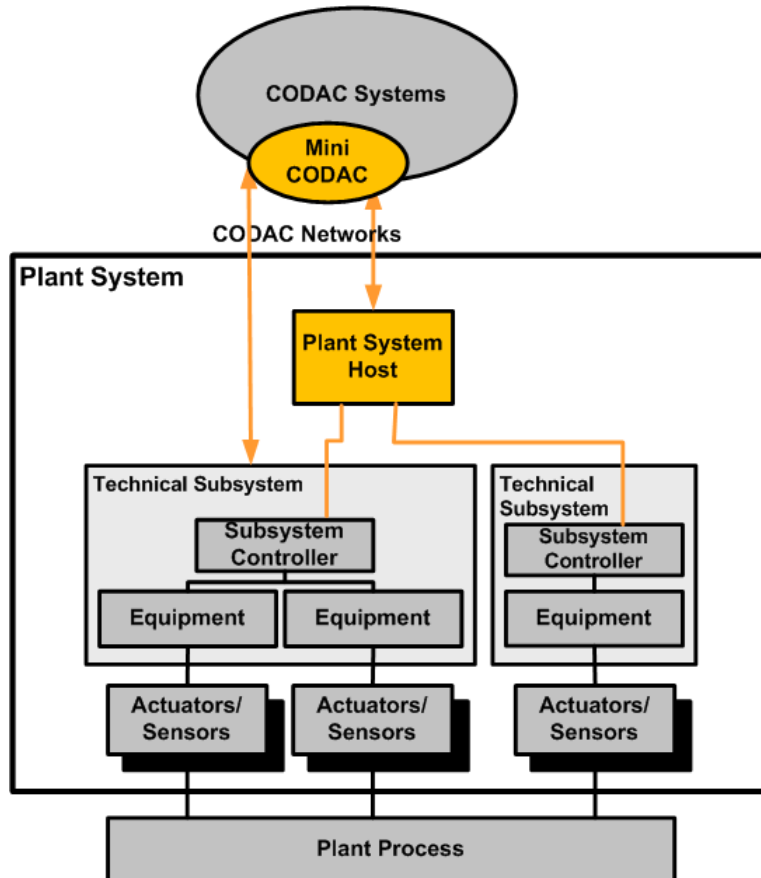


Figure 2.1. General conceptual architecture of Plant System Instrumentation & Control and interface to CODAC.

The scope of this task (indicated in orange in Figure 2.1) is to design and implement the Plant System Host and its interfaces to Technical Subsystems and CODAC Systems as well as to design and implement a prototype of Mini CODAC. Mini CODAC provides a subset of the CODAC Systems functionality required to perform Factory Acceptance Test (FAT) of Plant Systems.

The CODAC IO team is currently active in prototyping potential technologies to implement the Plant System Host, Technical Subsystems and Mini CODAC. The goal of these prototyping activities is to define the technologies (hardware and software) to be used for the Plant System Host, Technical Subsystems and Mini CODAC. The results of these prototyping activities, expected early 2009, will be made available to the contractor as requirements and the selected technologies (hardware and software) imposed.

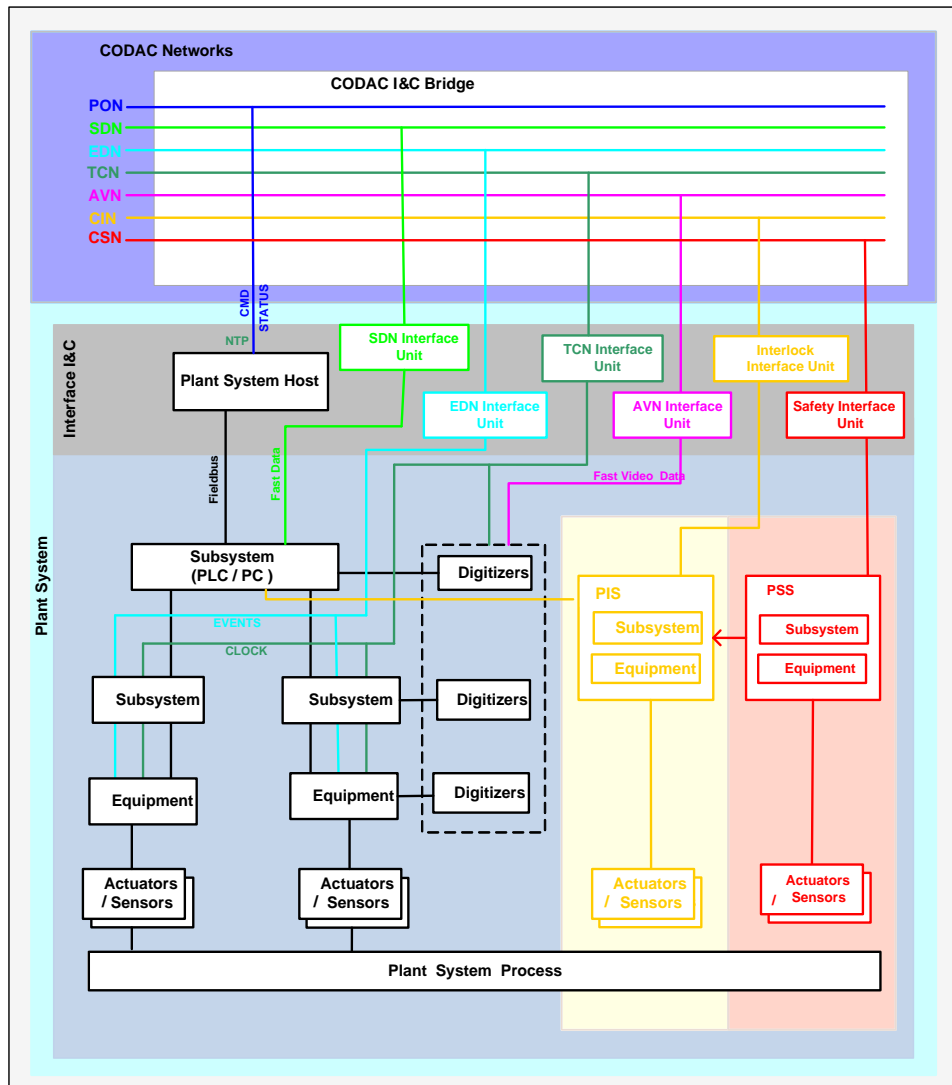


Figure 2.2. Details of networks interface between Plant System and CODAC Systems. The interlock (yellow) and safety (red) systems are outside the scope of this specification.

2.2 Plant System Host Requirements

Top level requirements for the Plant System Host (PSH) are as per the given list. The list below is tentative and reflects the most recent status at time of writing. This list shall be refined with time. These requirements shall be analyzed, revised and refined in the initial phase of the task.

Functional requirements

1. PSH shall be a single point of contact between CODAC and Plant System for asynchronous communications.
2. PSH shall comply with the concept of a Generic Plant System and pass Factory Acceptance Tests provided by CODAC emulator (Mini-CODAC).
3. PSH shall host all the information about Plant System in an ITER-defined unified manner [self-description, (TBD)] and provide it to CODAC as needed.
4. PSH shall validate CODAC commands and reject incorrect or dangerous ones. The mechanism is TBD.
5. PSH shall provide interface to PON network defined by ITER IO.
6. PSH shall provide interface to field buses defined by ITER IO.
7. PSH shall be made available in two types of configuration; rack mounted platform and embedded controller node.
8. All PSH platforms shall satisfy a set of technical requirements (TBD) including CPU characteristics, memory size and power consumption.

9. PSH shall support the ITER-supported operating systems for PSH (TBD).
10. Rack-mounted PSH shall only include ITER fully supported boards for processors, memory, mass storage and communications.
11. Rack-mounted PSH shall have a maximum dimension of 5U in a 19-inches rack.
12. Rack-mounted PSH shall allow controlling a maximum of 10 field-bus segments.
13. Embedded controller PSH shall be provided for each of the ITER supported platform format (TBD, e.g. PCIe, ATCA, microTCA).
14. PSH shall provide means of configuring and monitoring the interface units for high-performance networks (TCN, SDB, EDN, AVN) that are parts of the plant-system it interfaces.
15. Embedded controller PSH shall provide access to all monitoring and management functions of the shelf it is installed into.
16. PSH shall provide access to all the environment parameters (ex: temperature) of the cubicle it is installed into.
17. PSH shall provide a watchdog facility to detect timeout scenarios during communication with CODAC, with technical subsystems and internal functionality in PSH.
18. PSH shall have a supplied image of OS and programs as well as means of fast recovery of this information from a central repository.
19. PSH shall host all programs needed for instrumentation (with permanent licenses where appropriate).
20. All PSH software shall provide an English interface.
21. PSH shall support and utilize Quality of Service technologies in order to prevent CODAC PON network overload. Details TBD.
22. PSH shall provide means of remote hardware administration inside POZ (shutdown/restart/cold start, remote console, basic hardware diagnostics, etc).
23. PSH shall provide means of remote software administration inside POZ (software configuration and update, diagnostic and maintenance, etc).
24. PSH shall provide and utilize self-maintenance functionality at boot-time and run-time, but without affecting run-time performance.
25. PSH access shall be protected by authentication and credentials.
26. PSH shall implement access control using a dedicated authorisation process.
27. PSH shall keep its internal time synchronized with ITER NTP Master Clock and provide means of subsequent NTP time synchronization to the rest of its Plant System.
28. PSH shall record a history of important actions (updates, configurations, access, operation states changes, etc) and report it to CODAC.
29. PSH shall monitor and report to CODAC its health status.
30. PSH shall monitor and report to CODAC its connectivity status.
31. PSH shall not be equipped with wireless facilities.
32. PSH shall not be equipped with hot-pluggable I/O devices (removable disks, USB devices, etc).

Non-functional requirements

1. PSH shall use COTS solutions.
2. PSH shall have an industrial level of reliability and availability. MTBF of the hardware shall be larger than 50,000 hours.
3. PSH shall not introduce any latency larger than 10 ms [TBC] in forwarding messages (bi-directional control, event) between Mini CODAC and Technical Subsystems.
4. PSH shall support at least 1000 [TBC] messages per second between PSH and Mini CODAC.
5. PSH shall support a sustained data rate of 50 MB/s [TBC] on PON for scientific data. Data scalability shall be taken into account.
6. PSH shall be protected from an aggressive environment of the instrumentation room (noise, vibration, dust, sunlight, temperature, humidity, etc).
7. PSH shall be modular and provide means of partial hardware upgrade (CPU, memory, network cards, etc).

8. PSH shall provide a physical performance allowing running all its CPU/memory/storage intensive tasks with at least double reserve of resources.
9. PSH shall provide at least 50% reserve [TBC] for its network interfaces performance with regard to its provisional bandwidth consumption.
10. PSH shall be supplied with a Class II power.
11. PSH shall be equipped with easily available “Reset” and “On/Off” buttons.
12. PSH software shall be Unicode-conformant.
13. PSH shall take provisions to avoid alarm bursts.

Preferred requirements

1. PSH shall employ international, well-recognized and non-proprietary solutions and standards where they exist and are appropriate.
2. PSH software shall be as much platform-independent as possible in order to minimize migration effort.
3. PSH shall be free from mechanical moving components (spindle disks, fans, etc).
4. PSH shall be designed to allow easy replacement without extensive switching/plugging.
5. PSH shall be equipped with a visible LED indication of its current status (off or running, connectors status & activity).

TBD and TBC will be clarified during initial phase while working with ITER IO CODAC team.

2.3 Mini CODAC Requirements

The purpose of Mini CODAC are two-fold; to provide a test environment for Factory Acceptance Test of Plant Systems and to provide a tool to test Plant System Host and integration. In both cases one important requirement is to support automatic regression testing. Another important requirement is that Mini CODAC, as opposed to PSH, must support CODAC High Performance Networks (SDN, TCN, EDN and AVN) in addition to the asynchronous network PON. They will be further developed in the second half of 2009. These requirements shall be analyzed, revised and refined in the initial phase of the task in close collaboration with the CODAC IO team. In particular the distribution of functionality between Plant System Host and Mini CODAC shall be revisited. It is expected that iterations will occur in the course of the task and a close collaboration with other CODAC activities will be required.

2.4 Communication requirements between Mini CODAC and Plant System Host

The communication protocol between Mini CODAC and Plant System Host has already been analyzed and will be given as input. These results shall be further analyzed, revised and refined in the course of the task, in close collaboration with other CODAC activities. The implementation of the communication protocol will be based on the standard CODAC environment (2.6, 2.7). It is expected the bidder will contribute in defining final communication protocols.

2.5 Communication requirements between Plant System Host and Technical Subsystems

The communication protocol between Plant System Host and Technical Subsystems will depend on the selection procedure of PLC for “slow” Plant Systems (expected early 2009) and prototyping activities for “fast” Plant Systems (results expected late 2009). A potential outcome of these activities could be that two types of Plant System Host, using different technology but same interfaces, will be defined. The

implementation of the communication protocol will be based on the standard CODAC environment (2.6, 2.7). It is expected the bidder will contribute in defining final communication protocols.

2.6 Hardware Environment

ITER IO will specify standard hardware environment for Technical Subsystems, Plant System Host and Mini CODAC. These standards are expected to be defined in 2009. It is expected that the bidder will contribute in defining these standards.

2.7 Software Environment

All software components shall be developed and run in the standard CODAC environment covering operating system, communication middleware, software framework, programming languages, programming standards and QA. These standards are expected to be defined in 2009. It is expected that the bidder will contribute in defining these standards.

3. Description of Work

3.1 Task Description

All sub tasks defined herein shall be executed in close collaboration with the CODAC IO team and take into account other activities, internal and external, with any relevance to Plant System Host and prototype Mini CODAC. In particular, CODAC IO team may launch parallel contracts and tasks on Mini CODAC, which may need close coordination with this task.

1. Analyze the requirements as expressed herein, in the applicable and referenced documents, and experience from other similar devices and produce a detailed Requirement Specification on Plant System Host and prototype Mini CODAC. Produce a first draft Test Plan to verify those requirements.
2. Analyze the results from CODAC prototyping activities, the draft defined standard environment (software and hardware) and the produced detailed Requirement Specification and confirm technical feasibility and potential problem areas. This sub task includes a close collaboration with CODAC IO team in order to define the CODAC standard hardware and software environment.
3. Perform a functional analysis to clarify functionalities and interfaces of prototype Mini CODAC and Plant System Host, including interfaces to Technical Subsystems, and produce Functional Specifications and Interface Control Document(s). This sub task includes a close collaboration with CODAC IO team in order to further define the CODAC standard hardware and software environment.
4. Perform a detailed design of Plant System Host and prototype Mini CODAC, using a well established methodology, and produce Engineering Design Documents. Finalize Interface Control Document(s) and Test Plan.
5. Implement Plant System Host and prototype Mini CODAC in the CODAC standard environment (software and hardware).
6. Verify Plant System Host, prototype Mini CODAC and all interfaces by executing the Test Plan and document results in Test Report.
7. Produce User Manuals and Maintenance Manuals for Plant System Host and prototype Mini CODAC.
8. Define a case study of a Plant System. Ideally this shall be based on a real Plant System being developed and involve close collaboration with the Plant System RO and developers. Document and implement/configure this Plant System on the prototype Mini CODAC, Plant System Host and Technical Subsystems. This document shall be in a format such that it can be used as template for future real Plant Systems.
9. Define a mock-up of a Factory Acceptance Test (FAT) for the case study Plant System. The aim being to have a better understanding of FAT and the scenarios and environment where PSH and Mini CODAC will run. This will involve close collaboration with Plant System RO's and developers. Document the results in the case study document.
10. Update all documents to "As built". In particular the User Manuals and case study document must be of high quality considering the ITER procurement scheme with hundred Plant Systems being developed around the world.

3.2 Project Schedule and Key Milestones

The task shall span over a period not more than 36 months, from kick-off to delivery of the final results. All meetings are held at ITER IO premises in Cadarache. Team members of the bidder in Indian-office can participate through video conference or travel to site for particular review meetings/demonstrations at bidders' expense. Key milestones are summarized in Table 3.1.

Milestone and Bidder Deliverables	Dates	Action and ITER-IO Deliverables
Kick-off meeting	T ₀	At start of task (T ₀). Detailed schedule. <i>Minutes of Meeting.</i>
Progress meeting <i>Progress Report</i>	Every 1 month	<i>Minutes of Meeting.</i>
Delivery of <i>Requirement Specifications</i> and <i>draft Test Plan.</i>	T ₀ +2 months	Documents will be reviewed by ITER IO. <i>Review Report.</i>
Delivery of <i>Functional Specifications</i> and <i>draft Interface Control Document(s).</i>	T ₀ +6 months	Documents will be reviewed by ITER IO. <i>Review Report.</i> At this time documents shall be agreed between ITER IO and bidder before the task proceed.
Delivery of <i>Engineering Design Documents, Interface Control Document(s)</i> and <i>Test Plan.</i>	T ₀ +12 months	Documents will be reviewed by ITER IO. <i>Review Report.</i> At this time documents shall be agreed between ITER IO and bidder before the task proceed.
Demonstration of alpha version of <i>Plant System Host</i> and <i>prototype Mini CODAC.</i> Delivery of <i>Test Report.</i>	T ₀ +24 months	Bidder shall present a first demonstration of the system, which will be reviewed by ITER IO. <i>Review Report.</i> At this time demonstration shall be agreed between ITER IO and bidder before the task proceed.
Delivery of <i>Case Study Plant System Document, User Manuals</i> and <i>Test Plan.</i>	T ₀ +27 months	Documents will be reviewed by ITER IO. <i>Review Report.</i>
Demonstration of Case Study Plant System including <i>prototype Mini CODAC, Plant System Host</i> and <i>Technical Subsystems.</i>	T ₀ +30 months	Bidder shall present a first demonstration of the system, which will be reviewed by ITER IO. <i>Review Report.</i>
Delivery of all <i>final documents</i> reflecting “As-built” status and final demonstration.	T ₀ +35 months	Bidder shall present a final demonstration of the system, which will be reviewed by ITER IO. Documents will be reviewed by ITER IO.
<i>Final documentation and systems</i> after the bidder	T ₀ +36 months	Closure of task.

has closed all pending Action Items from Final Review.		
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Table 3.1. Schedule, Milestones and Deliverables

Documents to be reviewed shall be delivered not later than two weeks before the corresponding review meeting.

Minutes of meetings and review reports, including action item lists, shall be written by ITER- IO, agreed by the bidder and released in IDM not later than two weeks after the meeting.

3.3 Deliverables

All documentation shall be written in English and delivered in .doc MS format.

1. *Progress reports* shall be submitted by the bidder to ITER-IO every month. Each progress report shall summarize the work done during the reporting period and describe any problems encountered. The progress report shall be delivered 3 working days before the corresponding progress meeting. The progress report shall contain information on consumed PPY broken down on levels of individuals.
2. *Plant System Host Requirement Specification*. The Requirement Specification shall itemize requirements in such a detail that design can proceed. All requirements shall be verifiable. A verification matrix shall be part of the document.
3. *Prototype Mini CODAC Requirement Specification*. The Requirement Specification shall itemize requirements in such a detail that design can proceed. All requirements shall be verifiable. A verification matrix shall be part of the document.
4. *Plant System Host Functional Specification*. The Functional Specification shall itemize all functions provided by the Plant System Host. The primary goal of this document is to reach a consensus and common understanding what the Plant System Host tries to achieve.
5. *Prototype Mini CODAC Functional Specification*. The Functional Specification shall itemize all functions provided by the prototype Mini CODAC. The primary goal of this document is to reach a consensus and common understanding what the prototype Mini CODAC tries to achieve.
6. *Interface Control Document(s)* between prototype Mini CODAC, Plant System Host and Technical Subsystems. This, or these, documents shall detail the interfaces on a sufficient level to proceed with independent design and shall be constrained by the standard CODAC software environment.
7. *Plant System Host Engineering Design Document*. This document shall contain the detailed design, using a well established methodology selected by the bidder and approved by IO, of all Plant System Host components. The design shall be constrained by the standard CODAC software environment.
8. *Prototype Mini CODAC Engineering Design Document*. This document shall contain the detailed design, using a well established methodology selected by the bidder and approved by IO, of all prototype Mini CODAC components. The design shall be constrained by the standard CODAC software environment

9. *Plant System Host User Manual*. This document shall be the main source of information for Plant System developers. It shall be of sufficient high quality to allow Plant System developers anywhere in the world to integrate the Plant System Host in the Plant System with minimum support from CODAC team.
10. *Prototype Mini CODAC User Manual*. This document shall be the main source of information for Plant System developers and testers. It shall be of sufficient high quality to allow Factory Acceptance Tests to be designed and executed with minimum support from CODAC team.
11. *Plant System Host Maintenance Manual*. This document shall be the main source of information for the CODAC team to maintain the Plant System Host. It shall contain information to allow the evolution of the Plant System Host throughout the lifetime of ITER.
12. *Prototype Mini CODAC Maintenance Manual*. This document shall be the main source of information for the CODAC team to maintain the prototype mini CODAC. It shall contain information to allow the evolution of the prototype into a production system.
13. *Test Plan*. This document shall describe the required tests to verify all requirements, as expressed in the Requirement Specification.
14. *Test Report*. This document shall contain the results obtained by executing the Test Plan at the time of final demonstration as proof that all requirements for both systems are fulfilled by the delivered products.
15. *Document of Case Study Plant System*. This document shall describe the selected Case Study Plant System, its I/O, local control and interface. It shall document all actions in order to integrate the Plant System Host and prototype Mini CODAC. The scenario, design, implementation and execution of a Factory Acceptance Test shall also be documented. The primary purpose of this document is to act as a template for real Plant Systems.
16. All *software source code* versioned and delivered in the software repository according to CODAC standards (section 2.7)

This is to be noted that all deliverable must be completed within the stipulated time scale as per the table 3.1. Any discrepancy (not meeting milestones or non acceptance of deliverable by ITER-India and ITER IO) has to be resolved by the bidder without any extra cost.

3.4 Estimated Effort

It is expected that the tasks above can be carried out by a team of five experts in software engineering, electronics and computer science. Further, it is expected than one or two of these experts, including team leader, are permanently on-site to provide interface and day-to-day coordination with CODAC IO team. The total (on-site plus off-site) effort is estimated to **12 PPY over three years**.

3.5 Results dissemination

All results obtained and design development in the frame of the work described in this document shall be made property of ITER-India & ITER IO and can be partially or fully used for further specification. Selected party has to sign NDA with ITER-India before starting the task.

4. ITER will provide

1. Provide α (initial) specification of CODAC hardware and software standard environment at T_0+6 . This is a joint effort by ITER IO and the bidder, but under the responsibility of ITER IO. It is a pre-requisite to start producing the engineering design documents.
2. Provide α version of CODAC standard environment at T_0+12 . This is a pre-requisite to start implementation. This includes any required hardware and software; open-source, in-house developed or licensed.
3. Provide β (intermediate) version of CODAC standard software environment before T_0+24 . The final demonstration shall be executed under this environment.
4. For on site at Cadarache activity ITER IO shall provide all required hardware and software. For working at Indian site, special hardware and software recommended by IO and required for execution of task, will be provided by ITER-India

5. Abbreviations and Acronyms

AVN	Audio-Video Network
CIN	Central Interlock Network
CODAC	Control , Data Access and Communication
COTS	Commercial Off The Shelf
CPU	Central Processing Unit
CSN	Central Safety Network
EDN	Event Distribution Network
I&C	Instrumentation and Control
I/O	Input/Output
IDM	ITER Documentation Management
ITER-IO	ITER International Organization
LAN	Local Area Network
LED	Light Emitting Diode
MTBF	Mean Time Between Failures
MTTF	Mean Time To Failure
N/A	Not Applicable
NTP	Network Time Protocol
OS	Operation System
PC	Personal Computer
PIS	Plant Interlock System
PLC	Programmable Logic Controller
PON	Plant Operation Network
POZ	Plant Operation Zone
PPY	Professional Personnel Year
PSH	Plant System Host
PSS	Plant Safety System
QA	Quality Assurance
SCADA	Supervisory Control And Data Acquisition
SDN	Synchronous Databus Network
TBC	To Be Confirmed
TBD	To Be Defined
TCN	Time Communication Network
USB	Universal Serial Bus

III PRICE BID FORMAT

(Bidders are requested to offer their price bid in the following format)

S.No	Description	Unit cost per month per person Working at Cadarache France (Rs.) (inclusive of overheads)	Unit cost per month per person Working at bidder's site at India (Rs.) (inclusive of overheads)
1	Senior Engineers with required experience as specified in the requirement of the bidders (section 1.1 of Technical specifications).		
2.	Junior Engineers with required experience as specified in the requirement of the bidders (section 1.1 of Technical specifications).		

Place:

Signature of Bidder with seal

Date :