

Provision for Services in Support of Systems Engineering for ITER Tokamak: Divertor and Lower Ports Integration

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1 Background and Objectives

The ITER tokamak is a complex system designed to produce 500 MW of power through nuclear fusion reactions. The major components of the tokamak are the superconducting toroidal and poloidal field coils which magnetically confine, shape and control the plasma inside a toroidal vacuum vessel. The magnet system comprises toroidal field (TF) coils, a central solenoid (CS), external poloidal field (PF) coils, and correction coils (CC). The vacuum vessel is a double-walled steel structure. Inside the vacuum vessel, the internal, replaceable components, including blanket modules, divertor cassettes, and port plugs such as the heating antennae, test blanket modules, and diagnostics modules, absorb the radiated heat as well as most of the neutrons from the plasma and protect the vessel and magnet coils from excessive nuclear radiation. The heat deposited in the internal components and in the vessel is rejected to the environment by means of the tokamak cooling water system. The entire tokamak is enclosed in a cryostat, with 80K cooled thermal shields between the hot components and the 4.5K cryogenically cooled magnets.

The ITER machine is a complex system, not just because of its sheer size, but because of the interconnectivity between its components and the severity of its constraints. One element cannot be disturbed without affecting the others: all elements and aspects of the total system and the interactions among them, have to be considered simultaneously. ITER is using Systems Engineering to ensure that all aspects of the system have been considered and integrated into a whole.

The objective of this Task Order is to provide the ITER Organization with an engineer to provide services for the Divertor / Lower Ports Systems Engineering.

2 Scope of Work

In accordance with the Associated Framework Contract, the scope of this Task Order includes the supply of a specialised engineer to perform the following tasks.

- Review the current status of the system integration of the Divertor / Lower Ports, identify and quantify systems goals (review of System Review Requirements)
- Review the systems engineering development plan for the divertor and lower ports
- Chair Systems Engineering Coordination Meetings
- Interface with all involved ITER departments & interact with DAs when required
- Create alternative system design concepts as required
- Perform design trade-off studies
- Select and implement the most efficient designs
- Verify that the design is properly built and integrated into the data- base
- Perform or coordinate post-implementation assessment of how well the system meets the goals

3 Estimated Duration

The duration of the engineering support services will be for two years.

The IO may exercise the option to extend these services for a maximum of one additional period of one year. Such option shall be exercised by written notice to the Contractor no later than 30 days before the expiration of the initial term of the contract or of the additional period.

The expected starting date of the contract is **1st November 2013** or the signature date of the Task Order, whichever is later.

4 Work Description

The work description of the engineering support to be provided by the Contractor is, but not limited to, the following:

Subtask 1 - The subtask shall commence with the review the current status of the system integration of the divertor / lower ports and the review the systems engineering development plan. The engineer shall identify any issues and shortfalls and present improvement proposals. The plan shall be presented to the responsible officer for agreement.

Subtask 2 - The engineer shall coordinate the systems engineering meetings, coordinate design trade-off studies with the impacted sub-systems, and select and implement the most efficient design

Subtask 3 - The engineer shall be responsible for verifying that the design improvements of the different sub-systems are implemented into the data-base and shall be responsible of coordinating post-implementation assesments of how well the systems meet the goals

5 Responsibilities

5.1 Contractor's Obligations

The Contractor will provide personnel as required who is fully dedicated to performing the Services.

The Contractor is expected to assign one engineer at the ITER Site of Cadarache, France, for the entire duration of this Task Order, to perform the work for this Task Order.

The Contractor agrees not to remove or reassign the personnel for the duration of the task, without the prior approval of the IO. Notwithstanding the foregoing, the Contractor shall not be held responsible for any individual decision to leave or to seek reassignment.

Contractor's personnel will be bound by the rules and regulations governing IO safety and security.

In case of non EU personnel, it is required for the employees to obtain their French working visa prior their arrival in France.

5.2 Obligations of IO

IO shall make available to Contractor's Personnel dedicated and located on IO site at Cadarache:

- Procedures, information and data and any other information for the Contractor to perform its functions under this Scope of Work;
- User facilities on equipment (including communication lines and computers) with adequate capacity necessary for a proper execution of the Services by the Contractor; Computers, software and all data produced during the contract shall remain property of the ITER Organisation.
- A safe work area which meets the requirements which are generally made for such an area for the satisfactory execution of the Services.

6 Deliverables and Due Dates

Deliverable 1 – Report on the review of the current status of the systems engineering of the divertor / lower ports

Deliverable 2 – Technical memorandums to be submitted to the IO monthly as a progress report

Deliverable 3 – Final Report at the end of the contract

7 Specific Requirements and Conditions

The Contractor agrees that it shall require the person assigned to perform the services hereunder to abide by the following nondisclosure conditions:

- To not disclose, deliver, or use for the benefit of any person other than the IO, or its authorized agents, any restricted or confidential information or material he or she receives from the IO, other than material or information previously in the records of the Contractor or obtainable prior to such disclosure, delivery, or use, from third parties or from the public domain, or required to be disclosed by law or court order;
- To adhere to any reasonable policies or instructions provided by the IO as to the classification, use or disposition of any restricted or confidential information or materials;
- To not use any restricted or confidential information or material for personal gain.

The Contractor further agrees to take such reasonable steps as may be needed to ensure that the terms of the nondisclosure statements are observed during and after the termination of the Services.

8 Acceptance Criteria (including rules and criteria)

Monthly reports shall contain a description of the work carried out in the corresponding Task. All communications between the Contractor and the IO shall be in English language and all measures shall be given in the metric system SI. This includes all reports, documentation, correspondence and labelling. All the reports shall be properly bound.

Text and tables of the Final Report in MS-Word shall also be delivered electronically to the IO.

9 Technical Requirements

The contractor shall propose an engineer with the following competences:

- Masters or higher degree in Engineering or Physics
- Some fusion experience is desirable
- Experience in Nuclear Plant Engineering and Quality Control
- At least 3 year's practical experience in general Engineering Support
- At least 3 year's practical experience in Project Management
- Familiarity with CATIA CAD software
- Familiarity with ANSYS software (Mechanical and Workbench) is desirable
- Ability to work effectively in a multi-cultural environment in English language
- Ability to work in a team
- Ability to organize and monitor activities
- Good planning and organisational skills

10 Travel Expenses

The ITER Organization may request Contractor's staff to travel and work at places other than ITER site. Travel mission expenses are claimed by the Contractor according to the following:

- a) Only economy class flights are reimbursed by ITER Organization.
- b) Subsistence expenses reimbursement rate for Contractor's employee shall not exceed the respective per diem rates.
- c) Travel by train (first class) when agreed by ITER Organization
- d) Travel by car reimbursement rate is 0.50 € / km when flight or train are not available

All claims for mission travel will be reimbursed only when supported by original invoices and flight tickets.

The maximum amount to be invoiced to ITER Organization shall be 3 000 Euro per year of duration of this Task Order.

11 Payment schedule / Cost and delivery time breakdown

Invoices will be paid monthly, based on working days worked and according to the resources allocated to the Contract in the month, supported by accepted deliverables.

Time for acceptance of the deliverables and written reports by the IO Responsible Officer shall be 15 calendar days.