

Technical Specifications (In-Cash Procurement)

Technical Summary - Framework Service Contract Engineering Support to the ITER Organization for the ITER Fuel Cycle

The purpose of this Framework Service Contract is to provide engineering support to the ITER Organization (IO) for the procurement of the ITER Fuel Cycle.

Four Lots of work are anticipated under this Framework Service Contract:

- Lot 1: Specialist Support for Hydrogen Isotope Handling and Separation Technology
- Lot 2: Hydrogen Isotope Analysis Technology
- Lot 3: General Technical Delivery
- Lot 4: Secondary Barrier Technology



Framework Service Contract Engineering Support to the ITER Organization for the ITER Fuel Cycle

Call for Nomination

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2 Background

ITER is a joint international research and development project that aims to demonstrate the scientific and technical feasibility of fusion power. When ITER uses the real fusion fuel during operations — a mixture of deuterium and tritium — part of this fuel will not be burned. This leads to an exhaust mixture of fusion fuel and helium, which needs to be processed at unprecedented flow rates by the Fuel Cycle, with measures necessary for the confinement and safe handling of tritium. The Fuel Cycle systems will be procured by the IO with the in-kind contribution from the EU, Japan, Korea, China and the USA.

The ITER Fuel Cycle systems are a complicated and complex collection of small scale chemical plant sub-systems, utilising specialist technology with multiple confinement barriers. It uses well-proven fusion technologies and equipment (catalytic reactors, permeators, cryogenic distillation, chemical exchange columns, electrolyzers, gas distribution, cryogenic pellet injectors, glow wall conditioning, etc.), deployed at a larger scale than previously used.

The Fuel Cycle comprises three Plant Systems; Vacuum System, Tritium Plant System and Fuelling and Wall Conditioning System. This framework will apply the Tritium Plant System (TP) and the Fuelling and Wall Conditioning (FWC) System only.

The IO is planning to progress the preliminary and final design of some of the sub-systems for these Plant Systems, in particular but not limited to:

1. Preliminary Design of the TP Isotope Separation System (ISS)
2. Completing the preliminary design of TP Water Detritiation System (WDS)
3. Preliminary and Final Design of TP Analytical System (ANS)
4. Final Design of Gas Valve Box (GVB) and I&C
5. Preliminary and Final Design of Glow Discharge Cleaning System (GDC) Permanent Electrodes (PE)
6. Final design of DGC Temporary Electrodes (TE)
7. Final Design of Pellet Injection System (PIS) Flight Tube
8. Preliminary Design of Disruption Mitigation System (DMS)
9. Preliminary and Final Design of PIS in-cask components
10. Final Design of the integrated piping between systems

11. Standardised Design of TP Gloveboxes and Enclosures for systems

Under this Engineering Support Framework Service Contract, the selected Contractor will be required to provide support to the IO for the successful preparation and execution these design activities.

The tentative schedule of key milestones is as follows:

- | | |
|--|---------|
| • Completion of standardize Glovebox Design | Q4 2021 |
| • Preliminary Design Review of ANS | Q2 2022 |
| • Preliminary Design Review of ISS | Q3 2022 |
| • Signing procurement agreement with F4E for WDS Final Design & Delivery | Q2 2023 |
| • Preliminary Design Review of Interconnecting Piping | Q4 2024 |
| • Final Design Review of ANS | Q2 2026 |
| • Preliminary Design Review of DMS | Q3 2021 |
| • Final Design Review of GDC | Q3 2022 |
| • Final Design Review of DMS | Q3 2024 |

3 Scope

The scope of work under this Framework Service Contract is divided into four Lots:

Lot 1: Specialist Support for Hydrogen Isotope Handling and Separation Technology

The scope of work under this Lot will be as follows:

A. Specialist support for cryogenic equipment design and system design

- Reviewing and developing heat exchanger design (Condenser and Reboiler) for the Isotope Separation system cryogenic distillation system
- Developing a design of the helium cryogenic refrigeration system for ISS
- Layout and arrangement of the coldbox internals for ISS
- Dynamic modelling and component modelling for the ISS and interactions with interfacing systems e.g. WDS and SDS.
- Reviewing and development cryogenic distribution system design for DMS.
- Dynamic modelling and component modelling for the DMS pellet forming.

B. Specialist support for Water Detritiation equipment and system design

- Reviewing and developing electrolyser design compatible for the WDS application including hard shell enclosure integration
- Reviewing and developing permeator design compatible for the WDS application
- Supporting the process design development of missing aspects of the WDS preliminary design e.g. oxygen stream scrubbing, catalyst option study, etc.

Lot 2: Specialist tritium analytical technology support

Providing specialist support in development and application of specialist analytical equipment for the Tritium Plant, e.g. laser raman spectroscopy, cryogenic micro GC, scintillation counting, calorimetry, tritium diffusion and deposition to cryogenic pellets, etc.

Lot 3: General Technical Delivery

The Contractor shall provide engineering support and perform technical tasks in support of the Tritium Plant and Fuelling and Wall Conditioning System design. This may include preparation of technical deliverables, document control support, configuration management support, performing design calculations and analysis and preparing operation and maintenance plans. The tasks may fall into the full range of relevant disciplines including mechanical, structural, instrumentation, control, electrical, and process engineering as well as technical administration. The work will also include undertaking standard engineering analysis (such as mechanical stress and structural analysis, fluid dynamic analysis) and some fusion specific analysis (such as electromagnetic and neutron analysis).

Lot 4: Secondary Barrier Technology

The scope of work under this Lot will be as follows:

1 Tritium Gloveboxes

- Reviewing and developing the mechanical and instrumentation and control design of the standardized glovebox for the Tritium Plant
- Modularisation of the gloveboxes
- All aspects of the design including heat rejection, over and under pressure projection, pressure control, transfer ports, glove ports, maintenance access etc.
- Selection of standard components

2 Hardshell Enclosures

- Reviewing and developing the mechanical and instrumentation and control of harden leak tight enclosures for venerable process equipment
- All aspects of the design including heat rejection, over and under pressure projection, pressure control, leak tightness and demonstration, maintenance access etc.
- Selection of standard components

3 Guard Pipes

- Providing support in development and application of single and multiple double contained tubing/piping, etc.
- Selection of standard components

4 Required Experience and Skills

The required experience and skills are as follows:

Lot 1:

- Proven experience in specialist hydrogen isotope separation design, fabrication and operation utilising cryogenic distillation and combined electrolysis and chemical exchange technology
- Proven experience in specialist hydrogen isotope handling equipment design, fabrication and operation
- Experience with the tasks described under Lot 1 in Section 3.

Lot 2:

- Proven experience in specialist tritium analytical technology design, fabrication and operation.
- Experience with the tasks described under Lot 2 in Section 3

Lot 3

- Proven experience in chemical, mechanical, structural, electrical, instrumentation and control engineering

- Capacity to perform a range of technical activities with just a few examples being preparation and review of process, mechanical and electrical analysis deliverables such as calculations, equipment specifications and design documentation including mechanical, process and electrical drawings and diagrams.

Lot 4:

- Proven experience in specialist tritium confinement technology design, fabrication and operation utilising gloveboxes, harden enclosures and guard pipes.
- Experience with the tasks described under Lot 4 in Section 3.

Detailed criteria shall be provided during Pre-Qualification stage.

5 Duration of Contract

Lot 1: 4 years with the option to extend for 1 year

Lot 2: 4 years with the option to extend for 1 year

Lot 3: 4 years with the option to extend for 1 year

Lot 4: 4 years with the option to extend for 1 year

6 Schedule

The tentative timetable for setting up the services contract is as follows:

- | | |
|-----------------------------------|---------------|
| - Call for nomination | April 2020 |
| - Call for pre-qualification (PQ) | May 2020 |
| - Call for tender (CFT) | August 2020 |
| - Award of the contract | January 2021 |
| - Contract signature | February 2021 |

7 Candidature

Participation is open to all legal entities established in an ITER Member State. Entities can participate either individually or in a consortium. A legal entity 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 groupings shall be presented at the pre-qualification stage. The tenderer's composition cannot be modified without the approval of the ITER Organization after the pre-qualification.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Candidates (individual or consortium) must comply with the selection criteria. The IO reserves the right to disregard duplicated reference projects and may exclude such legal entities from the pre-qualification procedure.

On 31 January 2020, the UK left the EU and Euratom with a transition period from 1st February to 31 December 2020 to be used to determine the conditions of their future relationship. Euratom is the ITER Member and the withdrawal of the UK from Euratom leads to the fact that UK is not anymore party to the ITER project.

Until the 31 December 2020, current end date of the transition period, UK entities retain the right to participate in IO procurement procedures.