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Procurement of High Voltage Power Supply (HVPS) units for ITER Ion Cyclotron system

Call for Nomination (CFN)

Summary of Technical Specifications

1 Purpose

The Ion Cyclotron Resonance Heating (ICRH) proposed for ITER is designed to launch 20 MW of Radio Frequency (RF) power to the plasma of the ITER machine at frequencies in the range of 40 to 55MHz. The RF power is generated by 9 RF sources, similar to standard RF transmitters, each consisting of two parallel 4-stages amplifier chains. The IC High Voltage Power Supply (HVPS) shall supply the last 2 stages of the amplifier chains, referred to as the driver and the final stage, with electrical power and with stringent requirements in terms of accuracy, voltage ripple, response time, turn off time and fault energy. Each amplifier chain is fed by its dedicated HVPS unit. An “HVPS unit” shall be understood as a functional group supplying with electrical power both driver and end stages of an RF source amplifier chain (not necessarily a single physical item). The 9 RF sources therefore require 18 HVPS units, with 10 of which being under this contract.

2 Scope of work

The ITER Organization requires the design, the manufacturing, factory testing, delivery, installation and acceptance testing of 10 (out of 18) IC HVPS units to supply 5 (out of 9) IC RF Sources, consisting of the following components :

Item	Total Quantity
RF source End Stage Power Supply	10 units
RF source Driver Stage Power Supply	10 units
Control, Interlock and safety system	10 unit
Output DC disconnectors and earthing switches	30 units
Compressed Air and water cooling circuits from interface point	1 set
Testing equipment	1 set
Maintenance and handling tools	1 set

Table 1 : Main Components HVPS system

In addition to the supply of the above mentioned hardware in **Table 1**, the procurement shall also include the following items:

The activities consisting of

- Engineering activities for the Final Design of the system
- Design review processes
- Inspections and quality records
- Documentation
- Supervision and reporting of the manufacturing process
- Factory testing
- Packaging and Transportation to the ITER site
- Assembly, installation at ITER site
- Final Acceptance Tests on ITER Site
- Training

All the components and sub-components of this technical specification shall be made according to the present state-of-the art.

All the components shall be designed, manufactured and tested according to the applicable standard and QA System.

All the installation, testing and commissioning activities at the ITER Site shall be made according to the ITER Safety Rules and Regulations.

2.1 Functional Specifications

Table 2 gathers the functional specifications for the IC HVPS for one amplifier chain:

Parameters	Value
Input voltage	22kV \pm 10%
End stage supply	
Maximum output continuous power to one end stage tube	3250 kW
Rated current to one end stage tube	180 A
Rated voltage	30 kV
Accuracy of the End stage voltage	\pm 150V
Ripple of the End stage voltage	\pm 150V
Driver stage supply	
Maximum output continuous power to one Driver stage tube	250 kW
Rated Voltage	15 kV
Maximum current to one Driver stage tube	20 A
Accuracy of the driver stage voltage	\pm 150V
Ripple of driver stage voltage	\pm 150V

Load fault (for both driver and end stages)	
Fault energy (short circuit energy in case of load fault)	$\leq 10 \text{ J}$
Emergency voltage switch off time	$\leq 10 \text{ } \mu\text{s}$

Table 2 : Tentative requirements for IC HVPS system

The work requires the services of experienced manufacturers in design, manufacturing, testing and installation of HV DC rectifying power supplies

3 Experience

The following experience or capability are expected:

- Past experience in design of complex component requiring various engineering expertise
- Past experience in High Voltage DC rectifier system with stringent voltage regulation requirement
- Past experience on turnkey system based on functional specifications.
- Test facilities
- Quality Management
- Conformance to local EU human safety policy regarding electrical system, integrated in a complex environment.
- High power RF amplifier system experience is an advantage

4 Award of the Contract(s)

The ITER Organization reserves the right to award one Contract for the whole scope of work or to split the procurement of the different systems in separate contracts. Further details will be provided at the Call for Tender stage.

Suitable teaming arrangements for multiple companies (i.e. consortium as indicated in Section 5 below) are possible, where appropriate, to enhance the offering of the tenderer.

The language used at ITER is English. A fluent professional level is required (spoken and written English) with the Contractor staff liaising with ITER.

5 Candidature

Candidature is open to all companies participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person 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.

6 Withdrawal of the United Kingdom from the European Union (BREXIT)

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.

7 Timetable for Procurement Process

A tentative timetable is outlined as follows:

Call for Nomination release	July 2020
Receipt of nominations	August 2020
Issuance of Pre-qualification Application / Call for Tender*	August 2020
Tender Submission Date:	November 2020
Estimated Contract Signature:	April 2021

Table 3 : tentative procurement timetable

*The ITER may at its discretion combine the Pre-qualification Application / Call for Tender.