

Design and manufacturing of the VV PHTS pressurizer

Call for Nomination

Purpose

The purpose of this Contract is to design and manufacture the pressurizer of the Vacuum Vessel Primary Heat Transfer System.

The pressurizer shall be compliant with the French Order dated 30 December 2015 on Nuclear Pressure Equipment (ESPN) and the 2014/068 EU directive. The VV PHTS pressurizer named 26PHVV-PZ-3001 is classified as an ESPN equipment level N3.

The ITER Organization will act as Equipment Manufacturer as it pertains to the ESPN, which is the legal entity which assumes responsibility for the design, manufacture and inspection of a product to be marketed under its name as an item of pressure equipment, nuclear pressure equipment, or a nuclear pressure assembly. ITER will liaise with the Agreed Notified Body for the ESPN compliance assessment.

The supplier will be responsible of drafting the Nuclear Pressure Equipment (ESPN) and the 2014/068 EU directive required documentation, such as hazards and risk analysis, design notes and drawings, design notes justifying correct equipment behaviour for each possibility of damage from the different cases of load combinations, instruction manual as well as any other document that can be used to show compliance to the essential safety requirements.

The main design parameters of the pressurizer are the following:

Parameter	Value
Fluid type	Demineralized water
Operating liquid temperature	151°C plasma – 209°C baking
Operating steam pressure	0.5 MPa plasma – 1.9 MPa baking
Design temperature	240°C
Design pressure	2.6 MPa
Surge volume	8.2 m ³
Space constrains	6 m height / 2 m diameter
Heating power	75 kW proportional / 112 kW backup
Heating power supply	400 V, 50 Hz

The main nozzles are the following:

Nozzles⁽⁶⁾		
<i>Service</i>	<i>ID</i>	<i>DN / Schedule</i>
Spray Supply	N1	25 / 40S
Discharge to PRT	N2	50 / 40S
Surge Line	N3	100 / 40S
Level/Pressure Indicator	N8	20 / 40S
Level/Pressure Indicator	N10	20 / 40S
Level/Pressure Indicator	N12	20 / 40S
Level/Pressure Indicator	N14	20 / 40S
Level Indicator	N16	20 / 40S
Level Indicator	N18	20 / 40S
Level Indicator	N22	20 / 40S
Level Indicator	N24	20 / 40S
Relief to PRT	N28	80 / 40S
Concentration Measurement	N38	20 / 40S
Concentration Measurement	N40	20 / 40S
<i>Service</i>	<i>ID</i>	<i>Parameters</i>
Proportional Heater	N5	TBD
Backup Heater	N7	TBD
Manway	N9	TBD
Thermowell	N34	TBD
Thermowell	N36	TBD

Background

The Tokamak Cooling Water System (TCWS) is the primary coolant system of ITER machine having the aim to remove the power generated by the plasma and transferred to dedicated components of the machine and to release it to the secondary coolant system.

The TCWS is based on three Primary Heat Transfer Systems (PHTSs): VV PHTS for cooling the Vacuum Vessel, IBED PHTS for cooling the in-vessel components and NBI PHTS for cooling the Neutral Beam Injectors.

The TCWS includes auxiliary systems as the Chemical and Volume Control System (CVCS), Draining and Refilling System (DRS), and Drying System (DYS).

The TCWS is designed to reject all the heat generated in the plasma and transmitted to the in-vessel components to the intermediate closed loop CCWS-1 (Component Cooling Water System 1) and then to the environment via the HRS (Heat Rejection System). TCWS release heat also to the Chilled Water System (CHWS).

In the ITER Plant Breakdown Structure (PBS), the Cooling Water System consisting of TCWS, CCWS, CHWS and HRS, is represented by the PBS 26. The level 2 and 3 of PBS 26 and the sub-systems belonging to TCWS are reported in Table 2.1.

The Vacuum Vessel Primary Heat Transfer System (VV PHTS) provides cooling and baking services by supplying demineralized water to the main channels of the vacuum vessel, field joints, port extensions and port stub extension field joints at the lower ports, and the neutral beam port extensions. The VV PHTS is designed to provide the primary confinement for

Activated Corrosion Products and tritium entrained in the cooling water outside the Vacuum Vessel and maintains leak tight integrity during all operating modes. The VV PHTS Pressurizer, with proportional and backup heaters, hereinafter referred to as the PZ, is designed to perform the following functions: (a) pressurize the VV PHTS to keep the cooling water in a sub-cooled, liquid state; (b) in conjunction with the VV PHTS volume control loop, accommodate the system fluid expansion and contraction associated with different modes of operation; (c) maintain the client inlet pressure within the allowable range; (d) provide overpressure protection for the VV PHTS.

Scope of work

The contract will include design, fabrication, inspection, examination, testing, certification, packaging, and shipping of the VV PHTS pressurizer (including heating device and its controls).

Timetable

The tentative timetable is as follows:

Tender submission	November	2019
Contract placement	February	2020
Completion of Contract	August	2022

Experience

The contractor and its personnel shall have adequate experience in manufacturing of stainless steel pressure vessels in compliance with the 2014/068 EU directive and American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV) Section VIII, Division 2—2017 Edition or equivalent codes.

Candidature

Participation is open to all legal persons 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.