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**Technical Specifications (In-Cash Procurement)**

# Technical Summary for BOP-Group 5 Installation Works

The BOP Group 5 works include installation and commissioning of all the Items included in the Procurement Arrangement 4.1.P3.RF.01 such as Busbars, SNU and FDU in the following Buildings : Building 32 – Magnet Power Conversion Building 1, plus Plant Bridges between Building 32 and 74Building 33 – Magnet Power Conversion Building 2, plus Plant Bridges between Building 32 and 74Building 74 – Diagnostic Building Building 11 – Tokamak Building Building 75 – Fast Discharge & Switching Network ...

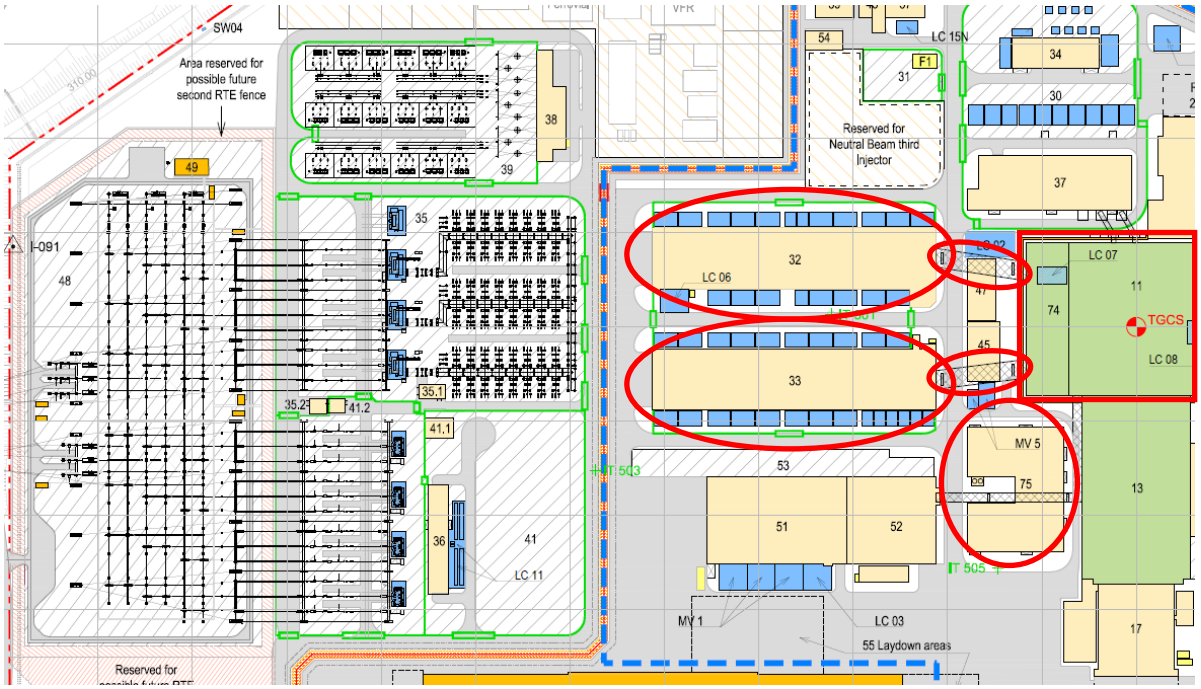
# Technical Summary

# BOP Group 5 - Busbars and FDU Installation Works

## 1 Purpose

The purpose of this Call for Nominations is to establish a list of candidates who will be invited to participate in a tender process, starting with a pre-qualification for a contract for plant installation works of Busbars, SNU and FDU in the following Buildings on the ITER Site, Cadarache , France:

- Building 32 – Magnet Power Conversion Building 1, plus Plant Bridges between Building 32 and 74
- Building 33 – Magnet Power Conversion Building 2, plus Plant Bridges between Building 33 and 74
- Building 74 – Diagnostic Building
- Building 11 – Tokamak Building
- Building 75 – Fast Discharge & Switching Network Resistor Building



The installation activities will include:

| Equipment | Building | Lot No. |
|---|---|---|
| DC Busbars and Switches | 32, 33, bridges | 1 |
| DC Busbars, Switches, SNU and FDU | 74 | 2 |
| DC Busbars and FDU | 11 | 2 |
| Fast Discharge Resistors and Switching Network Resistors | 75 | 1 |
| Coaxial Power Cables (TF FDU)<br>Coaxial Power Cables (PF/CS FDU and SNU)<br>Coaxial Power Cables (CCU, internal connections) | 75 to 11<br>75 to 74<br>11 and 74 | 1<br>1<br>2 |

# 2 Background

ITER is based on the 'Tokamak' concept of magnetic confinement, in which the plasma is contained in a doughnut-shaped vacuum vessel. The fuel - a mixture of Deuterium and Tritium, two isotopes of Hydrogen - is heated to temperatures in excess of 150 million °C, forming an hot plasma. Strong magnetic fields are used to keep the plasma away from the walls; these are produced by superconducting coils surrounding the vessel, and by an electrical current driven through the plasma.

ITER is a large research facility made of a combination of large conventional industrial equipment such as the cooling water system and challenging new high tech components such as diagnostics, superconductive magnets, etc. To ensure the future operation of all ITER subsystems a large amount of power and control cables will have to be designed, identified, routed and installed.

For more information on ITER Project please visit our web site www.iter.org.

# 3 Scope of Work

The installation works are to be performed in the following buildings:

- Building 32 – Magnet Power Conversion Building 1, plus Plant Bridges between Building 32 and 74
- Building 33 – Magnet Power Conversion Building 2, plus Plant Bridges between Building 33 and 74
- Building 74 – Diagnostic Building
- Building 11 – Tokamak Building
- Building 75 – Fast Discharge & Switching Network Resistor Building

All the equipment to be installed shall be free issued by the ITER Organization (IO) to the Contractor, except for the consumables and accessories for the installation.

The scope of the work to be awarded under this tender is split into Lots, as follows:

- **Lot 1:** all Works in buildings 32, 33, 75 and Bridges (see Section 3.1)
- **Lot 2:** DC Busbar, Switches, SNU and FDU installation in buildings 74 and 11 (see Section 3.2).

Pre-qualified Candidates will be eligible to tender for both Lots. During the tender phase, the tenderer shall submit offers for both Lots.

## 3.1 Lot 1 - Scope of Work

The equipment scope of the Lot 1, is comprised of the following main elements for installation only:

- The Busbars, that connect from the DC side of the AC/DC Converters in Bldgs#32 and 33 up to the bridges between 32 and 33, and Bldg#74;
- The Make Switches (MSs) which are used to shunt the Power Converters, in case of faulty events;
- The control and monitoring instrumentation for the busbars systems.

| Description | Total Quantity to be Installed |
|---|---|
| Make Switch (Electrical) skid: 2200 mm L x 900 mm W x 1500 mm H, weight 1300 kg | 15 |
| Busbars for PF and CS section size: Various (6000 – 12000 mm) L x 800 mm W x 340 mm H, weight 162 kg/m | 135 sections |
| Busbars for TF section size: Various (6000 mm – 12000 mm) L x 1250 mm W x 340 mm H, weight 316 kg/m | 10 sections |
| Busbars for CC and DL section size: Various (6000 mm – 12000 mm) L x 220 mm W x 170 mm H, weight 40 kg/m | 118 sections |
| Copper Flexible Links | 211 |
| Busbar Cooling Water Collector (Electro-mechanical box)<br>Inlet box : 568 mm L x 160 mm W x 200 mm H, weight 10 kg<br>Outlet box: 760 mm L x 508 mm W x 1014 mm H, weight 50kg | <br>62<br>60 |
| Supports For Busbars ( Total weight 159 Ton) | 289 |

- Fast Discharge & Switching Network Resistors in Building 75
- Pulling and Terminate cables in the galleries connecting the Resistors in Building 75 to the Tokamak Complex (Bldg#74 and #11).

| ITEM | unit WEIGHT, kg | DIMENSIONS, mm L x W x H | QUANTITES |
|---|---|---|---|
| **Resistors SNR** | | | |
| SNR stack (8 sections) | 5 240 | 915 x 1885 x 3563 | |
| SNR unit (2 stacks with ventilation) | 13 000 | 4260 x 5756 x 5312 | 32 |
| **Resistors FDR** | | | |
| FDR module consisting of two sections | 3000 | 1100 x 1000 x 3600 | 59 |
| FDR module of three sections | 4000 | 1100 x 1000 x 4300 | 21 |
| FDR module of four sections | 5000 | 1100 x 1000 x 5000 | 212 |
| **Power coaxial cables** | | | |
| For FDU – cross-section 2 x 300 mm2 | 8.2 kg/m | D = 63.2 mm | 20 km |
| For SNR – cross-section 2 x 120 mm2 | 4.4 kg/m | D = 52.58 mm | 18km |

For the above equipment, the contractor is responsible for providing and installing consumables and accessories, including:

- Terminals and Connections,
- Cable/Wiring Core Ferruling,
- Labels,
- Flexible Conduit,
- Cable Glands,
- Earthing and Bonding,
- Welding materials.

The Contractor shall be responsible for the following activities:

- Provide any required temporary works including, but not only, the means of protection and the tools needed to properly manage and perform the different stages of work in the buildings and on site,
- Perform the complete installation (including the thermal insulation and the final coating if necessary),
- Perform final installation tests (mechanical & electrical completion) and verifications,

- Issue all necessary documentation for the works, such as Quality Plan, Health and Safety plan, Workface planning (Installation sequence and Level 4 Schedule) and the List of documents to be issued for the execution of the works.
- Issue the As-Constructed documents,
- Provide support during commissioning phase (as required).

All above mentioned site works shall be performed by the Contractor within ITER Site at Cadarache in France.

Note that the above information is preliminary only and will be further detailed at the Call for Tender stage.

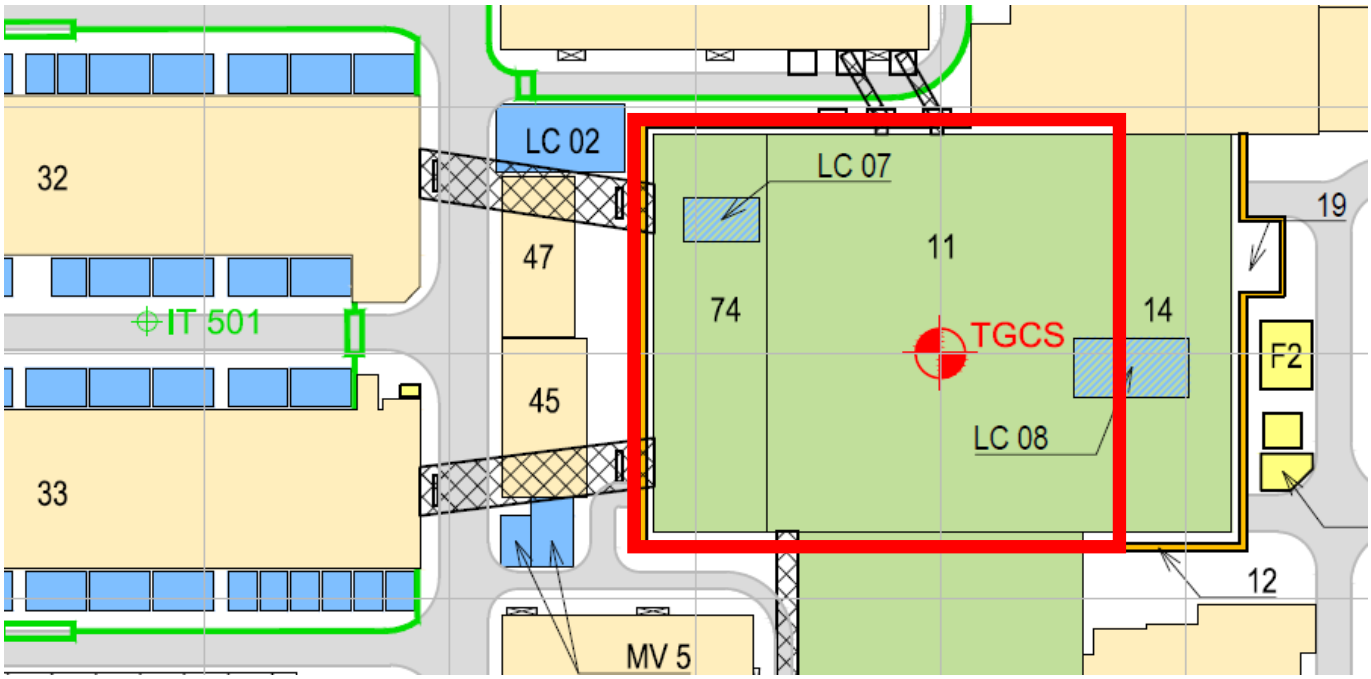
## 3.2 Lot 2: Scope of Work

The equipment scope of the Lot 2, is comprised of the following main elements for installation only:

- The Busbars, that connects the super conducting magnets in the Tokamak in Bldg#11. The busbars carry current to the magnets to initiate and control the plasma in the Tokamak;
- The Fast Discharge Units (FDUs) that protect the superconducting coils by rapid dissipation of the magnetic energy through resistors via fast acting switches. The switches are located in the Diagnostics and Tokamak Buildings (Bldgs# 74 and 11 respectively);
- The Switching Network Units (SNUs) which provide and control the high voltages required for initiation of the plasma; the switches are located in the Diagnostics Building (Bldg#74);
- The Protective Make Switches (PMSs) which are used to isolate the superconducting coils from the power supplies, in case of faulty events, and to protect the coils;
- The Disconnectors (DSs) and Earth Switches (ESs) provided to isolate the Coil Power Supply System to allow access to the Tokamak Building (Building 11);
- The voltage and current sensors used for machine protection and for the Plasma Control System;
- The control and monitoring instrumentation for the above systems.

All this equipment will be installed in a number of locations as listed below which can be identified in the Figure below:

- Diagnostics Building (Bldg# 74);
- Tokamak Building (Bldg #11);




| Description | Total Quantity to Be Installed |
|---|---|
| RMS - Resistor Make Switch (Electrical skid: 1646 mm L x 920 mm W x 1365 mm H, weight 500 kg) | 8 |
| BPMS –Bypass Make Switch (Electrical skid: 1646 mm L x 920 mm W x 1365 mm H, weight 700 kg) | 8 |
| BPOS - Bypass Open Switch (Electrical skid: 1600 mm L x 880 mm W x 1540 mm H, weight 200 kg) | 8 |
| FDU: SWG (by Siemens) + Pyrobreaker (Electrical skid: 2500 mm L x 2000 mm W x 1800 mm H, weight 2400 kg) | 21 |
| TF PMS: SWG + EPMS Unit (Electrical skid: 2500 mm L x 2000 mm W x 1800 mm H, weight 1850 kg) | 1 |
| Counterpulse Unit:<br>Bidirectional (Electrical skid: 1720 mm L x 900 mm W x 1878 mm H, weight 1200 kg)<br>Unidirectional (Electrical skid: 1720 mm L x 900 mm W x 1802 mm H, weight 1040 kg) | <br>12<br>18 |
| Charger (Electrical skid: 850 mm L x 750 mm W x 1878 mm H, weight 1040 kg) | 21 |
| FDU Snubber Circuit (Electrical skid: 1012 mm L x 900 mm W x 1315 mm H, weight 600 kg) | 21 |
| TCBU - Thyristor Circuit Breaker Unit (Electrical skid: 1200 mm L x 1000 mm W x 2200 mm H, weight 1000 kg) | 32 |
| LCC – Local Control Cubicle (Electrical Cubicle: 800 mm L x 800 mm W x 2200 mm H, weight 400 kg) | 100 |
| Busbars for PF and CS section size: Various (6000 mm – 12000 mm) L x 800 mm W x 340 mm H, weight 162 kg/m | 169 sections |

| Description | Total Quantity to Be Installed |
|---|---|
| Busbars for TF section size: Various (6000 mm – 12000 mm) L x 1250 mm W x 340 mm H, weight 316 kg/m | 20 sections |
| Busbars for TF section size: Various (6000 mm – 12000 mm) L x 420 mm W x 270 mm H, weight 316 kg/m | 4 sections |
| Busbars for CC section size: Various (6000 mm – 12000 mm) L x 220 mm W x 170 mm H, weight 40 kg/m | 207 sections |
| Copper Flexible Links | 3110 |
| Busbar Water Cooling Collector (Electro-mechanical box)<br>Inlet box : 568 mm L x 160 mm W x 200 mm H, weight 10 kg<br>Outlet box: 760 mm L x 508 mm W x 1014 mm H, weight 50kg | <br>65<br>59 |
| Supports For Busbars (Total weight 159 Ton) | 267 |
| For CCU (internal connection of FDU/SNU switches) – cross section 2 x 25mm$^2$, weight 1,9 kg/m Φ 40mm | 1 km |

For the above equipment, the contractor is responsible for providing and installing consumables and accessories, including:

- Terminals and Connections,
- Cable/Wiring Core Ferruling,
- Labels,
- Flexible Conduit,
- Cable Glands,
- Earthing and Bonding,
- Welding materials.

The Contractor shall be responsible for the following activities:

- Provide any required temporary works including, but not only, the means of protection and the tools needed to properly manage and perform the different stages of work in the buildings and on site,
- Perform the complete installation (including the thermal insulation and the final coating if necessary),
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- Issue all necessary documentation for the works, such as Quality Plan. Health and Safety plan, Workface planning (Installation sequence and Level 4 Schedule) and the List of documents to be issued for the execution of the works.
- Issue the As-Built documents,
- Provide support during commissioning phase (as required).

All above mentioned site works shall be performed by the Contractor within ITER Site at Cadarache in France.

Note that the above information is preliminary only and will be further detailed at the Call for Tender stage.

# 4 Interfaces with other companies

There will be other contractors working on the ITER site around the Buildings and also inside the Buildings involved in these installation activities.

To manage the coactivity and the Installation schedule IO is currently working with a Construction Management-as Agent (CMA). The CMA shall be also responsible for:

- Project management,
- Site coordination (including permit to work)
- Material management,
- Work supervision, quality control, record keeping
- Management of installation Completion Activities.

The CMA interfaces with the Contractor at the different steps of the works (preparation, quotation and scheduling, performance and acceptation).

The CMA acts as the Engineer for this Works Contract under the FIDIC “Red Book”.

# 5 Procurement Timetable

The tentative timetable is as follows:

| | |
|---|---|
| Issue of Call for nomintions | May 2017 |
| Issue of Pre-Qualification | June 2017 |
| Invitation to Tender | October 2017 |
| Tender Submission | February 2018 |
| Contract Award | July 2018 |
| Start of the Works | November 2018 |

The contract duration is estimated to be between 60 and 72 months for the whole of the installation works, each Lot will have a duration between 30 and 36 months, , including testing and preparation of the final documentation.

# 6 Nuclear and Quality Requirements

The ITER Organization is the nuclear operator of the ITER nuclear fusion facility (INB 174) under French nuclear law.

The Contractor shall install piping components in conformance with ASME B31.3-2010 Category M fluid and appropriate ASTM standards and for part of the scope to comply with ESP and ESPN French regulations. The Contractor will have to provide a Quality Assurance System required for installing of nuclear components. He shall comply with the defined requirements associated with those components as well as the French Order of 7th February 2012 establishing the general rules for basic nuclear installations. The Quality requirements imposed by the ESP and ESPN regulations, the defined requirements and the French Order of 7th February 2012 will be detailed at the Call for Tender stage..

**Protection Important Components** related to Nuclear Safety **are to be installed** under the Lot 1 and 2.

The Protection Important Activity (PIA) list to be performed by this contract will be given in the Call for Tender phase.