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Statement of Work for ECH TL Gyrotron Conditioning RF Load

Abstract or description:

This Statement of Work (SOW) is for the procurement of the design and fabrication of a prototype gyrotron conditioning Radion Frequency (RF) load assembly for the ITER ECH system.

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v1.1	OBSOLETE (Approved)	27 Feb 20	-Revised Scope section -Removed requirement for MRR -Separated MIP into separate plans for manufacturing and inspection -Added deliverable for operation and maintenance manual -Added requirements for procedures for outgas and vacuum conductance testing and for performance of these tests
v1.2	OBSOLETE (Approved)	16 Mar 20	Updated versions of references 1 and 14.
v1.3	OBSOLETE (Approved)	10 Jun 20	Updated version number for reference 1
v1.4	CURRENT (Approved)	06 Jul 20	Updated version number for reference 1 - Technical Specification for ECH TL Gyrotron Conditioning RF Load taken to version 5.0.

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1. INTRODUCTION

1.1 Background

ITER is an international collaborative research project with a programmatic goal of demonstrating the scientific and technological feasibility of fusion energy for peaceful purposes. The European Union is the host party for the ITER facility, which is being constructed in Cadarache, France. The US contribution to ITER is managed by the US ITER Project Office (USIPO), which is hosted by Oak Ridge National Laboratory (ORNL) under contract with UT-Battelle (hereinafter referred to as the “Company”), and located in Oak Ridge, Tennessee. Responsibility for operating the completed ITER facility will belong to the ITER International Organization (ITER IO).

The Electron Cyclotron Heating and Current Drive (ECH) system performs several functions in the ITER machine, including plasma heating, non-inductive current drive, neoclassical tearing modes instability suppression, plasma start-up, and vacuum vessel discharge cleaning. The ECH system consists of twenty-four (24) 1-MW gyrotrons, transmission lines and their components (including RF loads), and launchers to inject the RF beam power into the plasma.

RF loads or ‘dummy’ loads are devices designed to absorb power generated by the gyrotrons during daily conditioning. Each installed ECH gyrotron will have a dedicated water-cooled RF load connected (through a switch) for daily conditioning of the gyrotron.

Each RF load assembly is expected to consist of a water-cooled RF load, a pre-load (if necessary), structural supports, cooling water connections, and vacuum connection. Because no known existing RF load design is compatible with all the ITER-specific design requirements, it is expected that existing designs will require modification to fit into the available space in the ITER RF Building, meet the seismic requirements, and meet the weight limitations (including structural steel support frames). A design compliance matrix that identifies how each proposed RF load design meets all the ITER requirements will be a required part of the Seller’s design justification documentation package.

2. SCOPE

This Statement of Work (SOW) applies to the two-part procurement of the design and fabrication of a prototype gyrotron conditioning RF load assembly for the ITER ECH system. The first activity (Part 1) begins with preparation of a design package for the equipment identified in Table 1 and concludes with a design review. On successful completion of the design review, Company acceptance of the design package, and authorization by the Company to proceed, the Seller will fabricate and deliver one (1) prototype gyrotron conditioning RF load assembly (Part 2). This prototype gyrotron conditioning RF load assembly will be tested by the Company for operation with an ITER gyrotron or ITER-prototype gyrotron.

Procurement of the twenty-four (24) gyrotron conditioning RF load assemblies for installation in the ITER ECH system will commence at the Company’s discretion after successful completion of prototype RF load testing.

The Seller is expected to demonstrate that the proposed design will meet the technical requirements through the design package presented at the Part 1 design review (Sect. 4.1.2.1). The Seller will also prepare and submit a design verification matrix for the requirements in *Technical Specification for ECH TL Gyrotron Conditioning RF Load* [1] as part of this package. The design verification matrix will be the key deliverable to be used by the Company and ITER IO for design evaluation and approval.

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Table 1. ITER ECH TL Gyrotron Conditioning RF Load Assembly

Item	Title	Quantity
1	Gyrotron conditioning RF load assembly (including the water-cooled load, pre-load, if required, structural supports, and waveguide or miter bends necessary to connect to the transmission line interface)	1
2	Lifting fixtures, including any special tools required	To be determined by Seller

On acceptance of the detailed design proposed in Part 1, the Company may elect to have the Seller proceed to Part 2 for the manufacture, inspection, testing, packaging, and shipping of one prototype RF load assembly per Table 1 to be used as a test article. High power microwave testing and functional qualification testing of the prototype RF load assembly will be performed by the Company at one or more facilities in the US, Japan, or Europe. Qualification of the prototype RF load for use at ITER will be partially based on successful completion of the high-power testing, which will evaluate:

- Outgassing and the time it takes to condition the RF load to minimize outgassing
- Arcing in the RF load
- Overheating of surfaces in the RF load assembly or transmission line
- Interference with gyrotron operations due to reflected power from the RF load.

On completion of Part 2, prototype delivery and qualification, the Company may elect to order eight (8) gyrotron conditioning RF load assemblies in a separate procurement activity to support ITER first plasma operations. The Company also anticipates authorization of a third procurement activity for an additional sixteen (16) gyrotron conditioning RF load assemblies to support post-first plasma operations.

3. APPLICABLE DOCUMENTS

3.1 References

Reference documents are provided to supplement this SOW to the extent involved in defining tasks in this SOW. These documents include technical specifications, ITER design handbooks, procedures, and forms. National and international standards are to be provided by the Seller.

3.2 Reference Documents

- [1] Technical Specification for ECH TL Gyrotron Conditioning RF Load - EXPORT CONTROL, US_D_22T3KD, v5.0
- [2] Design and Calculation Procedure, US_D_227HSR, v3.3
- [3] Quality Plan Template for Suppliers and Subcontractors, US_D_23EG78, v1.4
- [4] Requirements for Producing a Quality Plan, ITER_D_22MFMW, v4.0
- [5] ITER Vacuum Handbook, ITER_D_2EZ9UM
- [6] Inspection Plan Template, US_D_22NBD3, v4.0

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- [7] Requirements for Producing an Inspection Plan, ITER_D_22MDZD, v3.7
- [8] Contractor Release Note Form, US_D_2299UW, v4.0
- [9] Contractor Release Note Procedure, US_D_22NEFV, v2.0
- [10] Manufacturing Dossier Guide, US_D_22863X, v1.0
- [11] Manufacturing Dossier Template, US_D_22M9FP, v1.1
- [12] Non-Conformance Report Form, US_D_23CRR3, v2.1
- [13] Nonconformance Reports Procedure, US_D_22GMTF, v9.3
- [14] Deviation Request Form, US_D_22C9DT, v2.1
- [15] Deviation Request Procedure, US_D_22A94F, v3.6
- [16] ASTM SI10-16, American National Standard for Metric Practice

4. PERFORMANCE REQUIREMENTS

All work under this SOW is to be performed at the facility of the Seller or the Seller's approved subcontractor(s).

The Seller shall provide all shop facilities, fabrication machines, qualified shop personnel, design personnel, management personnel, materials, inspection services, testing services, cleaning services, packaging services, required sub-tier vendors, software, hardware, and office space for completing this scope of work.

4.1 Part 1 – Detailed Design

4.1.1 Task 1.1: Preparation of Quality Plan (QP)

The Seller shall prepare a Quality Plan (QP) specifically for this SOW in accordance with the requirements and guidelines in *Quality Plan Template for Suppliers and Subcontractors* [3] and *Requirements for Producing a Quality Plan* [4].

The QP shall be submitted to the Company's Technical Project Officer (TPO) for review and approval per Sect. 6.1.

Further work for this SOW may not begin until the Seller receives notice from the TPO that the QP is approved.

Any revised QP is subject to the same approval and acceptance procedure as the original QP.

Unless otherwise directed by the TPO, in case of a QP revision, work should continue in accordance with the current approved version until the revised QP is accepted.

The ITER-specific QP shall be flowed down contractually from the Seller to the Seller's suppliers and subcontractors, unless the requirement is waived in writing on a case-by-case basis by the Company. [Example: commercial off-the-shelf (COTS) items not modified for ITER].

4.1.1.1 Task 1.1a: Kickoff Meeting

The Part 1 kickoff meeting will be held as soon as practical after Company approval of the QP. The kickoff meeting will include the project team and any other principal participants. The

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purpose of the meeting is to confirm that the project participants understand the terms and conditions of the subcontract, SOW, and technical specification [1]. The Seller shall prepare written kickoff meeting minutes, including the agreed itemization of the design package contents, and submit them to the TPO for review within 3 working days after the meeting.

4.1.2 Task 1.2: Preparation of Design Package

The Seller shall complete the design for the gyrotron conditioning RF load assembly that complies with the technical requirements defined in the *Technical Specification for ECH TL Gyrotron Conditioning RF Load* [1] and shall submit the design package to the Company for review per Sect. 6.1. Design calculations shall comply with the requirements of the *Design and Calculation Procedure* [2]. The following types of documentation as well as any other related documents that serve as the design basis for the gyrotron conditioning RF load assembly shall be included as part of the design package:

- Completed design verification matrix
- Hazards analyses required for compliance with EU Directives
- Engineering calculations and reports
- 3D CAD models
- 2D manufacturing and construction drawings
- Bills of material
- Deviation Requests (DRs)

The Company will be responsible for implementing cooling water flow monitoring and control, water temperature and pressure measurements, and valving.

The Company will be responsible for providing and installing an arc detection system to the interface points defined in [1].

4.1.2.1 Task 1.2a: Design Review

A design review meeting will be held after submission of the design package completed in Task 1.2. The purpose of this meeting is for the Seller to present their design solution and to demonstrate that it meets the design requirements and it is practical and manufacturable. The Seller shall prepare written meeting minutes and submit them to the TPO for review within 3 working days after the meeting.

4.2 Part 2 – Prototype Fabrication and Delivery

After Company and IO acceptance of the detailed design submitted in Part 1, and after Company approval to proceed with Part 2, the Seller shall deliver the prototype assembly hardware per Table 1 (and associated documentation) in accordance with the task descriptions and requirements identified in Sects. 4.2.1 – 4.2.9.

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4.2.1 Task 2.1: Update of Quality Plan

The Seller shall update the QP prepared in Part 1, Task 1.1, as necessary to reflect any changes resulting from the design review.

The updated QP shall be submitted to the Company's TPO for review and approval per Sect. 6.1.

Further work for Part 2 of this SOW may not begin until the Seller receives notice from the TPO that the updated QP is approved.

All other provisions of Sect. 4.1.1 remain applicable.

4.2.2 Task 2.2: Preparation of Cleaning Procedure and Clean Work Plan

The Seller shall prepare a Cleaning Procedure in accordance with the requirements of [1] and *ITER Vacuum Handbook* [5] and shall submit the procedure to the Company for approval.

The Seller shall also prepare a Clean Work Plan that specifies how cleanliness will be maintained throughout the manufacturing process, states when specific cleaning procedures will be applied, and identifies controls that will be in place to maintain cleanliness.

The Clean Work Plan shall include cleaning techniques, materials, and shall identify chemicals that will be used.

The Cleaning Procedure and Clean Work Plan shall be submitted to the Company's TPO for review and approval per Sect. 6.1. The procedures shall include evidence that all requirements of [1] and [5] are clearly satisfied.

4.2.3 Task 2.3: Preparation of Test Procedures

The Seller shall prepare leak test procedures for hydrostatic testing of the cooling lines and for vacuum leak testing of the RF load in accordance with the requirements of [1] and [5] and shall submit the procedures to the Company for approval per Sect. 6.1. The leak test procedures must be approved by the Company before any testing activities occur.

The Seller shall prepare an outgassing test procedure to ensure that the maximum steady-state outgassing rate for materials used in vacuum meets the requirements in [1] and [5] and shall submit the procedure to the Company for approval per Sect. 6.1. The test procedure must be approved by the Company before any outgassing testing activities occur.

The Seller shall prepare a vacuum conductance test procedure to ensure that the conductance at the RF load vacuum port flange meets the requirements in [1] and [5] and shall submit the procedure to the Company for approval per Sect. 6.1. The test procedure must be approved by the Company before any conductance testing activities occur.

The procedures shall include evidence that all requirements of [1] and [5] and the code for design and construction are clearly satisfied.

4.2.4 Task 2.4: Preparation of a Manufacturing Plan

The Seller shall prepare a manufacturing plan that provides a detailed listing and description of the sequence of operations encompassing the scope of prototype manufacturing, covering project schedule, required procedures, review of drawings, materials and material traceability, forging, heat treating, machining, welding, testing, cleaning, and final packaging, as applicable.

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Unless otherwise directed by the TPO, in case of a plan revision, work should continue in accordance with the current approved manufacturing plan until a revised plan is accepted.

The manufacturing plan shall be submitted to the TPO for review and approval per Sect. 6.1. Manufacturing activities may not begin until the Company approves the plan.

Intervention points during manufacturing shall be identified in the manufacturing plan.

US ITER and the ITER IO may add intervention points as deemed necessary to accurately monitor the manufacturing processes and to conform to ITER requirements.

The Seller shall notify the Company, in writing, ten (10) working days in advance of all tests, hold points, and witness points.

A project schedule identifying material procurements, manufacturing, testing, cleaning, packaging, hold points, witness points, and other important milestones that are a part of the fabrication of the gyrotron conditioning RF load assembly shall be included in the manufacturing plan.

The project schedule shall identify the critical path for completion of Part 2 of this SOW.

Subcontract deliverables described in Sect. 6 of this SOW shall be identified in the project schedule.

The project schedule shall be updated throughout the process.

At a minimum, schedule updates must occur monthly.

4.2.5 Task 2.5: Preparation of an Inspection Plan

The Seller shall prepare an inspection plan that provides a detailed listing and description of all inspection activities.

Unless otherwise directed by the TPO, in case of a plan revision, work should continue in accordance with the current approved inspection plan until a revised plan is accepted.

The inspection plan shall be submitted to the TPO for review and approval per Sect. 6.1. Inspection activities may not begin until the Company approves the plan.

A US ITER standard form *Inspection Plan Template* [6] is available from the Company for documenting the inspection plan. Inspection plan Requirements can be found in *Requirements for Producing an Inspection Plan* [7]

4.2.6 Task 2.5a: Oral Presentation

The Seller shall make an oral presentation to the Company describing the manufacturing and inspection plans and project schedule prior to Company approval of the plans.

4.2.7 Task 2.6: Fabricate, Clean, Inspect, Assemble, Leak Test, Package, and Prepare for Delivery ECH Gyrotron Conditioning RF Load Assembly Prototype

4.2.7.1 Fabricate

After the TPO issues direction to proceed, the Seller shall fabricate the gyrotron conditioning RF load assembly per Table 1 in accordance with the requirements stated in this SOW, the technical specification [1], the manufacturing plan, and Sect. 6.1.

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4.2.7.2 Clean

The Seller shall clean all components in accordance with the requirements in [1] and [5], referenced drawing(s), and the approved cleaning procedure. Results of tests required by the cleaning procedure shall be recorded and provided to the Company along with a Certificate of Vacuum Compliance.

4.2.7.3 Inspect

The Seller shall inspect all components in accordance with the requirements in [1], the inspection plan, and the fabrication drawing(s). The Seller shall record results of inspections and shall provide an inspection report to the Company.

4.2.7.4 Assemble

The Seller shall assemble components in accordance with the approved fabrication drawings.

4.2.7.5 Vacuum Leak Test

After assembly, the Seller shall perform vacuum leak testing in accordance with the requirements in [1] and [5], fabrication drawings, and the approved leak test procedures. The Seller shall record test results and shall provide a test report to the Company.

4.2.7.6 Hydrostatic Leak Test

After assembly, the Seller shall leak test all cooling lines in accordance with the code for design and construction, requirements in [1], fabrication drawings, and the approved leak test procedures. The Seller shall record test results and shall provide a test report to the Company.

4.2.7.7 Outgas Test

After assembly, the Seller shall perform outgas testing in accordance with the requirements in [1] and [5], fabrication drawings, and the approved test procedure, The Seller shall record test results and shall provide a test report to the Company.

4.2.7.8 Conductance Test

After assembly, the Seller shall perform conductance testing in accordance with the requirements in [1] and [5], fabrication drawings, and the approved test procedure, The Seller shall record test results and shall provide a test report to the Company.

4.2.7.9 Package and Prepare for Delivery

The Seller shall package the prototype gyrotron conditioning RF load assembly in accordance with the requirements in [1] and fabrication drawings. The Seller shall prepare the packaged assembly for delivery to the Company-designated test facility in accordance with the requirements and instructions in Sect. 7, Transportation Arrangements.

4.2.8 Labeling

The gyrotron conditioning RF load assembly prototype shall be labeled as specified in [1] and the fabrication drawings.

All reports, material certifications, and other reportable results shall identify each of these components/assemblies by serial number as applicable.

4.2.9 Documentation

The Seller shall provide the documentation specified in Sects. 4.2.9.1 – 4.2.9.7 with the prototype gyrotron conditioning RF load assembly.

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4.2.9.1 Material Certifications

Material certifications compliant with EN 10204 (or equivalent) shall be provided.

4.2.9.2 Visual Inspection and Dimensional Measurement Reports

Visual inspection and dimensional measurement reports shall include all drawing dimensions, surface finish, and workmanship requirements, as applicable.

At a minimum, each entry must include the drawing number, sheet, zone, nominal dimension or requirement, actual measurement, the Seller ID for the measuring or test equipment used, and whether the article meets or fails the referenced requirement.

4.2.9.3 Test Reports

At a minimum, each test report entry must include the drawing number, the Seller ID for the measuring or test equipment used, allowable values, test parameters, recorded results, and whether the article meets or fails the referenced requirement.

4.2.9.4 Certificate of Vacuum Compliance and Cleaning Records

The Seller shall provide a Certificate of Vacuum Compliance for the assembly verifying that all cleanliness test results conform to the requirements of the technical specification [1] and [5] and approved cleaning procedures.

4.2.9.5 Contractor Release Note (CRN)

Prior to final packaging for shipment of the prototype gyrotron conditioning RF load assembly, the Seller shall conduct a quality review to verify that all applicable requirements of this SOW have been met. The results of this review shall be documented on the Contractor Release Note (CRN), which shall be provided to the Company for approval before the assembly is packaged in preparation for shipment.

The Seller shall prepare the CRN in accordance with *Contractor Release Note Form* [8] and completed in accordance *Contractor Release Note Procedure* [9]

4.2.9.6 Manufacturing Dossier

The Seller shall provide an electronic version of the Manufacturing Dossier plus three printed and bound copies of the manufacturing dossier in accordance with the guidance in *Manufacturing Dossier Guide* [10] and *Manufacturing Dossier Template* [11].

4.2.9.7 Operation and Maintenance Manual

The Seller shall provide an operation and maintenance manual that as a minimum includes installation instructions, preventive maintenance procedures and schedule, repair, parts diagram, inspection procedures and schedule, operation, and storage and handling requirements for the RF conditioning load.

5. QUALITY ASSURANCE

The quality of work performed under this SOW will be controlled by the Seller assigning the appropriate, knowledgeable, and qualified personnel and sub-tier vendors to this task, providing appropriate facilities and manufacturing equipment, and following a rigorous quality assurance plan.

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5.1 Quality Assurance (QA) Program

The Seller and key sub-tier vendors are to have Quality Assurance (QA) programs that meet or exceed the requirements of ISO 9000 (or Company-approved equivalent).

The QA program shall be implemented as provided in the Company-approved Quality Plans sufficient to ensure that the quality of items produced or services provided will meet all the requirements as stated in this SOW and the technical specification [1].

5.2 Access for Source Surveillance Inspections

As part of the Company's QA program, source surveillance activities may be conducted at the Seller's facility or any sub tier Seller facility that the Company determines necessary to ensure quality objectives are met.

Representatives of the IO may visit with Company inspectors as observers.

IO representatives may be U.S. citizens or foreign nationals.

Such surveillance may include auditing and monitoring of CAD software, preparation of drawings and documents, performance of studies, inspection and tests, weld and welder qualification, and all other manufacturing steps.

The Seller is to provide the Company representatives access to all data and operating areas pertinent to this subcontract to assure that items or services are being furnished in accordance with specified requirements.

Source surveillance by the Company representative does not constitute product acceptance by the Company and will in no way relieve the Seller of the responsibility to furnish acceptable deliverables.

5.3 Test and Inspection

Testing and inspection requirements are addressed in the technical specification [1].

The Company has the right to witness all tests and inspections.

Calibration records shall be available for all measurement tools.

5.4 Non-conformance Reports (NCR)

Note: The issuance and acceptance of a non-conformance report in no way limits or affects the warranty provision of the subcontract.

The Company expects to receive equipment items, components, materials, and documentation that conform to all codes, standards, specifications, and procedures in the subcontract.

When a non-conformance is identified, the Seller is to:

- i. Identify and segregate when practical, the non-conforming item,
- ii. Stop any further work on the item until disposition is provided by the Company,
- iii. Record and report the occurrence to the Company in a Non-Conformance Report.

The NCR is to contain or refer to all relevant material available to enable an informed decision on the definite course of action to be taken.

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Non-conformance reports are to be submitted on the *Non-Conformance Report form* [12], completed per the *Nonconformance Reports Procedure* [13].

An accepted NCR does not establish a precedent or obligation to accept existing or future items not conforming to all provisions of the subcontract.

5.5 Deviation Requests (DR)

Note: The issuance and acceptance of a deviation request in no way limits or affects the warranty provision of the subcontract.

The Seller may propose deviations from the specifications, drawings, or other technical requirements of this procurement.

Where time is a consideration, the Seller may communicate the proposed deviation directly to the TPO, with a copy to the Company's Procurement Officer.

The request is to identify the affected items, drawing/specification number and revision number, a description of the proposed deviation, and the justification for it.

The TPO will evaluate the technical aspects and recommend acceptance/disapproval to the Subcontract Administrator, who will communicate acceptance or disapproval to the Seller.

Deviation requests are to be submitted on the *Deviation Request Form* [14], completed per *Deviation Request Procedure* [15].

An accepted DR does not establish a precedent or obligation to accept existing or future items not conforming to all provisions of the subcontract.

6. DELIVERABLES

6.1 Seller's Deliverables

The Seller shall provide the following deliverables in accordance with the format for documents and deliverables provided in Sect. 6.3:

Deliverable 1: Sect. 4.1.1 - Quality Plan (QP) – Within 2 weeks after subcontract award.

Deliverable 2: Sect. 4.1.2 – Design Package – Within 24 weeks after QP approval.

Deliverable 3: Sect. 4.2.1 – Update of QP – Within 2 weeks after authorization to proceed with Part 2.

Deliverable 4: Sect. 4.2.2 – Cleaning Procedure and Clean Work Plan - Within 4 weeks after Company approval of updated QP.

Deliverable 5: Sect. 4.2.3 – Test Procedures - Within 4 weeks after Company approval of the updated QP.

Deliverable 6: Sect. 4.2.4 – Manufacturing Plan - Within 4 weeks after Company approval of updated QP.

Deliverable 7: Sect. 4.2.5 – Inspection Plan - Within 4 weeks after Company approval of updated QP.

Deliverable 8: Sect. 4.2.6 – Oral Presentation – To be scheduled by TPO

Deliverable 9: Sect. 4.2.7 – Prototype hardware and associated documentation – March 31, 2022.

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6.2 Periodic Communication

The Seller shall participate in a weekly phone conference to be held with the Company's TPO to discuss any technical issues and schedule, personnel, and any other items pertinent to the work activities. The weekly phone conference will serve as a mechanism to get early visibility of problems and issues arising during the performance of this subcontract.

The Seller shall prepare and issue conference call minutes to the TPO within two business days after the weekly phone conference.

The Seller shall provide a written monthly status report containing an updated schedule and data to support the generation of the U.S. ITER Project monthly report.

Monthly report data shall include actual schedule progress, milestones reached, corrective actions needed, display of the present critical path for the Seller's work, and a brief narrative describing the status of work, significant accomplishments, actual and potential problems and risk mitigations or corrective actions.

The monthly report shall be submitted to the TPO on the twentieth calendar day of the month. If the twentieth day falls on a weekend or holiday of the country in which the Seller is located, the monthly report may be submitted on the first working day after the twentieth (20) calendar day.

6.3 Format for Documents and Deliverables

Electronic distribution will be the standard method of transmitting all deliverables including quality plans, reports, meeting minutes, drawings, general correspondence etc.

All documents are to be identified by contract number and provided in a searchable PDF format.

All documentation must reference the part number (drawing number) and serial number associated with the data.

All documents are to use metric units as specified in *ASTM SI-10 American National Standard for Metric Practice* [16].

Documents (including drawings) are not to bear any stamp (e.g., proprietary, confidential, business sensitive, etc.) that requires the document to be protected by US ITER unless the document relates to intellectual property that the Seller disclosed on the Background Intellectual Property form submitted with the proposal.

Revisions of documents submitted to the TPO for approval are to clearly identify substantive (non-editorial) changes made in the revision. The Seller's identification of the changes may be addressed in the document or in a summary accompanying the document (e.g., e-mail, letter, transmittal form).

Reports are to contain narratives, spreadsheets, calculations, illustrations, and drawings where necessary to supplement the text and improve understanding.

Reports and other narrative documents are to have a cover sheet stating the document number, document title, issue date, and subcontract number, as well as having a place to identify authors, checker, and approval signatures as required.

All reports and narrative documents are to begin with an executive summary briefly describing the contents and conclusions of the document.

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Narrative documents are to be transmitted to the TPO as the native file with an accompanying searchable PDF file for review and acceptance or approval.

Documentation created and delivered for this scope of work will become part of the official US ITER Document Management System (iDOCS) and potentially the ITER Document Management (IDM) System.

Models and drawings created by the Seller and sent to the US ITER Project are to be created using electronic CAD software and provided to the US ITER Project in either STEP or IGES format and a PDF file. Any required signatures are to be electronically applied to the PDF file and physically to any hard copy.

Oral presentations are to use PowerPoint software.

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7. TRANSPORTATION

The Seller is responsible for packaging, storage, and loading of all hardware/equipment covered by this SOW.

Packaging design requirements are specified in [1].

7.1 Transportation Arrangements

- a. For shipments subject to United States export control law, the Seller is to comply with the Export Administration Regulations (EAR) and Foreign Trade Statistics Regulations (FTSR). The Seller will serve as both the Exporter (Shipper of Record) according to the EAR and the U.S. Principal Party of Interest (USPPI) according to the FTSR.
- b. For shipments originating from foreign locations, the Seller will also serve as the Exporter according to the origin country's export control regulations.
- c. Transportation of the hardware/equipment from Seller's facility to its final destination is not part of the scope of this statement of work.
- d. Transportation activity will be conducted by the ITER Project's Global Logistics Service Provider (LSP), Daher International and/or its United States partner, St. Germain Heavy Industrial Projects through a separate arrangement.

7.1.1 Loading

- a. The Seller is required to load items to be transported onto the LSP transport vehicle (e.g. truck, van, trailer, vessel, ocean container, air freight container, rail car) at the factory. In doing so, Seller is to provide all necessary and customary equipment, personnel, and safety equipment for proper loading onto the vehicle.

7.1.2 Pre-shipment Documentation

NOTE: All shipment documentation must be completed in the English language.

The Seller is to provide information and documentation required for international shipment in accordance with the following schedule (see Deliverable 7, section 6):

7.1.2.1 Pre-Shipment Deliverable Package No. 1

- A. Pre-Shipment Deliverable Package #1 is to be provided no later than 30 weeks prior to planned date of shipment.
- B. Pre-Shipment Deliverable Package #1 is to contain the following items:
 - Written notice of the planned date on which the goods will be packaged and available for shipment.
 - Technical characteristics of the packaged component(s), as follows:
 - Physical data and drawings showing dimensions, total and distributed weights, center of gravity (in 3 dimensions), shipping orientation;
 - Address of the location where items are to be picked up by the LSP;

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- Documentation (e.g., Material Safety Data Sheets) regarding relevant compliance regimes, such as Export Control, Transportation of Dangerous Goods, and Environmental Protection;
- Identification of any items that have been identified as Safety Important Components (SIC) or Protection Important Components (PIC);
- Conditions or precautions to be respected when moving, loading/offloading, handling/sliding, and storing to include, when required, specific provisions and controls to be performed and recorded while under the control of the LSP;
- Documentation confirming that packaging is designed to withstand anticipated transport accelerations (e.g., International Maritime Organization (IMO) CSS Code) and weather conditions;
- Packaging specification including confirmation of compliance with international packing standards (e.g. International Standard for Phytosanitary Measures (ISPM)-15, Conformité Européenne/CE certification for relevant package lifting appurtenances such as eyes/rings), agreed barcoding requirements and regulations relating to packaging materials used. NOTE: All packaging using wood products must comply with the requirements of ISPM-15;
- Definition of packaging/frame, when the components are packed or tarped, including any particular procedures for handling, moving, clean-up, maintenance, storage;
- Any condition to be respected regarding marshaling and warehousing stages;
- Specification for securing and hanging packages/frames including jacking/lifting/lashing conditions, procedures, and acceptable securing points;
- Identification of specialized equipment/hardware (e.g., custom lifting fixture) interface requirements between each point of use within supply chain. NOTE: any specialized packing/handling frame or tool should be detailed in drawings, meet relevant domestic and international requirements (e.g., Occupational Safety and Health Administration, CE), and is subject to approval by LSP;
- Description of interface between Seller and LSP (e.g., release conditions for loads, Seller's loading means, etc.);
- Technical data concerning appropriate monitors provided to detect rough handling during transport (e.g., shock, vibration, tilt, impact and temperature change indicators)

7.1.2.2 Pre-Shipment Deliverable Package No. 2

- A. Pre-Shipment Deliverable Package #2 is to be provided no later than fourteen weeks prior to planned date of shipment.
- B. Pre-Shipment Deliverable Package #2 is to contain the following items:
 - Written confirmation of the date goods will be ready for shipment or submit revised shipment date for approval.
 - Contact information for Seller's Shipping/Logistics coordinator

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- Fabrication value of goods (for insurance purposes – should not include destination site support services)
- Transport drawings with sufficient detail to facilitate lifting/lashing/stowage and approval of the operators (e.g., steamship line, air carrier).
- The following business documents (in English language):
 1. Pro-forma/commercial invoice on Seller’s letterhead listing, at a minimum:
 - Subcontract number
 - Description and quantity of goods
 - Value of goods
 - Incoterm 2010 rule
 - Schedule B number (for U.S. exports) or Harmonized System code
 - Country of origin
 - Export control determinations (e.g., “ECCN: EAR99, No Export Control License required”)
 - **Consignee:**

NOTE: If shipped to the ITER site, use the address below.

ITER Organization
 Route de Vinon sur Verdon, CS 90 046
 13067 St. Paul lez Durance CEDEX, France
 Contact: Yanchun Qiao (+33-4-42-17-62-57; Cell: +33-6-26-31-29-96) Yanchun.Qiao@iter.org

- **Duty Free Declaration**
 Shipments on behalf of the ITER International Fusion Energy Organization ("ITER Organization") for its official use are eligible to duty-free customs clearance under the Agreement on the Privileges and Immunities of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, done in Paris on 21 November 2006 and ratified, accepted, and approved by the People’s Republic of China, EURATOM (for the European Union and Switzerland), the Republic of India, Japan, the Republic of Korea and the Russian Federation. **DIPLOMATIC SHIPMENT on behalf of the ITER Organization. FOR DUTY-FREE CUSTOMS CLEARANCE.**
- **Consignor** (Seller’s name, address, and contact information)
 2. Itemized packing list on Seller’s letterhead detailing the following at a minimum for each package:
 - Subcontract Number
 - Package number (sequential number assigned to each package)
 - Package type (e.g., wooden crate, item on pallet, etc.)
 - Seller’s equipment/component identification number(s)
 - ITER Equipment Identification Number(s) (if applicable)

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- Item Description
- Quantity of each item
- Gross Weight (kg)
- Net Weight (kg)
- Dimensions (cm)
- Volume (m³)
- Special Handling Instructions
- Storage Instructions (e.g., indoor, conditioned space)

NOTE: The invoice, packing list and other documents, where appropriate, must be acceptable to the importing country's Customs agency. The LSP will review submitted documents and request amendments where required. If amendments are requested, Seller must update and submit revised documents within seven (7) days.

3. Export Control License(s) or other authorization documents if required.

7.1.2.3 Pre-shipment Deliverable Package No. 3

A. Pre-Shipment Deliverable Package #3 is to be provided no later than two weeks prior to planned date of shipment.

B. Pre-Shipment Deliverable Package #3 is to contain the following items:

Evidence of appropriate proof testing and certification for any custom lifting apparatus that will travel with the item and be utilized during loading and unloading operations

7.1.2.4 Pre-shipment Deliverable Package No. 4

A. Pre-Shipment Deliverable Package #4 is to be provided no later than one week prior to planned date of shipment.

B. Pre-Shipment Deliverable Package #4 is to contain the following:

1. Any remaining information needed to facilitate appropriate completion of transport documents such as Bills of Lading or Air Waybills.
2. Data elements and authorizations (e.g., Shipper's Letter of Instruction, Power of Attorney) required for LSP submission of electronic filings in the Automated Export System (AES) when necessary.
3. Dangerous Goods Declaration if required for transport.

7.1.3 Package Marking

The Seller is required to mark each package with the following:

- Subcontract number
- Delivery address
- Consignor (Seller's name, address, and contact information)
- Package number (as identified on the packing list)
- ITER Equipment Identification Number(s) (if applicable)
- Gross Weight (kg)

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- Net Weight (kg)
- Special Handling Instructions
- Lifting/Lashing/Jacking points
- Center of gravity (in 3 dimensions)
- Compliance marks (e.g., ISPM-15, CE) (if applicable)

7.1.4 Deviations from Planned Date of Shipment

Seller is to immediately notify the TPO and Procurement Officer, in writing, of any actual or potential change to the agreed-upon date of shipment.

7.1.5 Storage of Finished Products

The Company, at its discretion, may require Seller to postpone the date of shipment by up to sixty (60) days from the agreed upon date of shipment. If the date of shipment is postponed, Seller is to, at no additional cost, store finished products in a safe and secure manner that protects their condition and preserves the integrity of all components and packaging. If storage is required beyond sixty (60) days, Seller agrees to good faith negotiation of extended storage terms.