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1 Purpose

This white paper provides background information to facilitate market response to the ITER Organization (IO) market survey (ref IO/MSY/21/HCC/PI) regarding the contract for the Project Integrator (''PI'') of Hot Cells Complex (''HCC''). This information is not binding or contractual in any way and will evolve based on response to the market survey and other information.

This document first introduces the HCC Project, describes foreseen PI main role, missions and scope at each phase of the project, as well as Procurement strategy, and provides a first project schedule outline.

2 Background

ITER is a first of a kind mega-project with a wide range of disparate leading edge/high-tech systems to be assembled and installed into buildings at its site in Saint Paul lez Durance, Cadarache, in the south of France.

The ITER Organization (IO) is the nuclear operator, complying with the relevant French Laws and regulations, authorization, codes and standards applicable to Basic Nuclear Installation (INB). IO is responsible for integrating the activities from the early stage of design, to the procurement, the assembly, commissioning and operation. The ITER Members contribute to the ITER Project with contributions in cash to the budget of the IO and with contribution in kind (buildings and/or equipment) through legal entities called "Domestic Agencies".

The HCC is composed mainly of the Hot Cell and Radwaste Building (B21), the Personal Access Control Building (PACB/B24) with the Radwaste process for the management of very low, low and medium radioactive waste, and the Remote Handling system of the Hot Cell and its storage building (B27). About 10% of the building floor surface will be used for miscellaneous systems that will be designed and procured by other Domestic Agencies, in particular the Detritiation System (DS) and the Port Plug Test Facility (PPTF).

The IO with the support from F4E is developing the conceptual design of the processes and of the whole HCC, including the nuclear buildings and related services. They will perform a Facility Review and a Safety Review by the end of 2021.

Abbreviations are given in appendix 1.

HCC Requirements, main features of plant and building are provided in appendix 2.

3 HCC Project scope

The HCC Project includes the delivery of building and processes design (preliminary, final, manufacturing, construction and execution designs) and realization activities (manufacturing, construction, assembly and commissioning) for:

- the B21/B24 Civil Work and the building services and mechanical systems (e.g. cranes, doors, trolleys, HVAC, fluids, red zone cooling, Stainless Steel Liner covering the surface of the contaminated rooms, fire prevention and mitigation),

- the Remote Handling and Radwaste processes (e.g. bespoke remote handling equipment, decontamination processing, size reduction and detritiation systems, liquid and cementation processing, laboratories).

The scope does not include the design and construction activities of the TAPB, B27, Port Plug Test Facility and the Detritiation System, but implies a strong coordination and the interfacing with these buildings and systems all along the HCC Project.

4 PI: Purpose and missions

The IO intends to deliver the HCC project through a collaborative contracting strategy where the main participants are organised and formally bound to work in collaboration with each other. This organisation is referred to as the "Collaboration" See 6.1.

The main purpose, as currently foreseen, for the HCC Project Integrator (PI) Contract, based on the Conceptual Design input from the Client, would be to:

- **to prepare and lead the Collaboration, which will involve the Client, the PI and the first-tier Contractors, along all of the HCC Project phases**
- **to manage and lead, in the frame of the Collaboration, the Preliminary and Final Design activities of the HCC that shall be performed by the first-tier Contractors for the nuclear buildings, their associated services and mechanical equipment, as well as the Remote Handling and the Radwaste processes**
- **to manage and lead, in the frame of the Collaboration, the Manufacturing and Construction phases of the HCC including the system and integrated Commissioning of the equipment, and the handover to the nuclear operator for the start of operation**

The **main missions** of the Project Integrator shall notably be, **for the whole implementation phase**:

- to perform the review and acceptance of the documents delivered by the first-tier Contractors,
- to ensure the global integration of all the systems at the HCC level during design, manufacturing and construction phases,
- to manage and control the HCC configuration,
- to propagate and track the requirements from the Client and the first-tier Contractors
- to control and detail the HCC interfaces
- to lead and share accountability for the HCC design development
- to develop and support the Nuclear Safety analyses, including the answers and submittals to ASN
- to develop and lead the implementation of the Quality Assurance in compliance with the ITER MQP
- to manage the construction, assembly and commissioning at the ITER Site
- to control and monitor the Project costs, schedule and R&O in close coordination with the IO Project Control Team
- to prepare, develop and lead the Collaboration with the support of the Client and the first-tier Contractors

The final outcome shall be an integrated facility, complying with safety and functional requirements, within the Client budget and schedule constraints, and substantiated with all the requested documentation.

It must be noted that part of the requested documentation shall be used as support documentation for the Client to answer to the French nuclear regulator.

The ITER facilities are qualified as a Basic Nuclear Installation identified in France by the number-INB-174 ("Installation Nucléaire de Base"). As a consequence, the Contractor is hereby informed, and shall inform the Subcontractors that:

- The Order 7th February 2012 (hereinafter referred to as the INB Order) applies to all the components important for the protection (PIC) and the activities important for the protection (PIA).
- The compliance with the INB-Order must be demonstrated in the chain of external contractors, if any,
- The supervision activities are also subject to a surveillance done by the IO as Nuclear Operator.

5 PI Scope of work at each phase of the Project

5.1.1 Planning phase

During this initial phase, the PI will be involved with the Client only and shall review the IO MQP and all applicable Client procedures and requirements. This will be the starting point to develop the HCC Project Collaboration framework, supported by the delivery of the updated HCC Project Execution Plan that shall be based on the best industry and engineering practices.

This plan shall cover all the phases (from design to commissioning) for technical, IT and BIM, cost and schedule, organization, resources and training requirements, governance, stage gates and engineering process, delegations and Client reserved matters. It will define the responsibility levels and the relationships between all the legal entities involved in the HCC Project delivery.

The PI shall also assess the expected HCC Client required project outcomes and the associated Risks & Opportunities register. This will be the opportunity for clarification and/or refinement that would better match the contracting structure, such as a detailed scope allocation or commercial model adaptations (e.g. incentive scheme).

The PI shall also prepare a method statement for each activity under its responsibility during the HCC Project.

Then the PI shall perform an independent check of the technical input from the Client, to assess its clarity, exhaustiveness and consistency.

5.1.2 Appropriation phase

The Project Integrator shall perform and coordinate with the first-tier Contractors (who will just have joined the Collaboration) the Appropriation of the HCC Design Brief.

This Design Brief will be composed of the Concept Design and an exhaustive set of requirements propagated through the SRDs, as well as the technical configuration of the HCC, based on the facility and safety reviews inputs (safety analysis, functional analysis, design definition, load specifications, PFD, P&ID, SLD, …).

By the end of this phase, the Collaboration participants, including the PI, shall prepare and hold a dedicated review, appropriate the Concept Design and Design Brief and formally take the full responsibility for them and the future design development of the HCC.

The PI shall in agreement with the Client, refine the scope allocation with the analysis and remedy to any potential gaps and overlaps.

The PI shall in agreement with the Client, also update the target cost, schedule and R&O plans.

5.1.3 Implementation phase

This phase shall start with the Preliminary Design, to be followed by the Final Design stage, both to be reviewed and validated through formal design gates.

The Preliminary Design will detail the solution appropriated in the previous phase, or any alternative design pursued and justified to a level sufficient to enable the Client to make decision to go to the next phases of design and construction. Clear stage gates decision points will be adopted to avoid further changes that could increase the cost and/or the critical path.

The Final Design will refine the design to a level of detail where the final definition of the facility is sufficiently complete to allow starting the manufacturing and construction, substantiated with a complete set of justification documents.

The manufacturing and construction design will be the next steps before the start of construction and assembly at the ITER Site. A risk review shall be held as part of each stage gate at the end of each phase, prior to the release of the next phase.

The Project Integrator shall handle ITER RESTRICTED information according to specific protection measures.

All these phases, together with the commissioning phase, shall be managed by the Collaboration under the leadership of the Project Integrator.

6 Procurement Strategy

6.1 Foreseen allotment for the HCC

The high-level allotment being currently considered for the HCC Collaboration (as per Figure 1) would consist in approximately 5 or 6 main work packages at Tier 1 level, namely the Project Integrator (PI), Civil works (CW), Service Systems, Mechanical Systems, Remote Handling (RH), and Radiological Waste (RW).

6.2 Collaborative Delivery

The Collaboration scheme adopts different contractual, commercial and organisational arrangements to facilitate and promote collaborative working; this is a different delivery strategy from what has been used at ITER in the past.

The principles of Collaboration and Integration currently being considered for the HCC are:

1. Integrated team comprising the Client participant (as per Figure 1), Tier 1 contractors and their supply chain partners best able to deliver the required project outcomes defined by the Client as Nuclear Operator (outcome-based contract). A core team will be based on-site.
2. Early and flexible involvement of these stakeholders, contractors and their supply chains.

3. Culture, behaviours and expressed commitment towards: collaboration, mutual support, openness, constructive challenge, innovation, efficiency, outperformance, no fault, no blame.
4. Visible commitment and unconditional support from the executive of each participant.
5. Equitable shared reward based on collective success in achieving required project outcomes rather than individual success for individual scope.
6. Shared ownership of risks and their management.
7. Equitable internal management and governance where decisions are on a "best-for project" basis.
8. The Client shall keep some reserved matters such as the decisions affecting the HCC functionality, and/or safety case and licensing arrangements, or cost/schedule changes that are beyond the delegations provided to the Collaboration.
9. Alignment of participants' objectives.
10. Shared information and tools which facilitate all of the above.
11. Contracts with obligations around a mutual relationship and collective performance and which facilitate all of the above.
12. Payment mechanisms and financial incentives which are transparent and which facilitate all of the above and support delivery of the HCC project outcomes.

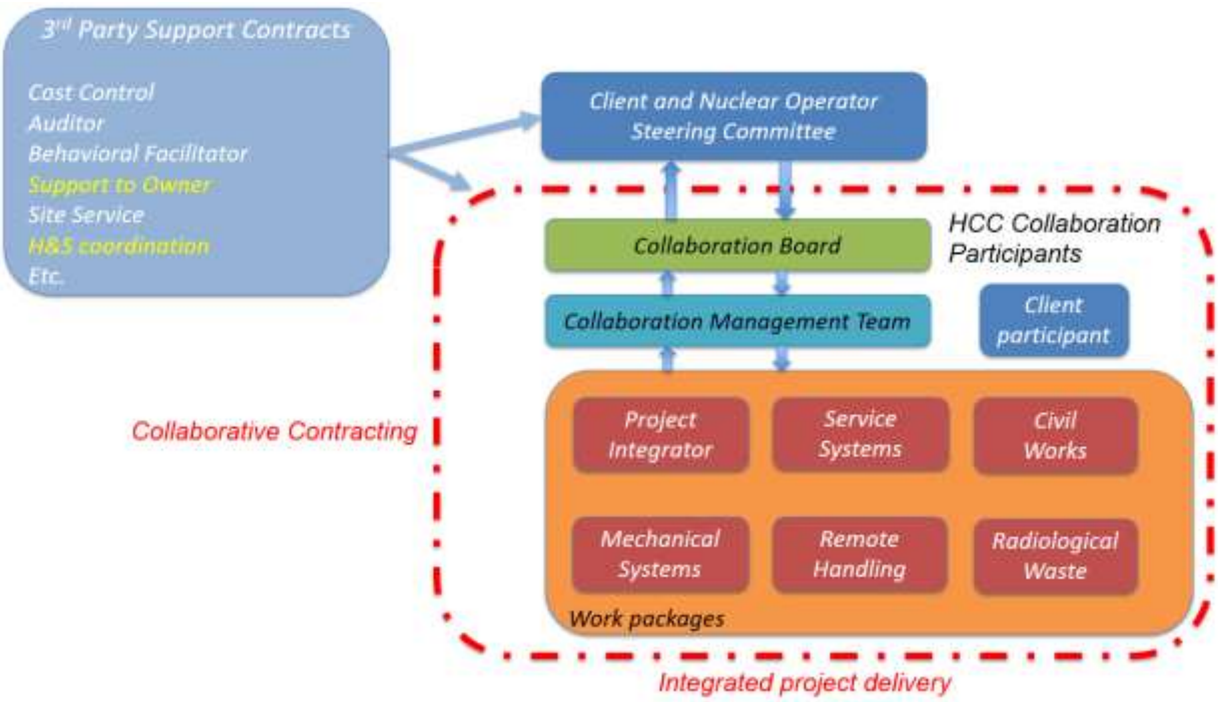

Figure 1 : preliminary Collaborative contracting structure (subject to changes)

The Collaborative contracting structure will involve the Client, the Project Integrator and the first-tier Contractors in charge of the design and realization of the civil work, building services and mechanical, remote handling and radwaste processes.

The Project Integrator is expected to lead the improvement of the draft poly-party agreement and support proactively its endorsement and signature by all participants.

As highlighted in Figure 3 above the following roles of the key overarching Collaboration structures are:

Steering Committee: Will comprise of members of the IO as owner and nuclear operator, delivering the input concept design, the Quality Management Programme and the defined required project outcomes, including budget and completion dates. It will retain control of certain reserved matters, e.g. decisions affecting facility functionality and nuclear safety.

Collaboration Board: Will comprise of senior executive representatives from each collaboration participant. The primary role will be to set the strategy, support the collaboration management team and provide leadership to help resolve issues ensuring the HCC project proceeds within budget and schedule in accordance with the collaboration intent.

Collaboration Management Team: Will comprise of representatives from all the collaboration participants (including the Client) and will be responsible for the day to day delivery of the project ensuring decisions are made on a best-for-project basis within the parameters as defined by the Collaboration Board and Steering Committee. As described earlier the PI will take a significant role leading many of the management activities and making decisions on behalf of the CMT within delegated limits of authority. The CMT leader will be appointed from the IO.

In addition, several collaborative features mentioned previously are described below:

6.2.1 Early Contractor Involvement (''ECI'')

ECI consists of involving the Tier 1 participants and specialist parts of their supply chain early in the project to provide design input and other contributions to the design development. The expected added value is notably:

- Improve maturity of design, based on already proven technical solutions,
- Clarify interfaces.
- Design accepted by all parties
- Earlier resolution of feasibility, buildability and manufacturing issues
- Better construction planning, more accurate cost-estimate
- Implement integrated team and relationship earlier

6.2.2 Integrated Team

During the design phases the core of the integrated team will be located on site. It is composed of the Client, Tier 1 participants and specialist parts of their supply chain. Under the general governance described above it will deliver the project in particular the management and coordination of the off-site and then on-site teams during first the design phase and then the construction phase. (see work packages, Fig 3).

6.3 Commercial scheme

This contract implies a long-term involvement of the PI across several project phases including: design, manufacturing, construction, assembly, commissioning. The IO commitment to the PI will also be phased with its continuation into the next phase dependent on successful performance in the previous phase.

Appropriate commercial and incentive arrangements shall be developed such that all key supply chain participants including the Project Integrator are rewarded for collective successful delivering of the Client defined project outcomes.

7 Schedule outline

The duration of the first phases, namely the Planning phase, the Appropriation phase and the design phases up to the Final Design Review is expected to be approximately 64 months (6 months for the Planning phase, 6 months for the appropriation, 12 months for Preliminary Design, 2 months for the PDR, and 40 months for Final Design).

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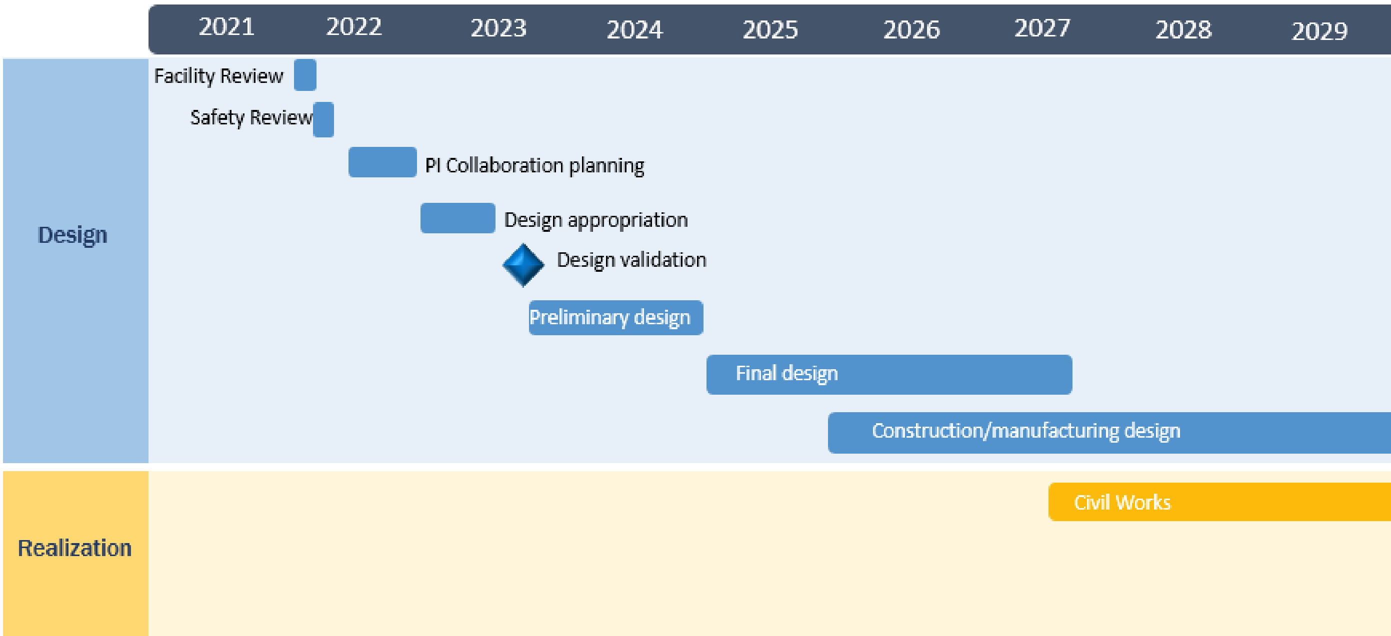

Figure *2* below gives an illustration of the sequence of activities, showing the projection up to the Fusion Power Operation (FPO) phase. The Collaboration shall aim at optimizing the overall duration of the Project.

To be noted that:

- Maintaining the schedule is crucial to the timely release of a key project stage gate by the French nuclear regulator (Autorité de Sûreté Nucléaire "ASN").
- The key personnel forming the core of the contractor team will be continuously located at ITER site in order to integrate the design with other stakeholders and ensure an efficient design process which meets requirements.
- As much as possible, technical solutions shall be based on existing and proven techniques, aiming at reducing risks and minimizing cost.

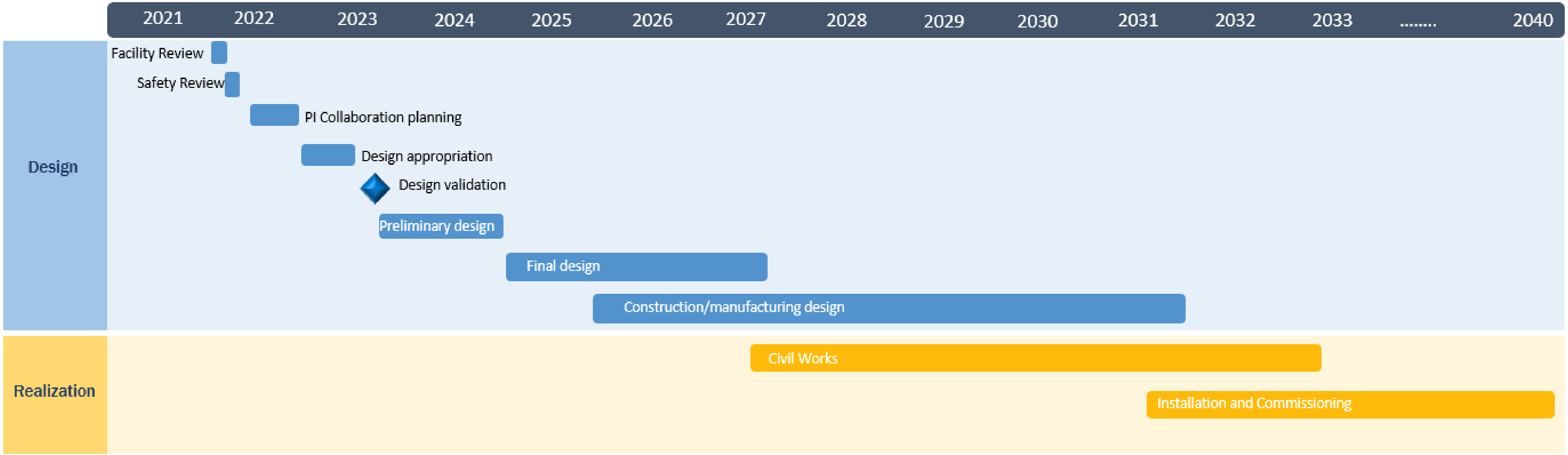

Figure 2 : Illustration of the sequence of activities (including FPO activities) – illustration only

8 PI main Skills and experience

Key technical skills are building design and process design of large scale nuclear projects, in particular hot cells, remote handling, radwaste management, tritium management and safety analysis, being familiar with the approach of the ASN and collaborative contracting.

	Domain	Detailed competencies
Project Management	Project Control	- HCC Project Target Cost - Cost estimate - Schedule update and monitoring - Baseline Change Procedure - Earned Value Management - HCC R&O register
	Technical management	- Configuration management - Requirements management - Interface management - Manufacturing and construction integration - Design Control - Digital Mock-up - Quality Management
Collaboration	Experience of large scale Collaboration contracting	- Coordination of the first-tier Contractors - Support to the Client steering committee - Poly-party agreement - Collaborative behaviour - Communication management - Complex international supply chain structure

Further topics involving in-depth knowledge and experience for the PI are given in Appendix 3.

Appendix 1: Abbreviations

ALARA	As Low As Reasonably Achievable
ASN	« *Autorité de Sûreté Nucléaire* » - French Safety Authority
Be	Beryllium
C4	Ventilation Classification C4 according to ISO 17873
CDR	Conceptual Design Review
DAC	Derived Atmospheric Contamination
DCM	Design Compliance Matrix
DIR	Design Integration Review
DS	Detritiation System
ED	Detailed Safety Requirement (former “Exigence Définie”)
F4E	Fusion For Energy, European Domestic Agency
FIDIC	International Federation of Consulting Engineers
FMA-VC	Low and Medium Activity, Short Life Radionuclide
HCB	Hot Cell Building
HCC	Hot Cell Complex
HCF	Hot Cell Facility
HVAC	Heating, Ventilation, and Air Conditioning
I&C	Instrumentation & Control
ICD	Interface Control Document
INB	« *Installation Nucléaire de Base* » - Nuclear Facility
IRMS	ITER Remote Maintenance System
IS	Interface Sheet
MAVL	Medium Activity, Long Life Radionuclide
MQP	Management and Quality Program

PACB	Personal Access Control Building
PCR	Project Change Request
P&ID	Piping and Instrumentation Diagram
PIA	Protection Important Activity
PIC	Protection Important Composant
PFD	Process Flow Diagram
PP	Port Plug
PPTF	Port Plug Test Facility
PT	« *Prescription Technique* » - Technical Prescription
QAP	Quality Assurance Program
QD	Safety Requirement (former "Qualité Définies")
R&O	Risks and Opportunities
RPrS	« *Rapport Préliminaire de Sûreté* » - Preliminary Safety report
RWB	Radwaste Building
SLD	Single Line Diagram
SRD	System Requirement Document
TFA	Low Level Waste
TKM	Tokamak
VE	Value Engineering

Appendix 2: Requirements, main features of plant and buildings

ITER project lifecycle

The Hot Cell, the Radwaste Facility and the Personal Access Control Buildings shall accommodate different phases of operations, with related constraints and objectives:

- The operational phase where plasma will be performed in the TKM, with very low activation but production of Beryllium dust: in this configuration, there shall be man access into the hot cells,
- The operational phase without Tritium but with low activation level of In-vessel components,
- The operational phase with Deuterium-tritium Plasma producing activated and contaminated In-vessel components, in particular with activated dust and tritium,
- The deactivation phase for which the HCC shall support, in particular, the removal, the treatment and the buffer storage of In-vessel components,
- The decommissioning of the TKM and later the decommissioning of the HCC itself.

Location of the HCC

The B21 concrete building is located adjacent to the Tokamak Complex, north side (see **Error! Reference source not found.** and **Error! Reference source not found.**). It is connected to the Tokamak Building through a number of access ports as shown in the picture below. A cargo lift is located in the TKM Complex for the transfer of equipment between different floor levels, while personal access corridors are allowing the entrance of operators.

The PACB – B24 for access control of personnel, changing rooms and control rooms, is located next to B21.

A separate building – B27 is foreseen for the storage of contaminated IRMS, and the TAPB – B22 shall host a part of radwaste type A storage.

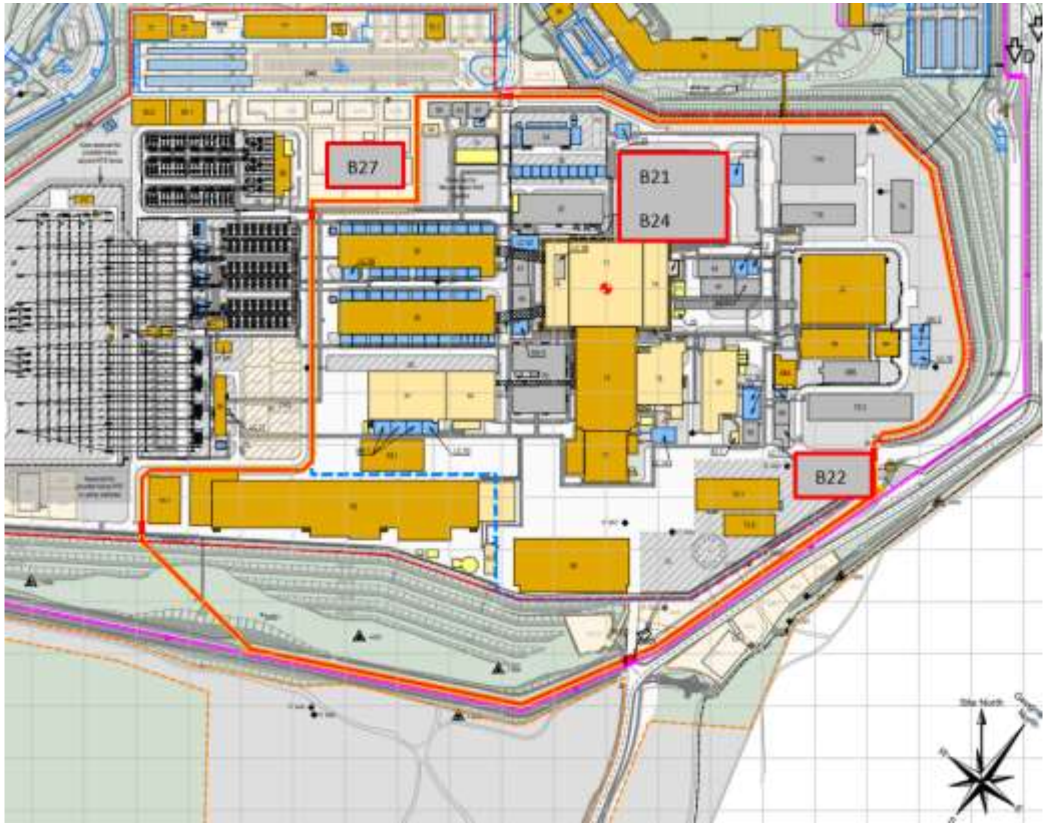

Figure 3 : Site master plan

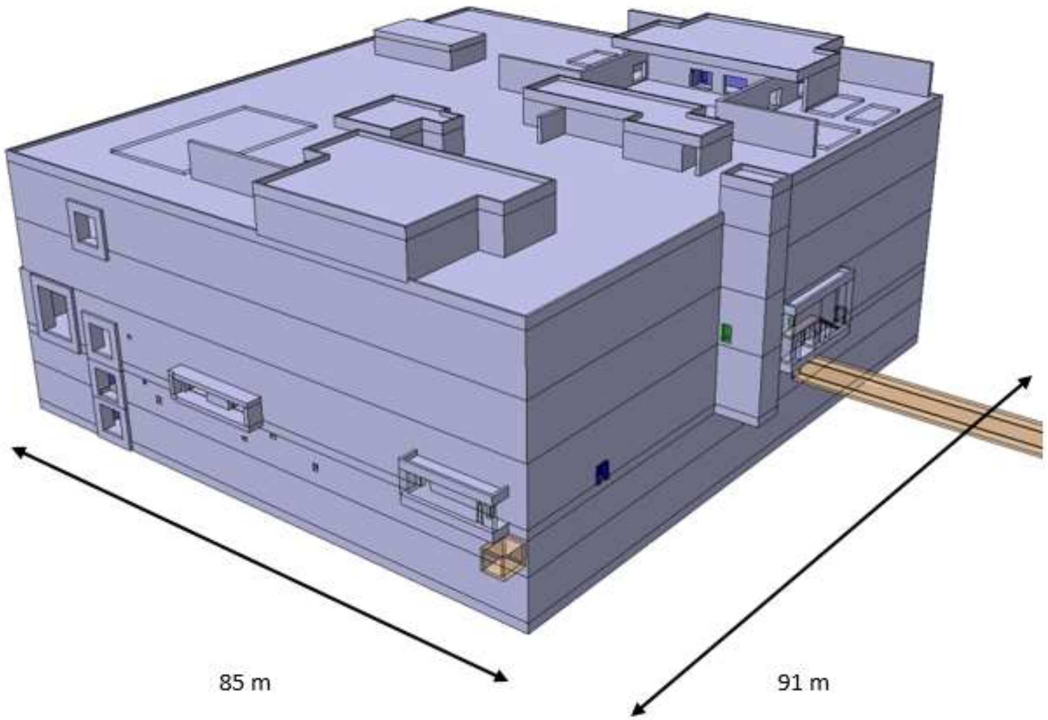

Figure 4 : Overview of the Hot Cell Complex (B21)

It must be noted that the construction of the HCC could occur at the same time as the construction of the TKM and the adjacent buildings, or during the TKM assembly and operation. This strong constraint shall be considered at an early stage of design, in term of technical feasibility, cost, functional and physical interfaces, and coordination of the work on site.

Maintenance and Radwaste process

The HCC and the PACB shall provide the following functions:

- **Refurbishment and storage of In-vessel components**: the HCC will be the place where activated and/or contaminated In-vessel components are located after their removal from the Tokamak. These In-vessel components will be refurbished, maintained, and for some of them buffer stored in this facility.
- **Test of In-vessel components after refurbishment**: Thermal cycling and functional tests are required on the repaired/refurbished Port Plugs (PP) using PP test facilities located in the HCC,
- **Port Cell equipment storage and maintenance**;
- **IRMS storage, decontamination and maintenance**: IRMS equipment will be decontaminated, maintained, refurbished, tested and stored between the shutdowns in a dedicated area of the HCC,
- **Radwaste processing and storage of**:
    - Solid Radwaste type B, also called "MAVL" (corresponding to "Medium Activity, Long Life Radionuclide"), which are mainly the discarded part of the In Vessel component,
    - Solid Purely Tritiated Waste,
    - Solid Radwaste type A, also called FMA-VC (corresponding to "Low and Medium Activity, Short Life Radionuclide"):
    - Solid Radwaste TFA (corresponding to Low Level Waste),
    - Buffer storage and treatment of radioactive effluent after accidental event in TKM,
    - Liquid Radwaste type A,
    - Suspect liquid effluents from radiological controlled zones that turn out to be radioactive,
- **Characterization, chemical analysis, packaging and export of Radwaste.**
- **Health physics facilities, access control of personnel, changing rooms** for personnel working in radiological controlled areas of the Tokamak Complex (TKM), and the HCC,
- **Control rooms for Remote Handling operations performed inside the nuclear facilities (TKM and HCC) and back-up control room for the safety systems**

Appendix 3: Examples of Deliverables

Hereunder are examples of typical deliverables that will be requested. The detailed list will be updated and clarified in the technical specification at the call for tender stage.

Collaboration planning phase:

- Collaboration QAP
- Project Execution Plan
- Detailed scope allocation
- Updated R&O plan
- Poly-party agreement
- Stakeholder management plan

Appropriation phase

- Technical assessment of the HCC Design
- Formal appropriation of the Design Brief
- Analysis and remedy to gaps and overlaps in the HCC scope
- Updated plans for costs, schedule and R&O
- Interface management plan
- High level WBS and scope allocation

Implementation phase

HCC functional analysis	HCC components list	Catalogue of standard qualified components
HCC Design plan	Detailed safety analyses	Status of PIC list
List of applicable documents	Updated zoning (ventilation, radioactive, tritium, beryllium, fire)	HCC mock-up program
Configuration items reporting and status	Safety room book	HCC detailed WBS
Change proposals	Detailed safety requirements status	HCC cost estimate
Minutes of CCB	Compliance matrix for Defined Requirements propagation	PCR cost estimate
Assessment reports for deviation requests	PIA/PIC status reporting	HCC DWS schedule
Configuration audit reports	Nuclear Safety Control plan	Earned Value Management and Physical Percent Complete data
DCM against SRDs and sub-SRDs	HCC flow analysis	HCC risks and opportunities register
Interface Compliance Matrices	HCC operation plan	IO/Collaboration Communication and reporting plan
Sub-SRDs	HCC general rules for operation	IO/Collaboration RACI matrix
ICD/IS	HCC maintenance program	Technical specifications for transverse contracts
HCC interface plan	HCC human factor plan	Minutes of the Collaboration board
DIR organization and reporting	HCC Investment Protection Plan	Delivery Readiness Reviews closeout
Verification sheets	Record of the preservation files	Construction Readiness Review verification sheets
Transverse documents	HCC decommissioning plan	Engineering Work Package verification sheets
Chits resolution reports	HCC needs and allocation for services	Engineering Work Package compliance matrices

Surveillance plans	Integration reports of the support systems	Construction Work Package
Audit and inspection reports	Load collection	Level 4 Construction Detailed Work Schedule
List of applicable standards for realization	Catalogue of standards for supporting	Monthly construction progress report
CAD work-plans	List of penetrations	HCC level 3 construction master schedule
CAD infrastructure qualification report	Catalogue of standard components	Verification of release note/ITP/QP, as-built measurements
Synthesis report for 3D model	Assessment reports of realization methods	Supervision sheets collection
HCC integrated 3D model	Assessment and answers to Deviation Requests/Non-Conformance Reports/Requests for Information	Work permit and LOTO procedure for HCC
Sequence of Construction/Assembly	HCC commissioning and operation plan	Completion file validation
Instructions and construction events reports	HCC qualification strategy	HCC site occupation plan
Lock-out Tag-out check-list	HCC integrated commissioning plan	Handover certificates

Appendix 4: Required skills face to main features of the HCC

	Demonstrable skills and experience	Main features of the Hot Cell Complex facility
Nuclear civil engineering of complex large scale project	High technology project	First-of-a-kind or research construction projects
	Strong links with industry and potential Plant manufactures	Wide range of disparate leading edge/high-tech systems and equipment to be designed for in the Preliminary and Construction Design stages in order to avoid risk of change during suppliers manufacturing design.
	International projects	ITER stakeholders are China, the European Union, India, Japan, Korea, Russia and the United States. It corresponds to 35 different nations. The project language is English and safety documentation to be delivered to the French safety authority shall be in French and English.
	Engineering/design	Design and overall integration of : - Building structure. Volume HCC 278,000 m^3 nuclear concrete building (B21 and B23) - Approximately 500 rooms within the HCC, - Building systems, e.g. Heating, Ventilation, and Air Conditioning (HVAC), fire protection, electrical distribution, Instrumentation & Control (I&C), liners, red zone cooling, - Mechanical heavy handling, e.g. cranes, doors, trolleys,
	HVAC and fire protection	2 air change per hour in accessible areas, switch to Detritiation System if tritium above threshold detection (safety function) Management of heat loads, fire loads, air conditioning, fire protection and mitigation
	Network routing (e.g. cabling, piping, HVAC), management of	About 400 Control Cubicles and 100 Electrical Distribution Boards located in the HCB and RWB. Routing of HVAC, cable trays, DS piping in peripheral corridor. Segregation of routing for PIC functions (e.g. power supply, instrumentation)

	Demonstrable skills and experience	Main features of the Hot Cell Complex facility
	penetrations and anchorage	
Hot Cells expertise	Numbers of hot cells / red zones	15 different hot cells in HCC, in total volume of red zones / C4 ventilation class = 20,000 m^3
	Management of irradiated and contaminated components	Contact dose rate = 400 Sv/h due to activation in the Tokamak. Contamination of tritiated and activated dust on In Vessel components and IRMS Constant efforts to prevent spread of dust in red zones (from design stage to operational procedures), ALARA
	Tritiated environment	High level of tritium concentration > 4000 DAC in red zones Red zone / C4 areas fully covered by stainless steel liner, with an gap between the wall and the liner
	Nuclear maintenance	8 different hot workshop, 200 m^2 average each, dealing with hands-on maintenance on components after remote decontamination, ALARA
	Remote heavy handling in red zone	Handling of various heavy components, non-exhaustive list: – Equatorial Port Plug (50t, 3.5m length x 2.4 m x 2m), – Upper Port Plug (25t, 6 m length), – Divertor (9t, 3.5m length, 2m high, 0.8m wide), – Vacuum Cryopump (2.9m length, 1.7m diameter), – Oversized Neutral Beam components up to 8m length, 3m high and 3.3m wide Two lines of defence: high reliability of heavy transfer systems and mitigation means in case of unexpected load drop.
	Docking of transfer casks	Transfer and docking of Remote Handing Transfer Cask, large size docking door: 2m x 2.4m
Radwaste	Treatment of radioactive solid waste	Orders of magnitude during 20 years operation: – 1000 tons of MAVL waste – 100 tons FMA-VC

	Demonstrable skills and experience	Main features of the Hot Cell Complex facility
		– 100 tons purely tritiated waste – 10 tons TFA
	Treatment of radioactive liquid effluent	Orders of magnitude: 200 m^3 / year
	Radwaste process remotely controlled	Type B radwaste process located in the red zones / C4 areas shall be fully remotely controlled (no man access).
Hot Cell Remote Handling	Complex remote operation	Port Plug refurbishment, example of tasks to be performed fully remotely: – tilting 90° of 50t port plugs, – removal of subcomponents, – welding and control, – testing.
	Hot Cell Remote Handling	Design and integration of: – Tens of heavy duty long range manipulator, fully powered by electrical motors, – Few telescopic power manipulators, – Shielded windows, – Lighting and viewing systems, – Frames and handling tools, Buffer storage, remote decontamination, hands-on maintenance.
	Centralized control system	Functions such as ventilation management, remote transfers, remote refurbishment of In Vessel Components, remote waste treatment, shall be controlled from a centralized control room located in the Personal Access Control Building
	Seismic requirement	High seismic requirement (2 to 3 g acceleration in different dimensions) on building structure and part of the building system and process which is seismic classified according to the safety analysis
Sa fet	Safety demonstration	Full traceability of safety requirement, from the “high level” safety requirement to the detailed safety requirement and the related reference documentation

Demonstrable skills and experience	Main features of the Hot Cell Complex facility
	Exhaustive list of prevention, detection and mitigation means for each internal and external safety hazard (deterministic approach).
ALARA	Implementation of the “As Low As Reasonably Achievable” approach into design activities, in particular regarding shielding calculation and hot workshops.
Human Factor	Human factor integration, definition and tracking of Human Factor requirements, development of virtual mockup and Human Machine Interfaces for the centralized control room.
French Nuclear Regulator licencing process	Safety analysis of the HCC and continuous support to the licencing process: answer to ASN request, data and safety analysis for the update of the RPrS.

Table 1: Demonstrable skills and experience