FUSION FOR ENERGY | Big Science Business Forum 2022

BIPS

Complex Buildings and Safety related Systems: The Hot Cell Complex

Laurent Schmieder

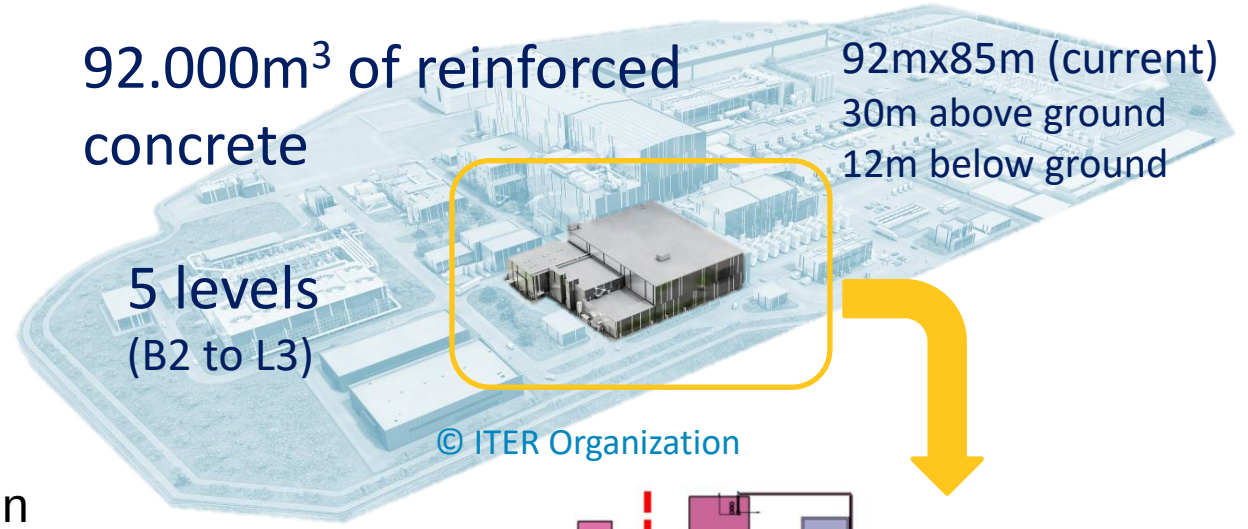
Buildings Infrastructure and Power Supplies Program Manager

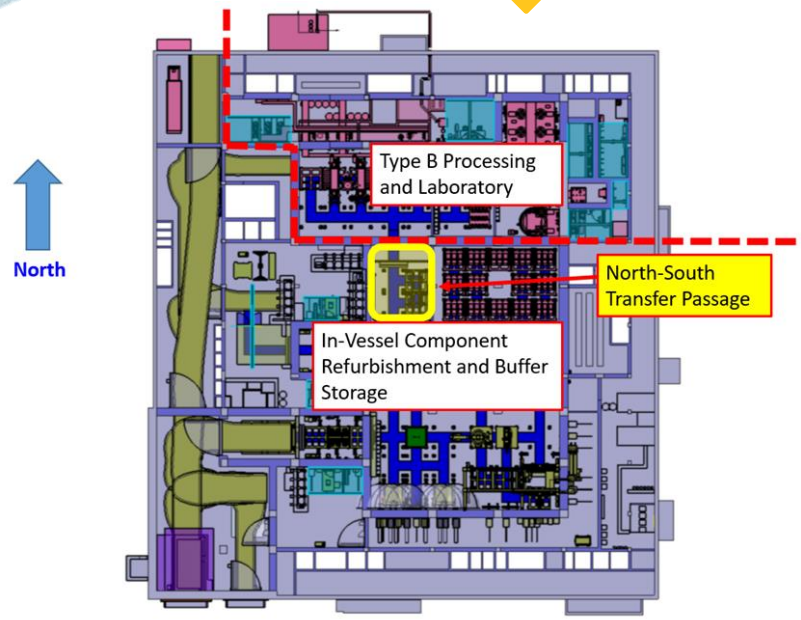
5 October 2022

Hot Cell Facility

Hot Cell Facility Functions:

- To maintain activated and/or contaminated equipment:
  - In Vessel Components
  - Ex-Vessel Equipment
  - Tokamak Remote Handling systems.
- To treat the radioactive waste and effluents generated in both the Tokamak Complex and the Hot Cell Facility itself: Low-Level Waste (LLW) (class A and B), Purely tritiated waste, Radioactive effluents, and any waste contaminated with beryllium.
- To import and export components and waste
- To control human access to the Hot Cell Facility and the Tokamak machine.



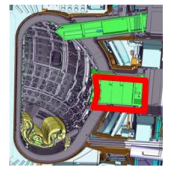


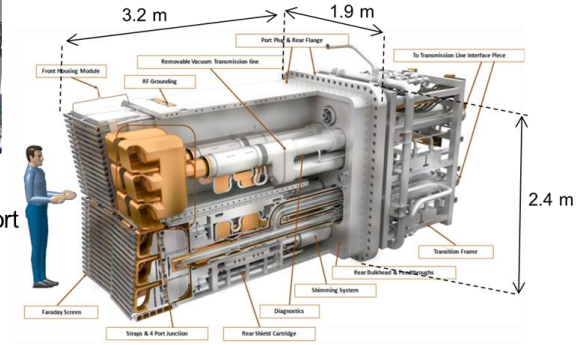
© ITER Organization

Hot Cell Facility

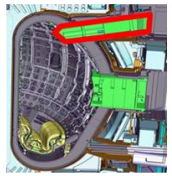
ITER Tokamak Maintenance:

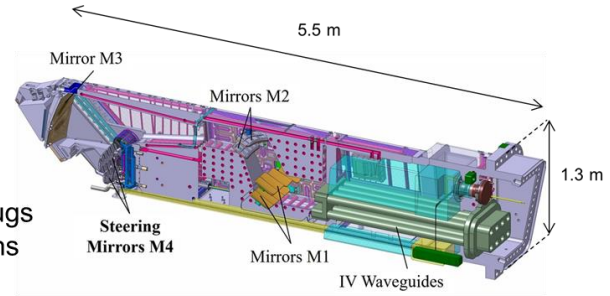
- A large number of In and Out of Vessel systems need to be maintained and / or repaired.
- Due to induced activity, activated dust or chemical hazards (like beryllium); remote, confined and shielded maintenance is a necessity.



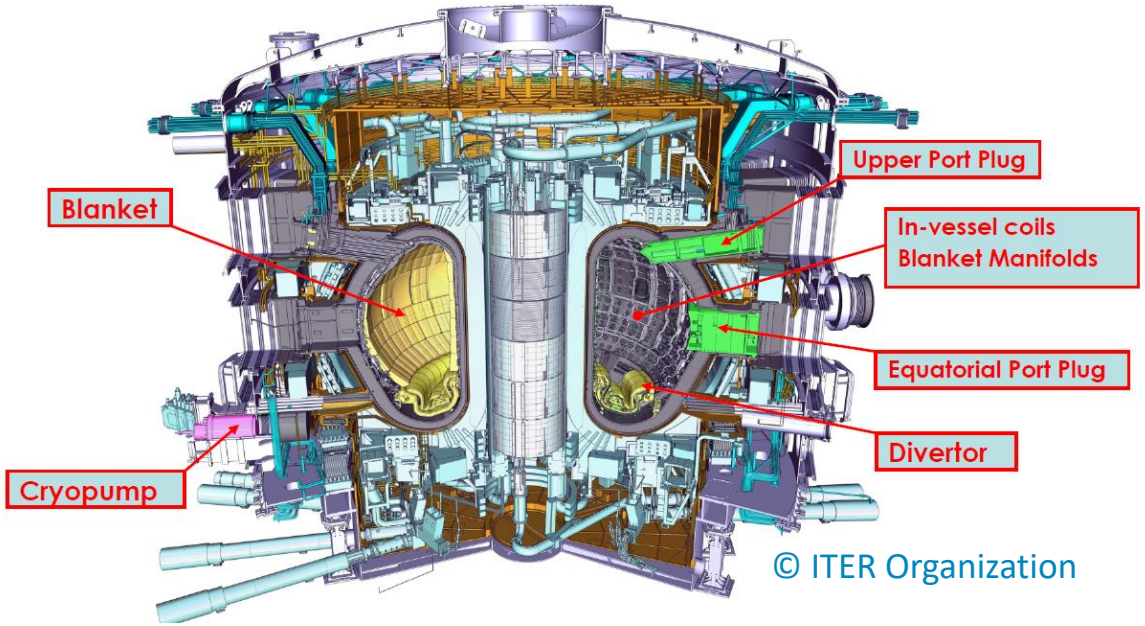


Max weight Port Plugs (EPP) ~ 50 tons



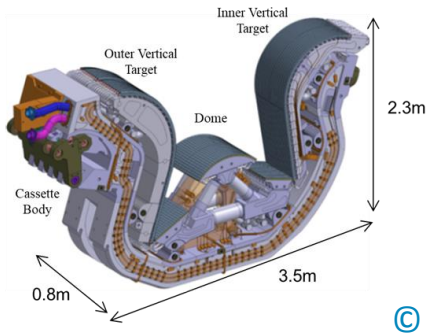


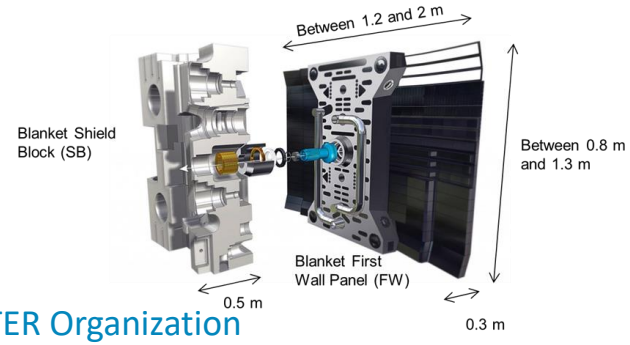
Upper Port Plugs (UPP) ~ 25 tons



© ITER Organization

Divertor ~ 8 tons

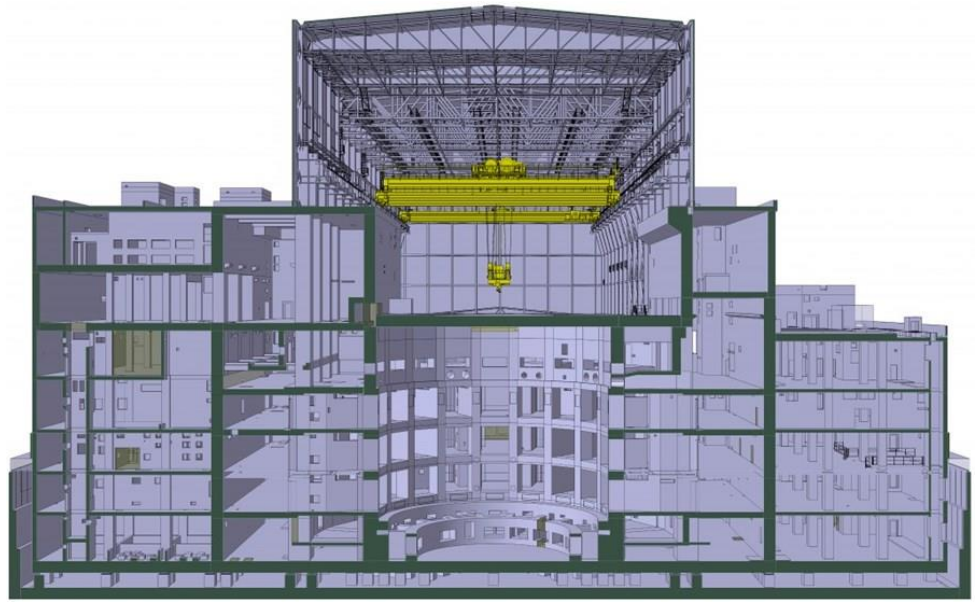




© ITER Organization

Lessons Learnt from the Tokamak Complex :

- Concurrent design development with clear, unambiguous and adequate design maturity from all stakeholders (building/services/processes). Transversal design gates reviews with sound verification of the safety demonstration.
- Leave flexibility for design solutions when appropriate.
- Enhance joint collaborative relationship IO and F4E regarding safety concerns. Upstream close collaboration with the Safety Department.
- Staged construction on operation need basis
- Contract for construction shall not be signed until requirements are well defined and baselined.
- Benefits of IO and F4E integrated team. Unique integration and coordination workforce, especially for interfaces definition
- Contain changes, control related disruptions on design and construction.
- Lean Processes especially for construction phase.



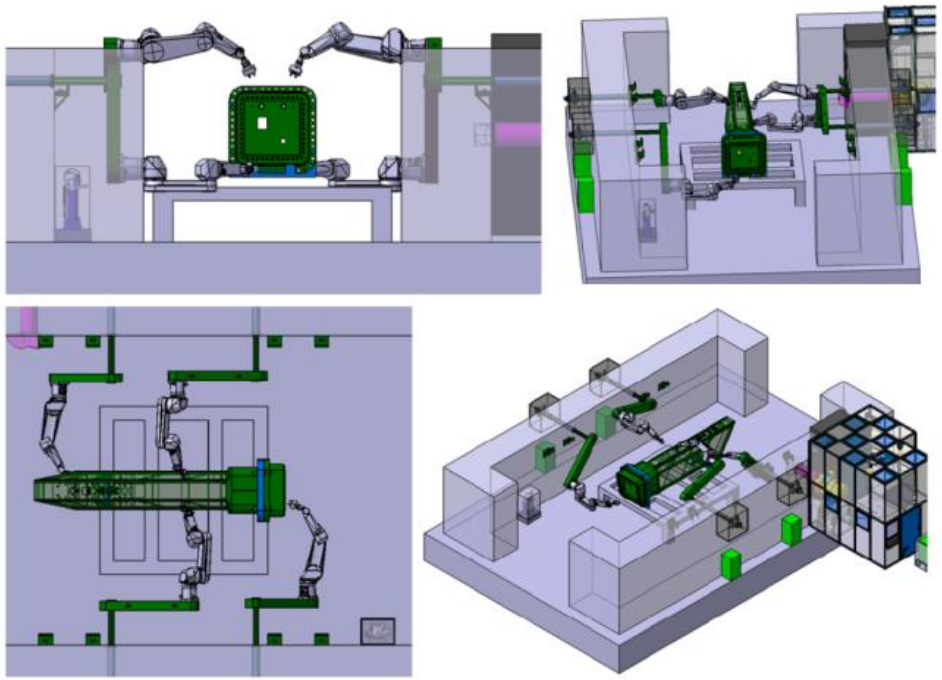
Tokamak Complex construction by F4E :

400,000-tonne edifice that reunites the Tokamak, Diagnostic and Tritium buildings. © ITER Organization

Hot Cell Facility

The TOP 5 challenges:

- Large and complex nuclear facility, comparable to the Tokamak Complex. First of A Kind (FOAK) for remote activities. Maintenance of sophisticated and heavy, large sized equipment.
- Licensing challenge : The Hot Cell Facility delivery is mandatory for obtaining the hold point release from the Nuclear Regulator to operate the ITER Tokamak,
- Schedule constraints: First functionalities need for Pre Fusion Power Operation (PFPO).
- Budget Constraints:
  - Adjust the scheduled and corrective maintenance program to the strict and real needs
  - Avoid conservative approach to rationalize the Facility
  - Build on the basis of mature and validated design
  - Design with a constrained budget in mind
- It is fully part of the science and technology demonstration of ITER.



Automated Cleaning Cell System (ACCS) © ITER Organization

Hot Cell Facility

Safety Challenge:

- Seismic conditions
- Fire protection
- Extreme climatic conditions
- Air Plane Crash
- Drop Loads (heavy and large components)
- Workers radiation exposure limitation
- Confinement of Radiological materials
- Workers Chemical risks (exposure limitation to Beryllium)

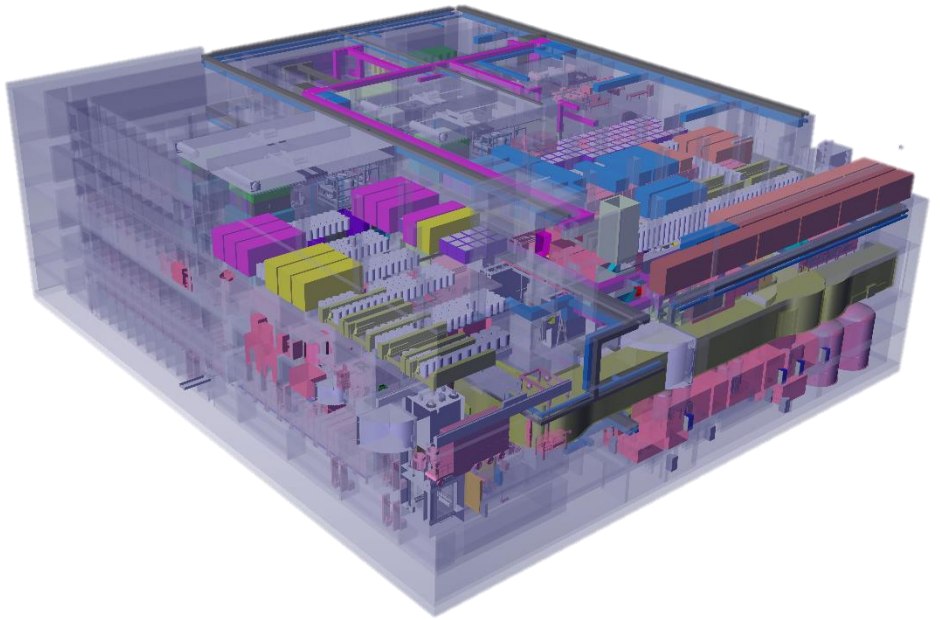
As a nuclear operator, the ITER Organization is regularly inspected and audited by French nuclear authorities, French Nuclear Safety Agency (ASN) © ITER Organization

The Hot Cell Facility delivery is mandatory as part of the licensing process with the Nuclear Regulator to operate the ITER Tokamak

Hot Cell Facility

Status of the design:

- Conceptual Design level of maturity
- The Review of the Concept Design occurred at the end of 2021
- The closure of the Concept Design phase in underway:
  - Answer to the comments and safety justification
  - Produce closure report
  - Prepare the input for the Preliminary Design



Hot Cell and Rad Waste Building B21© ITER Organization

Procurement to come:

- Hot Cell Complex Engineering support:

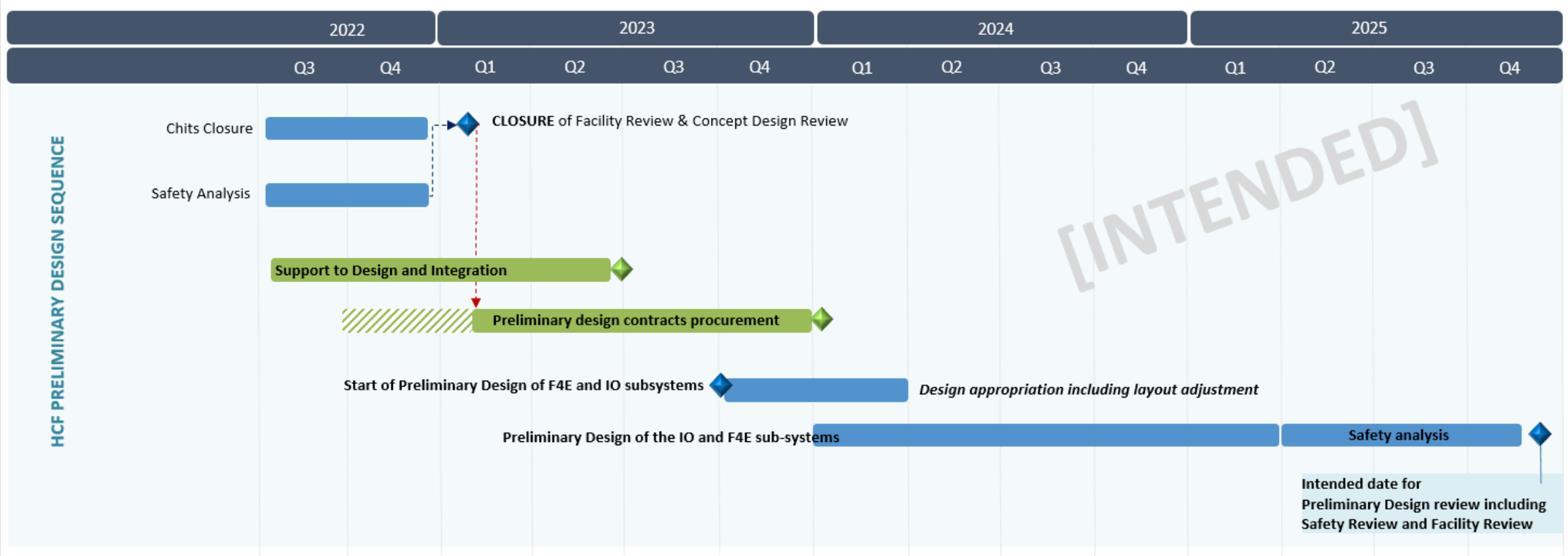
  Procurement 2023 — D — Item range above **10 000 000 EUR**

- Hot Cell Complex Preliminary Design contractors:

  Procurement 2023 — D — Item range above **10 000 000 EUR**

Hot Cell Facility

Tentative Short Term Schedule:



FUSION FOR ENERGY

Big Science Business Forum 2022

BIPS

Questions?

FUSION FOR ENERGY | Big Science Business Forum 2022

BIPS

Thank you for your attention

Follow us on:

- www.f4e.europa.eu
- www.twitter.com/fusionforenergy
- www.youtube.com/fusionforenergy
- www.linkedin.com/company/fusion-for-energy
- www.flickr.com/photos/fusionforenergy

Bringing the power of the sun to earth