FUSION FOR ENERGY

The European Joint Undertaking for ITER and the Development of Fusion Energy

The Governing Board

DECISION OF THE GOVERNING BOARD ADOPTING THE SINGLE PROGRAMMING DOCUMENT (SPD) OF THE EUROPEAN JOINT UNDERTAKING FOR ITER AND THE DEVELOPMENT OF FUSION ENERGY

THE GOVERNING BOARD OF FUSION FOR ENERGY,

HAVING REGARD to the Statutes annexed to Council Decision (Euratom) No 198/2007 of 27 March 2007 establishing the European Joint Undertaking for ITER and the Development of Fusion Energy (hereinafter "Fusion for Energy") and conferring advantages upon it[1] (hereinafter "the Statutes") and in particular Article 9 (a) thereof, last amended on 10 February 2015[2] by Council Decision Euratom 2015/224;

HAVING REGARD to Council Decision (Euratom) No 198/2007 establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it, last amended on 22 February 2021 by Council Decision (Euratom) No 2021/281[3];

HAVING REGARD to the Financial Regulation of Fusion for Energy[4] adopted by the Governing Board on 10 December 2019 (hereinafter "the Financial Regulation"), and in particular Title III thereof;

HAVING REGARD to the Commission Delegated Regulation (EU) 2019/715[5] of 18 December 2018 on the framework financial regulation for the bodies set up under the TFEU and Euratom Treaty and referred to in Article 70 of Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council, and in particular Title III thereof.

HAVING REGARD to the endorsement by the Governing Board of the draft SPD in accordance with Article 32 (1) of the Financial Regulation.

WHEREAS:

(1) The Director shall, in accordance with Article 11 of the Statutes, prepare each year the submission of the project plan to the Governing Board, the resource estimates plan and the detailed annual work programme, now merged in the Single Programming Document;

(2) The Administration and Management Committee shall, in accordance with Article 8a (2) of the Statutes, comment on and make recommendations to the Governing Board on the proposal for the project plan, the work programme, the resource estimates plan, the staff establishment plan, the staff policy plan and other related matters, now part of the Single Programming Document drawn up by the Director;

(3) The Technical Advisory Panel, in accordance with Article 6 (1) of the Statutes, shall advise the Governing Board on the adoption and implementation of the project plan and work programme, now part of the Single Programming Document;

(4) The Governing Board, in accordance with Article 6 (3) (d) of the Statutes, shall adopt the project plan, work programme, resource estimates plan, the staff establishment plan and the staff policy plan, now part of the Single Programming Document;

HAS ADOPTED THIS DECISION:

Article 1

The SPD 2022-2026 (F4E_D_2SGNZW 1.5) of Fusion for Energy annexed to this Decision is hereby adopted.

---

[1] O.J. L 90, 30.03.2007, p. 58.
[2] O.J. L 37 , 13.02.2015, p.8.
[3] OJ L 62, 23.2.2021, p. 41
[4] F4E (19) GB45 21.1 adopted on 10.12.2019.
[5] OJ L 122, 10.5.2019, p. 1–38.

Article 2

The Governing Board hereby delegates to the Director of Fusion for Energy the power to make non-substantial amendments to the annual Work Programme approved by the Governing Board.

Amendments are considered to be “non-substantial” if they do not cause the financial resources allocated to the Action concerned in Table 2 of the annual Work Programme to increase by more than EUR 1 million or 10%, whichever is higher.

In any event, the increase of the financial resource of an action shall not exceed 3% of the total budget of the annual Work Programme for the given year.
In addition, any related changes to the scope of the annual Work Programme shall not have significant impact on the nature of the Actions or on the achievement of objectives of the multiannual Project Plan.

Non-substantial amendments shall not lead to any increase in the total operational expenditure for Title 3 of the annual Budget approved by the Governing Board.

Article 3

This Decision shall have immediate effect.

Done in Barcelona, 10 December 2021.

For the Governing Board

Beatrix Vierkorn Rudolph
Chair of the Governing Board

For the Secretariat

Romina Bemelmans
Secretary of the Governing Board

Annex: Single Programming Document 2022-2026

FUSION FOR ENERGY

Single Programming Document

Years 2022-2026

F4E_D_2SGNZW

THE EUROPEAN JOINT UNDERTAKING FOR ITER AND THE DEVELOPMENT OF FUSION ENERGY

Josep Pla nº 2 · Torres Diagonal Litoral · Edificio B3· 08019 Barcelona · Tel. +34 93 320 18 00 · Fax +34 93 320 18 51

www.fusionforenergy.europa.eu

Fusion for Energy

The European Joint Undertaking for ITER
and the Development of Fusion Energy
C/ Josep Pla 2,
Torres Diagonal Litoral
Edificio B3
08019 Barcelona
Spain

Tel: +34 933 201 800
Fax: +34 933 201 851
E-mail: info@f4e.europa.eu

fusionforenergy.europa.eu

Foreword

Welcome to Fusion for Energy's (F4E) Single Programming Document for the period 2022-2026!
This will be one of the most exciting periods for F4E. For ITER, we will finish most of the buildings and deliver all the superconducting magnets and the vacuum vessel sectors. This should allow us together with the ONE ITER team to switch on ITER and produce the first plasma.

At the same time we will continue working closely with Japan on the Broader Approach projects allowing for the operation the JT-60SA tokamak for the benefit of our scientific community and as a preparation to ITER operation.

Last but not least, we will put the knowledge we will have gained from our projects to the use of the next phase of our mission – preparing Europe for the construction of a demonstration fusion reactor. Kicking off the DONES project is a first step towards this goal that you find in this SPD.
Let me conclude by thanking all our stakeholders for supporting the ambitious plan set on in this document.

Johannes P. Schwemmer
Director

Section I. General Context

Introduction

Purpose of the Annual and Multi-Annual Programming document

According to Article 32 (Single Programming Document) of the Fusion for Energy (F4E) Financial Regulation (F4E(19)-GB45-21.1 Adopted on 10/12/2019), the F4E Single Programming Document (SPD) contains:

1. The Project Plan (PP),
2. The financial Resource Estimates Plan (financial REP),
3. The Human Resource Estimates Plan (human REP),
4. The annual Work Programme (WP).

According to the F4E Statutes and Financial Regulation, the final Single Programming Document shall be adopted by the Governing Board (GB). The first step of the adoption process requests the preparation of a draft Single Programming Document for the year N – N+5 to be sent in January of the year N-1 to Commission, GB Chair, EU Parliament and Council.

In line with a recommendation from the MAP Ad Hoc Group adopted by Governing Board 45, the Single Programming Document is built in a modular approach with a “Main text” that is complemented by 4 sets of annexes:

SPD_figure 1 . Structure of SPD document

The reference for the budget data is the MFF 2021-2027 approved by the Council on 22/02/2021.

The reference date for the planning information in the present document is end of March 2021.

Due to the above mentioned cut-off date, the document is not capturing any subsequent evolutions, including the decisions taken at the recent ITER Governance meetings.

Vision and Overall F4E mission

"*Bringing the power of the sun to earth*".

This vision communicates the active role Fusion for Energy (F4E) takes in advancing fusion towards becoming a reliable source of clean abundant base load energy. F4E is the European centre to develop and build ITER and other facilities to turn fusion into a sustainable source of energy for mankind. F4E bridges the EU research community and the EU industry, to broaden the European industrial base for fusion technology.

F4E Projects

ITER[1]

The task of F4E, as the Euratom Domestic Agency for ITER, is to discharge Euratom obligations to deliver its share of in-kind components and cash contributions to the ITER project, about 45% of the total value of the project in the construction phase and 34% of the cost of operation, deactivation and decommissioning of the facility as well as preparing the site in Cadarache.

BROADER APPROACH (BA)

The Broader Approach agreement, concluded between Euratom and Japan, includes activities which support and complement the ITER project by developing and operating some advanced research infrastructures and technologies necessary for future demonstration reactors. The Euratom resources for the implementation of the BA have also been provided voluntarily by several participating European states (Belgium, France, Germany, Italy, Spain and, in the past, Switzerland) as well as EUROfusion[2].

DEMO

The task of F4E is to prepare and coordinate a programme of activities in preparation for the construction of a demonstration fusion reactor, so to say the successor of ITER.

Key Performance Indicators

F4E is using specific Key Performance Indicators (KPI) in order to measure how effectively the organization achieves the targets set in different areas (i.e. schedule, cost, quality, budget consumption, etc.). Some of them were developed by F4E, some by its Governing Board and ITER IO. F4E monitors

[1] Info on ITER can be found on www.iter.org and https://f4e.europa.eu/understandingfusion/iter.aspx

[2] www.euro-fusion.org

these KPIs and reports internally to the Project Steering Meeting (PSM) to discuss any possible event or risk that could threaten their achievement.

Reporting

Fusion for Energy produces a dashboard on progress and performance against the Project Plan and the Work Programme that is sent monthly to the Governing Board and its committees.

General background

Since its creation in 2007, Fusion for Energy (F4E) is responsible to provide Europe's contribution to ITER, the Broader Approach (BA) and the Demonstration Fusion Power Reactor (DEMO) projects.

2.1 ITER

ITER aims to produce a significant amount of fusion power to allow scientists to study "burning" plasma (i.e. heated by fusion reactions rather than by external heating systems) and also to test many of the key technologies needed for future fusion reactors. Euratom (represented by the European Commission) is one of the seven parties to ITER that represent half the world's population together with the Russian Federation, Japan, China, India, South Korea and the United States.

ITER is being built near Cadarache in the south of France. F4E's task, as the Euratom Domestic Agency for ITER, is to discharge Euratom obligations to deliver its share of in-kind components and cash contributions to the ITER project, about 45% of the total value of the project in the construction phase and 34% of the cost of operation, deactivation and decommissioning of the facility as well as preparing the site.

The main characteristic of ITER is that about 90% of the project is built by in-kind contributions distributed among the seven parties through the ITER Agreement to achieve the agreed level of contribution from each of them. The design, coordination, integration, commissioning and operations are managed by the Central Team of the ITER Organization (IO).

The project will reach its ultimate operational configuration [the so-called Deuterium-Tritium (DT) operation] via a series of intermediate configurations of gradually increasing capability. This is referred to as the staged approach and reflects the approach commonly adopted on complex developments with a progressive step-by-step assembly and commissioning process, validating each phase before moving on to the next. The first stage is referred to as First Plasma which is due in December 2025. The full configuration of DT operation is scheduled 10 years later in 2035. F4E notes that the overall ITER schedule is under review by the ITER Organisation and ITER Council taking into account the impacts of Covid-19 and other events.

The two major F4E responsibilities are

(a) Europe, as host, is providing components (including all buildings) representing 45 % of ITER's nominal value; European industries manufacture and provide them to the ITER Project as 'in kind' contributions. These are progressively delivered in line with the ITER assembly schedule, completing with the final deliveries for the DT phase components around 2030.

(b) the payment of an annual cash contribution to IO to fund the IO internal activities and the tasks subcontracted directly by IO. The cash contributions cover the four major phases of the ITER project:

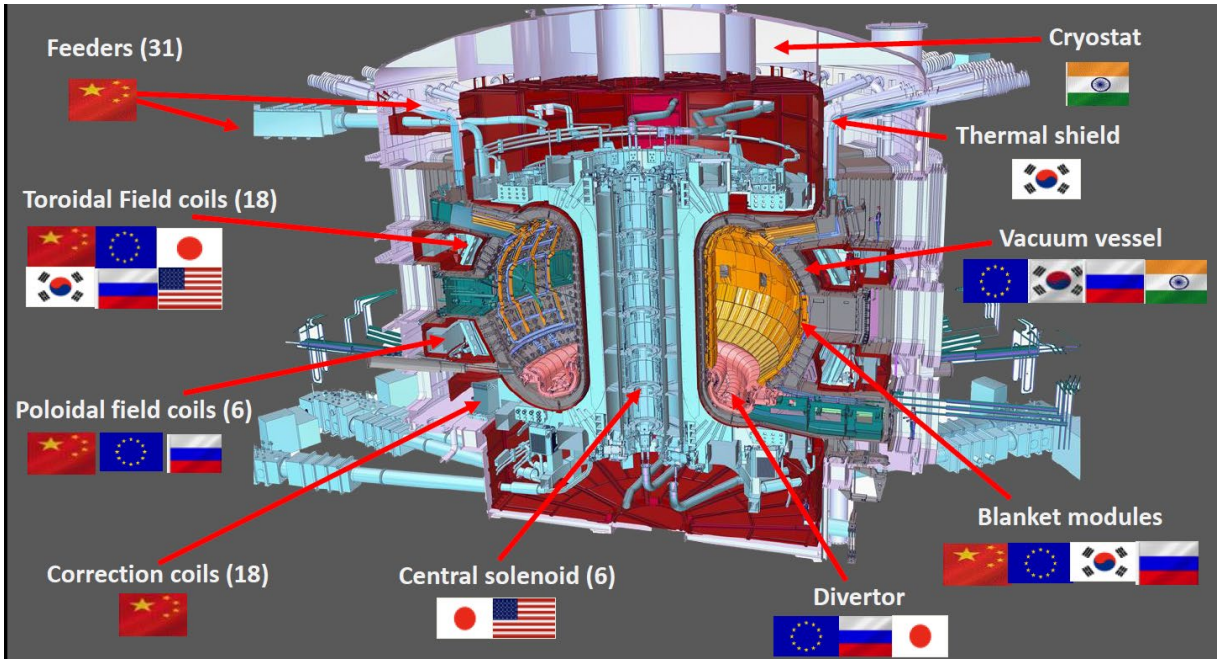
- ITER construction phase through to the build of the machine for the final DT configuration in 2035
- ITER operations phase running from 2026 through to the planned end of operation in October 2037[3]
- ITER deactivation phase from October 2037 until the end of the ITER Agreement in October 2042. During this phase the ITER machine is returned to a safe state following its operation with the DT fuels.
- Finally the decommissioning phase which starts in 2042, aimed to dismantle the machine and return the ITER site to normal. Since this phase falls outside the timeframe of the ITER Agreement, F4E and the other Domestic Agencies will make the corresponding cash contributions to a decommissioning fund during the ITER operations phase.

During these phases the F4E role is to provide the agreed cash contribution. However, it is anticipated that F4E will have a role to provide technical support to IO during machine assembly, commissioning and operations. The type and level of support, and mechanism to provide this support is not yet defined.

ITER Construction Phase	Overall cost IC-27 (kIUA)	EU share (kIUA)	EU share already released (kIUA)
In-kind	2870.38	1128.72	464.39
In-kind cash to Japan	*NA*	227.65	191.89
In-cash	4875.82	2165.06	798.84
Total	**7746.2**	**3521.43**	**1455.12**

SPD_table 1. Summary table of European contribution to ITER (Reference IC-27 contribution end of December 2020)

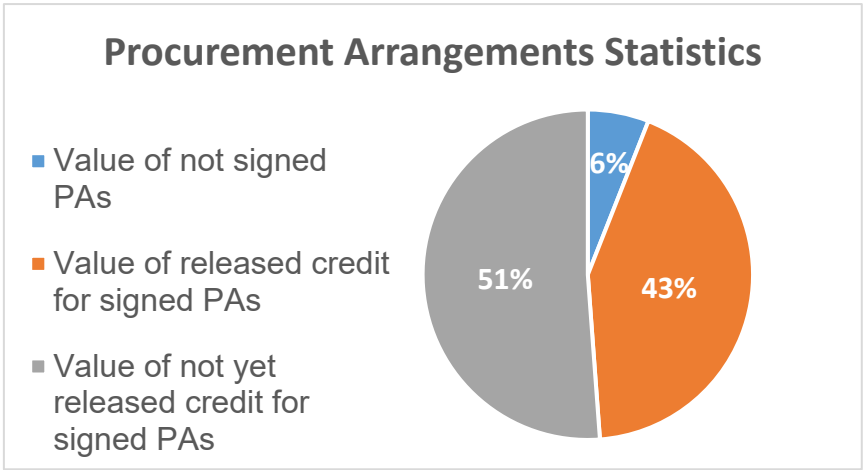
[3] To be noted that it is likely that the operation phase of ITER will be prolonged beyond 2037 as it would not make sense to operate ITER in the nuclear phase only during 2 years. Such decision, which will impact the current ITER baseline, will have to be taken by the ITER council at a later stage. It would impact similarly the dates of deactivation and dismantling phases.



SPD_figure 2 . Main DAs obligation toward ITER IO

IN KIND CONTRIBUTIONS TO IO

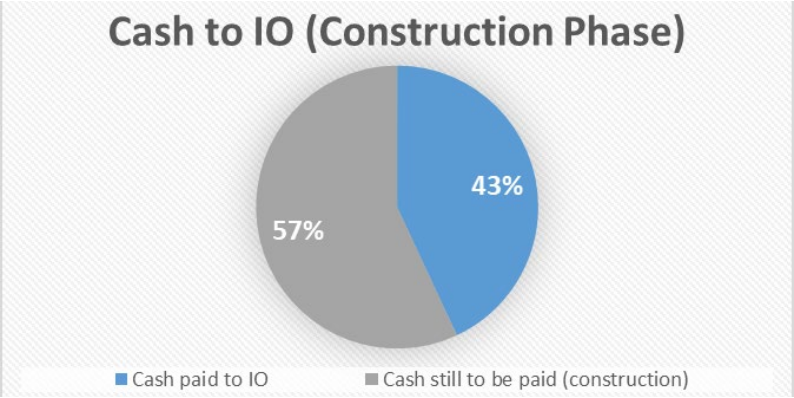
The Procurement Arrangements (PAs), progressively signed between the ITER Organization and each DA, define the specifications of the components to be provided in-kind. The level of detail of those specifications may vary depending on the level of development of the components. In some cases, Build-to-Print specifications will be provided, whilst in others, Detailed Design or only Functional Specifications will be available. These PAs are the basis for F4E to start the procurement procedures to competitively tender for the work. Once a contract is awarded, the work of the supplier can start. Each component has its development and manufacturing process with predefined stages and phase gates when F4E and IO will review and approve the design or manufacturing progress in order to determine the readiness to move to the next stage. The following table provides the list of the EU deliverables.



SPD_figure 3 . PA Credits of in-kind contribution in percentage: value of PA Signed & credit released / PA Signed & credit to be released / not Signed EU PA (status end of end March 2021)

CASH CONTRIBUTION TO IO

F4E provides a yearly payment according to the decisions taken at the ITER Councils. F4E has provided 869.35 kIUA amount of cash contribution until the end of March 2021.



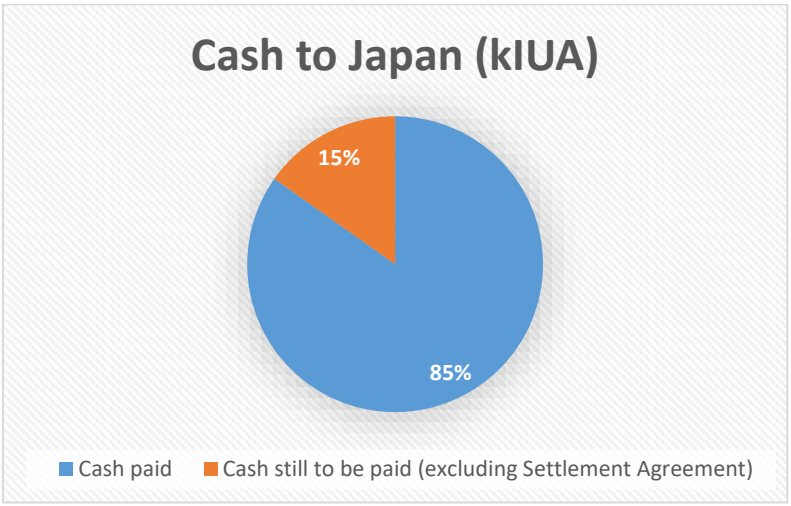
SPD_figure 4. Ratio cash paid to IO versus total expected cash contribution (status end of end March 2021)

CASH CONTRIBUTION TO JAPAN

According to the ITER Agreement, there is a transfer of 10% of in-kind procurement responsibility from Euratom to Japan under the supervision of the ITER Organization, equivalent to 227.65183 kIUA. This is financed through a cash contribution from EU to Japan paid by F4E.

Commitment of a new PA is foreseen in 2021 Q4 at the earliest. In 2020 F4E has signed with QST the Arrangement on Additional Cash Contribution implementing the MoU on Settlement agreed between Euratom and Japan in 2014.

F4E provides a yearly payment based on the documented achievement of progress.



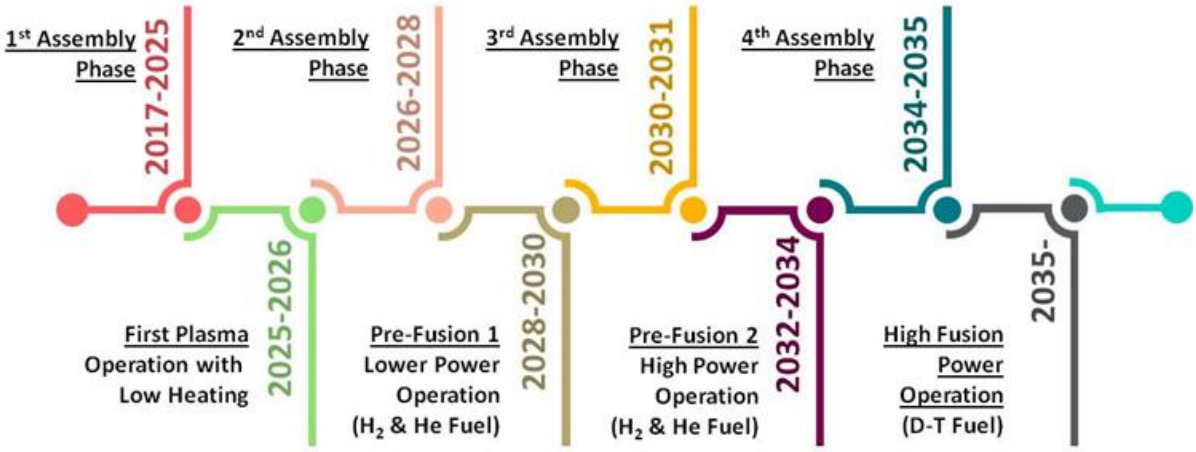
SPD_figure 5. Cash paid to Japan / cash still to be paid to Japan (status end of end March 2021) (excluding settlement agreement)

RECENT CHANGES AND DEVELOPMENT AT OVERALL ITER LEVEL WHICH AFFECT F4E OPERATIONS

The updated Project Baseline (Baseline 2016) is based on the Staged Approach (SPD_figure 6). It foresees Cryostat Closure in December 2024 and First Plasma in December 2025. F4E notes that the overall ITER schedule is under review by the ITER Organisation and ITER Council taking into account the impacts of Covid-19 and other events.
Work has progressed in all areas with continuous interactions between F4E and ITER IO to stabilize and optimize the ITER schedule, the risks with their mitigation and the cost of the in-kind procurements. The detailed planning continues to evolve through the so-called Revised Construction Strategy (RCS). This is a series of more detailed iterations on the planning to First Plasma with the objective to optimize the assembly sequencing to reflect evolving DA delivery forecasts.

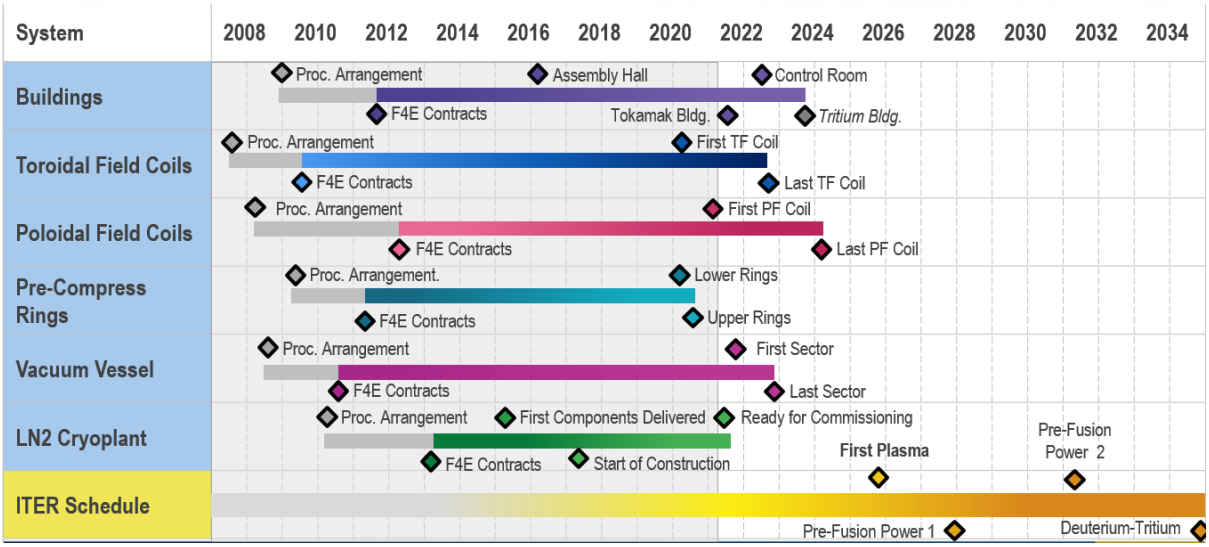
The following main significant points should be mentioned:

- The cost and planning impacts of Covid19 on F4E activities known at the time of writing this SPD have been taken into account. However some changes to the planned activities may occur in the future. These will be addressed via future Amendments to the Work Programme as necessary.
- A new reference schedule has been produced by IO and new RAD dates for First Plasma components will be made available for review by the Domestic Agencies.
- As of the end of March 2021, the EU has achieved a total of 22 IC and GB milestones out of a total of 57. 5 milestones are at risk of experiencing delays with respect to the agreed quarter. 13 milestones show some delays, in some cases due to be recovered when the new RAD dates will be implemented into the baseline. The remaining 17 are on track;

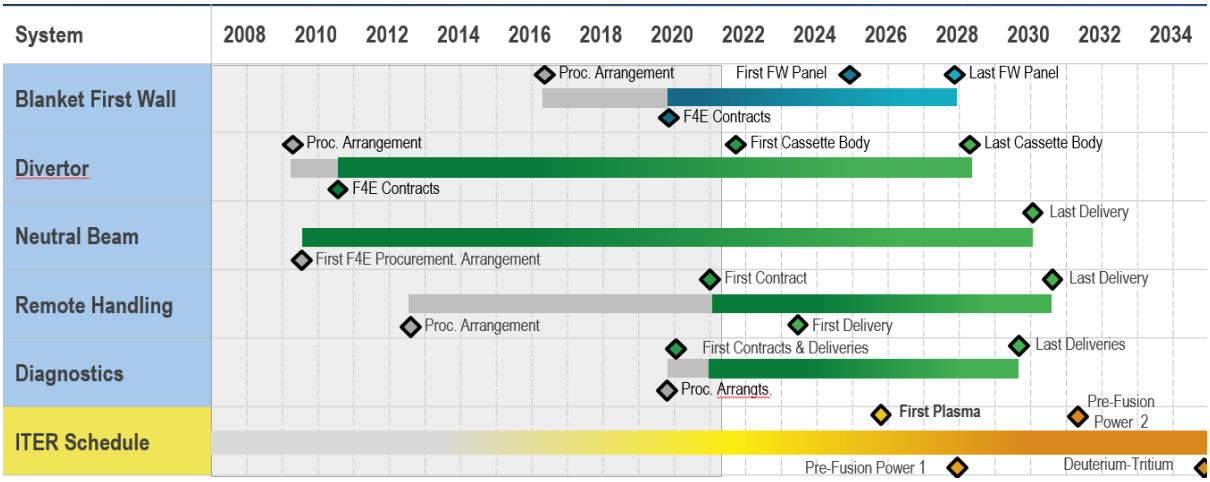


SPD_figure 6. Detail of the Staged Approach

Based upon the updated ITER baseline schedule, F4E's own top-level baseline schedule (fig. 7), known as "Level 0", outlines the most important ITER and F4E activities.



SPD_figure 7 . Top level schedule for First Plasma Systems (end of March 2021)



SPD_figure 8 . Top level schedule for other Systems (end of March 2021)

2.2 Broader Approach

Fusion for Energy is the Implementing Agency for the Euratom contribution to the three BA projects, designated by the European Commission to discharge its responsibilities as defined in the BA Agreement. In particular, F4E is the organization delegated to agree and execute Procurement Arrangements (PAs) with the Japanese Implementing Agency (QST).

The second phase of the BA activities, the so called "BA Phase II", started from April 2020 on the basis of the Joint Declaration by the representatives of the Government of Japan and the European Atomic Energy Community for the further joint implementation of the Broader Approach activities agreed on 2nd March 2020. In this new phase, focussed largely on enhancements as well as operation of the jointly developed infrastructures, resources will largely be provided by Fusion for Energy with a substantial contribution from European Laboratories channelled through the EUROfusion consortium. For BA Phase II both Parties pledge to contribute with a certain amount of credit on an annual basis and subject to budget availability.

Each of the BA Projects, while having some important differences, shares the common feature of being based on a collaboration in which the Parties contribute both to the definition of the overall integrated design and to the detailed design and realization.

The table below defines the planned contribution in summary and the already released credit for BA Phase II.[4]

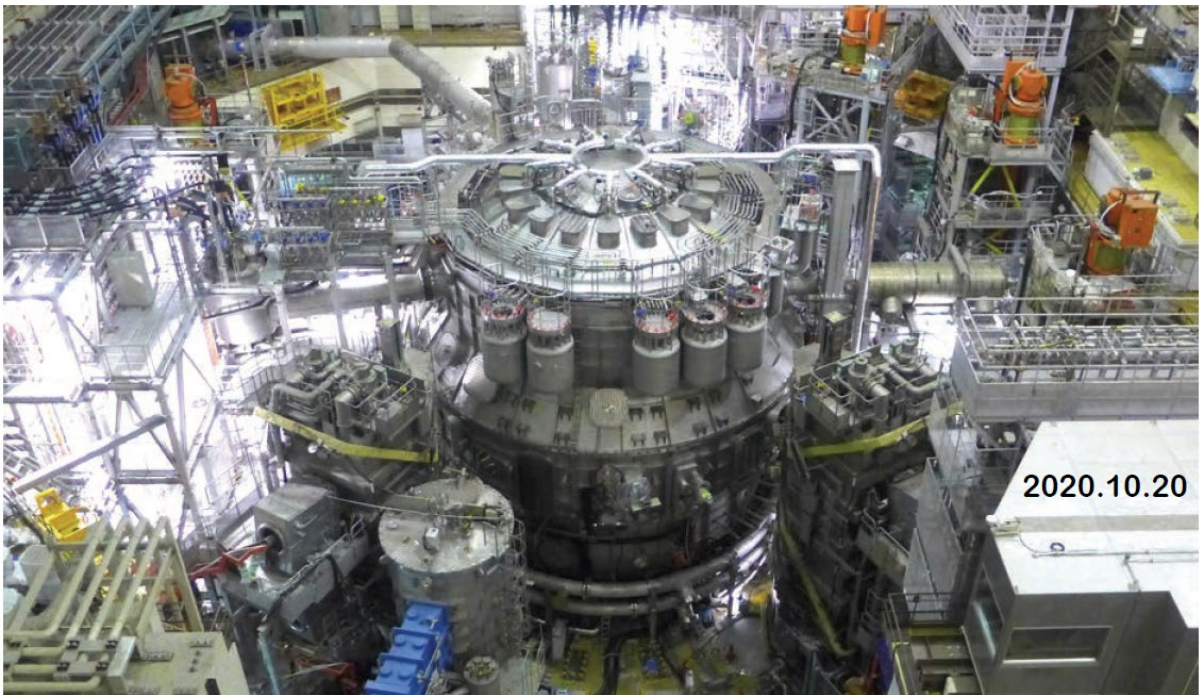
Further details are available in PP_table 8 of Annexes to Project Plan.

		BA-Phase II EU Scope April 2020 – March 2026		
Actions	**Name**	**Commitment Credit (kBAUA)**	***Of which committed***	***Of which completed***
14- Broader Approach	Satellite Tokamak (JT-60SA)	214.20	*25.93*	*13.08*
	IFMIF/EVEDA	47.39	*16.92*	*4.89*
	IFERC	17.41	*11.40*	*1.48*

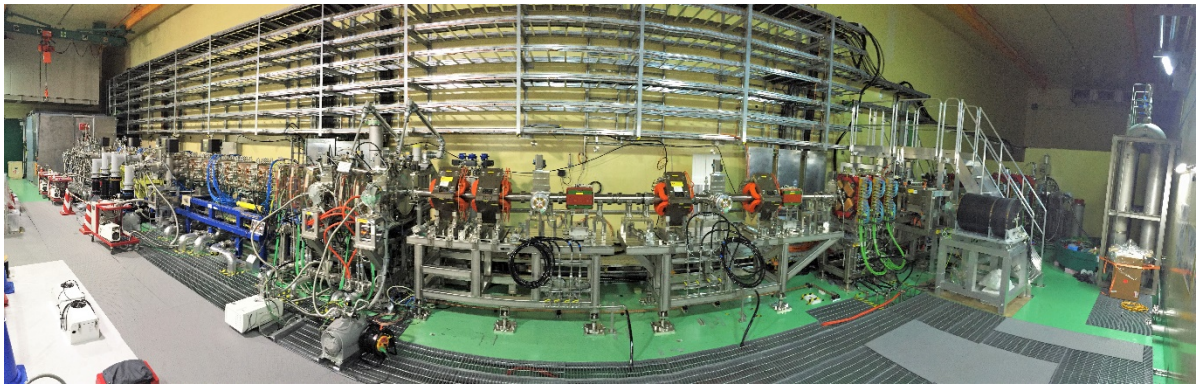
SPD_table 2 . Correspondence between Actions, WBS and WP ref for BA[5]

[4] Not all PAs are signed yet.

[5] All BA Phase I credits except for 0.5kBAUA (foreseen by March 2022) are expected to be achieved by the end of 2021.



SPD_figure 9 .JT-60SA – October 2020 – Magnets cool down on-going



SPD_figure 10 . IFMIF/EVEDA - View of LIPAc (Linear IFMIF Prototype Accelerator) in the complete phase B+ configuration to demonstrate operation with a deuterium beam of 125 mA at 5 MeV in continuous operation during at least 30 minutes

CHANGES AND DEVELOPMENT OVER THE LAST YEAR THAT AFFECT BROADER APPROACH OPERATIONS

- Satellite Tokamak (JT-60SA):
  By March 2020, all the components procured by EU and JA, under the original BA Phase I, were installed. In the first months of 2020 in particular the assembly and installation of the thermal shield and cryostat was completed together with all main auxiliaries.
  At JT-60SA site, activities progressed with the finalisation of electrical, hydraulic, cryogenics instrumentation and control connections and tests.
  For the magnet system, all of the feeders, joints, insulation, and high voltage/low voltage instrumentations was assembled and checked in the cryostat. Cable routing and feedthrough connections were completed in July 2020. High voltage tests on the magnet system were completed in September 2020.

In parallel the installation of in-vessel components (inboard first wall, upper divertor, glow discharge electrodes a, protection limiter and basic diagnostics) and the installation and vacuum test of the ECRF launcher and transmission line (from the gyrotrons to the launcher) was completed The final integration of the machine also included the installation and commissioning of the first EU diagnostic, the Event Detection Intelligent Camera.
In spite of strong efforts by QST and its contractors, a delay five months delay was accumulated (with respect to the original date of Sept 2020 for first plasma) ,partially due to COVID-19 constraints and limitations.
Vacuum pumping of the vacuum vessel and of the cryostat started on 14 and 15 September 2020, respectively with satisfactory results of leak testing.
The cool-down of the superconducting coil started from 10 October 2020, under careful control of thermal gradients. The magnet system reached 80 K on 12 November 2020. A superconducting transition of TFC, CS and EF coils was observed on 25 and 26 November 2020. The cool-down operation was completed and cold circulators and cold compressor started to supply supercritical helium to the magnets system. Temperatures, flow rate, and pressure of magnet system were ready for the coil energization tests. The Displacement and Stress Measurement System (provided by F4E) confirmed the mechanical behavior of the machine under cool-down.
The VV was heated at 50ºC operational temperature and baked at 200ºC in November and January 2020 achieving vacuum of 10-5 Pa.
By December 2020 also the power supplies (largely procured by EU) passed final tests, including the critical safety discharge system, and were ready for operation, scheduled in early January 2021.The relative smooth integrated commissioning allowed some recovery of schedule.
During all this period, F4E (in collaboration with EU laboratories, coordinated within the EUROFusion consortium) provided continuous support and expertise (including remote services from the industrial contractor which originally procured the cryoplant and the power supplies).
A Tri-Partite Agreement was established among F4E, QST and ITER Organization (IO) fostering IO participation to the integrated commissioning and future operation of JT-60SA. In this frame, substantial information was transferred to IO on assembly, while the direct participation to on-going integrated commissioning and experimental activities planning was promoted.
While machine integrated commissioning was carried out, primarily under QST responsibility, in Europe several activities were steadily progressing (also thanks to the cooperation with a number of EU laboratories under EUROFusion coordination). The activities part of the machine enhancement to be installed within mid-2023, include the finalisation of design and start of manufacturing of a number of diagnostics (Thomson Scattering, Fast Ion Loss Detector, VUV divertor spectrometer) and auxiliary systems (the divertor cryopumps, the pellet launching system, Massive Gas Injection, actively cooled divertor). Moreover F4E completed the design and launched the tender for the Error Field Correction Coils Power Supplies and for the second set of ECRF System Power Supplies.

- IFMIF/EVEDA:
  After the outstanding results obtained in July 2019, which allowed to validate from a beam physics standpoint the design of the injector, radiofrequency quadrupole (RFQ), Medium Energy Beam transport line (MEBT) and the diagnostics plate, the LIPAc project entered in 2020 in the preparation of the third commissioning stage, namely the phase B+. This phase is meant to validate with a 125-mA, 5 MeV deuteron beam in continuous waves the complete accelerator expect the superconducting radiofrequency LINAC with its final beam dump. The validation until the nominal energy of 9 MeV will be made after the completion of the LINAC (made of one cryomodule) whose assembly is due to start the fourth quarter of 2021. The construction of the LIPAc accelerator in the phase B+ configuration was completed in 2020 (cf. fig. 10). The checkout tests of the newly installed components for the phase B+ have started in 2020 and are planned to be completed during the second quarter of 2021. As the accelerator is growing and more subsystems need to be controlled, a central control room was built in 2020 in collaboration with the IFERC/REC project (cf. fig. 3). It will be used for the phase B+ beam commissioning phase due to start during the summer 2021.

In parallel, the Fusion Neutron Source engineering design activities and the Lithium Target Facility engineering validation activities have restarted in 2020 in collaboration with EUROfusion in the framework of the BA phase II, with the delivery of work plans to be implemented by both implementing agencies from 2021 to 2025. This theoretical and experimental work aims to provide an update of the Fusion Neutron Source Engineering Design report delivered in the framework of the BA phase I. The activities will be devoted to the enhancement of the design of the Lithium loop and the update of the Fusion Neutron Source Design focusing on the design activities for safety and accidental scenarios.

- IFERC:
  The IFERC project comprises three activities, DEMO design and R&D activities, CSC (Computational Simulation Centre) and REC (Remote Experimentation Centre).
  - The DEMO Design Activity (DDA) has focused on the definition of joint design work in key issues, which will impact the selection of main machine parameters and technical specifications for pre-conceptual designs of DEMO. In the DEMO R&D activity, the focus is on the compilation of the databases and engineering design handbooks.
  - In the CSC activity, joint EU-JA simulation project activities have continued, sharing Japanese and European supercomputers.
  - REC activities support actively the remote participation in IFMIF/EVEDA and JT-60SA Projects.

DONES

DONES (DEMO-Oriented Neutron Source) is a facility to provide a source of neutrons to test materials under conditions expected in fusion reactors so to evaluate their lifetime. This project aims to build upon the knowledge gained with the IFMIF/EVEDA project in the Broader Approach.

F4E's role in relation to DONES is to support any European host state candidate in its preparations for the project and to support negotiations between Euratom and Japan on the possible implementation of this project in the frame of an international collaboration. Fusion for Energy also aspires to contribute to the construction of DONES with the delivery of the main Accelerator System – a component which F4E is currently engaged to test in a full scale prototype form in the IFMIF/EVEDA project of the Broader Approach (Rokkasho – Japan).

A yearly 20 M€ budget (2008 value) for DONES was foreseen as of 2023 for a period of 5 years under the above assumption. Such plans are clearly still very provisional and any future work by F4E on DONES will need to be approved by the F4E GB once a global plan for the project is concluded with all stakeholders.

2.3 DEMO

F4E's task is to prepare and coordinate a programme of activities in preparation for the construction of a demonstration fusion reactor and related facilities. F4E is working closely on DEMO with EUROfusion (a European consortium of fusion laboratories) to which it has seconded a person and will increase its involvement as the construction of ITER will be progressively completed.

In particular, as first programmes of ITER in kind delivery will ramp down during the period of this SPD, F4E will ensure that the know-how gained in these programmes will benefit the DEMO research and design activities. F4E will increase its involvement by partly or fully making available a few key persons from those programmes.

Section II. Project Plan 2022-2026

In accordance with the Financial Regulation of F4E, this programming document is composed of a Project Plan (PP) that lays down an overall strategic programing foreseen to cover five years (i.e. 2022-2026). The Resource Estimate Plan (REP) complements it and covers the same period.
Within the scope of the Broader Approach programme, this document covers three individual projects: Satellite Tokamak Programme, IFMIF/EVEDA and IFERC (International Fusion Energy Research Centre).
DEMO, still in a far earlier stage if compared to ITER or BA, is also presented here with the provision of high level information.

Challenges

F4E is facing a number of significant challenges in technical, procurement, budget and human resource areas.

Technical and Procurement challenges

The most significant challenges for F4E are related to its major task of delivering the EU in-kind contributions to ITER. The nature of the F4E activities with respect to ITER is changing throughout its lifecycle. While at the beginning the focus was on the launching of the procurement of the EU in-kind components, the work has evolved into the follow-up of the manufacturing activities and will further evolve in the coming years with a higher degree of involvement in the assembly and testing of the machine.
The next years, covered by this SPD, represent the peak workload for the organization. Very significant efforts will be required to maintain the programme schedule through to the major milestone of First Plasma and for the preparatory work for the subsequent assembly phases. F4E will face the parallel activities of launching a large number of new contracts, while at the same time managing the ongoing delivery of the running contracts and supporting ITER IO with assembly.

Budgetary challenges

The budgetary sections of the document comply with the figures of the MFF 2021-2027 approved by the Council on 22/02/2021. The F4E budget is mainly funded by EURATOM members (mainly through the European Commission), France (additional host state funding) and most likely also UK once formal agreement is reached.

A very high challenge for F4E will be to avoid any significant cost increases as the project progresses through the increasingly challenging manufacture and test phases, while maintaining the delivery schedules. In the event of schedule delays, the possibility to fund acceleration measures will be limited by budget constraints.

Human Resources challenges

F4E recognises that it must carry out its activities following its statutes, in particular regarding staff regulations, and the associated implementing rules. Balancing the strict requirements of the regulatory framework with the flexibility needed to efficiently respond to the project's changing HR needs will therefore remain a key endeavour for the organisation.

Furthermore, F4E is heavily overloaded as the constraints of the Establishment Plan limit F4E's ability to adapt its workforce to the project needs. F4E compensates for this by engaging external support. The resort to external resources has certain implications in terms of cost benefit that are well understood and for which the organisation continuously improves its management.
Looking forward, F4E will progressively need to transition skills from contract and procurement related activities to supplier management and technical integration ones.

Schedule challenges

The dates provided in this document are according to the F4E Detailed Work Schedule (DWS) at the end of March 2021.

1. PROJECT EVOLUTION

1.1 ITER

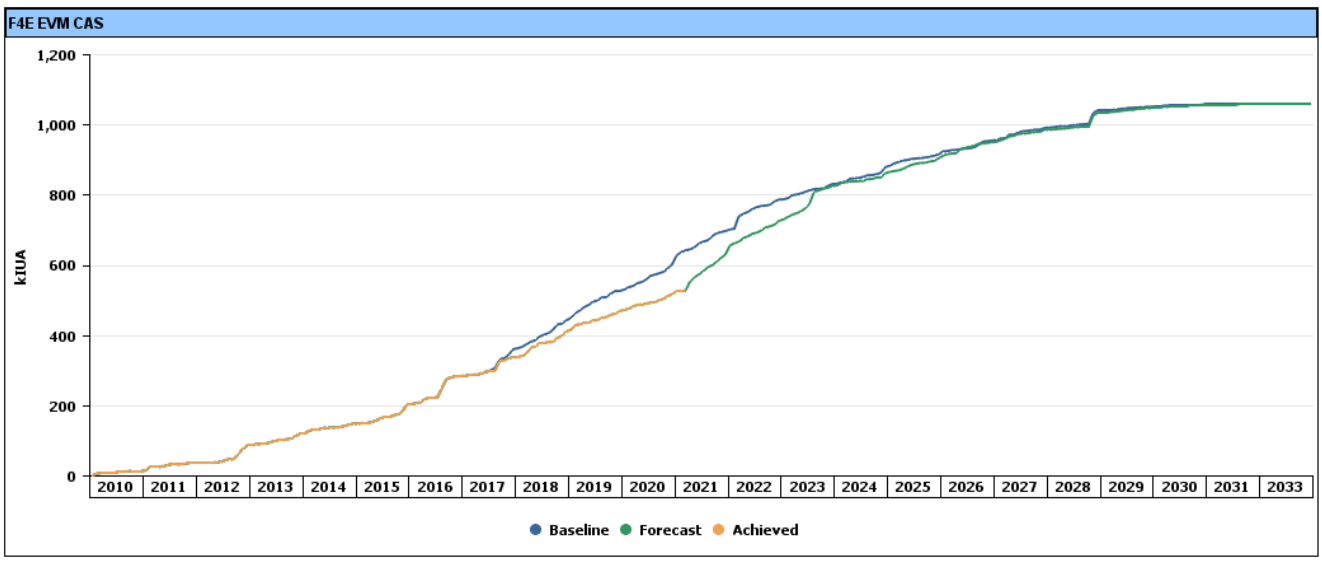
F4E is operating within the classical project 'iron triangle' of time, cost and quality, with quality interpreted in the general sense of achieving all the project scope objectives. This requires a continual balance of prioritisations made at management level, and in the daily work of all the staff.

In 2016, the management of the Project decided to assign the main priority to those activities that are relevant for achieving a FP in 2025. The Revised Construction Strategy with the definition of Required Arrival Dates (RAD) is also in-line with this approach and remains consistent with the Baseline-2016 dates of Cryostat Closure by December 2024 and First Plasma by December 2025. F4E notes that the overall ITER schedule is under review by the ITER Organisation and ITER Council taking into account the impacts of Covid-19 and other events.

As noted above, F4E is now at the peak period of its activities to deliver the various components under its responsibility to IO. The success of this will be critically dependent upon several factors:

- The performance of the various suppliers, and their ability to overcome the inevitable technical challenges and maintain the schedule and quality through the delivery;
- F4E's management of the suppliers, working with them to ensure a good performance in terms of schedule, quality and cost;
- The avoidance of changes in requirements, design and/or interfaces of the various components to ensure a smooth progression into production and test without perturbations. This has been a significant problem in the past, and considerable efforts have been devoted by both IO and F4E to achieving a stability in requirements and design.

The graph in Fig. 10 shows the ITER credit achieved until end of March 2021, and the forecast, compared to the 2016 baseline.



SPD_figure 11 . Credit Graph for all EU in-kind procurements

SPD_table 3 hereafter shows the progress, for all actions for ITER in kind deliveries, in terms of both achieved and released credits against the baseline as well as the forecast of credits for the next five years.

While the total credit value per action is largely stable as modifications would need the approval of the ITER Council through the Overall Project Cost (OPC) document, the credit profile over the years is prone to changes due to many reasons (e.g. delays in the schedule, change of strategy in specific procurements or modification of the IO assembly sequence).

Action*		Baseline to end March 2021 (kIUA)	Achieved Credit (kIUA)	Released Credit (kIUA)	2021	2022	2023	2024	2025	2026	2027+
Number	Name	641.27737	527.33381	482.13606	102.59744	95.60061	99.28646	36.36155	42.31756	45.58097	108.34873
Action 1	Magnets	145.85481	140.30081	130.64681	18.61600	19.01200	5.49500	2.39500	0.00000	0.00000	0.00000
Sub-action 2	Vacuum Vessel	86.00393	55.30400	40.57700	14.49300	13.66900	3.53793	0.00000	0.00000	0.00000	0.00000
Sub-action 3	In Vessel- Blanket	0.30000	0.30000	0.20000	0.15000	0.65000	0.55000	9.54200	5.83400	13.76300	13.97001
Sub-action 4	In Vessel- Divertor	3.67500	3.67500	2.19000	0.00000	0.11500	0.85500	1.92000	3.80000	5.03500	10.26000
Action 5	Remote Handling	5.02000	3.70000	1.10000	1.32000	4.29974	6.46000	3.75000	3.30000	5.88650	11.18431
Action 6	Cryoplant and Fuel Cycle	28.68013	26.84473	26.69154	3.53540	3.77503	5.38141	1.82200	0.15319	0.30000	0.30000
Action 7	Antenna and Plasma Engineering	1.17410	1.12410	0.50000	2.18225	2.55450	2.18240	2.18240	2.30635	0.05000	0.10000
Action 8	Neutral Beam and EC Power Supplies and Sources	37.81300	36.30300	29.46300	5.48972	5.27800	8.92000	7.16300	4.43502	3.12502	6.67078
Action 9	Diagnostics	3.46852	3.34960	2.40951	0.97617	3.19388	3.49247	2.40503	5.43364	3.47539	8.27303
Action 11	Site and Buildings and Power Supplies	329.28788	256.43257	248.35820	55.83490	43.05346	62.41225	5.18212	17.05536	13.94606	57.59060

* Sub-action 10 TBM, action 12 Cash Contributions and action 13 Technical Support Activities are not listed in the above table since no kIUA are associated to these actions. Action 14 Broader Approach uses kBAUA instead of kIUA (see full table under PP_table 8 on page 81)

SPD_table 3 . Credit per Action[6]

The maturity of each component evolves through a series of phases from design to delivery as normal for any development project. The transition from one phase to the next is authorized through gates where the maturity of the component to move to the next phase is analyzed by an independent panel. Approval of starting the next phase is granted only after resolution of the class 1 chits raised during the review.

While the design phases and the correspondent reviews could be competence of either ITER IO or F4E, depending on the agreed level of detail of the specific Procurement Arrangement (i.e. functional specifications, detailed design, build-to-print), the reviews for cost and manufacturing are always a F4E responsibility. A policy for the management of the phase gates across F4E has been approved and is being implemented.

[6] **Achieved credit** corresponds to milestones completed by F4E. **Release credit** corresponds to milestones for which F4E received the associated credits (in IUA) from IO.
Figures in column **Baseline** correspond to “Total credit initially planned to be achieved at the end of March 2021”,
Figures in column **Achieved** Credit correspond to “Total achieved credit at the end of March 2021”.
Figures in column **Released** Credit correspond to “Total released credit at the end of March 2021”.
Figures in columns **Forecast** correspond to the “yearly credit to be achieved”.

1.2 Cash contribution to Japan

According to the ITER Agreement, there is a transfer of 10% of in-kind procurement responsibility from Euratom to Japan under the supervision of the ITER Organization. This is financed through a cash contribution from EU to Japan paid by F4E.

1.3 Broader Approach

All BA projects are now in an advanced implementation stage. The early defined strategy to implement these projects has proven to be successful and hence continues to be employed. This is underpinned by the very close collaboration with the Japanese Implementing Agency QST and all other European stakeholders. The management model follows an agreed Common Quality Management System, defining resources and processes crossing the lines between all involved organisations. Such an approach has allowed to control costs and hence will continue to be pursued. For JT-60SA the same strategy is implemented also for the period beyond 2021, that is when the facility is planned to be jointly operated and enhanced by the EU and JA. For IFMIF/EVEDA the R&D results planned to be achieved by the beam commissioning of the LIPAc accelerator should provide solid grounds for its full experimental phase, to follow after 2020, as well as for the design and specification of the DONES accelerator. For IFERC F4E will continue to rely on the full support of EUROfusion for DEMO design activities, R&D activities in materials, and High Power Computing exploitation. F4E will take the lead in Remote Experimentation (REC) activities with IFMIF-EVEDA, ITER and JT-60SA.

1.4 DEMO

EUROfusion is currently most active in DEMO-related activities. It is foreseen that F4E will play a stronger role once ITER activities decrease. A continued and strengthened coordination between F4E and the EUROfusion DEMO activities has been suggested in recent reviews[7]. In particular, it is desirable that F4E gradually becomes more involved on key design decisions, and cost & schedule parameters during the DEMO conceptual design phase and is linked in the EUROfusion Project Governance of the DEMO design activities and other associated supporting technology projects (e.g., ITER TBM and DEMO breeding blanket work packages).
As a step in this direction, a DEMO Programme Steering Board has been established at the end of 2017, with the aim to establish high-level coordination of the DEMO Programme between EUROfusion and F4E, ensuring consistency between design activities and high-level milestones (i.e. IFMIF/DONES, DEMO Design, TBM/BB, BA etc.). F4E is represented by its Director and the Chairman of the Governing Board, EUROfusion is represented by the Programme Manager, the Chair of the General Assembly. In addition, the two Directorates of the EU Commission that are involved in Fusion, namely Research & Technology Development (RTD) and Energy policy (ENER) are represented in this Board together with Industry.

1.5 Collaboration with EUROfusion

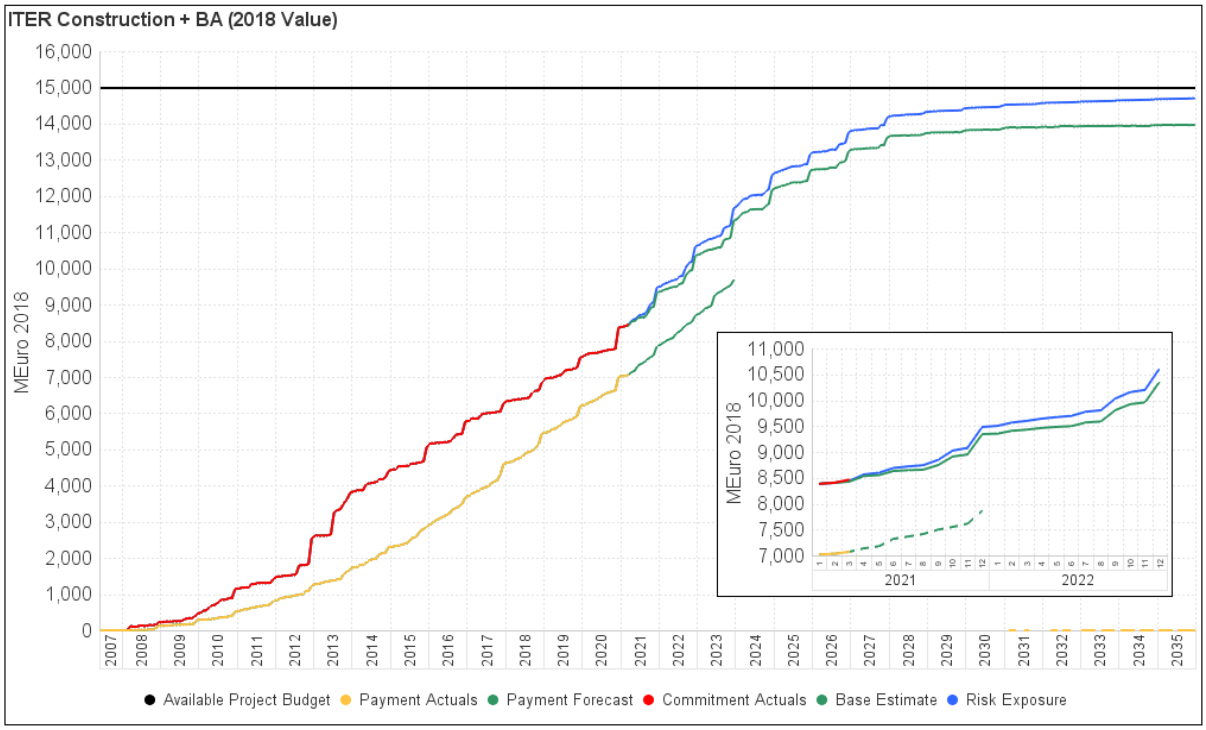
A collaboration with EUROfusion has been implemented on the activities of the ITER Test Blanket Module (TBM) Systems and the BA Projects (i.e. the Satellite Tokamak Programme (JT-60SA), IFMIF/EVEDA, IFERC), etc. A Memorandum of Understanding (MoU) between F4E and EUROfusion

[7] Management / Governance Assessment of EUROfusion & Industry Engagement, 11/07/2016, Ernst & Young

was signed in the areas of their respective fusion research and development activities, on the basis of mutual benefit and overall reciprocity. The collaboration activities within each specific fusion research and development area are further specified in a Multiannual Programme Plan, drawn up and agreed by the Parties.

1.6 F4E financial evolution

The F4E financial evolution is described in the below chart, with achieved values up to March 2021.



SPD_figure 12. Project Budget, Payments, Actual commitments and EAC.

The Allocated Project Budget is the portion of the Total Project Budget allocated to individual PAs, ITAs, TBs and Other funded activities.

The “available budget” is the budget that F4E assumes will be made available for all activities (including Broader Approach, F4E administration and Cash Contributions to IO and Japan) through to the end of the ITER construction phase in 2035.

The Payment Actuals represent the cash disbursement to honor legal obligation.

The Payment Forecast represents the most likely value of all payments in period to be done.

The Commitment Actuals represent the total amount of legal obligations already signed.

EAC Base is computed as the sum of Actual Commitments and the Estimate to Complete Base. Within F4E it does not include Risk Exposure.

The “Estimate to complete Base” are the future planned Commitments.

The “Risk Exposure” is the possible Commitment impact of the risks(s) multiplied by the probability of the risk(s) associated to a given activity.

Multiannual Objectives

This section of the document describes the strategic medium term objectives of F4E and the way the progress in their achievement is monitored.

F4E has a number of key corporate objectives covering important areas, in particular Health & Safety, nuclear safety and some related to stakeholder satisfaction. The ones included here are the most relevant ones to measure the progress of the projects.

F4E's operative objectives are divided in two types:
- Multiannual objectives;
- Annual objectives.

2.1 Selection Criteria

It is important to pick objectives which are not only top-level ones but also representatives of the work to be performed in the forthcoming years. Therefore milestones relevant to design, manufacturing, assembly and commissioning are the ideal candidates.
At the same time, it is important to establish a link between the long-term (i.e. Project Plan) planning and the short-term (i.e. work programme) activities, Therefore, as it can be seen in the work programme annex of this document, the multiannual objectives are mirrored on the annual milestones selected as the predecessors of the long-term ones. Such milestones in the short-term will act as an alert against the increasing risk of missing any critical and near-critical path milestones in the longer term.

Regarding the annual objectives, F4E has selected them to monitor those activities that have been identified during the last years as being most relevant for F4E stakeholders, both external (Commission, EU Member States, IO, etc) and internal. Some of them have been defined after specific request from Commission.

2.2 Multiannual objectives for ITER project

There are 3 multiannual objectives for the ITER Project:

AREA	Objective
GB/IC milestones	Achieve the GB and IC milestones within "agreed quarters"
Schedule Performance Index	SPI above a defined value
Overall Costs	Cost estimation for ITER + Broader Approach for period up to 2027 should be less than the total budget available for this period.

The GB/IC milestones have been selected by ITER Council and F4E Governing Board to represent at best critical achievements for the project and therefore their completion is very important for the progress in the construction of the machine. They are defined with a rolling wave approach with new ones added to the list as the project progresses. They encompass activities required for the first plasma as well as activities covering later phases of the project (see PP_table 2 in Annex to Project Plan).
The GB/IC milestones concern the in-kind procurements and do not include the Test Blanket Module (TBM) for which the work is not covered by a standard Procurement Arrangement, but by specific TBM

Arrangements (TBMA) signed by F4E in 2014. TBM milestones complement the GB/IC milestones as technical objectives and are presented in PP_table 3 of the Annexes to the Project Plan.

2.3 Multiannual objectives for Broader Approach

As of 2020, the Broader Approach focuses on enhancing, operating and exploiting the facilities that have been jointly developed with Japan. As ITER is approaching its own tokamak assembly and commissioning phases, teams working on the Broader Approach will work ever more closely with ITER to ensure that it moves forward as smoothly as possible – the collaboration has been underpinned by an agreement between IO, F4E and QST concluded in 2019.
The technical objectives defined for the period up to March 2026 are listed in PP_tables 4, 5, and 6 of the Annexes to the Project Plan. These simplified tables are largely based on the grouping of the relevant project milestones, originally defined and valorized in the EU (draft or already signed) relevant Procurement Arrangements.

2.4 Multiannual objectives for DEMO

The revised DEMO development plan foresees three phases:

(i) a Pre-Concept Design Phase;
(ii) a Conceptual Design Phase; and
(iii) an Engineering Design Phase.

Specific activities have been identified to be carried out by EUROfusion up to 2022. Some of them are also partially conducted as part of the BA effort.

2.5 Annual objectives

In addition to the multiannual objectives, 6 annual objectives are identified and are constantly monitored by F4E and are reported upon during the year. The annual objectives are the following ones:

AREA	Objective[8]
Work Programme objectives	Implement a minimum percentage of Work Programme objectives *[including GB milestones and predecessors]* by end of the year
Credit Allocation Scheme [CAS]	Reach a minimum percentage of achieved CAS by end of the year
Quality	Reduce number of long aging NCRs compared to total number of open NCRs
Annual budget	Implement minimum percentage of Commitment Appropriations by end of the year
Annual payment	Implement minimum percentage of Payment Appropriations by end of the year
Human Resources	Vacancy rate to be less than a defined value by end of the year

2.6 Key Performance Indicators

A Key Performance Indicator (KPI) is defined for each of the annual and multiannual objectives. The RAG status (Red, Amber, Green status) associated to each of these KPIs is described in the Project Plan.

On request of the Commission the following 2 additional Key Performance Indicators are also monitored:

- Turnover rate
- Absenteeism rate

2.7 Implementation of the F4E strategy to achieve the objectives and define recovery plans

The achievement of the objectives is based on defined strategies. The schedule has been reorganized so as to minimize the risks of delay for the delivery of the components on the critical path. Furthermore, resources have been redistributed to better support the areas where more effort is needed.
The forum for reviewing project progress and taking any necessary actions/decisions to maintain or recover the project status is the Project Steering Meeting (PSM), held once a month with the participation of both senior and middle management. On top of scheduled presentations on progress, KPIs and milestones trend analyses, the Programme managers who have identified a specific issue in their areas are requested to present the reason of the issue and to propose a strategy to recover it. The proposal is discussed and an immediate decision is taken.
Actions are assigned to support the decision taken and due dates for the actions are agreed.

[8] Targets are defined in the Project Plan under section “Objectives and KPIs”

The record of recovery plans and issues arising from KPIs are the Record of Decisions (RoD) of the PSM.

"Red-flagging" and KPI Control Process

The Project Management KPI process runs on a monthly basis in the background of the PSM.
In the case that a KPI is either amber or red, the Programme Manager may propose one of the following alternatives:

- Accept: The Programme Manager proposes in the PSM that the KPI value is accepted. This may be, e.g. because the milestone is not critical, a global commitment is allowed instead of an individual one, etc. If the Director accepts the proposal, the Programme Manager will continue to monitor the KPI and either he/she or the Project Planning and Controlling Group may raise the issue again at a subsequent PSM if the situation regarding the KPI changes or worsens.
- Recover: The Programme Manager presents in the PSM the recovery actions launched to bring back the KPI within the accepted range. A due date is also assigned for the completion of the action.

The Programme Manager will report on its progress in subsequent PSMs. When reporting on a recovery plan, the Programme Manager may propose the following alternatives:

- Close: The Programme Manager demonstrates in the PSM that the KPI has returned within the agreed range;
- Accept: The Programme Manager proposes in the PSM that the current KPI value is accepted. If the Director accepts this proposal, the Programme Manager will continue to monitor the KPI and either he/she or the Project Planning and Controlling Group may raise the issue again at a subsequent PSM if the situation regarding the KPI changes or worsens;
- Continue to recovery: The Programme Manager presents the progress on the existing recovery actions in the PSM and updates the PSM on the time period in which the recovery will be complete.

In the case that the Programme Manager has exhausted all available actions to solve the issue, it should be escalated to the next level of management.

Section III. Resource Estimates Plan

The Resource Estimates Plan (REP) sets out the indicative human and financial resources deemed necessary for the implementation of the Project Plan and the Annual Work Programme of the Joint Undertaking for the following five financial years[9].

The impact of the Strategic Resource plan 2021-2027 is not taken into account in the final version of the SPD 2022-2026 and is introduced in the Draft SPD 2023-2027.

FINANCIAL RESOURCE ESTIMATES PLAN

The EU contribution to ITER for the period 2021-2027 is laid down by the Multi Annual Financial Framework for 2021-2027[10]. The EURATOM contribution to F4E for the whole period 2021 to 2027 is authorised by the last amendment to F4E Constituent act[11], to a total value of EUR 5 614 million of which EUR 5 560 million (in current values) of direct contribution to ITER project.

The ITER Host State and Membership contributions are complementing the EURATOM contribution to F4E budget. The legal frame for establishment of the ITER Host state contribution and its final amount is still subject to the final formal agreement between Euratom and France.

Additional contribution from United Kingdom (UK) is envisaged based on the cooperation agreement between UK and European Commission signed on 25 December 2020. The amount of this contribution, still to be established is not included in the estimates yet.

[9] Article 32 of the F4E Financial Regulation and Communication from the Commission on the Guidelines for Programming Documents for decentralised agencies

[10] COUNCIL REGULATION (EU, Euratom) 2020/2093 of 17 December 2020 laying down the multiannual financial framework for the years 2021 to 2027

[11] COUNCIL DECISION (Euratom) 2021/281 of 22 February 2021 amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it (OJ L62/41 of 23.2.2021)

1. Overview of the past and the current situation

1.1 Budget outturn and Cancellation of appropriations

The budget outturn[12] for 2020 amounting to EUR 1.144 million has increased compared to the outturn for 2019 but it is lower than the outturn in 2018. The breakdown between administrative and operational expenditure for the outturn 2020 includes the correction of the negative operational outturn 2019.

Budget outturn	2018	2019	2020
Revenue actually received (+)	831 182 146.33	728 796 686.37	795 296 133.07
Payments made (-)	810 953 065.56	734 351 750.46	796 738 752.83
Carry-over of appropriations (-)	32 314 863.41	21 374 150.95	15 178 745.76
Cancellation of appropriations carried over (+)	1 064 674.13	910 116.73	933 726.90
Adjustment for carry over of assigned revenue appropriations from previous year (+)	12 338 033.29	26 853 065.07	16 832 766.00
Exchange rate differences (+/-)	- 190.61	- 9 792.63	- 1 305.53
Adjustment for negative balance from previous year (-)			
Total	**1 316 734.17**	**824 174.13**	**1 143 821.85**

SPD_table 4. Budget Outturns for the years 2018, 2019 and 2020

1.2 Execution of Budget 2020

In 2020, F4E has implemented its budget with the continuous engagement on in-kind deliveries to the ITER and the Broader Approach projects.

Commitments	**100% of implementation of the final available budget**	Final Budget: 885.67	Execution: 885.35 EUR million
	108.8% compared to the original budget	Original Budget: 813.61	Execution: 885.35 EUR million
	100.0% in individual commitments	Execution: 885.35	Ind. Commit.: 885.35 EUR million
Payments	**98% of implementation of the final available budget**	Final Budget: 816.46	Execution: 800.35 EUR million
	101.3% compared to the original budget	Original Budget: 789.69	Execution: 800.35 EUR million

SPD_figure 13. Execution of 2020 Budget

[12] The budget outturn for year N-1 shall be return back to EURATOM and reintroduced with budget for year N+1. It is calculated as the total revenue actually cashed deducted by the total payments incurred during the year and further deducted by the appropriations carried over to the following year. It is made of the unused payment appropriations, cancelled at the year-end.

1.3 Budget for 2021

The F4E Governing Board adopted Original Budget 2021 in December 2020. The budget is aligned with the Euratom contribution to F4E set by the final adopted 2021 EU budget.

The first budget amendment[13] is proposed to the Governing Board for its extraordinary meeting on November 5 with the purpose to approve new additional revenue from correction of 2019 administrative outturn and recovery orders from previous year.

A second amendment is proposed to the Governing Board for its extraordinary meeting on November 5 with the purpose to approve, (i) the increase in the EURATOM contribution by EUR 390 000 pending the approval of the European Commission, (ii) the deduction of the Swiss contribution by EUR 516 000 for 2021, with no rights as F4E member due the absence of association agreement with EURATOM in the field of controlled nuclear fusion since December 2020, (iii) the miscellaneous revenue of EUR 10 912 cashed in September 2021 linked to liquidated damages.

F4E has revised the budget nomenclature of the Statement of Expenditure for 2021 as requested in:

(i) Commission opinion on the SDP 2021-2025 to enhance the transparency and the readability of the figures in all type of budget documents;

(ii) ECA recommendation to create a new chapter “External Support Activities” to host the contracted and insourced staff.

The expenditure from external assigned revenue is allocated under new budget Title 4 “Earmarked expenditure” and a new chapter “Other earmarked expenditure” to provide more flexibility for future extensions of budget structure under both operational Titles 3 and Title 4.

2. FINANCIAL OUTLOOK FOR 2022 – 2026

2.1 Assumptions

For the period 2022-2026, the figures for EURATOM contribution to F4E are in line with the last amendment 2021/281 to F4E Constituent Act[14] laying down the financial ceilings for the Joint undertaking for the next MFF 2021-2027.

For 2022, the figures in the REP are aligned to the Commission proposal for EURATOM contribution to F4E Budget as published in Working Document III to EU general draft budget 2022.

[13] The Governing Board in its 50th meeting in July postponed the decision on the adoption first amendment to the Budget 2021 pending the approval of a Vacuum Vessel related plan action. In it 51th extraordinary meeting on October 7, the Governing Board further postponed it adoption to November 5 at 52nd extraordinary meeting.

[14] COUNCIL DECISION (Euratom) 2021/281 of 22 February 2021 amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it (OJ L62/41 of 23.2.2021)

The F4E administrative budget for 2022 will be covered by the dedicated EURATOM contribution, and by the membership contributions to the Joint Undertaking if needed. The forecast for budget 2022 is based on the following main assumptions:

- Annual salary adjustment: 2.0% for 2022 based on Brussels as reference with correction for the cost of living in Spain;
- Vacancy rate[15]: 2.0%;
- Inflation coefficient on other administrative expenditure: 2.0%;
- Other factors (allowances, promotions, advancements in step).

The F4E operational budget for 2022 is based on the EURATOM contribution for the MFF 2021-2027, the contributions from the ITER Host state and the F4E members for 2022. The amount of the ITER Host State Contribution is still subject to the final agreement between Euratom and France.

The main F4E operational activities in 2022 will be covered under two budget chapters: ITER construction including the site preparation and ITER Host State (IHS) contribution for the ITER construction that complements the first chapter for the ITER construction. The biggest part of the operational budget for 2022 will be spent for the provision of the cash contribution to ITER due for year 2023, followed by the, Buildings and Power supplies for the ITER site in Cadarache, In Vessel, Broader Approach, Neutral Beam programmes.

The F4E Financial Regulation foresees the possibility to make the unused appropriations available again as revenue in subsequent budgetary years according to the project needs. F4E plans to reintroduce whenever needed the amount of EUR 17.6 million of commitment appropriations cancelled by the end of September 2021.

For years 2023-2026, the figures are indicative and subject to the outcome of the respective budgetary procedure.

The tables below show the Estimates of Revenue and Expenditure for the next five years, from 2022 to 2026, the execution for 2020 and current budget 2021, including amendment 2 proposed to the Governing Board. The explanatory notes of the Estimates for revenue and expenditure are provided in the annexes.

[15] Estimate at the end of 2022

2.2 Estimate of Revenue in Commitment Appropriations for next five years

REVENUE Commitment appropriations (EUR)	2020 Execution	2021 Estimated Budget available AM2	2021 Forecast	2021 VAR 2021/20	2022 Budget	2022 VAR 2022/21	2023 Planned needs	2023 VAR 2023/22	2024 Planned needs	2024 VAR 2024/23	2025 Planned needs	2025 VAR 2025/24	2026 Planned needs	2026 VAR 2026/25
1 REVENUE FROM FEES AND CHARGES														
2. EU CONTRIBUTION	**390 085 340**	**857 957 197**	**857 957 197**	**119.9%**	**703 990 455**	**-17.9%**	**1 012 304 412**	**43.8%**	**798 605 078**	**-21.1%**	**682 298 966**	**-17.0%**	**848 363 486**	**19.6%**
Administrative (To Title 1 and 2)	*52 781 500*	*62 483 826*	*62 483 826*	*18.4%*	*65 043 221*	*4.1%*	*65 008 173*	*-0.1%*	*66 308 336*	*2.0%*	*67 634 503*	*2.0%*	*68 987 193*	*2.0%*
Operational (To Title 3)	*336 239 356*	*794 649 197*	*794 649 197*	*136.3%*	*637 938 663*	*-19.7%*	*947 296 239*	*48.5%*	*732 296 742*	*-22.7%*	*614 664 463*	*-19.1%*	*779 376 293*	*21.1%*
Recovery from previous years administrative	*1 064 484*	*824 174*	*824 174*	*-22.6%*	*1 008 571*									
Recovery from previous years operational														
3 THIRD PARTIES CONTRIBUTION	**86 590 850**	**190 683 100**	**190 683 100**	**120.2%**	**150 500 000**	**-21.1%**	**220 200 000**	**46.3%**	**169 200 000**	**-23.2%**	**141 800 000**	**-19.3%**	**174 800 000**	**18.9%**
Of which ITER Host State contribution	*80 490 850*	*184 700 000*	*184 700 000*	*129.5%*	*143 800 000*	*-22.1%*	*213 100 000*	*48.2%*	*162 000 000*	*-24.0%*	*134 500 000*	*-20.4%*	*167 300 000*	*19.6%*
Of which Membership contribution	*6 100 000*	*5 983 100*	*5 983 100*	*-1.9%*	*6 700 000*	*12.0%*	*7 100 000*	*6.0%*	*7 200 000*	*1.4%*	*7 300 000*	*1.4%*	*7 500 000*	*2.7%*
Of which United Kingdom contribution														
4 MISCELLANOUS REVENUE	**1 324 715**	**12 091**	**12 091**	**-99.1%**										
5 ADMINISTRATIVE OPERATIONS														
6 REVENUES FROM SERVICES RENDERED AGAINST PAYMENT														
7 CORRECTION OF BUDGETARY IMBALANCES														
8 INTERESTS GENERATED														
9 UNUSED APPROPRIATIONS FROM PREVIOUS YEARS - CARRIED OVER	**2 572 784**	**536 653**	**536 653**	**-79.1%**										
9 BIS UNUSED APPROPRIATIONS FROM PREVIOUS YEARS - MADE AVAILABLE AGAIN	**390 696 539**												**17 568 557**	
TOTAL REVENUE	**871 270 227**	**1 049 189 042**	**1 049 189 042**	**20.4%**	**854 490 455**	**-18.6%**	**1 232 504 412**	**44.2%**	**967 805 078**	**-21.5%**	**824 098 966**	**-17.4%**	**1 040 732 043**	**20.8%**
ADDITIONAL REVENUE	**14 398 842**	**19 918 485**	**19 918 485**	**38.3%**	**17 190 000**	**-13.7%**	**17 530 000**	**2.0%**	**41 850 000**	**138.7%**	**18 240 000**	**-129.4%**	**18 610 000**	**2.0%**
Revenue from ITER Organization	*10 196 552*	*18 037 252*	*18 037 252*	*77%*	*17 190 000*	*-4.7%*	*17 530 000*	*2.0%*	*41 850 000*	*138.7%*	*18 240 000*	*-129.4%*	*18 610 000*	*2.0%*
Revenue from ITER Organization carried over	*3 816 705*	*286 888*	*286 888*	*-92.5%*										
Other Assigned Revenue		*1 399 516*	*1 399 516*	*-*										
Recoveries	*185 101*	*161 668*	*161 668*	*-12.7%*										
Recoveries carried over	*200 484*	*33 162*	*33 162*	*-83.5%*										
TOTAL REVENUE AVAILABLE	**885 669 069**	**1 069 107 527**	**1 069 107 527**	**20.7%**	**871 680 455**	**-18.5%**	**1 250 034 412**	**43.4%**	**1 009 655 078**	**-19.2%**	**842 338 966**	**-19.9%**	**1 059 342 043**	**20.5%**

Note 1: the 2020 figures for the third parties contribution differs from the Draft Budget request 2022 because the carried over are presented separately in the REP (cf. 9 unused appropriations from previous years)
Note 2: The figures for the ITER Host State contribution are indicative as the new calculation methodology is still under discussion between France and Euratom indicativethe 2023-2026 breakdown is only indicative subject to the outcome of the budget procedure
Note 3: The 2023-2026 breakdown is only indicative subject to the outcome of the budget procedure

SPD_table 5. Revenue in Commitment Appropriations for 2020-2026

2.3 Estimate of Revenue in Payment Appropriations for next five years

REVENUE Payment appropriations	2020 Execution	2021 Estimated Budget available AM2	2021 Estimated Budget available AM2 (including admin carry over)	2021 Forecast	2021 VAR 2021/20	2022 Budget	2022 VAR 2022/21	2023 Planned needs	2023 VAR 2023/22	2024 Planned needs	2024 VAR 2024/23	2025 Planned needs	2025 VAR 2025/24	2026 Planned needs	2026 VAR 2026/25
1 REVENUE FROM FEES AND CHARGES															
2. EU CONTRIBUTION	**633 593 734**	**607 601 868**	**607 601 868**	**607 601 868**	**-4.1%**	**689 954 958**	**13.6%**	**716 013 893**	**3.8%**	**704 346 903**	**-1.6%**	**741 402 137**	**5.0%**	**646 129 617**	**-14.7%**
Administrative (To Title 1 and 2)	*52 781 500*	*62 483 826*	*62 483 826*	*62 483 826*	*18.4%*	*65 043 221*	*4.1%*	*65 008 173*	*-0.1%*	*66 308 336*	*2.0%*	*67 634 503*	*2.0%*	*68 987 193*	*2.0%*
Operational (To Title 3)	*579 495 500*	*544 293 868*	*544 293 868*	*544 293 868*	*-6.1%*	*623 767 915*	*14.6%*	*651 005 720*	*4.4%*	*638 038 567*	*-2.0%*	*673 767 634*	*5.3%*	*577 142 424*	*-16.7%*
Recovery from previous years administrative	*1 064 484*	*824 174*	*824 174*	*824 174*	*-22.6%*	*1 008 571*									
Recovery from previous years operational	*252 251*				*-*	*135 251*									
3 THIRD PARTIES CONTRIBUTION	**156 100 000**	**135 083 100**	**135 083 100**	**135 083 100**	**-13.5%**	**155 500 000**	**15.1%**	**150 500 000**	**-3.2%**	**148 700 000**	**-1.2%**	**152 300 000**	**2.4%**	**147 500 000**	**-3.3%**
Of which ITER Host State contribution	*150 000 000*	*129 100 000*	*129 100 000*	*129 100 000*	*-13.9%*	*148 800 000*	*15.3%*	*143 400 000*	*-3.6%*	*141 500 000*	*-1.3%*	*145 000 000*	*2.5%*	*140 000 000*	*-3.4%*
Of which Membership contribution	*6 100 000*	*5 983 100*	*5 983 100*	*5 983 100*	*-1.9%*	*6 700 000*	*12.0%*	*7 100 000*	*6.0%*	*7 200 000*	*1.4%*	*7 300 000*	*1.4%*	*7 500 000*	*2.7%*
Of which United Kingdom contribution															
4 MISCELLANOUS REVENUE	**542 423**	**12 091**	**12 091**	**12 091**	**-97.8%**										
5 ADMINISTRATIVE OPERATIONS															
6 REVENUES FROM SERVICES RENDERED AGAINST PAYMENT															
7 CORRECTION OF BUDGETARY IMBALANCES															
8 INTERESTS GENERATED															
9 UNUSED APPROPRIATIONS FROM PREVIOUS YEARS - CARRIED OVER	**4 541 952**		**3 535 437**	**3 535 437**	**-22.2%**										
TOTAL REVENUE	**794 778 110**	**742 697 059**	**746 232 497**	**746 232 497**	**-6.6%**	**845 454 958**	**13.8%**	**866 513 893**	**2.5%**	**853 046 903**	**-1.6%**	**893 702 137**	**4.5%**	**793 629 617**	**-12.6%**
ADDITIONAL REVENUE	**21 681 342**	**18 398 501**	**18 398 501**	**18 398 501**	**-15.1%**	**25 000 000**	**35.9%**	**25 000 000**	**0.0%**	**23 960 000**	**-4.2%**	**25 000 000**	**4.2%**	**25 000 000**	**0.0%**
Revenue from ITER Organization	*4 663 475*	*5 194 009*	*5 194 009*	*5 194 009*	*11.4%*	*25 000 000*	*381.3%*	*25 000 000*	*0.0%*	*23 960 000*	*-4.2%*	*25 000 000*	*4.2%*	*25 000 000*	*0.0%*
Revenue from ITER Organization carried over	*16 632 282*	*11 610 147*	*11 610 147*	*11 610 147*	*-30.2%*										
Other Assigned Revenue		*1 399 516*	*1 399 516*	*1 399 516*	*-*										
Recoveries	*185 101*	*161 668*	*161 668*	*161 668*	*-12.7%*										
Recoveries carried over	*200 484*	*33 162*	*33 162*	*33 162*	*-83.5%*										
TOTAL REVENUE AVAILABLE	**816 459 451**	**761 095 560**	**764 630 998**	**764 630 998**	**-6.8%**	**870 454 958**	**14.4%**	**891 513 893**	**2.4%**	**877 006 903**	**-1.6%**	**918 702 137**	**4.5%**	**818 629 617**	**-12.2%**

Note 1: the 2020 figures for the miscellanous revenue differs from the Draft Budget request 2022 because the REP make the distinction between the budgeted miscellaneous revenue and the recoveries (cf. additional revenue recoveries and recoveries carried over)

Note 2: The figures for the ITER Host State contribution are indicative as the new calculation methodology is still under discussion between France and Euratom indicativethe 2023-2026 breakdown is only indicative subject to the outcome of the budget procedure

SPD_table 6. Revenue in Payment Appropriations for 2020-2026

2.4 Expenditure in Commitment Appropriations for next five years

EXPENDITURE In Commitment Appropriations (EUR)	2020	2021			2022			2023		2024		2025		2026	
	Execution	Estimated Budget available AM2	Forecast	VAR 2021/20	Budget	Forecast	VAR 2022/21	Planned needs	VAR 2023/22	Planned needs	VAR 2024/23	Planned needs	VAR 2025/24	Planned needs	VAR 2026/25
Total Title 1 & Title 2 Administrative Expenditure	**59 223 413**	**63 361 711**	**63 295 681**	**7.0%**	**66 051 792**	**68 772 823**	**4.25%**	**71 113 893**	**7.66%**	**72 006 903**	**1.26%**	**73 102 137**	**1.52%**	**75 529 617**	**3.32%**
Title 1 Staff Expenditure	**51 882 160**	**54 581 177**	**54 357 035**	**5.2%**	**57 347 992**	**58 802 862**	**5.1%**	**61 505 893**	**7.3%**	**62 204 903**	**1.1%**	**63 103 137**	**1.4%**	**65 330 617**	**3.5%**
Salaries & allowances	47 187 713	48 596 000	48 491 935	3.0%	50 888 372	51 551 562	4.7%	54 485 893	7.1%	55 100 903	1.1%	55 767 137	1.2%	57 752 617	3.6%
Establishment plan posts	*35 897 721*	*37 198 000*	*37 528 396*	*3.6%*	*38 981 810*	*39 645 000*	*4.8%*	*41 813 892*	*7.3%*	*42 404 643*	*1.4%*	*42 991 327*	*1.4%*	*44 579 558*	*3.7%*
External staff	*11 289 992*	*11 398 000*	*10 963 539*	*1.0%*	*11 906 562*	*11 906 562*	*4.5%*	*12 672 000*	*6.4%*	*12 696 261*	*0.2%*	*12 775 810*	*0.6%*	*13 173 059*	*3.1%*
Expenditure relating to Staff recruitment	692 910	685 000	671 000	-1.1%	814 000	814 000	18.8%	857 000	5.3%	874 000	2.0%	891 000	1.9%	909 000	2.0%
Mission expenses	225 819	650 771	250 000	188.2%	582 000	582 000	-10.6%	800 000	37.5%	816 000	2.0%	832 000	2.0%	849 000	2.0%
Socio-medical infrastructure	343 200	500 000	533 000	45.7%	504 000	504 000	0.8%	531 000	5.4%	542 000	2.1%	553 000	2.0%	564 000	2.0%
Training	639 238	689 000	719 900	7.8%	676 620	942 300	-1.8%	712 000	5.2%	726 000	2.0%	741 000	2.1%	756 000	2.0%
External Services		570 000	669 800	-	550 000	830 000	-3.5%	561 000	2.0%	572 000	2.0%	583 000	1.9%	595 000	2.1%
Receptions, events and representation	500	10 000	1 000	1900.0%	10 000	10 000	0.0%	10 000	0.0%	10 000	0.0%	10 000	0.0%	10 000	0.0%
Social welfare	46 000	47 000	55 000	2.2%	46 000	46 000	-2.1%	49 000	6.5%	50 000	2.0%	51 000	2.0%	52 000	2.0%
Other Staff related expenditure	2 746 781	2 833 406	2 965 400	3.2%	3 277 000	3 523 000	15.7%	3 500 000	6.8%	3 514 000	0.4%	3 675 000	4.6%	3 843 000	4.6%
Title 2 Infrastructure and operating expenditure	**7 341 253**	**8 780 533**	**8 938 646**	**19.6%**	**8 703 800**	**9 969 961**	**-0.9%**	**9 608 000**	**10.4%**	**9 802 000**	**2.0%**	**9 999 000**	**2.0%**	**10 199 000**	**2.0%**
Rental of buildings and associated costs	1 426 164	1 474 047	1 423 500	3.4%	1 499 000	1 688 000	1.7%	1 564 000	4.3%	1 596 000	2.0%	1 629 000	2.1%	1 662 000	2.0%
Information, communication technology and data proc.	3 609 616	3 960 325	4 121 000	9.7%	3 935 000	4 175 000	-0.6%	4 259 000	8.2%	4 345 000	2.0%	4 432 000	2.0%	4 521 000	2.0%
Movable property and associated costs	234 200	369 000	327 000	57.6%	375 000	460 000	1.6%	414 000	10.4%	422 000	1.9%	430 000	1.9%	438 000	1.9%
Current administrative expenditure	1 196 481	1 638 000	1 762 055	36.9%	1 616 000	2 001 799	-1.3%	1 947 000	20.5%	1 986 000	2.0%	2 026 000	2.0%	2 067 000	2.0%
Postage / Telecommunications	448 200	531 000	544 000	18.5%	547 000	712 000	3.0%	590 000	7.9%	602 000	2.0%	614 000	2.0%	626 000	2.0%
Meeting expenses	146 950	469 000	414 250	219.2%	443 000	594 000	-5.5%	527 000	19.0%	537 000	1.9%	547 000	1.9%	557 000	1.8%
Running costs linked to operational activities		33 162	33 162	-		33 162									
Information and publishing	46 000	40 000	17 054	-13.0%	38 000	40 000	-5.0%	36 000	-5.3%	37 000	2.8%	38 000	2.7%	39 000	2.6%
Studies															
Other infrastructure and operating expenditure	233 642	266 000	296 625	13.8%	250 800	266 000	-5.7%	271 000	8.1%	277 000	2.2%	283 000	2.2%	289 000	2.1%
Total Title 3 & Title 4 Operational Expenditure	**823 537 434**	**1 005 745 816**	**1 005 811 846**	**22.1%**	**805 628 663**	**802 907 632**	**-19.9%**	**1 178 920 519**	**46.3%**	**937 648 175**	**-20.5%**	**769 236 829**	**-18.0%**	**983 812 426**	**27.9%**
Title 3 Operational expenditure	**726 747 432**	**800 785 507**	**800 851 537**	**10.2%**	**644 638 663**	**641 917 632**	**-19.5%**	**948 290 519**	**47.1%**	**733 798 175**	**-22.6%**	**616 496 829**	**-16.0%**	**797 902 426**	**29.4%**
ITER construction including site preparation	688 708 900	756 785 849	756 851 879	9.9%	569 331 726	566 610 695	-24.8%	839 252 519	47.4%	627 335 175	-25.3%	512 359 829	-18.3%	641 747 426	25.3%
Technology for ITER and DEMO	800 134	6 299 857	6 299 857	687.3%	4 339 492	4 339 492	-31.1%	11 838 000	173%	7 763 000	-34.4%	4 037 000	-48.0%	54 555 000	1251.4%
Technology for Broader Approach	19 390 300	13 544 091	13 544 091	-30.2%	41 009 373	41 009 373	202.8%	43 300 000	5.6%	44 200 000	2.1%	45 100 000	2.0%	46 000 000	2.0%
Technology for DONES								28 900 000		29 500 000	-	30 000 000	1.7%	30 600 000	2.0%
External Support Activities		18 257 931	18 257 931	-	24 156 472	24 156 472	32.3%	20 000 000	-17.2%	20 000 000	0.0%	20 000 000	0.0%	20 000 000	0.0%
Other Operational Expenditure	17 848 098	5 897 778	5 897 778	-67.0%	5 801 600	5 801 600	-1.6%	5 000 000	-13.8%	5 000 000	0.0%	5 000 000	0.0%	5 000 000	0.0%
Title 4 Earmaked Expenditure	**96 790 002**	**204 960 309**	**204 960 309**	**111.8%**	**160 990 000**	**160 990 000**	**-21.5%**	**230 630 000**	**43.3%**	**203 850 000**	**-11.6%**	**152 740 000**	**-25.1%**	**185 910 000**	**21.7%**
ITER construction- from ITER host state contribution	83 063 634	185 236 653	185 236 653	123.0%	143 800 000	143 800 000	-22.4%	213 100 000	48.2%	162 000 000	-24.0%	134 500 000	-17.0%	167 300 000	24.4%
Tasks from ITER Organization	13 726 369	18 324 140	18 324 140	33.5%	17 190 000	17 190 000	-6.2%	17 530 000	2.0%	41 850 000	138.7%	18 240 000	-56.4%	18 610 000	2.0%
Other Earmarked expenditure		1 399 516	1 399 516	-											
TOTAL EXPENDITURE	**882 760 847**	**1 069 107 527**	**1 069 107 527**	**21.1%**	**871 680 455**	**871 680 455**	**-18.5%**	**1 250 034 412**	**43.4%**	**1 009 655 078**	**-19.2%**	**842 338 966**	**-16.6%**	**1 059 342 043**	**25.8%**

SPD_table 7. Expenditure in Commitment Appropriations for 2020-2026

2.5 Expenditure in Payment Appropriations for next five years

EXPENDITURE In Payment Appropriations (EUR)	2020	2021				2022			2023		2024		2025		2026	
	Execution	Estimated Budget available AM2	Estimated Budget available AM2 (including admin carry over)	Forecast (including admin carry over)	VAR 2021/20	Budget	Forecast	VAR 2022/21	Planned needs	VAR 2023/22	Planned needs	VAR 2024/23	Planned needs	VAR 2025/24	Planned needs	VAR 2026/25
Total Title 1 & Title 2 Administrative Expenditure	**59 295 634**	**63 361 711**	**66 897 148**	**66 831 118**	**6.9%**	**66 051 792**	**68 772 823**	**4.2%**	**71 113 893**	**7.7%**	**72 006 903**	**1.3%**	**73 102 137**	**1.5%**	**75 529 617**	**3.3%**
Title 1 Staff Expenditure	**51 858 421**	**54 581 177**	**55 555 404**	**55 331 262**	**5.3%**	**57 347 992**	**58 802 862**	**5.1%**	**61 505 893**	**7.3%**	**62 204 903**	**1.1%**	**63 103 137**	**1.4%**	**65 330 617**	**3.5%**
Salaries & allowances	47 132 140	48 596 000	48 757 359	48 653 294	3.1%	50 888 372	51 551 562	4.7%	54 485 893	7.1%	55 100 903	1.1%	55 767 137	1.2%	57 752 617	3.6%
Establishment plan posts	*35 897 721*	*37 198 000*	*37 198 000*	*37 528 396*	*3.6%*	*38 981 810*	*39 645 000*	*4.8%*	*41 813 892*	*7.3%*	*42 404 643*	*1.4%*	*42 991 327*	1.4%	*44 579 558*	3.7%
External staff	*11 234 419*	*11 398 000*	*11 559 359*	*11 124 898*	*1.5%*	*11 906 562*	*11 906 562*	*4.5%*	*12 672 000*	*6.4%*	*12 696 261*	*0.2%*	*12 775 810*	0.6%	*13 173 059*	3.1%
Expenditure relating to Staff recruitment	706 182	685 000	716 515	702 515	-3.0%	814 000	814 000	18.8%	857 000	5.3%	874 000	2.0%	891 000	1.9%	909 000	2.0%
Mission expenses	653 219	650 771	736 414	335 642	-0.4%	582 000	582 000	-10.6%	800 000	37.5%	816 000	2.0%	832 000	2.0%	849 000	2.0%
Socio-medical infrastructure	343 200	500 000	654 117	687 117	45.7%	504 000	504 000	0.8%	531 000	5.4%	542 000	2.1%	553 000	2.0%	564 000	2.0%
Training	439 085	689 000	1 091 687	1 122 587	56.9%	676 620	942 300	-1.8%	712 000	5.2%	726 000	2.0%	741 000	2.1%	756 000	2.0%
External Services		570 000	570 000	669 800	-	550 000	830 000	-3.5%	561 000	2.0%	572 000	2.0%	583 000	1.9%	595 000	2.1%
Receptions, events and representation	932	10 000	10 060	1 060	973.1%	10 000	10 000	0.0%	10 000	0.0%	10 000	0.0%	10 000	0.0%	10 000	0.0%
Social welfare	46 000	47 000	80 080	88 080	2.2%	46 000	46 000	-2.1%	49 000	6.5%	50 000	2.0%	51 000	2.0%	52 000	2.0%
Other Staff related expenditure	2 537 664	2 833 406	2 939 173	3 071 167	11.7%	3 277 000	3 523 000	15.7%	3 500 000	6.8%	3 514 000	0.4%	3 675 000	4.6%	3 843 000	4.6%
Title 2 Infrastructure and operating expenditure	**7 437 212**	**8 780 533**	**11 341 744**	**11 499 856**	**18.1%**	**8 703 800**	**9 969 961**	**-0.9%**	**9 608 000**	**10.4%**	**9 802 000**	**2.0%**	**9 999 000**	**2.0%**	**10 199 000**	**2.0%**
Rental of buildings and associated costs	1 483 947	1 474 047	1 877 987	1 827 441	-0.7%	1 499 000	1 688 000	1.7%	1 564 000	4.3%	1 596 000	2.0%	1 629 000	2.1%	1 662 000	2.0%
Information, communication technology and data proc.	3 814 437	3 960 325	5 362 996	5 523 671	3.8%	3 935 000	4 175 000	-0.6%	4 259 000	8.2%	4 345 000	2.0%	4 432 000	2.0%	4 521 000	2.0%
Movable property and associated costs	139 582	369 000	523 312	481 312	164.4%	375 000	460 000	1.6%	414 000	10.4%	422 000	1.9%	430 000	1.9%	438 000	1.9%
Current administrative expenditure	1 199 775	1 638 000	1 849 045	1 973 100	36.5%	1 616 000	2 001 799	-1.3%	1 947 000	20.5%	1 986 000	2.0%	2 026 000	2.0%	2 067 000	2.0%
Postage / Telecommunications	381 078	531 000	701 107	714 107	39.3%	547 000	712 000	3.0%	590 000	7.9%	602 000	2.0%	614 000	2.0%	626 000	2.0%
Meeting expenses	199 275	469 000	525 370	470 620	135.4%	443 000	594 000	-5.5%	527 000	19.0%	537 000	1.9%	547 000	1.9%	557 000	1.8%
Running costs linked to operational activities		33 162	33 162	33 162	-		33 162									
Information and publishing	46 000	40 000	41 293	18 347	-13.0%	38 000	40 000	-5.0%	36 000	-5.3%	37 000	2.8%	38 000	2.7%	39 000	2.6%
Studies																
Other infrastructure and operating expenditure	173 119	266 000	427 472	458 097	53.7%	250 800	266 000	-5.7%	271 000	8.1%	277 000	2.2%	283 000	2.2%	289 000	2.1%
Total Title 3 & Title 4 Operational Expenditure	**740 953 607**	**697 733 850**	**697 733 850**	**697 799 880**	**-5.83%**	**804 403 166**	**801 682 135**	**15.29%**	**820 400 000**	**1.99%**	**805 000 000**	**-1.88%**	**845 600 000**	**5.04%**	**743 100 000**	**-12.12%**
Title 3 Operational expenditure	**581 267 997**	**550 430 178**	**550 430 178**	**550 496 208**	**-5.3%**	**630 603 166**	**627 882 135**	**14.6%**	**652 000 000**	**3.4%**	**639 540 000**	**-1.9%**	**675 600 000**	**5.6%**	**578 100 000**	**-14.4%**
ITER construction including site preparation	551 764 613	513 819 266	513 819 266	513 885 296	-6.9%	589 603 166	586 882 135	14.7%	583 900 000	-1.0%	576 040 000	-1.3%	598 500 000	3.9%	496 200 000	-17.1%
Technology for ITER and DEMO	1 623 503	4 100 000	4 100 000	4 100 000	152.5%	7 000 000	7 000 000	70.7%	8 300 000	18.6%	8 200 000	-1.2%	6 700 000	-18.3%	6 400 000	-4.5%
Technology for Broader approach	16 338 816	11 500 000	11 500 000	11 500 000	-29.6%	13 000 000	13 000 000	13.0%	31 000 000	138.5%	21 300 000	-31.3%	32 100 000	50.7%	33 200 000	3.4%
Technology for DONES									3 800 000		9 000 000	-	13 300 000	47.8%	17 300 000	30.1%
External Support Activities		15 010 912	15 010 912	15 010 912	-	15 000 000	15 000 000	-0.1%	20 000 000	33.3%	20 000 000	0.0%	20 000 000	0.0%	20 000 000	0.0%
Other Operational Expenditure	11 541 065	6 000 000	6 000 000	6 000 000	-48.0%	6 000 000	6 000 000	0.0%	5 000 000	-16.7%	5 000 000	0.0%	5 000 000	0.0%	5 000 000	0.0%
Title 4 Earmarked expenditure	**159 685 610**	**147 303 672**	**147 303 672**	**147 303 672**	**-7.8%**	**173 800 000**	**173 800 000**	**18.0%**	**168 400 000**	**-3.1%**	**165 460 000**	**-1.7%**	**170 000 000**	**2.7%**	**165 000 000**	**-2.9%**
ITER construction- from ITER host state contribution	150 000 000	129 100 000	129 100 000	129 100 000	-13.9%	148 800 000	148 800 000	15.3%	143 400 000	-3.6%	141 500 000	-1.3%	145 000 000	2.5%	140 000 000	-3.4%
Tasks from ITER Organization	9 685 610	16 804 156	16 804 156	16 804 156	73.5%	25 000 000	25 000 000	48.8%	25 000 000	0.0%	23 960 000	-4.2%	25 000 000	4.3%	25 000 000	0.0%
Other Earmarked expenditure		1 399 516	1 399 516	1 399 516	-											
TOTAL EXPENDITURE	**800 249 241**	**761 095 560**	**764 630 998**	**764 630 998**	**-4.9%**	**870 454 958**	**870 454 958**	**14.4%**	**891 513 893**	**2.4%**	**877 006 903**	**-1.6%**	**918 702 137**	**4.8%**	**818 629 617**	**-10.9%**

SPD_table 8. Expenditure in Payment Appropriations for 2020-2026

HUMAN RESOURCE ESTIMATES PLAN

1. HUMAN RESOURCES – OUTLOOK FOR 2022 – 2026

Recruitment policy

The Fusion for Energy personnel structure consists of EU Officials, Temporary Agents and Contract Agents.

All F4E recruitments are consistent with article 53 of the Condition of Employment of Other Servants for Temporary Agents and article 80 of Condition of Employment of Other Servants for Contract Agents, as well as their Model Decision on the engagement and use of Temporary staff under article 2.f.

The tasks related to the operational mission of F4E require highly specialized profiles especially in the core areas related to the ITER and Broader Approach projects. This is also true for many of the staff working in the support functions as the project complexity and amount of capital involved are considerable.

EU Officials (FO) and Temporary Agents (TA) may be recruited under two function groups:

- Administrator (AD) profiles for senior and non-senior technical/legal/financial/procurement officers, contract managers, etc.
- Assistant (AST) profiles for senior and non-senior assistant positions.

Contract Agents (CA) work under the supervision of EU Officials and/or Temporary Agents and may be recruited under four function groups (from FGI to FGIV). However, F4E typically recruits the majority of its contract agents at the level of:

- FGII, who are in charge of clerical and secretarial tasks
- FGIII, who are in charge of administrative and financial tasks in various support and operational units (e.g. Team Assistants) and
- FGIV, who are mainly specialized technical staff (e.g. Technical Support Officers, Project Management Support Officers) and qualified specialists in administrative fields (e.g. human resources, procurement, project management, legal, finance, etc.).

In terms of contract duration, F4E distinguishes between (1) long-term and (2) short-term employment contracts as follows:

1. Long-term employment

EU Officials – appointed by F4E from reserve lists or transferred from other EU institutions. Temporary Agents - recruited on five year renewable contracts which can be extended once for another period of five years and which are then followed by an indefinite duration contract if extended beyond the end of the first extension.

Contract Agents - recruited on a three year renewable contract which can be extended once for a further period of four years, and which is then followed by an indefinite duration contract if extended beyond the end of the first extension.

2. Short-term employment.

The employment contract of the F4E Director falls under the short-term category as it cannot be extended more than once and is hence limited to a maximum period of two consecutive 5 year periods.

Pursuant to the temporary reinforcement agreed in 2014 with the Commission (exchange of letters between F4E and Commissioners Mr H. Oettinger (Vice-President of the European Commission and

Commissioner for Energy) and Mr J. Dominik (Commissioner for Financial Programming and the Budget) on 23 October 2014)), the budget authority granted 24 CA short-term posts in 2015 and 21 TA short-term posts in 2016.

These posts are filled using non-renewable short-term contracts not exceeding 4 years.

Fusion for Energy may also employ Seconded National Experts (SNE). These are seconded to F4E for an initial maximum period of two years, renewable for another period of two years and up to a total maximum period of four years. SNEs are paid by the seconding organization (although F4E may reimburse the annual emoluments to the seconding organization) and receive a daily allowance and monthly allowance paid for by F4E.

	Staff population and its evolution, overview of all categories of staff								
	Actually filled as of 31.12.2019	Authorised under 2020 EU budget	Actually filled as of 31.12.20[1]	Authorised under 2021 EU budget	Envisaged in 2022	Envisaged in 2023	Envisaged in 2024	Envisaged in 2025	Envisaged in 2026
Subtotal FO/TA	273	280	275	280	280	280	272	264	262
Subtotal CA	165	170	160	170	170	170	163	157	157
Subtotal SNE	2	3	2	3	7	7	8	8	8
TOTAL	440	453	437	453	457	457	443	429	427

[1] The subtotal CA reflects the filled in posts while the CA figure in *HR_table 2. Statutory staff, SNE* of the REP Annexes indicates the FTEs in 2020

SPD_table 9. Overview of staff population and its evolution

For a more detailed view on staff see HR_table 01 of the annexes to HR REP.

Section IV. Work Programme 2022

This Work Programme 2022 offers an overview of the objectives of the European Joint Undertaking for ITER and the Development of Fusion Energy (F4E) for 2022 and also identifies the financial decisions for the actions that are planned to be carried out in 2022 with the available budget.
It covers the work on both ITER and Broader Approach (BA) according to the tasks entrusted to the organization.

The WP2022 objectives, the main milestones and the allocation of the human resources provide a good idea of the complexity of the tasks to be carried throughout the year and of the technical challenges they entail.

The table below provides a quick overview of the expected results in 2022 in terms of achieved credit for ITER in kind deliveries.

Action*		Baseline to end March 2021 (kIUA)	Achieved Credit (kIUA)	Released Credit (kIUA)	2022
Number	**Name**	**641.27737**	**527.33381**	**482.13606**	**95.60061**
Action 1	Magnets	145.85481	140.30081	130.64681	19.01200
Sub-action 2	Vacuum Vessel	86.00393	55.30400	40.57700	13.66900
Sub-action 3	In Vessel- Blanket	0.30000	0.30000	0.20000	0.65000
Sub-action 4	In Vessel- Divertor	3.67500	3.67500	2.19000	0.11500
Action 5	Remote Handling	5.02000	3.70000	1.10000	4.29974
Action 6	Cryoplant and Fuel Cycle	28.68013	26.84473	26.69154	3.77503
Action 7	Antenna and Plasma Engineering	1.17410	1.12410	0.50000	2.55450
Action 8	Neutral Beam and EC Power Supplies and Sources	37.81300	36.30300	29.46300	5.27800
Action 9	Diagnostics	3.46852	3.34960	2.40951	3.19388
Action 11	Site and Buildings and Power Supplies	329.28788	256.43257	248.35820	43.05346

* Sub-action 10 TBM, action 12 Cash Contributions and action 13 Technical Support Activities are not listed in the above table since no kIUA are associated to these actions. Action 14 Broader Approach uses kBAUA instead of kIUA (see full table under PP_table 8 on page 81)

SPD_table 10[16]: Expected 2022 results in terms of discharge of Euratom obligations to ITER (status: end of March 2021)

[16] **Achieved credits** corresponds to milestones completed by F4E. **Release credits** corresponds to milestones for which F4E received the associated credits (in IUA) from IO.
Figures in column **Baseline** correspond to “Total credits initially planned to be achieved at the end of March 2020”,
Figures in column **Achieved** Credit correspond to “Total achieved credits at the end of March 2020”.
Figures in column **Released** Credit correspond to “Total released credits at the end of March 2020”.
Figures in columns **2021** correspond to the “Credits to be achieved in year 2021”.

WP2022 Executive summary

The work programme 2022 is mostly focused on the following activities (FP-relevant areas are shown):

- **Magnets** (FP): All major contracts have been signed and manufacturing activities are underway for the two remaining main components (i.e. TF Coils and PF Coils). In 2022, it is expected to complete the production of all 10 TF Coils. In the PF Coils Workshop, the last 2 Coils (PF#3 & PF#4) will be in full production in order to be delivered in the following years. The evolution of these activities is highly dependent on the impacts generated by COVID-19 during the previous year.
- **Vacuum Vessel** (FP): All major contracts have been signed and manufacturing activities are underway. All Sector deliveries are currently planned to be completed by the end of 2022[17]. Commitments for the transportation of these sectors to Cadarache will be signed with the main contractor. Furthermore, extensions, modifications or amendments to existing contracts and arrangements, some of them being triggered by PCRs, may have to be signed. Also, Specific Contracts for support activities, like Inspectors, Documentation Support, Engineering and Analysis, Project Management support etc… will continue to be issued depending on the project needs.
- **In-Vessel [Blanket System** and **Divertor]**:

  Blanket System (non-FP): For Blanket First Wall project, the most important activities in 2022 are the continuation of the implementation of Blanket First Wall series production, including the award of task orders for the procurement of CuCrZr and Beryllium raw materials.
  For Blanket Cooling Manifold project, negotiations with tenderers will be completed and framework contracts will be awarded to start the first stage of the series production.
  Divertor Systems (non-FP): For the Divertor Inner Vertical Target (IVT) project, the main activities will be to complete the negotiated procedure and sign several framework contracts for the IVT series production. In addition, there will be some activities devoted to the follow-up of the manufacturing and testing of the full-scale prototypes, including the completion of the second full-scale prototype.
  For the Divertor Cassette Body project, the main activities will be devoted to the follow-up of the on-going manufacturing of the series fabrication (both for Stage 1 and Stage 2).
  For the Divertor Rails project, the Procurement Arrangement will be signed.

- **Remote Handling (partly FP): The procurement of the Remote Handling Systems (RHS) will** focus mainly on the final design activities and first plasma components moving gradually towards manufacturing. Some areas of non-first plasma component will continue with the preliminary design and moving towards final design. Complementary RH technology activities will be implemented (design and tests) aiming at manufacturing of first components (e.g. rad hard cameras and electronics) to be integrated in the RH systems.
- **Cryoplant and Fuel Cycle**

  For Vacuum Pumping (Partly FP), contracts of Torus and Cryostat Cryopumping System, Front-end Cryopump Distribution system, Leak Detection and Localization systems will focus on design, manufacturing and assembly. Contracts for Neutral Beam Front-end Cryopump distribution will be signed.

  In the area of Tritium Plant and REMS (mostly FP): contract for first plasma activities of REMS (Radiation and Environmental Monitoring Systems) and Task Order for Value engineering and final

[17] After the cut-off of end of March 2021 on which this document is drafted, F4E informed IO of updated delivery dates for all VV sectors, resulting in sector 2 planned to be delivered in Q1 2023.

design of REMS Tokamak complex will continue. Signature of PA amendment for Tokomak complex is planned.

In the area of Cryoplant (FP): commissioning for LN2 Plant and Auxiliary Systems components will take place.

- **Antennas and Plasma Engineering** (partly FP):

  Electron Cyclotron Upper Launcher: Following the signature of the PA amendment in 2021, all major contracts and specific contracts will be signed by the end of 2022. In 2022, the material procurement and series production for the main in-vessel structural components will continue while the design finalization will continue for the remainder of the scope. In addition, the Specific Contracts for support activities, such as Inspectors, Engineering and Design review support will be placed as per programme needs.
  ITER operations: Coordinate collaboration with Eurofusion and IO on ITER exploitation and EU role in it. **Plasma Engineering:** continue support to F4E procurement – step up modelling and simulation work for first plasma and ITER exploitation in general. **Electron Cyclotron Control System:** continue the implementation of the PA 5.2.P1B.EU.01. This includes exploiting the synergies between the PA implementation activities and the FALCON facility development. **FALCON:** Manage the facility, develop as necessary and ensure availably of the test beds. Main "clients": EC ex-vessel systems and DDT gyrotron tests (risk reduction for the EU gyrotron series production).

- **Neutral Beam Heating and EC Power Supplies and Sources** (non-FP):

  Electron Cyclotron (EC) Power Supplies (PS) and Power Sources (Gyrotrons):
  Manufacturing, testing and deliveries of the remaining Main and Body HV Power Supplies sets and the installation and commissioning of the units will continue at ITER site. The Call for Tender procedure for Gyrotrons procurement, including tender evaluation, will be finalized up to the framework contract signature.

  NB Test Facility (NBTF) at RFX-Padua:
  At the test facility, MITICA components will continue to be put in operation and auxiliaries integration (CODAS, Interlock, and Safety) will proceed.
  MITICA Beam Line Components (BLC) Manufacturing will continue as planned and assembly will start.
  MITICA Beam Source manufacturing will be completed, assembly will proceed and factory testing will start, in preparation for delivery to site.

  NB for ITER at Cadarache:
  [PA 53-01] - We will sign the Specific Tooling contract for the HNB Assembly and progress towards signing the PA stage 2 for Heating Neutral Beam general assembly.

  [PA 53-04 and 53-05] - We will progress with Neutral Beam Vessel tendering procedure up to contract signature, subject to timely signature of the PA mid 2021, and will progress procurement activities for Drift Duct, Absolute Valve, PMS and ACC coils including signatures of PA for some components, subject to timely availability of technical specifications from IO.

  [PA 53-06] - We will progress with the detailed and manufacturing design of the Neutral Beam power supplies systems for the ITER units, subject to the consolidation of external interfaces, and revision of technical requirements with IO.

- **Diagnostics** (partly FP): Manufacturing activities for several Diagnostic components and systems will continue, most of them being essential for First Plasma. Design of all remaining Diagnostics systems will progress, as well as the design of ITER port structures and the integration of Diagnostics into the ports. Several Diagnostics systems or sub-systems will complete their design activities, with approval of the final design review. Procurement activities will focus mainly on the signature of a major framework contract for manufacture of First Plasma components and

subsequent placement of tasks orders, as well as grants and contracts for the completion of the design of less mature Diagnostics systems or sub-systems.

- **Test Blanket Systems** (non-FP, non-in-kind contribution): The activities will focus on the preliminary design of the two TBM Sets, Ancillary Systems, Safety Studies and Accidental Analyses. Analogously the activities aimed to prove the feasibility of the fabrication and assembly processes of the TBM-sets will continue. As in the previous years, support and transversal activities such as the consultancy of an Agreed Notified Body, the storage, handling and, when needed, transportation of steel materials will proceed. The codification of the database of EUROFER in RCC-MRx will resume. Some activities could be executed under the ITER TBM Project Team Funding scheme. The collaboration with EUROfusion is expected to continue in the R&D area.
- **Site, Buildings and Power Supplies**: The focus of the Buildings works will be to advance the construction of the medium voltage distribution buildings (B44, B45, B46 and B47) and the Tritium Building civil works (B14) up to the roof and to deliver it painted until level L2, to deliver the Control building (B71 Non PIC part), the Fast Discharge Resistor building (B75), and to complete the installation of HVAC, Electrical & Handling Equipment in the Heating building (B15). Load center LC04 will be made operational. Execution design, qualification activities and procurement of buildings services for the Tokamak Complex will progress. The preliminary design for the Hot Cell Complex will start.
- **Cash contribution:** The activities in 2022 will focus on the commitment of the agreed cash contribution for 2023.
- **Technical Support Activities** including the signature of task orders for experts, Quality control inspectors for manufacturing activities, all Engineering unit domains: System Design-Mechanical Engineering, CAD Data Management, Material-Manufacturing Technologies and Processes, Analysis and Codes, Metrology, I&C-CODAC, other Domestic Agencies' components Transportation and project management activities (on QA, system engineering, PM tools, planning, risk and cost) are foreseen. F4E also plans renewal of existing Frameworks contracts and signature of new ones.

In addition, amendments, indexation and release of options of existing contracts in all areas will need to take place. Quality control inspection services will be necessary for the majority of the areas through available framework contracts.

Concerning the Broader Approach (BA), the EU activities are carried out in the frame of the Agreement, concluded between Euratom and Japan, consisting of activities which complement the ITER project and accelerate the realisation of fusion energy towards DEMO. Activities in 2022 will be based on the Project Plans expected to be agreed by the BA Steering Committee in Spring 2021. According to present drafts, in 2022 the main activities will be:

- **Satellite Tokamak Programme** (STP, or JT-60SA): The implementation of activities for the Operation/Enhancement phase of the project will continue. These activities include the procurement of critical spare parts and engineering services for EU already supplied systems and components, and selected machine enhancements and diagnostics in collaboration with EUROfusion (including maintenance and assistance to on-site assembly and commissioning).

Critical contracts for the integration of casette bodies, HHF and NHF elements of the JT-60SA actively cooled Divertor, several studies and procurements for the enhancements of the power supply systems and the cryoplant will also be launched in 2022. The activities under the responsibility of F4E are carried out through task orders of existing/new framework contracts or existing/new supply and service contracts. F4E will be continuously supported by experts, and on-site health and safety services to ensure safe operations, funded respectively by F4E through expert contracts and specific contracts. Cash contributions on specific QST Call for Funds, covering EU Contribution to operation, maintenance and assembly will also be made.

- **IFMIF/EVEDA:**

In 2022, the LIPAc (Linear IFMIF Prototype Accelerator) operation at Rokkasho will focus on demonstrating the expected performances required for beam operations at high duty cycle of all the accelerator subsystems except the superconducting part (cryomodule) whose assembly will be carried

out in parallel on Rokkasho site by a European company under F4E responsibility. Additional contracts will have to be placed for demonstrating the operation and for optimizing the maintainability of the accelerator and subsequently the beam availability. Activities for the preparation of the LIPAc accelerator in its final configuration for the forthcoming operation phases will continue in 2022. F4E will be continuously supported by experts, and on-site health and safety services to ensure safe operations, funded respectively by F4E through expert contracts, specific contracts, Agreements of Collaboration with European Institutes, and EUROfusion. Cash contributions as contribution to Common Fund and Common Expenses will also be made.

- **IFERC:** The IFERC project comprises three activities, CSC (Computer Simulation Centre), REC (Remote experimentation Centre and DEMO design and R&D):

The CSC objective is to provide high power computer (HPC) resources for JA and EU scientists in order to advance simulation studies for ITER, JT-60SA and fusion reactors in general (e.g. DEMO). CSC will foster collaboration research projects between JA and EU by sharing computer resources and by further jointly developing state-of-the art models.

REC activities focus on the implementation of the remote collaboration tools agreed with JT-60SA, ITER, and the IFMIF-EVEDA LIPAc accelerator. The collaboration under the ITER BA agreement will continue to advance test technologies for remote experiments and data transfer, including remote CODAC application testing, remote data access, live data viewing for ITER, fast data transfer, and secure remote connection.

In the DEMO design activities, priority will be given to activities directly relevant for ITER and JT-60SA exploitation, such as plasma scenario development, divertor and power exhaust, breeding blanket and tritium extraction and removal. The objective of activities in fusion materials R&D will be to continue to support ITER in issues related to Tritium retention in first wall materials, and to contribute to the materials database for future reactors such as DEMO, which will be in part validated in a future IFMIF type installation. All activities will be performed in collaboration with EUROfusion.

See details of the Work Programme 2022 in the annexes to Work Programme.

Section V. Other information

1. Barcelona Office Building Policy

#	Building Name and type	Location	SURFACE AREA(in m²)			RENTAL CONTRACT					Host country (grant or support)	Building present value(€)
			Office space	non-office	Total	RENT (€/year)	Duration of the contract	Type	Breakout clause Y/N	Conditions attached to the breakout clause (if applicable)		
1	TDL B3	Barcelona	9000	750	9750	220.000 € *	Long term rent lease agreement until 2042 Short term rent lease agreement until 2022 or 2024, depending on the floors		Y	End of the third year, 6 months' notice to inform the landlord of the non-renewal for the part paid by F4E	Rent paid by Spain for 9000 m2; Rent paid by F4E for 750 m2, directly to the building owner (short term contract)	N/A
TOTAL						220.000 €						

* Total annual rent for 3 modules for F4E short term lease

SPD_table 11 . F4E building

In accordance with the 2007 Host Agreement, Spain (Host State) shall provide permanent premises in Barcelona. After several suggestions for a new building, the Spanish Ministry offered in April 2016 to fix F4E's permanent premises at its current location, which was deemed to be of temporary nature only. This offer consisted of a long-term lease agreement until 2042 for the current premises and an extension of approximately 1 000m2 of additional space. The offer also included that Spain will cover the costs of the refurbishment works of this additional space. In May 2016, the long-term agreement was signed between Spain, the building owner, and F4E.

The expenditure for the refurbishment of the additional space is foreseen at an estimated cost of EUR 1.5 million that will be financed by Spain and the building owner. An annual expenditure for the operation of the cafeteria and the additional space will be charged on the F4E budget. The possibility of a subsidy is also included to keep a competitive price level for the meals. Following a decision taken by the GB, a Working group has been set up in 2021 to discuss with the Host State. A final decision is expected at the July GB on the associated refurbishment costs for all the other floors of the building. The multi-annual planning will then be up-dated accordingly.

F4E had to rent, under the title III, 3 additional office modules for a total of 750 m2 in order to host external experts from services contracts working on F4E site, as the office space made available by Spain free of charge and according to the 2007 Host Agreement, was not sufficient. F4E launched an official request to the Spanish Authorities to cover these new expenses. Discussions with the new government, foreseen in spring 2020, were postponed due to the Covid-crisis and have resumed through the Working group. A final decision is also expected by Summer 2021. If Spain finally covers the costs, F4E will regularise it.

2. Privileges and immunities

Joint undertaking privileges	Privileges granted to staff	
	Protocol of privileges and immunities / diplomatic status	Education / day care
As provided by the Host State, according to the Seat Agreement: - VAT exemptions - Building free of charge	Diplomatic status only for the Director, and the person appointed to replace him in his absence - The PPI applies to all staff - VAT reimbursements during the first year on goods and furniture. - Purchase of one motor vehicle without taxes. - Exemption of import tax registration for vehicles (if done through the Spanish Ministry of Foreign Affairs)	- No privilege granted regarding education/day care

SPD_table 12 . Privileges and Immunities

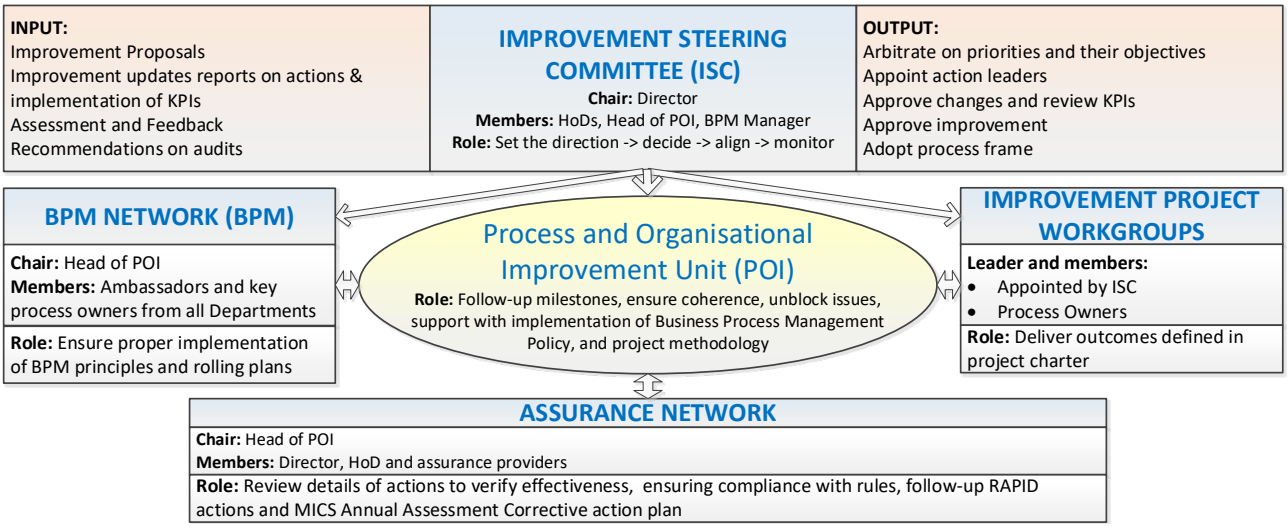
3. Environment management

Fusion for Energy shares the same headquarters building in Barcelona with several companies; therefore, the room for manoeuvre to reduce its impact on the environment is limited and EMAS registration very difficult. However, after the Host State's decision (Spain) to fix F4E's permanent premises at its current location, subsequent refurbishment works will be undertaken, which will allow F4E to aim at an EMAS certification.

4. Strategy for achieving efficiency gains and synergies

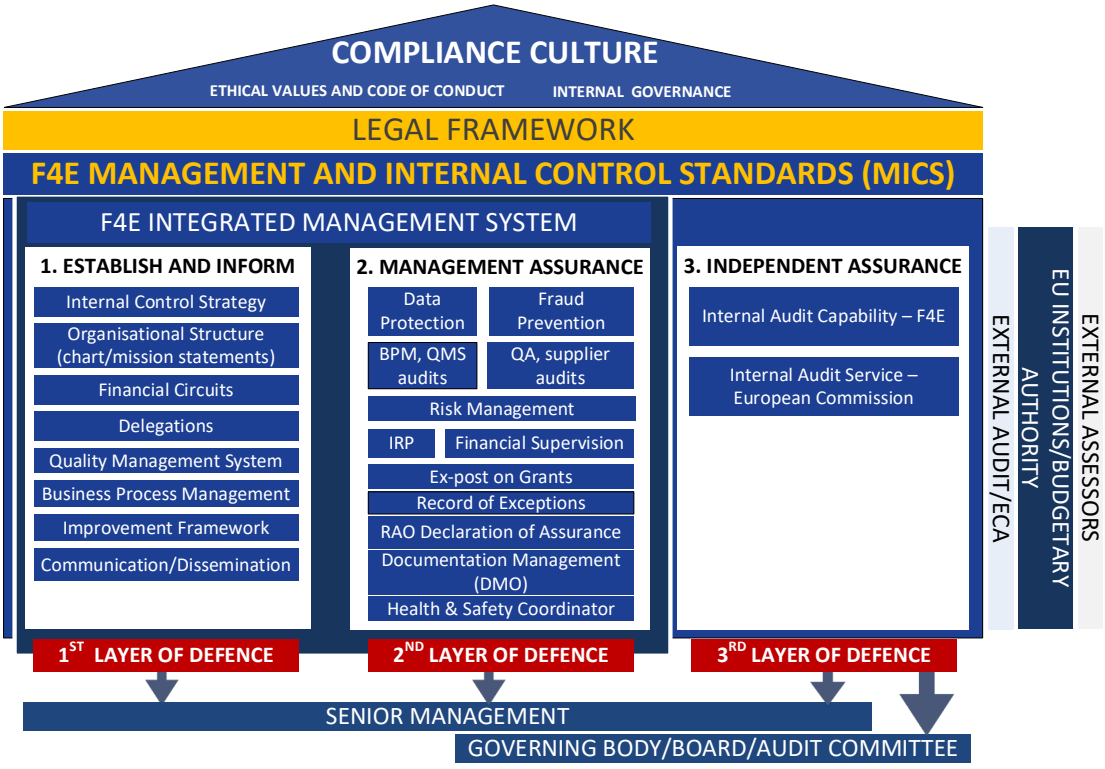
F4E Improvement framework

F4E is fully committed to continuous improvement and manages its corporate improvement projects triggered by a Senior Management decision which is then implemented through its various committees and networks. In 2016, F4E set up an **Improvement Steering Committee** (ISC) to provide a dedicated forum to set priorities on corporate improvement actions and align management views. This committee monitors results and proposes corrective actions if needed. The **Project Steering Meeting** focuses on activities linked to fulfilling the technical programmes of the ITER Project.



F4E uses the **DMAIC** (Define, Measure, Analyse, Improve, and Control) **approach** which forms part of the Lean Six Sigma methodology (a set of techniques and tools for process improvement). This is used to ensure that processes are more efficient and effective to achieve efficiency gains. Results are measured over a certain period with key performance indicators to confirm the positive trends, and corrective actions are taken if needed to further reinforce and streamline F4E's core activities.

Strategy for organisational management and internal control systems including their anti-fraud strategy



The Internal Control System (ICS) comprising F4E's Integrated Management System is based on the 3 layers of defence of the IIA (Institute of Internal Auditors) and combines the two control environments within which F4E operates - the ITER-wide quality system which is intended to ensure the performance of ITER and the compliance with the nuclear safety requirements, and the European Commission Internal Control Framework which is inspired in the internationally recognised COSO framework. The F4E Management and Internal Control Standards are central to the assessment of the effectiveness of this system. F4E makes an Annual Assessment, in line with the EC Internal Control Framework and methodology which determines the functioning of its F4E's 20 Management and Internal Control Standards covering the five components: control environment, risk assessment, including risks of fraud, control activities, information and communication and monitoring activities. F4E identifies deficiencies which affect the effective functioning of any of the MICS and adopts a corrective action plan to ensure follow-up.

- *1st LAYER (1st LINE OF DEFENCE) ESTABLISH AND INFORM*: Internal controls as defined by F4E Management for application by all F4E Staff and providing adequate training and raising awareness.
- *2nd LAYER (2nd LINE OF DEFENCE) MANAGEMENT ASSURANCE*: The Management (in its role of 1st line of defence) puts in place the 2nd layer of defence by establishing risk management and assurance functions to help build and/or monitor the first line-of-defence controls.
- *3rd LAYER (3rd LINE OF DEFENCE) INDEPENDENT ASSURANCE* Internal auditors (IAS/IAC) who provide the Governance bodies and Senior Management with comprehensive assurance based on the highest level of independence and objectivity within the organisation. IAC activities (including ex post audit on contracts) are described in the IAC annual audit plan. OLAF carries out independent investigations.

The F4E Internal Control Strategy defines internal control roles and responsibilities and outlines how the Internal Control System provides reasonable assurance of achieving the following objectives (based on Article 30 of the F4E FR):

1.1. effectiveness, efficiency and economy of operations;

1.2. reliability of reporting;

1.3. safeguarding of assets and information;

1.4. prevention, detection, correction and follow-up of fraud and irregularities;

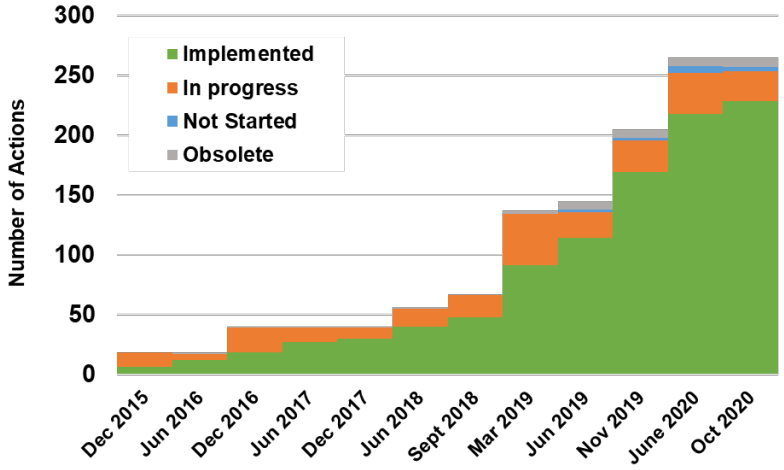
1.5. adequate management of the risks relating to the legality and regularity of the underlying transactions, taking into account the multi-annual character of programmes as well as the nature of the payments concerned.

The F4E Anti-Fraud Strategy adopted by the Governing Board in December 2019 is coordinated by the Anti-Fraud and Ethics Officer. The actions foreseen in the Action Plan were elaborated on the basis of a comprehensive risk assessment done by the F4E Risk Officer in close collaboration with the F4E Anti-Fraud and Ethics Officer as well as the correspondents of the respective F4E departments. The implementation of the actions in the Anti-fraud Action Plan is systematically monitored through a dedicated database (RAPID) which details the scope of each action, the action owner and the target date for its implementation.

5. Evaluations

The Corporate Action Plans respond to recommendations from Annual Assessments and Ad-Hoc Groups of the Governing Bodies, Governing Board Actions and also own-initiative actions.
During 2020, the overall percentage of completed Corporate Actions increased from 85% to 90% despite the addition of 60 new actions. During its meeting on 9-10 December 2020, the GB "took note of the status of action plan implementation (90% completed) and commended F4E for maintaining a high level of commitment towards the implementation of governance and audit recommendations". In addition:

- In response to the 8th annual assessment, F4E implemented 25 of the 35 actions including most actions in the area of leadership development
- F4E completed all actions from the 6th annual assessment and 7th annual assessment and 97% of the actions from the Ad-Hoc Group on nuclear safety



SPD_Figure 14: Evolution of the implementation of F4E's corporate level actions

6. Strategy for cooperation with third countries and/or international organisations

The F4E Statutes endow F4E with a prominent international role and all F4E's objectives have an international dimension:

1. *International Cooperation Projects*

    a. ITER

F4E has been created with the main objective to provide Euratom's contribution to the ITER project in an international collaboration to demonstrate the scientific and technological feasibility of fusion energy

for peaceful purposes. Euratom has formally designated F4E as the EU domestic agency for ITER under the ITER International Agreement.[18]
While Euratom is formally represented at the ITER Governance level by the EU Commission (DG-ENER), the further implementation of Euratom's contribution to ITER is realised through F4E cooperation with the ITER International Organisation (IO) as well as with bodies nominated by the ITER parties, the domestic agencies of the other ITER partners, China, India, Japan, Korea, Russia and the United States.

b. Broader Approach

The second main objective the Statutes entrust to F4E is to carry out the Broader Approach activities with Japan. The purpose of the Agreement between Euratom and Japan for the Joint Implementation of the Broader Approach Activities in the Field of Fusion Energy Research[19] is to introduce a framework for the achievement of a "broader approach" in the field of fusion energy designed to facilitate the rapid realisation of fusion energy.
F4E has been formally designated by Euratom as the implementing agency to discharge its obligations for the implementation of the Broader Approach Activities vis-à-vis Japan. In this capacity, F4E cooperates with Japan on the project on the Engineering Validation and Engineering Design Activities for the International Fusion Materials Irradiation Facility (IFMIF/EVEDA; see Section 1.c below), the project on the International Fusion Energy Research Centre (IFERC) and the project on the Satellite Tokamak Programme.

c. DEMO and IFMIF

The third main objective the Statutes entrust to F4E is to prepare and coordinate a programme of activities in preparation for the construction of a demonstration fusion reactor (DEMO) and related facilities including the international fusion materials irradiation facility (IFMIF).
The purpose of DEMO is to bring fusion energy research to the threshold of a prototype fusion reactor opening the way to its industrial and commercial exploitation. Currently, different conceptual DEMO projects are under consideration by all ITER Members (China, EU, India, Japan, Korea, Russia and, to a lesser extent, the United States).
The International Fusion Materials Irradiation Facility (IFMIF) is a projected materials test facility in which candidate materials for the use in an energy producing fusion reactor can be fully qualified. The IFMIF project was started in 1994 as an international scientific research program, carried out by Japan, the European Union, the United States, and Russia, and managed by the International Energy Agency. Since 2007, it has been pursued by Japan and F4E under the Broader Approach Agreement in the field of fusion energy research (see Section 1.b above), through the IFMIF/EVEDA project, which conducts engineering validation and engineering design activities for IFMIF.

[18] Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, 21 November 2006.

[19] Cf. Council Decision 2007/614/Euratom of 30 January 2007 concerning the conclusion, by the Commission, of the Agreement between the European Atomic Energy Community and the Government of Japan for the Joint Implementation of the Broader Approach Activities in the Field of Fusion Energy Research.

d. TBM

F4E's participation in the Test Breeding Modules (TBM) Programme falls under F4E's first statutory objective (see section 1.a above). TBM Programme, however, has some particular features.
The Programme aims to test tritium breeding module concepts in the ITER reactor, so that future (DEMO) reactor could achieve tritium self-sufficiency, the extraction of high grade heat and electricity production. TBM are formally not part of the ITER facilities, and the Programme falls under the ITER Agreement as "*any other activities that are necessary to achieve its* [ie, the ITER Organization*] purpose*" (Article 3.1.d of the ITER Agreement).

European collaboration in the TBM Programme is based on the detailed TBM Arrangements signed between F4E and the ITER Organization. The implementation of the TBM activities involves F4E cooperation with the European fusion laboratories participating in the EUROfusion consortium.

F4E supports the European Commission, in negotiations with the Ministry of Science and ICT of the Republic of South Korea in view of a collaboration on the helium-cooled Test Blanket Module System.

e. Supervision of F4E

The objectives of F4E cooperation with third countries and international organisations are clearly defined in its Statutes as outlined above.[20] F4E cooperation with these international partners takes place within the boundaries set out in the F4E Statutes and is enshrined in international agreements and arrangements which translate the F4E objectives set out in its Statutes and define the details of cooperation with F4E's international partners.
All F4E binding international agreements and arrangements require the formal approval by the F4E Governing Board in accordance with Article 6(3)(n) of the F4E Statutes: *"The Governing Board shall … approve the conclusion of agreements or arrangements regarding cooperation with third countries and with institutions, undertakings or persons of third countries or with international organisations with the exception of the procurement arrangements"* with the ITER IO.
The only exception are so-called F4E-ITER IO Procurement Arrangements which spell out the details of the technical implementation of the Euratom contribution to the ITER Project as pre-defined in the ITER International Agreement.
In all other cases, before F4E enters into international obligations, prior F4E Governing Board approval is mandatory.
In this context, it should be kept in mind that Euratom has *"the right to make a reservation to a decision by the Governing Board, when it considers that that decision may be contrary to Community law, including notably its international commitments arising from the ITER International Agreement. Euratom shall give due legal justification to such reservation. In this case the decision shall be suspended and the matter referred to the Commission for a review of its legality, together with the view of the Governing Board, including representatives of Euratom, must be consulted."*
Consequently the mechanism requiring prior Governing Board approval of international agreements and arrangements concluded by F4E constitutes a safeguard ensuring that F4E remains within the mandate and institutional framework defined in its Statutes and does not appear as representing the European Union beyond its statutory remit.

[20] Cf. Article 3 F4E Statutes annexed to the Decision of the Council of the EU Council Decision of 27 March 2007 establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it.

2. Switzerland as F4E Member

In addition to Euratom and the EU Member States, Switzerland was a full F4E member based on a cooperation agreement in the field of controlled nuclear fusion. Switzerland ceased being an F4E member in December 2020, when such agreement expired.

3. Relations with the United Kingdom

Following the United Kingdom's withdrawal from Euratom, the United Kingdom's membership in F4E depends on the adoption of Articles 7 and 8 of draft Protocol I (Programmes and activities in which the United Kingdom participates) of the Joint Declaration on Participation in Union Programmes and Access to Programme Services by the Specialised Committee under the EU-UK Trade and Cooperation Agreement.

List of figures

List of tables

Annexes to Project Plan

The ITER Procurement Arrangements and their status
Broader Approach overall information
Multiannual objectives for ITER Project, TBM project and Broader Approach
Annual objectives
Key Performance Indicators
PAs, cash contributions, secondment agreements for Broader Approach

Annexes of Financial REP

Estimate of Revenue
Estimate of Expenditure
Monitoring of implementation of Expenditure in Commitment Appropriations

Annexes to HR REP

Organization chart
Resources per action
Statutory staff, SNE and other staff
Multiannual staff policy plan
Implementing Rules on recruitment policy
Appraisal and reclassification/promotion
Gender representation
Geographical balance
Staff mobility
Schooling

Annexes to Work Programme

Definitions, assumptions and supporting information to WP2022
Objectives and key performance indicators
List of 14 WP2022 actions
Work Programme 2022 budget summary
WP2022 indicative value of financial resources for the actions
2022 main procurement activities (per action)
2022 list of grants per action
Time of call for the procurement plan
Essential selection, award criteria and upper funding limits for grants

List of figures in annexes to Project Plan

List of tables in annexes to Project Plan

List of tables in annexes to financial REP

List of tables in annexes to HR REP

List of tables in annexes to Annual Work Programme

List of Acronyms

ASN	Autorité de Sûreté Nucléaire (French Nuclear Regulator)
BA	Broader Approach
BAUA[21]	Broader Approach Unit of Account.
BA SC	Broader Approach Steering Committee
C-O	Close-Out
CD	Current Drive
CDR	Conceptual Design Review
CQMS	Common Quality Management System
COSO	Internal Control standard
CXRS	Core plasma charge-exchange Recombination Spectroscopy
DA	Domestic Agency
DEL	Delivery
DEMO	Demonstration fusion reactor
DIV	Divertor
DT	Deuterium Tritium
DWS	Detailed Work Schedule
EB	Electron Beam
EC	Electron Cyclotron
EC UL	Electron Cyclotron Upper Launcher
ECH	Electron Cyclotron Heating
Euratom	The European Atomic Energy Community
F4E	Fusion for Energy
FAT	Factory Acceptance Test
FDR	Final Design Review
FP	First Plasma
FW	First Wall
GB	Governing Board
HCLL	Helium Cooled Lithium-Lead
HCPB	Helium Cooled Pebble Bed
H&CD	Heating & Current Drive
HHF	High Heat Flux
HV	High Voltage
HVD	High Voltage Deck
IC	Ion Cyclotron or ITER Council
I&C	Instrumentation and Control
ICH	Ion Cyclotron Heating
IFERC	International Fusion Energy Research Center
IFMIF	International Fusion Materials Irradiation Facility
INB	Installation Nucleaire de Base

[21] 1,000 BAUA equal to 678,000 EUR (value 5 May 2005).

IO	ITER Organization
IR	Infra-Red
IRS	Internal Reporting system
ISEPS	Ion Source and Extraction Power Supplies
ISS	Isotope Separation System
ITA	ITER Task Agreement
ITER	International Thermonuclear Experimental Reactor
IUA[22]	ITER Unit of Account.
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
KPI	Key Performance Indicator
LIPAc	Linear IFMIF Prototype Accelerator
MV	Medium Voltage
NB	Neutral Beam
NBI	Neutral Beam Injector
NBTF	Neutral Beam Test Facility
PA	Procurement Arrangement
PBS	Product Breakdown Structure
PCR	Project Change Request
PDR	Preliminary Design Review
PE	Plasma Engineering
PF	Poloidal Field
PIC	Protection Important Components
PM	Project Management
PP	Project Plan
QA	Quality Assurance
QC	Quality Control
QST	Japanese Implementing Agency
R&D	Research & Development
REC	Remote Experimentation Centre
REM	Radiological Environmental Monitoring
RF	Radio Frequency
RFCU	Radio Frequency Control Unit
RFE	Ready For Equipment (when access is granted to IO)
RFIOC	Ready for IO Contractors
RFOC	Ready for other contractors (when civil work is complete enough to enable access to other contractors)
RH	Remote Handling
RWM	Resistive Wall Mode
SAT	Site Acceptance Test
SC	Specific Contract

[22] In 2008, the IUA exchange rate approved by the ITER Council corresponded to 1498.16 Euros.

SR2FP	Straight Road to First Plasma
SS	Steady State
STP	Satellite Tokamak Programme
STIK	Short Term In-Kind
TBM	Test Blanket Module (Tritium breeding blanket)
TF	Toroidal Field
TFC	Toroidal Field Coils
TO	Technical Officer
VAR	Variation
VC	Voluntarily Contribution
VCDIS	Voluntarily Contribution Design Institutions
Vis	Visible
VV	Vacuum Vessel
WAVS	Wide Angle Viewing System
WBS	Work Breakdown Structure
WDS	Water Detritiation System
WP	Work Programme, Work Package or Winding Pack

SPD2022_ANNEXES TO PROJECT PLAN

The ITER Procurement Arrangements and their Status

This table shows the credit value that F4E should have earned up to end of March 2021 (baseline) against the credit that F4E has actually achieved and the credit that IO has already released to F4E as acknowledgement of the achieved milestones F4E has formally declared as such to ITER IO. It provides all details per PA with the yearly forecast credit up to end 2026 and the cumulative value for the years beyond.
Once a CAS milestone is achieved, before F4E can formally declare its achievement to ITER IO, all necessary data, reports and other information has to be collected from the supplier and then submitted to ITER IO. This information is linked to the delivery by the supplier of all the necessary contractual deliverables that have to be formally approved by F4E before being sent to ITER IO. Then, it will be the turn of ITER IO to revise and validate the whole set of documents provided in order to confirm such achievement and release the credit through its SAP tool.
For this reason, the process can last some months.

					Forecast (kIUA)					
Action	**PA**	**Baseline to end March 2021 (kIUA)**	**Achieved Credit (kIUA)**	**Released Credit (kIUA)**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027+**
		641.27737	**527.33381**	**482.93606**	**95.60061**	**99.28646**	**36.36155**	**42.31756**	**45.58097**	**108.34873**
Action 1 Magnets	PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets	68.41600	64.86200	55.20800	13.76200	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 1.1.P2A.EU.01 Pre Compression Rings	0.60000	0.60000	0.60000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6	22.22000	20.22000	20.22000	5.25000	5.49500	2.39500	0.00000	0.00000	0.00000
	PA 1.1.P6A.EU.01 Toroidal Field Conductors	43.39000	43.39000	43.39000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 1.1.P6C.EU.01 Poloidal Field Conductors	11.22881	11.22881	11.22881	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sub-action 2 Vacuum Vessel	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel	86.00393	55.30400	40.57700	13.66900	3.53793	0.00000	0.00000	0.00000	0.00000
Sub-action 3 In	PA 1.6.P1A.EU.01 Blanket First Wall	0.10000	0.10000	0.00000	0.50000	0.50000	8.40000	4.80000	12.00000	13.93000

Vessel-Blanket	PA 1.6.P6.EU.01 Blanket Manifolds	0.20000	0.20000	0.20000	0.15000	0.05000	1.14200	1.03400	1.76300	0.04001
Sub-action 4 In Vessel-Divertor	PA 1.7.P1.EU.01 Cassette Body	0.56000	0.56000	0.53000	0.09000	0.83000	1.14000	0.95000	0.76000	1.71000
	PA 1.7.P2B.EU.01 Inner Vertical Target	3.11500	3.11500	1.66000	0.02500	0.02500	0.78000	2.85000	4.27500	8.55000
Action 5 Remote Handling	PA 2.3.P2.EU.01 Divertor Remote Handling System	1.40000	1.20000	0.00000	0.80000	0.40000	0.00000	1.52000	4.90000	0.60000
	PA 2.3.P3.EU.01 Cask and Plug Remote Handling System	0.80000	0.80000	0.00000	1.30000	4.40000	1.80000	0.90000	0.41337	7.67431
	PA 2.3.P5.EU.01 Neutral Beam Remote Handling System	0.62000	0.30000	0.30000	1.01974	0.66000	0.55000	0.48000	0.00000	2.91000
	PA 5.7.P1.EU.01 In-Vessel Viewing System	2.20000	1.40000	0.80000	1.18000	1.00000	1.40000	0.40000	0.57313	0.00000
Action 6 Cryoplant and Fuel Cycle	PA 3.1.P1.EU.03 Torus and Cryostat Cryopumps	0.00000	0.00000	0.00000	0.00000	2.49141	1.32200	0.00000	0.00000	0.00000
	PA 3.1.P1.EU.04 Neutral Beam Cryopumps	0.54000	0.18000	0.18000	0.66000	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 3.1.P1.EU.01 Warm Regeneration Lines	0.20000	0.20000	0.20000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 3.1.P1.EU.02 Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box	0.35203	0.22979	0.07660	0.25996	0.00000	0.00000	0.15319	0.00000	0.00000
	PA 3.1.P3.EU.01 Primary and Cryostat Leak Detection System	0.00000	0.00000	0.00000	0.70000	2.30000	0.00000	0.00000	0.00000	0.00000
	PA 3.1.P3.EU.01 Primary and Cryostat Leak Localisation System (phase II - 1st Amendment)	0.00000	0.00000	0.00000	0.15000	0.20000	0.35000	0.00000	0.00000	0.00000
	PA 3.2.P5.EU.01 Water Detritiation System - Tanks	3.25200	3.25200	3.25200	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 3.4.P1.EU.01 Liquid Nitrogen Plant and Auxiliary Systems	24.27610	22.98294	22.98294	1.70507	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 6.4.P1.EU.01 for Design of REMS	0.06000	0.00000	0.00000	0.30000	0.39000	0.15000	0.00000	0.30000	0.30000
Action 7 Antenna	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher	0.12410	0.12410	0.00000	2.50450	2.13240	2.13240	2.25635	0.00000	0.00000

and Plasma Engineering	PA 5.2.P1B.EU.01 Electron Cyclotron Control System	1.05000	1.00000	0.50000	0.05000	0.05000	0.05000	0.05000	0.05000	0.10000
Action 8 Neutral Beam and EC Power Supplies and Sources	PA 5.2.P3.EU.01 Electron Cyclotron Gyrotrons	0.00000	0.00000	0.00000	0.00000	1.25000	0.30000	1.53502	2.03502	2.83507
	PA 5.2.P4.EU.01 Electron Cyclotron High Voltage Power Supply	4.54300	4.54300	4.54300	3.94800	0.00000	1.16300	0.00000	0.00000	0.00000
	PA 5.3.P6.EU Neutral Beam Power Supply	15.56000	15.36000	14.56000	0.40000	4.95000	1.80000	2.90000	1.09000	3.83571
	PA 5.3.P9.EU.01 Neutral Beam Test Facility Components	17.71000	16.40000	11.16000	0.93000	2.72000	3.90000	0.00000	0.00000	0.00000
Action 9 Diagnostics	PA 5.5.P1.EU.02-16-17-19 Diagnostics - Magnetics	0.39686	0.45658	0.45658	0.28855	0.00000	0.00000	0.04705	0.00000	0.00000
	PA 5.5.P1.EU.03 Diagnostics - Bolometers	0.00000	0.00000	0.00000	0.08850	0.53101	0.32450	0.56051	0.73751	0.58974
	PA 5.5.P1.EU.07 Diagnostics - Pressure Gauges	0.19160	0.19160	0.00000	0.19160	0.00000	0.00000	0.55563	0.00000	0.01907
	PA 5.5.P1.EU.18 Diagnostics - Tokamak Services	0.56614	0.38750	0.20612	0.28307	0.56614	0.46445	0.00000	0.15390	0.27482
	PA 5.5.P1.EU.15 Diagnostics - Radial Neutron Camera/Gamma Spectrometer	0.13769	0.13769	0.00000	0.13769	0.07868	0.07868	0.00000	0.29506	1.23927
	PA 5.5.P1.EU.08 Diagnostics - CPTS 55.C1	0.00000	0.00000	0.00000	0.00000	0.88840	0.53304	0.31982	0.52170	1.24378
	PA 5.5.P1.EU.09 Diagnostics - Low Field Side Collective Thomson Scattering	0.17218	0.17218	0.00000	0.17218	0.17218	0.22957	0.00000	0.37879	0.02296
	PA 5.5.P1.EU.04 Diagnostics - Core-Plasma Charge Exchange Recombination Spectrometer	0.00000	0.00000	0.00000	0.41100	0.20550	0.41100	0.20550	0.68499	1.50696
	PA 5.5.P1.EU.06 Diagnostics - Equatorial Visible/Infrared Wide-Angle Viewing System	0.11724	0.11724	0.00000	0.23448	0.73274	0.26379	0.11724	0.70344	0.76205
	PA 5.5.P1.EU.10-11-12-13-14 Diagnostics - Port Engineering Systems	1.38681	1.38681	1.38681	1.38681	0.00000	0.00000	3.51589	0.00000	2.61438
	PA 5.5.P1.EU.01 Diagnostics - Magnetics Electronics & Software	0.50000	0.50000	0.36000	0.00000	0.31782	0.10000	0.11200	0.00000	0.00000
Action 11 Site and	MAIN MILESTONES	5.01601	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Buildings and Power Supplies[1]	COMMON	60.00196	53.84865	50.54060	3.76527	2.43430	0.50000	3.99152	3.59152	5.43810
	TOKAMAK COMPLEX	75.16667	58.62221	56.38589	6.07454	39.29593	2.72400	5.69784	10.35454	0.00000
	AUX BUILDINGS TB03/TB04	69.39760	58.43916	57.91916	8.05104	0.55000	0.00000	0.00000	0.00000	0.00000
	AUX BUILDINGS D&B TB05	15.00156	14.30000	14.30000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	AUX BUILDINGS D&B TB06	9.66842	7.48000	5.81000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	AUX BUILDINGS D&B TB07	6.37420	6.37420	6.03420	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	AUX BUILDINGS TB09/TB10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	42.46250
	AUX BUILDINGS D&B TB12	0.89000	0.00000	0.00000	4.02207	10.70452	1.31812	0.00000	0.00000	0.00000
	AUX BUILDINGS D&B TB13	0.00000	0.00000	0.00000	0.91200	6.69800	0.00000	0.00000	0.00000	0.00000
	LOAD CENTERS	11.35500	0.00000	0.00000	1.02150	2.72950	0.00000	5.26600	0.00000	0.00000
	INTERCONNECTING ACTIVITIES	19.77646	0.72835	0.72835	19.20704	0.00000	0.00000	0.00000	0.00000	0.00000
	AUX BUILDINGS D&B TB17	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	9.69000
	COMMON CONTRACTUAL ACTIVITIES	42.79000	42.79000	42.79000	0.00000	0.00000	0.64000	2.10000	0.00000	0.00000
	PA 6.2.P2.EU.06 Headquarters Building	13.85000	13.85000	13.85000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Sub-action 10 TBM, action 12 Cash Contributions and action 13 Technical Support Activities actions are not listed in the above table since no kIUA are associated to these actions. Action 14 Broader Approach uses kBAUA instead of kIUA (see full table under PP_table 8 on page 81).

PP_table 1. Credits per Procurement Arrangement

[1] All SBPS related PAs have all already been signed. The PA signature dates appear as “Not Applicable” for SBPS since the CAS allocation is monitored at the level of the Tender Batches (TB) rather than the PAs.

BA Overall Information

The Satellite Tokamak Programme

The mission of the JT-60SA project is to contribute to the early realization of fusion energy by supporting the exploitation of ITER and research towards DEMO by addressing key physics issues associated with these machines, in particular by designing, constructing and operating a device:
1. Capable of confining break-even equivalent class high-temperature deuterium plasmas lasting for a duration longer than the timescales characteristic of plasma processes.
2. Pursuing full non-inductive steady-state operation with high plasma beta close to and exceeding no-wall ideal stability limits.
3. Establishing ITER-relevant high density plasma regimes well above the H-mode power threshold.
As of 2021 the primary reference for the Satellite Tokamak Programme is the Project Plan for the next five-year-period revised and submitted for endorsement to the BA Steering Committee[2].
The assembly of the facility has been completed by March 2020. The period of April 2021 – March 2026 in BA Phase II covers the operation of the facility as well as machine enhancements of the JT-60SA device, starting from the integrated commissioning. The original date of the first plasma, September 2020, had to be postponed, due to delays generated largely by the COVID 19 pandemic, limiting the availability of personnel and introducing strict rules for work onsite.
On March 9th 2021, during the last phases of integrated commissioning, a breakdown on the terminals of one of the poloidal field coils forced the stop of activities. After warm-up of the machine, access to cryostat volume was gained and root-cause analyses started. While the local damage appears limited and reparable, plans for recovery should address, also, all other areas of the machine where similar problems may arise, due to identified weaknesses of design or manufacturing/assembly techniques. QST and F4E are developing such plans, in close collaboration, but, presently, no firm date for completion and restart of plasma operation can be defined.
When the repair will be completed, the last phase of integrated commission can be performed.
After completion of the integrated commissioning, the Experiment Team shall be established, composed of the Experiment Leaders, the Topical Group Leaders and the participating researchers.

The research area will expand gradually together with some upgrades of the hardware such as plasma heating systems, diagnostics, control actuators, divertor and other in-vessel components, remote handling systems, power supplies, cryogenics etc. European contribution to machine enhancements, diagnostics, maintenance and spare parts and integrated commissioning/operation support are handled also with the collaboration of Eurofusion.

For the period April 2020-March 2026 the total commitment for the EU amounts to 214.2 kBAUA.

The sharing of activities with Japan, which leads to this associated total credited budget, has been agreed in principle by the parties in early 2021 and is currently awaiting formal approval by the BA Steering Committee in the form of the document : ‘Satellite Tokamak Program Project Plan for BA Phase II’ . The original Project Plan will need modifications of schedule and scope as consequence of the incident and its repair and recovery plan.

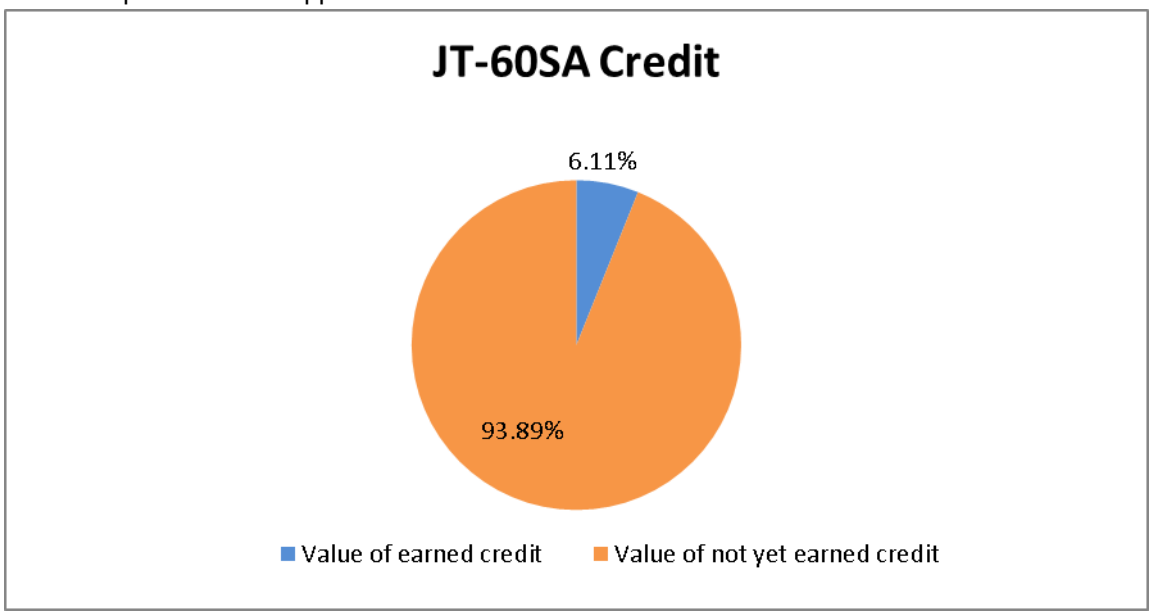
In broad terms the F4E activities for this period will include the following machine enhancements (in-kind). Part of the scope hereinafter is designed and procured with support of EUROFusion):

- In-vessel Components (Actively Cooled Divertor, cryopumps, MGI).
- Heating & CD Systems (EC RH Power Supplies and Transmission Lines).

[2] The Project Plans for the BA Phase II (from 2021-2026) for all three projects are to be approved by the Broader Approach Steering Committee in June 2021

- Plasma Diagnostics (Thomson Scattering, FILD, VUV).
- Cryogenic System (Cryoplant Enhancements, Spare parts and Nitrogen Storage).
- Magnet and Power Supply (PS Enhancements, Spare parts, EFCC Power Supplies).
- Control System (Sensors and Tokamak Simulator Development).
- EU Personnel in support of Integrated Commissioning and Operation.
- Power Supplies Spare parts, industrial support and expertise.

In addition a share of EU contribution is provided by F4E through cash transfer to a dedicated fund, primarily dedicated to consumables (electricity, helium, nitrogen etc.), IT infrastructures and support to EU on-site personnel in support.



PP_figure 1. JT-60SA: percentage of earned/not yet earned credits for BA Phase II (Status April 2021)

The IFMIF/EVEDA

The IFMIF/EVEDA Project (Engineering Validation and Engineering Design Activities for IFMIF), started in June 2007, aims to provide a detailed, complete and fully integrated engineering design of the IFMIF facility and all data necessary for future decisions on the construction, operation, maintenance, and decommissioning of such a fusion neutron source. In order to fulfill this commitment, the IFMIF/EVEDA project consists of two parallel mandates: the Engineering Design Activity (EDA) and the Engineering Validation Activity (EVA). The IFMIF/EDA mandate delivered the Intermediate IFMIF Design by issuing the Intermediate IFMIF Engineering Design Report that was approved by the stakeholders in December 2013. As for the EVA mandate, it deals with the three key technological demonstrators, namely:

- the Accelerator Facility (“LIPAc”),
- the Lithium Target Facility,
- the Test Facilities.

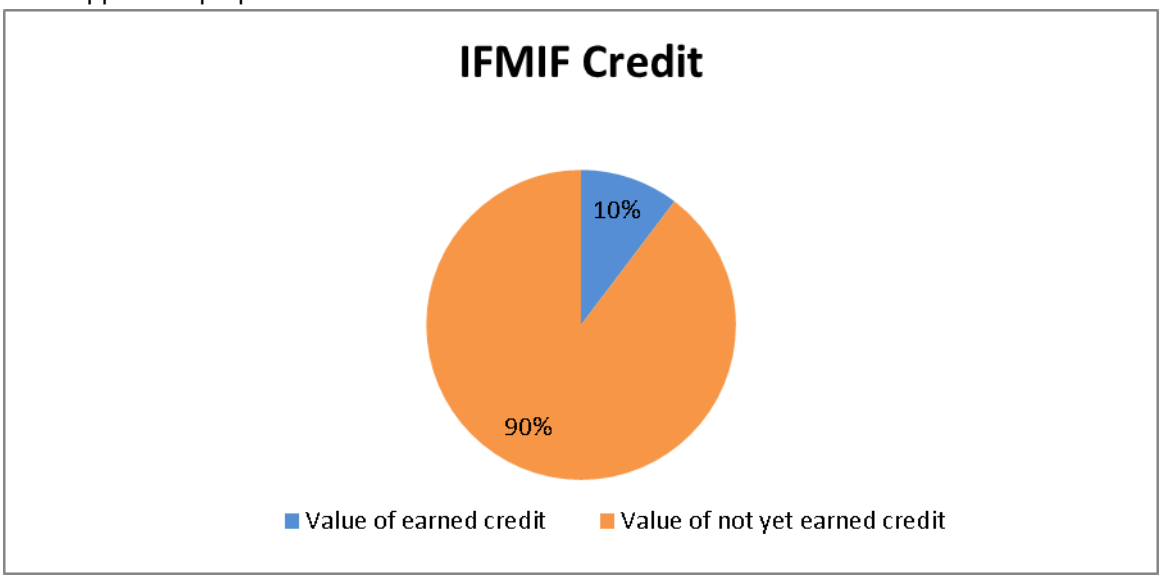
While the EVA phase of the Lithium Target Facility and the Test Facility was successfully completed in February 2017, the EVA phase of the LIPAc Facility is still on-going on Rokkasho site. In July 2019, a 125 mA D+ beam was successfully accelerated up to 5 MeV with the required characteristics. This remarkable result proves that the design of all the LIPAc components of the low and medium energy part is validated from the beam physics standpoint. These achievements obtained in the framework of the Broader Approach phase I are a telling illustration of the fruitful collaboration between Europe and Japan for the development of a future fusion neutron source.

Considering the activities which will be carried out during the BA Phase II in support of the construction of the fusion neutron source, the Fusion Neutron Source engineering design activities and the Lithium Target Facility engineering validation activities have restarted in 2020, in collaboration with EUROfusion, with the delivery of the work plans to be implemented by both implementing agencies from 2021 to 2025.
The next step planned in 2021-22 in the LIPAc engineering validation is to operate a 125-mA D+ beam at 5 MeV in CW mode during at least 30 minutes, so that the design of these components will be fully validated. Then, the cryomodule, which will be assembled in parallel, will integrated in the beam line. The LIPAc accelerator will be then fully completed in its final configuration. In 2022-2024 the LIPAc commissioning will be implemented starting at low DC and low intensity, to reach 9-MeV with a 125-mA deuteron beam meeting the beam characteristics requirements in CW. The full demonstration of the IFMIF accelerator concept will be then completed. In the meantime, over the period 2023-2026, the refurbishment and improvement based on the operational feedback of key subsystems, like the injector, the control system, and the RF power system, will be carried out. The objective is to maintain the facility in operation, as a test stand, until the safe and regular operation of the fusion neutron source, to test new equipment, train scientists, engineers, and operators, and optimize the beam operation strategies.
In addition to the above activities F4E is engaged with EUROfusion for the preparation of the necessary supporting documents for deciding and starting the IFMIF-DONES project (building a scaled down IFMIF plant with number of accelerators reduced from 2 to 1). If decided within the EU and at international level with Japan, we expect the construction of this facility to start after 2021.
For the period April 2020-March 2026 the total commitment for the EU corresponding amounts to 47.39 kBAUA.

The sharing of activities with Japan, which leads to this associated total credited budget, has been agreed in principle by the parties in early 2021 and is currently awaiting formal approval in June 2021 by the BA Steering Committee in the form of the document : “IFMIF/EVEDA Project Plan for BA Phase II’.

In broad terms, the F4E activities for this period will focus on achieving:

- The full performance of the LIPAc facility, though the completion of assembly of the superconducting LINAC, beam commissioning and operation, provision of expertise, enhancements, consumables as well as spare parts.
- Support the preparations for the IFMIF/DONES neutron source.



PP_figure 2 . IFMIF/EVEDA: percentage of earned/not yet earned credits for BA Phase II (Status April 2021)

The IFERC

The IFERC activities include three sub projects:

- DEMO Design and R&D activities,
- establishment and operation of a Computer Simulation Centre (CSC),
- establishment and operation of a Remote Experimentation Centre (REC)

While in BA phase I a large part of the effort was to establish the IFERC as a research centre in Rokkasho and to initiate the various research collaborations, in BA phase II the work of IFERC has refocused to support the projects ITER, JT-60SA and IFMIF/EVEDA.

The EU contribution DEMO Design work will concentrate in five key areas, prioritised in terms of direct relevance to ITER and JT-60SA exploitation, and aiming to integrate lessons learned towards the construction of future machines.

In BA phase I the DEMO R&D activities concentrated on materials for blankets in order to establish a common basis for a DEMO design. In BA phase II, the objective of activities in fusion reactors R&D will be to contribute to the materials database and handbooks for future reactors and to continue to support ITER in issues related to Tritium retention in first wall materials..

Regarding the CSC activities, in BA phase I the EU procured and delivered the Helios supercomputer for the Rokkasho CSC. In BA phase II, the CSC activities include managing the HPC resources provided by JA as host in order to advance high priority simulation studies for ITER, JT-60SA and fusion reactor in general (e.g. DEMO).

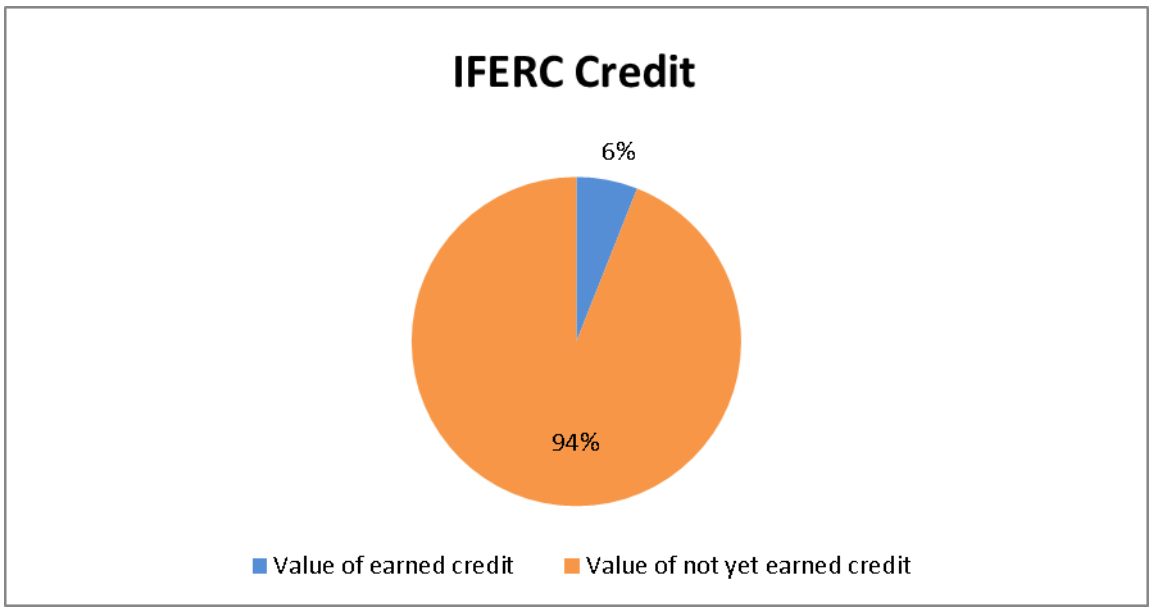
The Remote Experimentation Centre in Rokkasho aims to facilitate broad participation of scientists into ITER experiments. In BA phase I, the remote experimentation room was procured, and remote experimentation techniques were tested on existing machines, such as JT-60SA, JET and WEST. In BA phase II, the activities will concentrate on collaborative activities with ITER, the IFMIF/EVEDA LIPAc accelerator, and JT-60SA. Most of the contribution to REC is provided by F4E.

For the period April 2020-March 2026 the total commitment for the EU amounts to 17.41 kBAUA.

The sharing of activities with Japan, which leads to this associated total credited budget, has been agreed in principle by the parties in early 2021 and is currently awaiting formal approval in June 2021 by the BA Steering Committee in the form of the document : “IFERC Project Plan for BA Phase II’.

In broad terms, the F4E activities for this period will focus on supporting JT-60SA, LIPAc as well as ITER by:

- Maintaining the Rokkasho infrastructure,
- Developing remote experimentation/participation tools for the three projects (i.e. so called REC project)
- Maintaining the operation of a high performance computer facility,
- And furthering the consolidation of tokamak design and licensing through the so called DEMO activities carried out in collaboration with EUROfusion and QST



PP_figure 3 . IFERC: percentage of earned/not yet credits for BA Phase II (Status April 2021)

Objectives and KPIs

Multiannual objectives for the ITER Project

There are 3 multiannual objectives for the ITER Project:

AREA	Objective	Target
GB/IC milestones	Achieve the GB and IC milestones within "agreed quarters"	Ensure that the Governing Board milestones are delivered before the end of the agreed quarters
Schedule Performance Index[3]	SPI above a defined value	SPI≥0.95
Overall Costs	Cost estimation for ITER + Broader Approach for period up to 2027 should be less than the total budget available for this period.	Cost estimation for ITER + Broader Approach for period up to 2027 should be less than the total budget available for this period.

Focus on GB/IC milestones:

Since 2016 the ITER Council approves and monitors a set of high-level milestones to track the overall progress of the project. To supplement the ITER Council (IC) milestones, F4E's Governing Board (GB) approved additional ones. The list of milestones is updated each year with a rolling wave approach.
These GB/IC milestones are ideal for the purpose of being used as technical objectives as they are not only critical path oriented but they cover a larger group of components at different stages of their development. Most of them are key to achieve FP, but some of them also relate to non-FP systems due to be delivered in later years. This is why F4E has decided that its technical objectives will be the achievement on time of the GB/IC milestones.

F4E regularly reports on the status of these milestones via monthly reports, tracks the risks of not achieving them and, where necessary, implements recovery actions to mitigate any forecasted delays.
In order to show the close link between the long-term (i.e. Project Plan) planning and the short-term (i.e. Work Programme) activities, F4E is tracking in the Work Programme some selected existing technical milestones leading to the GB/IC ones (i.e. the predecessors) and in the chain of all critical and near-critical paths. Therefore such milestones in the short-term will act as an alert against the increasing risk of missing any critical and near-critical path milestones in the longer term.

PP_table 2 below shows these milestones (the First Plasma ones are in pale yellow).

The table includes all additional milestones selected up to end of March 2021 as well as all modifications of quarters of completions agreed by ITER Council/Governing Board until that date.

[3] F4E has also decided to implement annual SPI starting from 2022. This SPI will be piloted in 2022, and if successful it will be included in SPD indicators in the future.

IC/GB Reference	Programme	Milestone	Type of Milestone	Agreed Quarter	Forecast Date of Achievement	PA	PA Deliverable
IC02/GB00	Site, Buildings & Power Supplies Project team	Start of B1 civil works in Tokamak building	IC	Q1 2016	Achieved	6.2.P2.EU.05	Building Construction
IC04/GB01	Site, Buildings & Power Supplies Project team	Erection of Tokamak Main Cranes in Assembly Hall	IC	Q2 2016	Achieved	6.2.P2.EU.05	Building Construction
IC05/GB02	Magnets Unit	Completion of first EU TF winding pack	IC	Q2 2016	Achieved	1.1.P1A.EU.01	10 Toroidal Field (TF) Magnet Windings
IC09/GB03	Site, Buildings & Power Supplies Project team	Installation of WDS tanks in Tritium building	IC	Q2 2016	Achieved	6.2.P2.EU.05	Building Construction
IC13/GB04	Vacuum Vessel Unit	First Sub Segment Assembly of VV Sector 5 completed	IC	Q4 2016	Achieved	1.5.P1A.EU.01	Vacuum Vessel: 5 sectors
IC14/GB05	Cryoplant & Fuel Cycle Unit	First Liquid Nitrogen Refrigerator equipment Factory Acceptance Tests completed	IC	Q4 2016	Achieved	3.4.P1.EU.01	Cryoplant system - LN2 Plant and Auxiliary Systems
IC19/GB06	Site, Buildings & Power Supplies Project team	Energisation of 400KV switch yard	IC	Q1 2017	Achieved	4.1.Pn.EU	Steady-State Electrical Network and Pulsed Power Electrical Network Installation
IC21/GB07	Site, Buildings & Power Supplies Project team	Completion of RFE 1A (Assembly Hall)	IC	Q2 2017	Achieved	6.2.P2.EU.05	Building Construction
IC24/GB08	Site, Buildings & Power Supplies Project team	Tokamak Concrete crown civil works achieved	IC	Q3 2018	Achieved	6.2.P2.EU.05	Building Construction
IC25/GB09	Site, Buildings & Power Supplies Project team	Civil works and finishing performed in B2 level allowing TB04 installation to begin in tokamak building B2 level	IC	Q4 2018	Achieved	6.2.P2.EU.05	Building Construction
IC30/GB10	Neutral Beam & EC Power Supplies and Sources Unit	Neutral Beam Test Facility (NBTF): Start of integrated commissioning of SPIDER beam	IC	Q1 2018	Achieved	5.3.P9.EU.01	NB Test Facility Components

IC33/GB11	Site, Buildings & Power Supplies Project team	Buildings: First limited access to Tokamak pit for installation without large crane availability (RFE 1B stage 1)	IC	Q2 2018	Achieved	6.2.P2.EU.05	Building Construction
IC42/GB12	Magnets Unit	PF Coil: EU PF 5 coil ready for cold test	IC	Q1 2020	Achieved	1.1.P3A-B.EU.01	5 Poloidal Field (PF) coils (PF2-PF6)
IC50/GB13	Site, Buildings & Power Supplies Project team	Building: Limited crane access between Assembly Hall and Tokamak Building (RFE 1B stage 2)	IC	Q1 2020	Achieved	6.2.P2.EU.05	Building Construction
IC54/GB14	Magnets Unit	PF Coil: Manufacturing complete for EU PF 6 Coil and delivery to site	IC	Q2 2020	Achieved	1.1.P3A-B.EU.01	5 Poloidal Field (PF) coils (PF2-PF6)
IC53/GB15	Magnets Unit	TF Coils: Complete FAT for PA work scope for first EU TF Coil	IC	Q1 2020	Achieved	1.1.P1A.EU.01	10 Toroidal Field (TF) Magnet Windings
IC58/GB16	Vacuum Vessel Unit	VV: First EU Vacuum Vessel Sector fabrication complete and delivered to IO site	IC	Q4 2020	29/10/2021	1.5.P1A.EU.01	Vacuum Vessel: 5 sectors
IC76/GB18	Cryoplant & Fuel Cycle Unit	Commissioning: Cryostat Leak Detection System delivery to site	IC	Q3 2023	14/02/2023	3.1.P3.EU.01	Leak detection and Localisation System
GB19	Site, Buildings & Power Supplies Project team	Buildings: Cryoplant Compressor Building (51) RFE (RFE #8B)	GB	Q2 2019	30/06/2021	6.2.P2.EU.05	Building Construction
GB20	In Vessel Unit	In-vessel: Delivery of the first all-Tungsten prototype test assembly of the Divertor Inner Vertical Target to the RF test facility.	GB	Q4 2018	Achieved	1.7.P2B.EU.01	Divertor inner vertical targets
GB21	Site, Buildings & Power Supplies Project team	Buildings: Construction of Cryoplant Coldbox Building (52) Completed	GB	Q3 2019	23/12/2021	6.2.P2.EU.05	Building Construction
GB22	Plasma Engineering & Operations Unit	EC UL: Manufacturing of 1st batch of Diamond Disks for EC Upper Launcher 1 finished	GB	Q3 2023	27/05/2021	5.2.P1B.EU.02	EC Upper Launchers (4 port plugs) and ex-vessel Waveguide system (32 for EC Upper Launcher and 24 for EC Equatorial Launcher)
GB23	Magnets Unit	TF Coil: Seventh EU TF Coil delivery to site	GB	Q2 2021	27/01/2022	1.1.P1A.EU.01	10 Toroidal Field (TF) Magnet Windings
IC64/GB24	Site, Buildings & Power Supplies Project team	Buildings: Medium Voltage distribution LC1A Ready for Equipment	IC	Q4 2022	16/06/2023	6.2.P2.EU.05 4.1.Pn.EU	Building Construction & Steady-State Electrical Network

							and Pulsed Power Electrical Network Installation
GB25	Vacuum Vessel Unit	VV: Delivery of Sector 9 by EU-DA to ITER Site	GB	Q2 2021	31/05/2022	1.5.P1A.EU.01	Vacuum Vessel: 5 sectors
GB26	Site, Buildings & Power Supplies Project team	Buildings: Medium Voltage Distribution Building LC/2B (47) RFE (RFE #10)	GB	Q3 2022	16/06/2023	6.2.P2.EU.05 4.1.Pn.EU	Building Construction
GB27	Neutral Beam & EC Power Supplies and Sources Unit	NB&PS: Start of Installation of Acceleration Grid Power Supplies - Converter System of Neutral Beam Injector-1 Q2	GB	Q3 2023	22/11/2023	5.3.P6.EU.01	NB Power Supply
GB28	Cryoplant & Fuel Cycle Unit	Cryo&FC: Delivery of Torus and Cryostat Front-End Cryopump Distribution System and Cryojumpers 5-8 (4 no.) Batch 2 by EU-DA to Site	GB	Q4 2022	31/10/2022	3.1.P1.EU.02	Front-End Cryopump distribution
GB29	Plasma Engineering & Operations Unit	EC UL: Manufacturing of 1st batch of Waveguides for EC Upper Launcher 1 finished	GB	Q4 2023	30/04/2024	5.2.P1B.EU.02	EC Upper Launchers (4 port plugs) and ex-vessel Waveguide system (32 for EC Upper Launcher and 24 for EC Equatorial Launcher)
GB30	Neutral Beam & EC Power Supplies and Sources Unit	NB&PS: Start of Installation of High Voltage Dec 1 of Neutral Beam Injector -1	GB	Q1 2024	30/05/2025	5.3.P6.EU.01	NB Power Supply
GB32	Remote Handling Unit	Remote Handling: Task Order Signed for Manufacturing for Cask and Plug Remote Handling System (CPRHS)	GB	Q3 2022	05/08/2022	2.3.P3.EU.01	15 Cask and Plug RH systems
GB33	Cryoplant & Fuel Cycle Unit	Cryo&FC: Delivery of First Torus & Cryostat	GB	Q2 2022	15/12/2022	3.1.P1.EU.03	Cryopumps: 6 Torus and 2 Cryostat Cryopumps
IC90.2/GB34	Site, Buildings & Power Supplies Project team	Buildings: B71 North ready for IO Installation	IC	Q2 2022	30/06/2022	6.2.P2.EU.05	Building Construction
GB35	Cryoplant & Fuel Cycle Unit	Cryo&FC : Delivery of Primary (VV)Leak Detection and Localisation by EU-DA to ITER Site for 1st Plasma	GB	Q4 2023	15/12/2023	3.1.P3.EU.01	Leak detection and Localisation System
GB36	Diagnostics Unit	Diagnostics: Delivery of In-V Elec Feedthroughs for Upper Ports Batch 2 by EU-DA to IO ITER Site	GB	Q2 2024	23/05/2024	5.5.P1.EU	Diagnostics (roughly 25% of all diagnostic systems)

GB37	In Vessel Unit	In-Vessel: Completion of the qualification phase prior to start of Blanket First Wall series production	GB	Q1 2023	04/01/2023	1.6.P1A.EU	Blanket First Wall (215 panels)
GB38	In Vessel Unit	In-vessel: Completion of Stage I of the series production of Divertor Cassette Bodies.	GB	Q4 2024	11/12/2024	1.7.P1.EU.01	54 Divertor cassette bodies
GB39	Diagnostics Unit	Diagnostics: Electronics and Software for Magnetics Delivered to ITER Site	GB	Q3 2023	20/02/2023	5.5.P1.EU	Diagnostics (roughly 25% of all diagnostic systems)
GB40	Remote Handling Unit	Remote Handling :Equatorial Port Plug First Assembly Cask Delivered to ITER Site	GB	Q4 2023	10/07/2023	2.3.P3.EU.01	15 Cask and Plug RH systems
GB41	Remote Handling Unit	Remote Handling: Upper Port Plug First Assembly Cask Delivered to ITER Site	GB	Q4 2023	27/09/2023	2.3.P3.EU.01	15 Cask and Plug RH systems
GB42	Remote Handling Unit	Remote Handling :Monorail crane of Neutral Beam Remote Handling System and Delivered to ITER Site	GB	Q1 2024	21/11/2023	2.3.P5.EU.01	1 Neutral Beam RH system.
GB43	Neutral Beam & EC Power Supplies and Sources Unit	NB & PS: 8th Set of Main High Voltage Power Supplies & Body Power Supplies (MHVPS & BPS) Delivered to ITER Site by EU-DA	GB	Q2 2024	24/04/2023	5.2.P4.EU.01	67% EC High Voltage Power Supplies
GB44	Plasma Engineering & Operations Unit	ECCS: EC Upper Launcher Control System ITER Site Acceptance completed	GB	Q3 2024	22/02/2024	5.2.P1B.EU.01	Electron Cyclotron (EC) Control System
GB45	In Vessel Unit	In-vessel: Completion of Stage I of the series production of Divertor Inner Vertical Target.	GB	Q3 2024	17/09/2024	1.7.P2B.EU.01	Divertor inner vertical targets
GB46	Plasma Engineering & Operations Unit	EC UL: Delivery 1st EC Upper Launcher from EU-DA to IO	GB	Q2 2024	29/08/2024	5.2.P1B.EU.02	EC Upper Launchers (4 port plugs) and ex-vessel Waveguide system (32 for EC Upper Launcher and 24 for EC Equatorial Launcher)
GB47	Remote Handling Unit	In Vessel Viewing System Unit #1 Delivered to ITER Site	GB	Q4 2024	19/09/2024	5.7.P1.EU.01	6 In-Vessel Viewing systems
GB48	Neutral Beam & EC Power Supplies and Sources Unit	NB&PS: Delivery of 1st Set (1MW) of Gyrotrons Tubes by EU-DA to ITER Site	GB	Q1 2025	21/11/2024	5.2.P3.EU	25% EC Gyrotron Sources

GB49	In Vessel Unit	In-vessel: Delivery of the Divertor Rails to the ITER Site.	GB	Q1 2027	10/12/2026	1.7.P2E.EU.01	Divertor rails
GB50	Cryoplant & Fuel Cycle Unit	Cryo&FC : Delivery of Heating Neutral Beam Cryopumps 1 from EU-DA to ITER Site	GB	Q1 2027	03/12/2026	3.1.P1.EU.04	Cryopumps for the Neutral Beam system (ITER and MITICA)
IC43/GB51	Site, Buildings & Power Supplies Project team	Building: Assembly building complete	IC	Q4 2018	Achieved	6.2.P2.EU.05	Building Construction
IC67/GB54	Magnets Unit	TF coils: Complete FAT for PA work scope for 18 TF Coils	IC	Q4 2021	30/08/2022	1.1.P1A.EU.01	10 Toroidal Field (TF) Magnet Windings
IC32/GB55	Site, Buildings & Power Supplies Project team	Cryostat: Cryostat support bearings full scale prototype delivery to site	IC	Q2 2018	Achieved	6.2.P2.EU.05	Building Construction
GB56	Neutral Beam & EC Power Supplies and Sources Unit	NB & PS: 1st Set of Main High Voltage Power Supplies & Body Power Supplies (MHVPS & BPS) Delivered to ITER Site by EU-DA	GB	Q1 2020	Achieved	5.2.P4.EU.01	67% EC High Voltage Power Supplies
IC90.1/GB57	Site, Buildings & Power Supplies Project team	Buildings: Cryoline Bridge available for installation of systems	IC	Q2 2022	10/06/2022	6.2.P2.EU.05	Building Construction
IC91.1/GB58	Site, Buildings & Power Supplies Project team	Buildings: Busbar Bridge available for installation of systems	IC	Q4 2022	30/11/2022	6.2.P2.EU.05	Building Construction
IC59.1/GB59	Site, Buildings & Power Supplies Project team	Building: Tokamak Building access granted in L3	IC	Q2 2020	Achieved	6.2.P2.EU.05	Building Construction
IC59.2/GB60	Site, Buildings & Power Supplies Project team	LV and MV Load-centers for all First Plasma nonnuclear	IC	Q2 2020	Achieved	6.2.P2.EU.05	Building Construction

PP_table 2 . Multiannual objectives of the ITER project (IC-GB milestones) (as of 31st March 2021).

Multiannual objectives for the Test Blanket Module (TBM)

The work carried out on the Test Blanket Module (TBM) is not covered by a standard Procurement Arrangement, but by specific TBM Arrangements (TBMA). Through the TBMAs signed by F4E in 2014, EU has committed to deliver two Test Blanket Systems and the associated equipment/tools to the ITER Site according to an agreed schedule.
Initially two independent European TBM Systems were to be tested in ITER, a Helium-cooled Lead-Lithium (HCLL) and a Helium-cooled Pebble-Bed (HCPB).
F4E, in line with the 2017 recommendations of the working group for the realignment of the TBM and DEMO Breeding Blanket programmes, is reorganizing the TBM project as follows:

i) scope change: a Water-cooled Lead-Lithium TBM (WCLL) shall replace the HCLL TBM concept;
ii) collaboration with EUROfusion will continue for the R&D activities.

A detailed implementation plan, developed in 2018, has been approved by the F4E Governing Board.
The following milestones of the TBM project complete the set of the Technical Objectives for the ITER project.

Reference	Action	Milestone	Date
TBM01	10-Test Blanket Module	Initiation of the official process for changing one European TBM System and preparation of a new TBM Arrangement	2018-Achieved
TBM02	10-Test Blanket Module	Signature of the WCLL TBM Arrangement	2020-Achieved
TBM03	10-Test Blanket Module	WCLL TBS Conceptual Design Review (CDR)	2020-Achieved
TBM04	10-Test Blanket Module	WCLL TBS and HCPB TBS Preliminary Design Review (PDR)	Q4 2022
TBM05	10-Test Blanket Module	WCLL TBS and HCPB TBS Final Design Review (FDR)	Q4 2025
TBM06	10-Test Blanket Module	Signature of FD and procurement of WCLL and HCPB ancillary systems	Q2 2026
TBM07	10-Test Blanket Module	Signature of procurement of WCLL TBM and HCPB TBM sets	Q2 2027
TBM08	10-Test Blanket Module	Delivery of WCLL and HCPB ancillary systems to ITER site	Q3 2028
TBM09	10-Test Blanket Module	Delivery of WCLL and HCPB TBM sets to ITER site	Q3 2029

PP_table 3 . Multiannual objectives of the TBM project

Multiannual objectives for the Broader Approach and DEMO

The technical objective for the European part of the BA projects for Phase II, as presently defined in the Project Plan to be approved by the BA Steering Committee, is the achievement on time of the milestones that are listed, project by project, in the tables below in which the achievements are shown in pale green.

These simplified tables are largely based on the grouping of the relevant project milestones, originally defined and valorized in the EU relevant Procurement Arrangements. The technical objectives are defined based on the Project Plans 2021-2026 for all three projects[4].

Related PA (BA)	Description	Baseline Achievement Date - Year	Credit Allocation (kBAUA)
Pellet injector (PEINJ)*	- Delivery of fueling source	2021	1.460
Pellet injector (PEINJ)*	Delivery of Pacing Source, Delivery of Centrifuge and Drift Tube and Integrated Test in Europe	2022	4.380
Power Supplies Spare Parts – Part 1 (PSSP01)	Power Supplies Maintenance Support	2021	2.420
Actively Cooled Divertor (DIV)*	Design and Fabrication of actively cooled Divertor – Year 2022	2022	14.318
ECRH Transmission (ECRHWG)*	Electro Cyclotron Resonance Heating Waveguides – year 2022	2022	2.000
EF Correction Coils (EFCC PS)	Design and Procurement of the Error Field Correction Coils -Approval of First Design Report	2021	1.074
Cryopumps (CRPUM)*	Cryopumps support	2021	0.200
Thomson Scattering (TOSCA)	Fabrication and Tests - Optical fibres	2021	2.420
Thomson Scattering (TOSCA)	Fabrication and Tests – delivery of all other hardware	2022	3.650
ECRH PS Spare Parts (ECPSSP01)	Electro Cyclotron Resonance Heating – Approval of First Design Report	2022	1.257
Pellet injector (PEINJ)*	Pellet Injector Acceptance Tests on Site	2023	1.460
Cryopumps (CRPUM)	Cryopumps - delivery on site – (10 units)	2022	2.200
ECRH Transmission (ECRHWG)*	Electro Cyclotron Resonance Heating Waveguides – year 2022	2023	3.000
Actively Cooled Divertor (DIV)*	Design and Fabrication of actively cooled Divertor - – Year 2023	2022	16.969
Thomson Scattering (TOSCA)*	On-Site Installation & Commissioning Assistance	2023	0.120
ECRH PS Spare Parts (ECPSSP01)	Electro Cyclotron Resonance Heating – Part 2 and maintenance support - Approval of Report on Factory Tests and Delivery to Site	2024	2.514
ECRH PS Spare Parts (ECPSSP01)	Electro Cyclotron Resonance Heating –Acceptance Tests on Site	2025	0.419
EF Correction Coils (EFCC PS)	Design and Procurement of the Error Field Correction Coils – Approval of Report on Factory Tests	2022	1.074
Actively Cooled Divertor (DIV)*	Design and Fabrication of actively cooled Divertor -	2024	4.000

[4] The Project Plans are to be approved by the BA Steering Committee in June 2021.

ECRH Transmission (ECRHWG)*	Electro Cyclotron Resonance Heating Waveguides – Year 2024	2024	4.800
EF Correction Coils (EFCC PS)	Design and Procurement of the Error Field Correction Coils - Delivery to Site and Acceptance Tests on Site	2023	1.412
Actively Cooled Divertor (DIV)*	Design and Fabrication of actively cooled Divertor -- Year 2024	2024	16.969
ECRH PS (ECPSSP02)	Electro Cyclotron Resonance Heating – Procurement of 2 PS	2024	5.106
Cryoplant (CRENH01)	Enhancement of Cryoplant Performance	2023	2.789
Actively Cooled Divertor (DIV)*	Design and Fabrication of actively cooled Divertor Year 2025	2025	4.773
Cryoplant (CRENH01)	Enhancement of Cryoplant Performance	2025	1.489

PP_table 4 . Multiannual objectives JT-60SA for BA Phase II

Related PA (BA)	Description	Baseline Achievement Date - Year	Credit Allocation (kBAUA)
Injector Spare parts (AF02-3)	LIPAc injector spare parts - Upgraded ion source and accelerator and emittance metre	2022	1.800
RF Power System (AF6-2)	Spare parts for the RF Power System – Refurbished PSYS (protection system) and Work plan for upgraded RFPS	2022	0.730
SRF Linac (AF4-2)	SRF Linac – Assembly of the LIPAc cryomodule and supply of high sensitivity beam loss Monitors	2023	2.940
RF Power System (AF6-3)	RF Power System - Enhancement pre-series	2023	0.600
Control System (AF8-3)	Control System – maintenance of hardware and software – year 2023	2023	0.600
RF Power System (AF6-2, AF6-3 and AF6-4)	Refurbishment and work plan, Enhancement pre-series and Enhancement RFQ series	2024	2.950
Control System (AF8-3)	Control System – maintenance of hardware and software – year 2024	2024	0.790
Control System (AF8-2)	Control System – maintenance of hardware and software – year 2025	2025	0.500
RF Power System (AF6-4)	RF Power System - Enhancement RFQ series	2025	2.000
LF Enhancement (LF6-2)	LF Enhancement: Li Loop, Purification System & Safety - Li purification system validation activities in EU	2025	2.888
LF Enhancement (LF6-2)	LF Enhancement: Li Loop, Purification System & Safety - Li target diagnostics design and validation in EU	2025	1.170
FNS Engineering Design (ED6-2)	Accident analysis in Safety	2025	1.080
FNS Engineering Design (ED6-2)	Use of LIPAc as a testing facility	2025	2.310

PP_table 5. Multiannual objectives IFMIF/EVEDA for BA Phase II

Related PA (BA)	Description	Baseline Achievement Date - Year	Credit Allocation (kBAUA)
Demo Design Activities and DEMO R&D (5 PAs)	Complete planning with EUROfusion of DEMO design and DEMO R&D activities from 2021-2024 EU	Achieved	1.279
CSC-EU	Computer resources and joint simulation projects contribution 2020-2022	2022	0.400
REC-EU	Choice of technologies for ITER REC and collaboration with IFMIF/EVEDA (Establishment of LIPAc control room) year 2022	2022	0.450
DEMO Design Activities	Summary report of activities	2025	4.686
DEMO R&D	Structure material development for in-vessel components	2025	1.874
DEMO R&D	Database for material corrosion	2025	0.469
DEMO R&D	Neutron irradiation experiment of breeding functional materials	2025	1.405
DEMO R&D	Tritium technology for collection and inventory evaluation	2025	0.937
CSC-EU	Computer resources and joint simulation projects contribution 2022-2025	2025	0.800
REC-EU	Remote tests with IO, IFMIF/EVEDA and JT-60SA – year 2025	2025	0.750

PP_table 6. Multiannual objectives IFERC for BA Phase II

No separate technical objectives are set for DEMO considering the current limited involvement of F4E in such activities.

Annual Objectives

In addition to the multiannual objectives, Annual objectives are identified and are constantly monitored by F4E and are reported upon.
The PP_table 7 below provide a list of these objectives.

AREA	Objective	Target
Work Programme objectives	Implement a defined percentage of Work Programme objectives *[including GB milestones and predecessors]* by end of the year	95% implementation of Work Programme objectives
Credit Allocation Scheme [CAS]	Reach a defined percentage of achieved CAS by end of the year	KPI≥0.95
Quality	Reduce percentage of long aging NCRs compared to total number of open NCRs.	KPI≤0.22
Annual budget	Implement a defined percentage of Commitment Appropriations by end of the year	96% implementation of commitment
Annual payment	Implement a defined percentage of Payment Appropriations by end of the year	96% implementation of payment
Human Resources	Vacancy rate to be less than a defined value by end of the year	Vacancy rate to be less than 4%

PP_table 7 . Annual Objectives

Definition of the F4E Key Performance Indicators (KPIs) and their thresholds

Multiannual KPI

Equation 1: GB milestones variance

$$\text{GB milestone Achieved Date} - \text{GB milestone Foreseen Date}$$

Equation 2: Schedule Performance Index (SPI)

$$\frac{\textit{Number of milestones which are in the current baseline wih baseline dates later than the beginning of the 2017 and have been achieved}}{\text{Number of milestones which are in current baseline with baseline dates later than the beginning of the 2017 with baseline dates before the end of the current month}}$$

Equation 3: Overall Costs

$$\frac{\text{Cost estimation for "ITER + Broader Approach"}}{\text{Total budget available for "ITER + Broader Approach"}}$$

Annual KPI:

Equation 4: Work Programme objectives

$$\frac{\textit{Number of Work Programme objectives met on time}}{\textit{Number of Work Programme objectives planned to be met}}$$

Equation 5: Credit Allocation Scheme (CAS)

$$\frac{\textit{Amount of CAS achieved}}{\textit{Amount of CAS planned to be achieved}}$$

Equation 6: Annual budget

$$\frac{\text{Actual commitment executed to date} + \text{remaining commitment planned to be executed between date and year's end}}{\text{Latest approved annual commitment budget}}$$

Equation 7: Annual payment

$$\frac{\text{Actual payment executed to date} + \text{remaining payment which is planned to be executed between date and year's end}}{\text{Latest approved payment appropriation for the year}}$$

Equation 8: Quality

$$\frac{\text{F4E NCRs open for more than 12 months}}{\text{Total F4E NCRs open}}$$

Equation 9: Vacancy rate

$$\frac{\text{Number of vacant posts}}{\text{Total authorised posts in the Establishment Plan (FO, TA and CA)}}$$

Equation 9: Turnover rate

$$\frac{\text{Number of departures}}{\text{Total authorised posts in the Establishment Plan (FO, TA and CA)}}$$

Equation 10: Absenteeism rate

$$\frac{\text{Cumulative number of days of sick leave of staff member in year N}}{\text{Total number of staff members in year N*365}}$$

KPI Thresholds

Each KPI has thresholds:

Green	The KPI is within the accepted range.
Amber	The KPI is at risk of moving outside of the accepted range.
Red	The KPI is outside of the accepted range.

A project manager may choose to flag a KPI as at risk whenever there is a risk that the KPI may move outside of the accepted range. This step should be reflected in the identification of specific risks in the risk log with a consequent tracking and mitigation actions.

The objective of the KPIs is to ensure that the project is proceeding in line with the overall plan so that

1. The long-term project schedule and deliverables are on schedule.
2. The project costs are under control.
3. The project quality management process is functioning as planned.
4. The Establishment Plan is being utilized effectively.

List of main KPIs monitored during the year and associated thresholds

- GB Milestones

Blue	Milestone completed
Green	Forecast date more than one month before the end of target quarter
Amber	Forecast date in the final month of target quarter (or Project Manager has flagged KPI as being at risk)
Red	Forecast date later than end of target quarter

- Schedule Performance Index (SPI)

Green	SPI ≥ 1.0
Amber	1.0 > SPI ≥ 0.80
Red	SPI < 0.80

- Overall costs

Green	KPI ≥ 1.0
Amber	1.0 > KPI ≥ 0.95
Red	KPI < 0.95

- Work Programme objectives

Green	KPI ≥ 0.95
Amber	0.95 > KPI ≥ 0.80
Red	KPI < 0.95

- Credit Allocation Scheme

Green	KPI ≥ 0.95
Amber	0.95 > KPI ≥ 0.80
Red	KPI < 0.95

- Quality (Long aging NCRs)

Green	KPI ≤0.1
Amber	0.25 ≥ KPI > 0.1
Red	KPI >0.25

- Annual Budget (overall at F4E Level)

Green	0.98 ≤ KPI
Amber	0.90 ≤ KPI < 0.98
Red	KPI <0.90

- Annual Payment (overall at F4E Level)

Green	0.95 ≤ KPI
Amber	0.90 ≤ KPI < 0.95
Red	KPI <0.90

- Vacancy rate

Green	KPI ≤0.04
Amber	0.04<KPI<0.07
Red	KPI ≥ 0.07

PAs, cash contributions, secondment agreements for Broader Approach

Title	BA EU Commitment kBAUA
JT-60SA Enhancements in-kind	
In-vessel Components	65.211
Heating & CD Systems	14.906
Plasma Diagnostics	9.848
Cryogenic	4.278
Magnet and Power Supply	4.650
Control System	0.700
Other Tokamak Systems	0.300
EU on-site personnel	7.000
JT-60SA Operation / Maintenance / Assembly	
Consumables	75.566
EU on-site personnel support and Project Team Cost	1.200
Maintenance & Assembly	11.041
Replacement parts	13.300
IT infrastructure	4.000
Others	2.200
JT-60SA (Total)	**214.200**
Fusion Neutron Source	4.800
Lithium Target Facility	4.800
LIPAc-Injector	1.800
LIPAc-SRF Linac	3.340
LIPAc-RF Power System	6.280
LIPAc-Control System	2.090
Common Expenses (Europe)	1.200
Common Fund (Europe)	10.490
On site personnel (Europe)	12.600
IFMIF/EVEDA (Total)	**47.390**
DEMO Design	6.495
DEMO R&D	6.497
CSC	1.400
REC	1.400
Project Team	1.620
IFERC (Total)	**17.412**

PP_table 8 . PAs, cash contributions, secondment agreements for BA Phase II[5]

[5] As not all PAs are signed the PAs have been summed up based on topics, to show the total credit values planned.

Action number	Action name	PMP delivery status
Action 1	Magnets	Q1 2022
Sub-action 2	Vacuum Vessel	Delivered
Sub-action 3 & 4	In Vessel - Blanket and Divertor	Delivered
Action 5	Remote Handling	Q2 2021
Action 6	Cryoplant and Fuel Cycle	Delivered
Action 7	Antennas and Plasma Engineering	Q4 2021
Action 8	Neutral Beam and EC Power Supplies and Sources	Delivered
Action 9	Diagnostics	Delivered
Sub-action 10	Test Blanket Module	Q3 2021

PP_table 9 . State of play on Project Management Plans preparation

List of Figures

List of Tables

ANNEX TO SECTION III "RESOURCE ESTIMATES PLAN"

The REP for F4E Financial Resources includes the Estimate of Revenue and Expenditure for the following five years according to:

- Estimate of Revenue from the Contributors (EURATOM, ITER Host State and Members),
- Estimate of Expenditure in Commitments according to the corresponding Work Programme for the current year and estimates of needs until 2026,
- Estimates of expenditure in payments according to detailed Payment Forecasts for 2021 and 2022 and estimates based on commitment needs until 2026.

1. Assumptions of the Resource Estimates Plan

The REP is based on the general assumptions introduced in the Single Programming Document 2022 and on the following specific budget assumptions.

1.1. Estimate of Revenue

The F4E revenue is made up of:

- EURATOM contribution
- ITER Host State contribution
- Other contributions
    - Membership contributions from members other than EURATOM
    - United Kingdom contribution
- Additional Revenues, for tasks requested by ITER Organization, from Other Assigned Revenue (Japan/UP#10), and from recoveries
- In kind contribution to F4E

1.1.1. EURATOM contribution

The contribution from EURATOM constitutes the main source of revenue for F4E. This revenue is divided in earmarked revenue for operational and administrative expenditure. The latter covers the main part of the F4E administrative costs.

The breakdown of the annual EURATOM contribution until 2027 is included in the Legislative Financial Statement[1] accompanying the Council Decision (2021) 281, which has been further adjusted during the annual budgetary procedures.

[1] Legislative financial statement to Commission proposal COM (2013) 607 for a Council Decision amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it

The French contribution and the Membership contributions are calculated on the basis of this proposal.

F4E receives no other contribution from EU than for the ITER and Broader Approach projects.

1.1.2. ITER Host State Contribution (IHS)

Until 2020, the contribution from the ITER Host State constitutes the second source of revenue for F4E. France as the ITER Host State covers 9.09% of the total costs of the ITER construction phase. This is equivalent to 20% of F4E budget minus the domains of exclusion as agreed in the exchange of letter[2] from 2011 and defined as follows:

- Administrative expenditure,
- Test Blanket Modules cost,
- Broader Approach cost,
- The IFMIF construction cost (DONES),
- The Transportation cost.

The same assumptions have been taken for the MMF 2021-2027, subject to final agreement.

The table below represents the expenditure allocated under the Host State contribution, based on commitments and excluding the bank interests gained on this contribution:

In Commitment Appropriations Current value (EUR)	<2007 ITER Construction	2007- 2020 ITER Construction	2021- 2026 ITER Construction	*TOTAL*
Total F4E budget	**42 129 070**	**7 606 599 791**	**5 631 014 825**	**13 339 743 685**
Of which Administration		*541 907 266*	*421 166 052*	***963 073 318***
Of which Test Blanquet Modules		*36 111 741*	*90 079 064*	***126 190 805***
Of which Technology for Broader Approach		*77 671 434*	*233 153 464*	***310 824 898***
Of which DONES Expenditure			*119 000 000*	***119 000 000***
Of which Transportation		*46 041 660*	*42 762 854*	***88 804 514***
Of which scope for IHS contribution	**42 129 070**	**6 904 867 690**	**4 724 853 390**	**11 731 850 149**
IHS Expenditure	**1 484 200**	**1 377 156 497**	**936 336 653**	**2 327 377 350**
Ratio IHS/IHS Scope	3.52%	19.94%	19.82%	**19.84%**

In Commitment Appropriations Constant 2008 value (EUR)*	TOTAL <2007	TOTAL 2007- 2020	*TOTAL*
Total F4E budget	43 912 668	6 529 103 561	**6 573 016 229**
Of which Administration		*471 904 552*	***471 904 552***
Of which Test Blanquet Modules		*31 600 424*	***31 600 424***
Of which Technology for Broader Approach		*65 367 311*	***65 367 311***
Of which Transportation		*36 145 929*	***36 145 929***
Of which scope for IHS contribution	43 912 668	5 924 085 345	**5 967 998 013**
IHS Expenditure	**1 556 614**	**1 174 379 609**	**1 175 936 223**
Ratio IHS/IHS Scope	3.54%	19.82%	**19.70%**

*calculations in 2008 value applies until 2020 only

Financial_Table 1 IHS Contribution <2007-2026 to ITER construction phase (in current and 2008 value)

The figures shown in the table 1 are indicative, based on F4E estimates and adjusted to the actual cost for the domain of participation of the ITER Host State.

2 Contribution financière française à la construction d'ITER : Lettre du Haut Représentant Français pour ITER (formal exchange of letters on 8 September and 17 November 2011 between France and the European Commission).

1.1.3. Other contributions

1.1.3.1. Membership Contributions

The Annual Membership Contributions are composed of:

- A minimum contribution of 0.1% of the total amount of annual membership contributions and,
- Additional contribution calculated in proportion to the EURATOM financial participation (excluding JET) in the Member's expenditure in the framework of the Community Fusion Research Programme in year N-2.

The contributions are established and adopted annually within the F4E budget. The calculations correspond to 10% of the F4E draft administrative budget prepared in year N-2.

The revenue from the Membership contributions is not assigned. As from 2016 onwards, the breakdown by Member is established by EURATOM on the basis of the figures provided by EUROfusion, in compliance with the frame defined in F4E statutes.

1.1.3.2. United Kingdom contribution

Revenue resulting from the annual contribution from United Kingdom (UK) to F4E budget and ITER project received from EURATOM based on the cooperation agreement between UK and the European Commission[3].

1.1.4. Additional Revenues (Revenue from ITER Organization, from Other Revenue and from Recoveries)

The revenue from the ITER Organization (IO) [4] is covering the tasks implemented by F4E at IO request:

- For the implementation of the Project Change Requests originating from IO that have been introduced after 05 March 2015 according to the terms of reference of IO Reserve Fund.
- In the frame of resolution of non-conformities on request of IO DG.
- For tasks requested by IO DG for the general interest of the project, considering the capacity of F4E suppliers.

The Revenue considered under Other Assigned Revenue, is revenue coming from Other Domestic Agencies covering the transfer of specific tasks to be implemented by F4E.

Miscellaneous revenue according to F4E financial Regulation as for liquidity damages or administrative fees.

The Recoveries include revenues from undue payments which are returned to the budget.

3 Cooperation Agreement between United Kingdom and European Commission signed on 25 December 2020.

4 Article 6e and Article 20 of F4E Financial Regulation in accordance with art. 4(2) and art. 12 (1e) of the F4E Council Decision and Statutes

1.1.5. In kind contribution to F4E

There is no in kind contribution to the F4E Budget, except for the premises hosting the F4E seat in Barcelona. The office building used by F4E is provided free of charge by the Host Country (Spain).

For year 2020 this service in-kind amounts to EUR 2.9 million.

1.2. Estimate of Expenditure

The F4E expenditure is divided in:

- Administrative expenditure covering the staff and operating costs
- Operational expenditure covering the needs of F4E projects

1.2.1. Administrative Expenditure

The F4E administrative expenditure is composed of F4E staff and operating costs, mainly related to staff remuneration and building's infrastructure.

1.2.2. Operational Expenditure

The operational expenditure corresponds to F4E tasks discharging EURATOM obligations with regard to:

A. EURATOM contribution to ITER Organization (IO), in accordance with the ITER Agreement[5];

B. EURATOM contribution to the Broader Approach (BA) activities, in accordance with the BA Agreement with Japan[6];

C. Coordination of a programme of activities in preparation of the construction of a demonstration fusion reactor (DEMO).

The F4E activities are grouped under two headings (projects):

1. ITER project that represents the main activity of F4E and consists of:
   (a) Tasks related to the ITER construction phase according to the Procurement Arrangements and ITER Tasks Arrangements signed with IO;
   (b) Contribution in cash to ITER Organization to ensure the financing for its management, the research and development and for the participation to the ITER fund;
   (c) Contribution in cash to Japan within the frame of the transfer of procurement responsibilities from EURATOM to Japan;
   (d) ITER site support activities.
2. Technology project that clusters the R&D activities necessary for ITER and Broader Approach:

[5] Final Report of Negotiations on ITER Implementation, 1 April 2006 (Attachment 2_C)

[6] Broader Approach Agreement F4E_D_22FTK5

(a) Technology for ITER and DEMO, to allow extra R&D activities, in particular related to the completion of specification for ITER and the preparation of DEMO;

(b) Technology for BA corresponding to the EURATOM contribution managed by F4E for IFMIF-EVEDA, the IFERC at Rokkasho and the JT-60SA Tokamak;

(c) Technology for DONES/IFMIF construction.

Additional operational expenditure are dedicated to tasks executed on request of ITER Organization, mainly amendment to existing contracts related to Project Change Requests initiated by IO and approved for financing from the IO Reserve Fund and other tasks requested and financed from IO Budget.

1.3. Monitoring of implementation of Expenditure in Commitment Appropriations

1.3.1. Specific assumption: reference to 2008 value

The EU global envelope of EUR 6.6 billion (2008 value) until the end of year 2020 excludes the revenue from ITER Organization (Reserve fund), the recoveries from undue payments, the recovery of the outturn, the carry overs, and the amounts made available again.

When converting from current year EUR values to 2008 economic conditions and vice versa the following escalation/de-escalation rates are applied:

Item/Year	≤ 2020
Operational Expenditure (Title III) linked to the delivery of in-kind contributions	2.60%
Cash Contribution (IO, Japan, NBTF, BA etc.)	2%
Administrative expenditure (Title I and II)	2%
ITER Organisation (Reserve Fund and Undistributed budget)	2%

Financial_Table 2 Escalation Rate

The link between the 2008 value and the current economic conditions is given in table 3, it relies on the data from the table 4 Expenditure in Commitments (in current value).

1.3.2. Implementation of Expenditure in Commitment Appropriations in 2008 value

The table below shows an expenditure of EUR 6.529 billion for the period 2007-2020, in line with the ceiling of EUR 6.6 billion (in 2008 value).

Constant Value MEUR(2008)		< 2007 Executed	Total 2007-2013	2014 Executed	2015 Executed	2016 Executed	2017 Executed	2018 Executed	2019 Executed	2020 Executed	Total 2014-2020	Total 2007-2020
Commitment Appropriations	ITER Construction	43.91	2 882.28	478.31	296.06	321.79	373.49	477.22	480.12	584.13	3 011.12	5 893.40
	Technology		45.39	13.76	11.92	10.73	11.87	9.18	4.32	15.45	77.23	122.62
	Technology for ITER		25.79	8.19	5.76	5.60	3.84	6.36	1.11	0.59	31.46	57.25
	Technology for Broader Approach		19.59	5.57	6.16	5.13	8.03	2.82	3.21	14.86	45.77	65.37
	Technology for DONES		0.00								0.00	0.00
	Other Expenditure		4.91	1.36	2.06	1.52	3.38	4.60	10.25	13.12	36.27	41.18
	F4E Administration		173.55	37.85	38.33	40.68	43.81	45.44	45.55	46.70	298.36	471.90
	F4E Total Budget	43.91	3 106.12	531.27	348.37	374.72	432.56	536.44	540.23	659.40	3 422.98	6 529.10
	Tasks from ITER Organization		0.00		0.94	11.46	1.18	2.59	16.62	10.82	43.60	43.60
	F4E Total Expenditure	43.91	3 106.12	531.27	349.31	386.18	433.73	539.03	556.85	670.22	3 466.58	6 572.70

Financial_Table 3 Annual Expenditure in Commitment Appropriations (2008 value)

1.3.3. Implementation of Expenditure in Commitment Appropriations in current value

The table below shows the expenditure for the period 2007-2026. The figures provided beyond 2020 are based on the last amendment to F4E Constituent act[7], fixing the EURATOM contribution to F4E for the whole period 2021 to 2027 to a total value of EUR 5 614 million of which EUR 5 560 million (in current values) of direct contribution to the project.

[7] COUNCIL DECISION (Euratom) 2021/281 of 22 February 2021 amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it (OJ L62/41 of 23.2.2021)

	Current Value MEUR	< 2007 Final Execution	Total 2007-2013	2014 Executed	2015 Executed	2016 Executed	2017 Executed	2018 Executed	2019 Executed	2020 Executed	Total 2014-2020	Total 2007-2020
Commitment Appropriations	**ITER Construction**	**42.129**	**3 120.217**	**555.610**	**348.920**	**382.784**	**462.907**	**605.114**	**621.732**	**771.773**	**3 748.839**	**6 869.056**
	Technology		**48.092**	**16.007**	**14.008**	**12.901**	**14.552**	**11.354**	**5.689**	**20.190**	**94.702**	**142.794**
	Technology for ITER		27.499	9.521	6.740	6.694	4.606	7.790	1.471	0.800	37.623	65.122
	Technology for Broader Approach		20.592	6.486	7.268	6.207	9.946	3.565	4.218	19.390	57.079	77.671
	Technology for DONES		-									-
	Other Expenditure		**5.297**	**1.582**	**2.462**	**1.868**	**4.254**	**5.942**	**13.591**	**17.848**	**47.546**	**52.843**
	F4E Administration		**183.982**	**42.625**	**44.028**	**47.669**	**52.361**	**55.388**	**56.630**	**59.223**	**357.925**	**541.907**
	F4E Total Budget	**42.129**	**3 357.587**	**615.825**	**409.418**	**445.221**	**534.074**	**677.799**	**697.642**	**869.034**	**4 249.012**	**7 606.600**
	Tasks from ITER Organization		**-**	**-**	**1.078**	**13.422**	**1.406**	**3.158**	**20.661**	**13.726**	**53.451**	**53.451**
	Other Earmarked expenditure										**-**	**-**
	F4E Total Expenditure	**42.129**	**3 357.587**	**615.825**	**410.496**	**458.643**	**535.480**	**680.957**	**718.303**	**882.761**	**4 302.464**	**7 660.051**

	Current Value MEUR	2021 Budget AM2	2022 Budget	2023 Planned needs	2024 Planned needs	2025 Planned needs	2026 Planned needs	Total 2021-2026	Total <2007-2026
Commitment Appropriations	**ITER Construction**	**942.023**	**713.132**	**1 052.353**	**789.335**	**646.860**	**809.047**	**4 952.749**	**11 863.934**
	Technology	**19.844**	**45.349**	**84.038**	**81.463**	**79.137**	**131.155**	**440.986**	**583.780**
	Technology for ITER	6.300	4.339	11.838	7.763	4.037	54.555	88.832	153.955
	Technology for Broader Approach	13.544	41.009	43.300	44.200	45.100	46.000	233.153	310.825
	Technology for DONES			28.900	29.500	30.000	30.600	119.000	119.000
	Other Expenditure	**24.156**	**29.958**	**25.000**	**25.000**	**25.000**	**25.000**	**154.114**	**206.957**
	F4E Administration	**63.362**	**66.052**	**71.114**	**72.007**	**73.102**	**75.530**	**421.166**	**963.073**
	F4E Total Budget	**1 049.384**	**854.490**	**1 232.504**	**967.805**	**824.099**	**1 040.732**	**5 969.015**	**13 617.744**
	Tasks from ITER Organization	**18.324**	**17.190**	**17.530**	**41.850**	**18.240**	**18.610**	**131.744**	**185.195**
	Other Earmarked expenditure	**1.400**						**1.400**	**1.400**
	F4E Total Expenditure	**1 069.108**	**871.680**	**1 250.034**	**1 009.655**	**842.339**	**1 059.342**	**6 102.158**	**13 803.536**

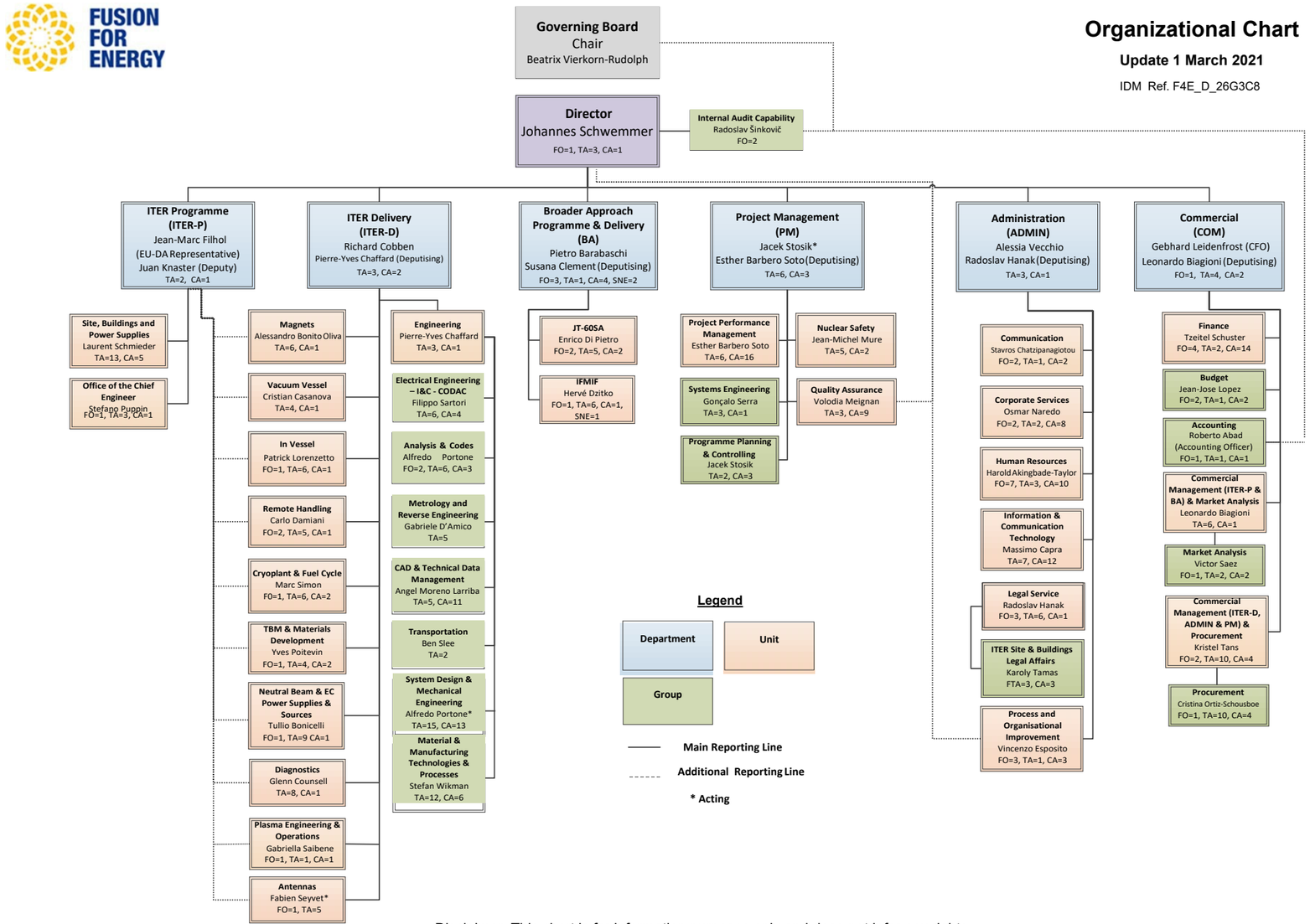
Note 1: The past executed figures in this REP can differ from the figures in previous REP due to the impact of de-commitments and recoveries, accounted in the year of origin of the initial commitment.

Financial_Table 4 Annual Expenditure in Commitment Appropriations (current value)

List of Tables

SPD2022_ANNEXES TO HR REP

1. Organization chart



Disclaimer: This chart is for information purposes only and does not infer any rights

2. Human Resources per action 2022-2026

The allocation of the F4E staff varies according to the needs of the project and depends on the nature of the work, its complexity and the required expertise.

The allocation of staff in the forthcoming year will be made with a rolling wave approach and therefore the staff figures may vary depending on change of requirements in each programme.

The staff reduction in the years 2024, 2025 and 2026 reflects the return of 31 posts that F4E had obtained as part of a provisional reinforcement of 45 posts agreed by the Commission in 2015. The return of these posts to the Commission must be done by a non-renewal of employment contracts of the staff employed on these positions. In practice, this means that the ramp down for some of these posts will be sooner than the dates suggested in the tables.

Action #	Action	2021			2022			2023			2024			2025			2026		
		FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Budget allocated
1	Magnets	18.5	11.2	€ 5,750,000	14.9	9.2	€ 5,887,034	14.3	9.6	€ 746,680	5.1	0.0	€ 322,189	5.2	0.0	€ -	5.2	0.0	€ -
2,3,4,10*	Main Vessel	56.4	34.7	€ 151,092,194	59.6	35.8	€ 112,527,825	55.2	31.5	€ 210,668,006	50.2	27.2	€ 119,142,356	48.7	26.1	€ 116,486,752	48.2	25.9	€ 89,619,322
5	Remote Handling	24.4	13.6	€ 24,703,115	28.0	16.8	€ 16,691,822	25.8	15.2	€ 53,666,005	27.8	17.5	€ 109,097,713	26.7	16.5	€ 48,168,814	26.4	16.5	€ 6,235,277
6	Cryoplant & Fuel Cycle	16.9	8.9	€ 9,501,477	17.2	9.2	€ 8,479,232	16.5	9.9	€ 12,992,960	17.6	10.8	€ 40,967,269	16.7	9.8	€ 129,035,975	16.6	9.9	€ 33,478,336
7	Antennas and Plasma Engineering	19.3	8.5	€ 78,726,455	26.4	13.6	€ 4,354,175	19.6	8.3	€ 68,516,919	21.1	9.9	€ 3,450,892	20.6	9.5	€ 1,609,491	20.4	9.5	€ 3,406,594
8	Neutral Beam and EC Power Supplies and Sources	28.5	13.7	€ 7,772,014	24.1	11.1	€ 32,305,159	29.5	14.9	€ 103,309,147	31.4	16.7	€ 45,813,812	30.2	15.8	€ 56,934,980	30.1	16.1	€ 13,917,354
9	Diagnostics	27.3	12.7	€ 41,484,562	32.1	15.4	€ 21,342,879	30.6	15.0	€ 39,215,020	32.5	16.7	€ 61,792,681	31.2	15.6	€ 34,491,025	31.0	15.5	€ 1,769,616
11	Site and Buildings and Power Supplies	39.5	31.9	€ 356,203,917	34.9	27.5	€ 226,426,063	39.7	30.9	€ 225,518,149	39.2	30.6	€ 22,149,528	38.9	29.7	€ 15,920,001	38.4	29.4	€ 237,545,391
12	Cash Contributions	0.8	1.6	€ 295,532,180	0.8	1.6	€ 308,004,235	0.8	1.6	€ 342,457,531	0.8	1.6	€ 442,062,684	0.8	1.6	€ 286,172,052	0.8	1.6	€ 461,897,853
13	Technical Support Activities	23.8	21.8	€ 21,115,369	18.1	17.4	€ 28,237,365	23.5	20.2	€ 24,339,936	23.1	20.2	€ 23,062,581	23.1	20.3	€ 14,939,704	23.0	20.6	€ 29,486,615
14	Broader Approach	24.4	14.6	€ 13,864,535	24.0	19.5	€ 41,372,873	24.4	19.9	€ 97,490,167	23.1	19.9	€ 69,786,470	21.9	20.0	€ 65,478,034	22.0	20.0	€ 106,456,068
		280.0	**173.0**	**€ 1,005,745,816**	**280.0**	**177.0**	**€ 805,628,663**	**280.0**	**177.0**	**€ 1,178,920,519**	**272.0**	**171.0**	**€ 937,648,175**	**264.0**	**165.0**	**€ 769,236,829**	**262.0**	**165.0**	**€ 983,812,426**

Notes/assumptions:

* The Actions of Vacuum Vessel, In-Vessel Blanket, In-Vessel Divertor and Test Blanket Module are presented merged in one single line due to commercial sensitive information.

1 2021 figures correspond to the budget allocated for the Work Programme amendmend 2.

2 2022 figures corresponds to the budget allocated for the original Work Programme

3 2023-2026 figures are generated by applying a correction to the Estimate in Year value

4 The figures within are very preliminary, generated using high level assumptions.
As agreed during December 2020 GB, F4 planning will be adjusted to take into account spending priorities based on the updated ITER Project Baseline, IO is currently working on, and when the budget implications of UK re-joining Euratom are known. Until then, the numbers quoted herein should be viewed as indicative only.

5 Figures are limited to operational budget (administrative expenditure are excluded). All figures in other parts of the SPD regarding the Work programme contain exclusively operational budget and thus can be reconciled with the resource table figures.

6 Figures exclude Risk Exposure.

7 Operation Phase is included.

8 Reference September 2021 Data.

9 The global reduction of the HR numbers from 2024 is linked to the phasing out of 31 short term posts

10 A minimum capacity of operational staff and administrative support is envisaged in Magnets and Vacuum Vessel at the end of their manufacturing phases

HR_table 1. Resources allocation per activity 2022-2026

3. HR Quantitative

3.1. Statutory staff, SNE and other staff

Human Resources	Year 2020			Year 2021	Year 2022	Year 2023	Year 2024	Year 2025	Year 2026
ESTABLISHMENT PLAN POSTS	Authorised Budget	Filled as of 31/12/2020[1]	Occupancy rate (%)	Authorised Budget	Envisaged staff[2]	Envisaged staff	Envisaged staff[3]	Envisaged staff[4]	Envisaged staff[5]
Administrators (AD)	243	231	95%	243	238	238	233	228	226
Assistants (AST)	37	44	119%	37	42	42	39	36	36
Assistants/Secretaries (AST/SC)	-	-	-	-	-	-	-	-	-
TOTAL ESTABLISHMENT PLAN POSTS	**280**	**275**	**98%**	**280**	**280**	**280**	**272**	**264**	**262**
EXTERNAL STAFF	FTE corresponding to the authorised	Executed FTE as of 31/12/20	Execution Rate %	FTE corresponding to the authorised	Envisaged FTE[6]	Envisaged FTE	Envisaged FTE[7][8]	Envisaged FTE[9]	Envisaged FTE
Contract Agents (CA)	170	161.8	95%	170	170	170	163	157	157
Seconded National Experts (SNE)	3	2	67%	3	7	7	8	8	8
TOTAL EXTERNAL STAFF	173	164	95%	173	177	177	171	165	165
TOTAL STAFF	**453**	**439**	**97%**	**453**	**457**	**457**	**443**	**429**	**427**
Structural service providers		28							
External Service Providers[10]		329							
Interim staff		13.9							

[1] Of which 2 job offers accepted (1 TA and 1 CA)

[2] 5 short term AD posts are converted into AST to better reflect the effective use of the short term TA posts

[3] Return of 8 TA posts in the framework of the phasing out of the 21 TA short term posts granted in 2016
The distribution of those between AD and AST is indicative but it cannot be confirmed yet

[4] Return of 8 TA posts in the framework of the phasing out of the 21 TA short term posts granted in 2016
The distribution of those between AD and AST is indicative but it cannot be confirmed yet

[5] Return of 2 TA posts in the framework of the phasing out of the 21 TA short term posts granted in 2016

[6] Out of the 7 SNEs, 4 are fully credited and cost neutral

[7] Out of the 8 SNEs, 5 are fully credited and cost neutral

[8] Return of 7 CA posts in the framework of the phasing out of the 24 CA short term posts granted in 2015

[9] Return of 6 CA posts in the framework of the phasing out of the 24 CA short term posts granted in 2015

[10] Figure reported in the Strategic Resource Plan 2021-2027 presented to AMC in June 2021 (data as at 1 March 2021)

HR_table 2. Statutory staff, SNE and other staff

3.2. Multiannual staff policy plan Year N+1, Year N+2, Year N+3, Year N+4, Year N+5

A. Staff in Establishment Plan

Function group and grade	Year 2020				Year 2021		Year 2022		Year 2023		Year 2024		Year 2025		Year 2026	
	Authorised Budget		Actually filled as of 31/12/20		Authorised Budget		Envisaged[1]		Envisaged		Envisaged[2]		Envisaged[2]		Envisaged[2]	
	Permanent posts	Temporary posts	Permanent posts	Temporary posts	Perm. Posts	Temp. posts	Perm. Posts	Temp. posts	Perm. Posts	Temp. posts	Perm. Posts	Temp. posts	Perm. Posts	Temp. posts	Perm. Posts	Temp. posts
AD 16																
AD 15		1				1		1		1		1		1		1
AD 14	5	3	2	1	5	3	3	1	5	3	5	3	5	4	6	5
AD 13	14	9	7	6	13	10	7	5	5	6	6	7	6	9	5	10
AD 12	15	21	10	15	14	21	10	23	13	31	13	36	15	44	16	52
AD 11	2	27	5	19	2	29	3	22	5	29	6	33	6	38	6	40
AD 10		31		30		33	5	37	6	40	5	40	4	45	4	44
AD 9		41	10	60		42	6	54	3	50	2	47	1	39		35
AD 8	1	33	1	24	1	33	1	29		27		26		11		2
AD 7	2	21		20	2	21	2	20		14		3				
AD 6	1	16	1	20	1	12		9								
AD 5																
AD TOTAL	**40**	**203**	**36**	**195**	**38**	**205**	**37**	**201**	**37**	**201**	**37**	**196**	**37**	**191**	**37**	**189**
AST 11	5		1		6		1		6		6		6		6	
AST 10	1		1				3									
AST 9	4		2		4	1	1	1	4	1	4	2	4	2	4	4
AST 8	1	2	2		1	2		2	1	2	1	2	1	2	1	4
AST 7		4	1	2		5	1	6		5		6		6		6
AST 6		9		9		9	1	8		10		12		12		11
AST 5		9	3	7		8	2	12		13		6		3		
AST 4		2	2	6		1	1	2								
AST 3			1	7			1									
AST 2																
AST 1																
AST TOTAL	**11**	**26**	**13**	**31**	**11**	**26**	**11**	**31**	**11**	**31**	**11**	**28**	**11**	**25**	**11**	**25**
AST/SC 6	-	-			-	-	-	-	-	-	-	-	-	-	-	-
AST/SC 5	-	-			-	-	-	-	-	-	-	-	-	-	-	-
AST/SC 4	-	-			-	-	-	-	-	-	-	-	-	-	-	-
AST/SC 3	-	-			-	-	-	-	-	-	-	-	-	-	-	-
AST/SC 2	-	-			-	-	-	-	-	-	-	-	-	-	-	-
AST/SC 1	-	-			-	-	-	-	-	-	-	-	-	-	-	-
AST/SC TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**51**	**229**	**49**	**226**	**49**	**231**	**48**	**232**	**48**	**232**	**48**	**224**	**48**	**216**	**48**	**214**
GRAND TOTAL	**280**		**275**		**280**		**280**		**280**		**272**		**264**		**262**	

Note: The requested posts for 2022 and the forecasts for 2023, 2024, 2025 and 2026 are calculated according to the promotion rates of Annex I of the Staff Regulations.

[1] Conversion of 1 FO AD post into TA AD in view of the departure of one official in 2021
In addition, 5 ST TA AD posts are converted into AST

[2] The AD/AST distribution of the TA posts to be returned to the Commission (8 in 2024, 8 in 2025 and 2 in 2026) is indicative and can vary depending on the end date of the contracts linked to those positions.

HR_table 3. Multi-annual staff policy Plan 2022-2026 – Staff in Establishment Plan

B. External personnel

Contract agents	FTE corresponding to the authorised budget 2020	Executed FTE as of 31/12/2020	Headcount as of 31/12/2020[1]	FTE corresponding to the authorised budget 2021	FTE corresponding to the authorised budget 2022	FTE corresponding to the authorised budget 2023[2]	FTE corresponding to the authorised budget 2024[3]	FTE corresponding to the authorised budget 2025[3]	FTE corresponding to the authorised budget 2026
Function Group IV	97	97.8	95	97	97	97	92	88	88
Function Group III	50	50.0	53	50	50	55	54	53	53
Function Group II	23	14.0	12	23	23	18	17	16	16
Function Group I	-	-	-	-	-	-	-	-	-
TOTAL	170	161.8	160	170	170	170	163	157	157

Seconded National Experts	FTE corresponding to the authorised budget 2020	Executed FTE as of 31/12/2020	Headcount as of 31/12/2020	FTE corresponding to the authorised budget 2021	FTE corresponding to the authorised budget 2022[4]	FTE corresponding to the authorised budget 2023	FTE corresponding to the authorised budget 2024[5]	FTE corresponding to the authorised budget 2025	FTE corresponding to the authorised budget 2026
TOTAL	3	2	2	3	7	7	8	8	8

[1] Staff in place only. It may differ from the recruited/filled in figure reported in table 2.2. External Staff of the FIFI

[2] 5 CA FGII posts are converted into FGIII

[3] The distribution per function group of the CA posts to be returned to the Commission (7 in 2024 and 6 in 2025) is indicative and can vary depending on the end date of the contracts linked to those positions.

[4] Of which 4 are fully credited and cost neutral

[5] Of which 5 are fully credited and cost neutral

HR_table 4. Multi-annual staff policy Plan 2022-2026 – External personnel

C. Additional external staff expected to be financed from grant, contribution or service-level agreements

Human Resources	Year N	Year N+1	Year N+2	Year N+3	Year N+4	Year N+5
	Envisaged staff	Envisaged staff	Envisaged staff	Envisaged staff	Envisaged staff	Envisaged staff
Contract Agents (CA)	-	-	-	-	-	-
Seconded National Experts (SNE)	-	-	-	-	-	-
TOTAL	0	0	0	0	0	0

HR_table 5. Staff financed from grant, contribution or SLA

D. Selection procedures

F4E applies the General Implementing Provisions (GIP) on the Procedure governing the Engagement and use of Temporary Agents and those specific to Contract Agents. For the selection and use of EU Officials, F4E follows the rules applied by the Commission, by analogy. In agreement with the Commission and following a verification exercise by the European Personnel Selection Office (EPSO) of the F4E selection procedures, F4E has been selecting staff on the basis of both interviews and written tests since April 1st, 2013 for all long-term employment contracts.

Vacancy announcements have typically been advertised on the career opportunities section of F4E's website. Various other job portals and specialized media are also used to attract applicants from as wide a geographical basis as possible. The increased reliance on social media is part of a sourcing strategy emphasizing a more tailored approach to filling vacancies.

1. Selection of Established Officials

Vacant permanent posts intended to be occupied by already established Officials and/or candidates on reserve lists, are filled in conformity with the Staff Regulations. Interviews are conducted by a Panel (composed by a representative of the administration and a representative of the concerned department) using pre-defined criteria stipulated in the corresponding vacancy notice and a standard evaluation grid based on the aforementioned criteria.

Since 2007, F4E has launched 64 publications for FO positions. However, in an effort to harmonize its workforce structure and in keeping with the time limited mandate of F4E, a decision was taken to stop expanding the F4E FO staff complement. This decision was taken in 2015 and provides that whenever FO positions become vacant, they shall be replaced by equivalent or lesser graded TA positions.

2. Selection of Temporary Agents

These are typically organized on the basis of the following grade brackets:

- AST 1 – AST 4 for assistant positions (technical and administrative).
- AD5 – AD12 for technical and administrative profiles;
- AD9 – AD12 for managerial and senior profiles (technical/scientific experts, group leaders depending on the group and functions to be developed);
- AD12 for Heads of Department[1].
- AD14 for the F4E Director.

E. Recruitment forecasts 2022 following retirement/mobility

Below are the selections expected for 2022 according to the information available.

Recruitment forecasts N+1 following retirement/mobility or new requested posts					
Job title in the Agency	Type of contract (Official, TA or CA)		TA/Official Function group/grade of recruitment internal		CA
	Due to foreseen retirement/mobility	New post requested due to additional tasks	Internal (brackets)	External (single grade)	Recruitment Function Group (I, II, III or IV)
Programme Manager	**FO/TA**	-	**9-12**	**9**	-

HR_table 6. Recruitment forecast

4. HR Qualitative

4.1. Implementing Rules on recruitment policy

Implementing rules in place		Yes	No	If no, which other implementing rules are in place		
Engagement of CA	Model Decision C(2019)3016	**X**		-	Decision of the Administration and Management Committee on the use and engagement of contractual agents (15 November 2019)	https://f4enet.f4eda.local/sectionMyF4E/HR/About_us/Documents/decision_final_use%20and%20engagement%20of%20CA%20with%20annexes_signed.pdf
Engagement of TA	Model Decision C(2015)1509	**X**		-	Decision of Administrative and Management Committee of F4E on general implementing provisions governing the engagement and use of temporary staff under Article 2(f) of the CEOS (15 October 2015).	https://f4enet.f4eda.local/sectionMyF4E/HR/Staff_regulations/Documents/Article_2f.pdf
Middle management	Model decision C(2018)2542	**X**		-	Decision of the Administration and Management Committee of F4E on	https://f4enet13.f4eda.local/ourorganisation/SiteAssets/Pa

[1] While the model Implementing Rule on middle management applicable to agencies only considers management to be senior as of grade AD14, F4E considers the role of Head of Department as an intermediate step between the Director (senior management) and the Heads of Unit.

					middle management staff (13 June 2018).	ges/OurOrg/AMC%20middle%20management_signe.pdf
Type of posts	Model Decision C(2018)8800	X			Decision of the Administration and Management Committee on types of post and post titles (14 June 2019).	https://f4enet.f4eda.local/sectionMyF4E/HR/career/my_contract/Documents/AMC%20decision%20type%20of%20post%20final%20signed.pdf

HR_table 7. Implementing Rules for 2022

4.2. Appraisal and reclassification/promotion

A. Performance management

Staff performance is assessed annually based on an F4E-wide performance appraisal. The latter serves the purposes of improving individual staff performance by establishing and subsequently reducing gaps between desired and actual performance. The key constituent parts of the mechanism are:

1. Establishment of "SMART" and jointly agreed performance objectives.
2. Self-assessment by the staff member.
3. Performance review and dialogue with the line manager.
4. Definition of career development and training objectives addressing agreed areas of improvement and career aspirations. The assessment period coincides with the calendar year and runs from January, 1st to December, 31st. In keeping with the staff regulations, the appraisal assesses three main areas of competence as follows: efficiency, ability and conduct in the service. The use of languages and the level of responsibility exercised are two additional constituent components of the merit rating.

Looking ahead, and in keeping with its project nature, F4E will further optimise the annual performance appraisal system to increase the effectiveness of the matrix structure. One aim is to better capture performance feedback from both line managers and functional managers of staff having dual reporting lines in the framework of the matrix structure. Another objective is to better cascade the corporate objectives down to individual objectives and to implement mid-year performance reviews. In keeping with the corporate challenge of enhanced accountability, F4E also looks to establish standardized performance objectives for different workforce population groups. These standards will be based on a job classification review aimed at establishing clearly defined responsibility standards for each grade. These are major steps forward in optimizing performance management.

Promotions and reclassifications shall be exclusively by selection from officials, temporary agents and contract agents who have completed a minimum of two years in their grade.

Promotion/reclassification takes place on the 1 January of the year of the exercise (N) (or on the first day of the month following that in which the 2 years seniority are acquired). In recognition of the need to be in alignment with the promotion rates foreseen in the relevant implementing rule F4E will endeavor to align its rate of promotion/reclassification to the average duration grades foreseen in the staff regulation and associated implementing rules. Illustratively. The Tables below provide an overview of the number of promotions awarded in each grade during the last exercise.

B. Implementing Rules in place

Implementing rules in place		Yes	No	If no, which other implementing rules are in place		
Reclassification of TA	Model Decision C(2015)9560	**X**		-	Decision of Fusion for Energy Administration and Management Committee laying down general implementing provisions regarding Article 54 of the Conditions of Employment of Other Servants of the European Union (reclassification of Temporary Agents, 9 June 2016).	https://f4enet.f4eda.local/ourorganisation/SiteAssets/Pages/OurOrg/54.pdf
Reclassification of CA	Model Decision C(2015)9561	**X**		-	Decision of Fusion for Energy Administration and Management Committee on general implementing provisions regarding Article 87(3) of the Conditions of Employment of Other Servants of the European Union (reclassification of Contract Agents, 9 June 2016).	https://f4enet.f4eda.local/ourorganisation/SiteAssets/Pages/OurOrg/87.pdf

HR_table 8. Adopted Implementing Rules

C. Reclassification of TA / promotion of officials

Reclassification of Temporary Agents / Promotion of Officials							
Grades	**Year 2016**	**Year 2017**	**Year 2018**	**Year 2019**	**Year 2020**	**Actual average over 5 years**	**Average over 5 years (Annex IB SR)**
AD05		3.7				**3.7**	2.8
AD06	2.3	2.4	5.2	2.7	3.1	**3.1**	2.8
AD07	2.3	2.3	2.3	2.6	2.5	**2.4**	2.8
AD08	2.3	3.0	2.8	3.1	2.9	**2.8**	3
AD09	3.0	3.1	2.8	4.0	3.4	**3.3**	4
AD10	3.7	4.4	5.1	3.9	3.9	**4.2**	4
AD11			5.5	4.3	4.0	**4.6**	4
AD12			10.9		11.8	**11.3**	6.7
AD13				8.0	10.0	**9.0**	6.7
AST1	3.1					**3.1**	3
AST2		4.0		3.0		**3.5**	3
AST3	3.5	3.3	3.1	2.5	2.8	**3.0**	3
AST4	2.3	2.8	2.5	4.0	4.3	**3.2**	3
AST5	2.5	2.0		3.2	3.4	**2.8**	4
AST6	3.5	3.0	2.0		3.5	**3.0**	4
AST7				3.0		**3.0**	4
AST8				4.0		**4.0**	4
AST9							N/A
AST10 (Senior Assistant)				7.0		**7.0**	5

The average duration in grade in 2018 of the AD12 was missing in the SPD 2021 since a retroactive promotion in 2019 had not been updated in the table. Any other discrepancies in 2018 or 2019 is due to the fact that we indicated the average of the average durations for FO and TA, instead of putting the average of the whole population of FO and TA in the grade, which is the normal data reported for reclassification and promotion.

HR_table 9. Reclassification of TA / promotion of officials

D. Reclassification of contract agents

Reclassification of Contract Staff					
Function Group	**Grade**	**Staff in activity at 01.01.2019**	**How many staff members were reclassified in 2020***	**Average number of years in grade of reclassified staff members***	**Average number of years in grade of reclassified staff members according to decision C(2015)9561**
CA IV	17	3			Between 6 and 10 years
	16	21	3	3.0	Between 5 and 7 years
	15	25	5	3.9	Between 4 and 6 years
	14	41	10	2.7	Between 3 and 5 years
	13	5	3	2.6	Between 3 and 5 years
CA III	12	0			
	11	14	3	6.0	Between 6 and 10 years
	10	24	7	4.8	Between 5 and 7 years
	9	15	4	4.0	Between 4 and 6 years
	8	1			Between 3 and 5 years
CA II	7	4			
	6	6			Between 6 and 10 years
	5	3	2	3.4	Between 5 and 7 years
	4	1			Between 3 and 5 years
CA I	2				Between 6 and 10 years
	1				Between 3 and 5 years
Total		**163**	**37**		

HR_table 10 . Reclassification of contract staff

4.3. Gender representation

The figures are consistent with workforce statistics in the industry sectors related to the core tasks of the Agency and show a predominance of male colleagues in the technical functions. Conversely female colleagues are predominantly represented in administrative and support roles. F4E will continue to try to address the issue and try to increase the representation of female staff. Special efforts will be made for the managerial functions where F4E has only five female staff members.

A. Statutory staff (only officials, AT and AC)

		Official		Temporary Agents		Contract Agents		Grand Total	
		Staff	%	Staff	%	Staff	%	Staff	%
Female	Administrator	11	22.4%	44	19.6%			55	12.7%
	Assistant	8	16.3%	10	4.4%			18	4.2%
	FGII, FGIII, FGIV					86	54.1%	86	19.9%
	Total female	**19**	38.8%	**54**	24.0%	**86**	54.1%	**159**	36.7%
Male	Administrator	25	51.0%	150	66.7%			175	40.4%
	Assistant	5	10.2%	21	9.3%			26	6.0%
	FGII, FGIII, FGIV					73	45.9%	73	16.9%
	Total male	**30**	61.2%	**171**	76.0%	**73**	45.9%	**274**	63.3%
Grand Total		**49**	100%	**225**	100%	**159**	100%	**433**	100%

HR_table 11. Gender representation Officials, AT and AC on 31/12/2020

B. Evolution over 5 years of the Middle and Senior management

	2015		2019		2020	
	Number	%	Number	%	Number	%
Female Managers	2	**7%**	4	**12.5%**	5	**16%**
Male Managers	25	**93%**	28	**87.5%**	27	**84%**
Total	27	100%	32	100%	32	100%

	2015		2019		2020	
	Number	%	Number	%	Number	%
Female Senior Managers	0	**0%**	0	**0%**	1	**3.1%**
Female Middle Managers	2	**7.4%**	4	**12.5%**	4	**12.5%**
Male Senior Managers	3	**11.1%**	7	**21.9%**	6	**18.8%**
Male Middle Managers	22	**81.5%**	21	**65.6%**	21	**65.6%**
Total	27	100%	32	100%	32	100%

HR_table 12. Gender evolution of Senior and Middle management

4.4. Geographical balance

The table below provides the geographical distribution as at 31.12.2020 based upon the filled in posts on 31.12.2020 (accepted job offers are included).

The over representation of Spanish nationals follows from the Agency being headquartered in Spain and from the large proportion of short-term non-renewable positions which typically do not entice non- Spaniards to apply. A diversity policy is being developed to address the imbalance. Looking forward F4E will continue to strike a balance between ensuring a broad geographical distribution of staff and the non-discrimination principle enshrined in its selection and recruitment policies.

A. Statutory staff per nationality

Nationality	AD + CA FGIV		AST/SC - AST + CA FGI / FGII / FGIII		TOTAL	
	Number	% of Total Staff members in AD and FG IV categories	Number	% of Total Staff members in AST SC/AST and FG I, II and III categories	Number	% of total staff
Belgian	8	2.5%	10	9.3%	**18**	4.2%
British	9	2.8%	4	3.7%	**13**	3.0%
Bulgarian	3	0.9%	1	0.9%	**4**	0.9%
Croatian	1	0.3%		0.0%	**1**	0.2%
Czech	2	0.6%	2	1.9%	**4**	0.9%
Dutch	5	1.5%		0.0%	**5**	1.2%
Estonian	1	0.3%		0.0%	**1**	0.2%
Finnish	3	0.9%	1	0.9%	**4**	0.9%
French	66	20.3%	18	16.7%	**84**	19.4%
German	10	3.1%	6	5.6%	**16**	3.7%
Greek	5	1.5%	3	2.8%	**8**	1.8%
Hungarian	6	1.8%		0.0%	**6**	1.4%
Irish	4	1.2%	2	1.9%	**6**	1.4%
Italian	66	20.3%	21	19.4%	**87**	20.1%
Lithuanian		0.0%	3	2.8%	**3**	0.7%
Maltese	1	0.3%		0.0%	**1**	0.2%
Polish	6	1.8%		0.0%	**6**	1.4%
Portuguese	10	3.1%	1	0.9%	**11**	2.5%
Romanian	9	2.8%	1	0.9%	**10**	2.3%
Slovak	1	0.3%		0.0%	**1**	0.2%
Spanish	105	32.3%	35	32.4%	**140**	32.3%
Swedish	4	1.2%		0.0%	**4**	0.9%
TOTAL	325	100%	108	100%	433	100.0%

HR_table 13. Nationalities of staff

B. Evolution over 5 years of the most represented nationality

Most represented nationalities	2015		Most represented nationalities	2020	
	Number	%		Number	%
Spanish	117	**35%**	**Spanish**	140	**32%**
Italian	85	**21%**	**Italian**	87	**20%**
French	72	**18%**	**French**	84	**19%**
Belgian	21	**5%**	**Belgian**	18	**4%**
British	21	**5%**	**German**	16	**4%**
German	18	**4%**	**British**	13	**3%**
Total F4E	**401**		**Total F4E**	**433**	

HR_table 14. Evolution over 5 years of the most represented nationalities

4.5. Staff mobility

A. Internal mobility

Increased career mobility consistently features as the foremost concern of staff. In recognition of this wish, the agency adopted an internal mobility policy in June 2015 foreseeing that all vacancies are subject to internal selections prior to opening them externally. The policy only provides for horizontal mobility and complements vertical mobility, which is only possible through external selection procedures and/or promotion/reclassification decisions.
In keeping with its project nature and matrix organization, F4E will also seek to increase the effectiveness of its workforce management through increased flexibility and transience of project assignments. As part of this endeavor F4E will seek to progressively 'flatten' its structure and reduce the number of vertical levels currently in place. In parallel F4E will increase the number of clearly visible project manager roles thereby creating more attractive internal development paths.

B. Inter-agency job Market

It will predominantly concern support and administrative profiles rather than operational and technical staff. Where necessary and deemed useful F4E will use the Interagency Job Market to publish its vacancy notices.

4.6. Schooling

In the absence of a European School in F4E's Barcelona and Cadarache work sites, the Agency established Service Level Agreements with a number of international schools located in and around these two sites. Under these agreements, F4E staff enjoys easier access to school registration and enrolment for their dependent children. The agreements also provide a framework for the direct settlement of school fees by the Agency. The number of international schools making up the F4E schooling offer has gradually grown over the years and is currently a prominent part of F4E's employee value proposition. In addition, F4E continues to be involved in the governance of the International School of Manosque where it is part of the international Advisory Council and where it strives to uphold the interests of its staff with dependent children in that establishment. While, F4E does not currently envisage any further actions at this time, it will endeavor to maintain its appeal in this domain for both existing and prospective staff members.
Taken together, Service Level Agreements have been established with 28 international schools of which 24 in the area of Barcelona and 4 in Cadarache (France).

Agreement(s) in place with School(s)				
Contribution agreements signed with the EC on type I European schools	Yes		No	**X**
Contribution agreements signed with the EC on type II European schools	Yes		No	**X**
Number of service contracts in place with international schools:	**27**			
Description of any other solutions or actions in place: F4E has in place an agreement with a school for children with special needs				

HR_table 15. Service Level Agreements with International schools

List of Tables

SPD2022_ANNEXES WORK PROGRAMME 2022

1. DEFINITIONS, ASSUMPTIONS AND SUPPORTING INFORMATION TO WP2022

The 2022 Work Programme takes into account to the extent possible the EU Commission guidelines for the Programming document as requested by the Financial Regulation. It comprises a general overview of the progress of work and the procurement activities that will be committed during 2022, detailed objectives, expected results and target for each WP Action.

Main assumptions

The following assumptions are considered as the basis of the Work Programme 2022:

- The F4E schedule used for the preparation of this document is the one submitted to IO at the end of March 2021.[1]
- The F4E schedule takes into account:
  - ✓ The latest input and developments of the schedules from the F4E suppliers, taking into account the agreed fabrication routes and showing the real development of the work.
  - ✓ The most realistic assumption of Procurement Arrangement (PA) signature dates based on the current status of the design of components and on the forecasted dates of the required design reviews prior to the PA signature.
  - ✓ The available manpower in F4E, taking into account bottlenecks in specific areas where staffing is not sufficient to grant a prompt process of the work. In specific cases, F4E foresees to satisfy its manpower needs by using external contractors.
  - ✓ The most realistic assumptions on the input data availability from IO to take into account the existing delays and the agreed dates of data delivery.
  - ✓ The information provided by the other DAs through their monthly Detailed Work Schedule to take into account any possible delay in the delivery of items to F4E that can cause delays to the EU in-kind procurements.
- The budget figures are based on the MFF 2021-2027 approved by the Council on 22/02/2021 plus ITER Host State and Membership contributions. The budget summary table of Work Programme 2022 (WP_table 1) reflects the current status of the draft budget for the 2022 financing decision.
- In order to achieve an improvement of the quality of the PAs that need still to be signed, a common F4E/IO effort is still in progress to better identify the requirements that are linked to the specific procurement.
- Technically and commercially complex procurements will be implemented whenever appropriate through the competitive dialogue procedure or through the negotiated procedure, in order to improve the alignment of supply chain response to F4E needs and to proactively adopt cost containment measures. This will be done in compliance with F4E Financial Regulation.
- Grants related to recurring and sequential R&D activities, with a well-defined development path eventually leading to an EU procurement package, will be implemented whenever appropriate, through Framework Partnership Agreements (FPA), in order to streamline and channel R&D funding, improve its effectiveness and decrease the administrative burden to beneficiaries and F4E alike.
- Procurements which require a very close coordination between F4E and other entities will be implemented, whenever appropriate, through the Joint Procurement procedure.

[1] Except for the Work Programme objectives of action 7 Antennas and Plasma Engineering and action 12 Cash Contributions that reflect the situation at the end of September 2021.

- All the activities described in the overview of each Action and the list of contracts in WP_Table 3 is intended as credited by PA or ITA. If an Action is not credited, then it is explicitly mentioned in the overview. This is not applicable for the Action “Broader Approach” (i.e. not credited).
- F4E endorsement of the Japanese Procurement Arrangement that foresees an EU financial contribution will be preceded by a budgetary commitment for the entire amount of the F4E contribution.
- Changes originated by IO, or other DA’s, will be fully compensated by the IO Reserve Fund.
- The Art. 5 of the F4E Statutes states that the Joint Undertaking may award grants and prizes in accordance with the rules of its financial regulation. In this regard, Essential selection, award criteria and Upper funding limits are defined in these annexes.
- Article 74 (2) of the F4E financial regulation in conjunction with Article 1(5) of Annex III to the F4E Statutes provides for the possibility to make use of annual instalments for actions extending over more than one financial year. An annual instalment consists in breaking down a budgetary commitment into annual instalments. Annual instalments can be implemented according to forecast of annual payment due, forecast of progress in the implementation of the contract, or annual budget availability.

Definitions and supporting information

1. "Action" for the purposes of Work Programme means “a coherent area of action with objectives and resources”. The list of the Actions and their definition is defined in the main text of the SPD.

2. Each Action of WP2022 comprises:

(a) **General overview** that is split into two parts. The “Progress of Work” part aims at providing the information concerning the activities foreseen during 2022 in that area. The “Procurement Activities” part instead focuses on the legal commitments foreseen during the year and to be covered by the financial decision and to be financed under the budget 2022. Furthermore, it includes (even if not explicitly mentioned):

i. Provisions for urgent general support tasks as cost/risk analysis, engineering support/analysis, I&C develop and support, experts, quality assurance and quality control, nuclear safety, CE marking analysis, transportation, storage, material characterization and qualification activities, resolution of non-conformities (in line with the mechanism agreed at ITER level), metrology and external legal support, cost of legal proceedings and alternative dispute settlement, including arbitration, as needed[2]. These tasks will be mainly implemented through specific contracts under existing framework contracts.

ii. Provisions for payment of liquidated damages, late payment interests, cost escalation, claims, release of options, indexation and other financial compensations that F4E may be obliged to pay under its contracts.

iii. Provisions for amendments to ongoing contracts covered by a previous financing decision(s) in accordance with the Implementing Rules.

iv. Provisions for BREXIT-related contractual modifications.

v. Provisions for Covid 19 related contract modifications and Covid 19 related new contracts for ITER and Broader Approach

vi. Provisions for new contracts and contractual modifications related to expiry of Switzerland co-operation agreement

(b) **Annual objectives** defined as the achievement on time of the following milestones:

[2] In accordance to F4E WBS implementation rules, whenever a procurement activity is in support of a specific WBS L3, the related procurement should be implemented under the mentioned WBS L3. This is not the case for general technical support activities to multiple WBSs (e.g. external resource to support overall risk management, etc.). In this case, they are included under Action 13

i. ITER Council/Governing Board (IC/GB) milestones in 2022;

ii. Milestones that will lead to the achievement of the future IC/GB milestones from the following years (defined as predecessor of future IC/GB milestones (if applicable).

iii. Key milestones marking significant schedule progress (only in the event that none of the above are applicable).

iv. Link with the ITER Project multi-annual objectives (defined as the whole set of IC/GB milestones): when a WP annual objective is a predecessor of a multi-annual objective (IC/GB milestones), it is clearly identified to which milestone is linked in the column “type of milestone”.

(c) The **expected results** define the main outcomes of the Actions.

(d) The **target** is defined, when applicable, as the yearly CAS foreseen to be achieved in 2022 and the cumulative CAS foreseen to be achieved by the end of 2022 per PA (PAs associated with each Action are listed in Table 2 of the main text of the SPD).The value is according to the CAS profile implemented in the F4E DWS.

(e) **Human resources** (see HR_Table 1 of annexes to HR REP annexes). The table shows an indicative estimate of the Full Time Equivalent (FTE) staff assigned to the specific Action to cover all the activities carried out in 2022. Per each Action it is identified the “core” team and the additional staff (i.e. legal, financial, contractual, project management) assigned to the action according to the F4E matrix structure. Remaining staff from the Commercial Dept., Admin. Dept. and Office of the Director is instead allocated per action on a pro-rata basis.

(f) **Procurement plan**:

i. Main Procurement Initiatives (see WP_Table 3 of these annexes): these are, per Action, the list of the foreseen main contracts with value higher than 139,000 Euros[3]. Amendments, claims, reimbursement, indexation, late interest and budget reserve are grouped together due to the sensitivity of this information. The list is based on the current information at the time of writing the Work Programme. During the implementation of the Work Programme activities, F4E may identify the need for new calls, group more activities in a single call or split one activity in more calls. This will in any case be performed preserving the scope and objective presented in WP2022. Contracts that do not fulfill the Work Programme scope identified for each Action are not covered by this financial decision and therefore will not be authorized. A change to this list shall be considered as a non-substantial for the purposes of the Article 32 point 4 of the F4E Financial Regulations if not affecting the available budget for 2022 within the limit of the flexibility rule and if any related changes to the scope of the annual Work Programme do not have significant impact on the nature of the Actions or on the achievement of objectives of the multiannual Project Plan.

ii. Value per Action: WP_Table 2 presents an indicative value of financial resources corresponding to each Action. F4E has evaluated the level of commitments planned for the Actions in 2022 by taking into account the progress of the project and the available manpower. A good implementation of the annual commitment is one of the objectives for F4E (see PP_Table 7 in Annexes to Project Plan). Any additional budget required and exceeding the currently available one will consist of unused appropriations adjusted to match the final needs.

iii. Indicative timeframe for launching the procurement and type of procedure/contract: the foreseen time of publication of calls and type of contracts is shown in WP_Table 5 of these annexes. The dates are indicative only and based on the present understanding of the project development. For specific contracts and specific grants or use of Joint Procurements the foreseen time of publication of calls is not included as no formal publication will take place (the signature date is used to give anyway an indication of time). Publication of the call for tender is intended as the date of publication on the Industry Portal (for open procedures/call for proposals) and the date of the Invitation letter to be sent out to the Suppliers (for negotiated procedures). For restricted procedures and competitive dialogues this milestone refers to the date of the call for expression of interest (first phase of the procedure).

[3] The threshold has been selected so to be in line with the FR.

iv. The plan may cover some activities moved from previous years into WP2022 due to changes in the overall planning and priorities.

v. The plan does not (and cannot) include the consequences for the Action of PCRs and deviations approved by the IO Director General or his delegates in the frame of Reserve Fund Management Plan. As a result, these will be implemented under the budget line 3.6. For information, F4E will present to the final meeting of the GB each year, in an amendment to the Work Programme, a summary of the PCRs agreed within the year and the activities that the PCRs (including those agreed in previous years) have funded.

vi. Grants and specific Grants are clearly identified and information is provided to fulfill art.58 of the Financial Regulation (see WP_Table 4 of these annexes).

vii. Framework Partnership Agreements (FPA) or Framework Contracts (FWC) are included in the year of signature for clarification purposes only and do not constitute part of the financing decision.

3. Some of the Work Programme activities refer to provision for recurrent activities with the same ultimate objective of supporting the final achievement either of the design (e.g. CAD support, engineering analyses, etc.), the manufacturing process (e.g. QA/QC Inspectors, engineering support for deviations analyses, CE marking, etc.) as requested in ITAs/PAs, or the site support services (access control and security, Facility Management Services, etc.). Therefore the description in terms of the financing decision does not change significantly from one year to the next.

2. OBJECTIVES AND KEY PERFORMANCE INDICATORS

Work Programme objectives

The Work Programme objectives are the achievement on time of a selected number of milestones. A minimum of 4 objectives is provided per Action as described in below section 3.

There is a close link between the long-term planning (i.e. Project Plan) and the short-term activities (i.e. work programme). In the Work programme, F4E is tracking as Work Programme objectives some selected existing milestones leading to the IC/GB ones (i.e. the predecessors) and in the chain of all critical and near-critical paths. Therefore such milestones in the short-term will act as an alert against the increasing risk of missing any critical and near-critical path milestones in the longer term.

Annual objectives

From the full list of Annual objectives described in the Project Plan, the following ones apply directly to the Work Programme:

AREA	Objective[4]
Work Programme objectives	Implement a minimum percentage of Work Programme objectives *[including GB milestones and predecessors]* by end of the year
Credit Allocation Scheme [CAS]	Reach a minimum percentage of achieved CAS by end of the year
Annual budget	Implement minimum percentage of Commitment Appropriations by end of the year

Key Performance Indicators

From the full list of Key Performance Indicators described in the Project Plan, the following ones apply directly to the Work Programme:

Work Programme objectives

$$\frac{Number\ of\ Work\ Programme\ objectives\ met\ on\ time}{Number\ of\ Work\ Programme\ objectives\ planned\ to\ be\ met}$$

Credit Allocation Scheme (CAS)

$$\frac{Amount\ of\ CAS\ achieved}{Amount\ of\ CAS\ planned\ to\ be\ achieved}$$

Annual budget

$$\frac{\begin{array}{c}Actual\ commitment\ executed\ to\ date\ + \\ remaining\ commitment\ planned\ to\ be\ executed\ between\ date\ and\ year's\ end\end{array}}{Latest\ approved\ annual\ commitment\ budget}$$

3. LIST OF WP2022 ACTIONS

[4] Action 12 of the MAP Ad Hoc group endorsed by Governing Board 45 stated that "*The targets for these measures will be defined before the start of each year to which the measures apply*".

Action 1. Magnets

Action 1	Magnets

TF & PF Conductors

Progress of Work

All work for TF and PF conductor activities is completed, only some storage of strands will be required.

Procurement Activities

Amendments and/or options for existing contracts may be signed (i.e., storage of strands, claims, deviation notices, etc.)

Pre-Compression Rings

Progress of Work

All work for Pre-Compression Rings is completed.

Procurement Activities

No procurement activities are expected.

Toroidal Field Coils

Progress of Work

In 2022, the last TF Coils will be delivered to IO. These delivery dates are highly dependent on the impacts generated by COVID-19 and on the quality of the TF Coil Cases delivered by Japan.

Procurement Activities

Amendments and/or options for existing contracts may be signed (i.e., Non-Conformities on free issue items, Project Change Requests, components storage, contract extensions, claims, deviation notices, etc.).

Task orders related to quality inspection services or production support might be signed to reinforce the TF Coil manufacturing activities.

Some task orders might be signed to cover for Engineering, Qualification and Testing activities related to the manufacturing of the coils.

Poloidal Field Coils

Progress of Work

The ground insulation, impregnation and final assembly (before cold test) for the fourth PF Coil (PF #4) will be completed. In parallel, the production of the last PF Coil (PF #3) Double

Pancakes will be in full swing. The evolution of these activities is highly dependent on the impacts generated by COVID-19.

Procurement Activities

Amendments and/or options for existing contracts may be signed (i.e., contract extensions, claims, deviation notices, etc.).

Task orders related to quality inspection services or production support might be signed to reinforce the PF Coil manufacturing activities.

Some task orders might be signed to cover for Engineering, Qualification and Testing activities related to the manufacturing of the coils.

Some minor complementary Contracts and/or task orders might be signed, if needed, to support the production in the PF Building (i.e., Framework Contracts for materials, services, etc.)

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope description	Forecast Achievement Date	Type of Milestone	PA/ITA
EU11.1A.11800	IPL > Delivery of TF17 (EU 07) by EU-DA to ITER Site (GB 23)	Q1 2022	GB23	PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets
EU11.1A.28115	HPC- Approval by IO for Document CFAD (HP 9.1.6) / TF-EU10 (IC64 /GB54)	Q3 2022	GB54	PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets
EU11.3B.41960	Placing DP7 for PF3 Stacking/Connections/Ground Insulation/Impregnation	Q2 2022	WP22 objective	PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6
EU11.3B.571090	PF4 WP VPI Completed	Q3 2022	WP22 objective	PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6

EXPECTED RESULTS

The main expected results for this action are:

1. Delivery of the 8th TF Coil to IO.2. Delivery to IO of 3 to 4 TF Coils.
2. Delivery of the 10th TF Coil to IO.
3. Final assembly (before cold test) of PF4 completed.
4. Completion of PF3 DP3 Double Pancake (6th DP of PF3).

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets	13.76200	89.74000
PA 1.1.P2A.EU.01 Pre Compression Rings	0.00000	0.60000

PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6	5.25000	32.97000
PA 1.1.P6A.EU.01 Toroidal Field Conductors	0.00000	43.39000
PA 1.1.P6C.EU.01 Poloidal Field Conductors	0.00000	11.22881

Sub-action 2. Vacuum Vessel

Sub-action 2	**Vacuum Vessel**

Progress of Work

By the end of 2022 the manufacturing of all 5 Vacuum Vessel sectors is scheduled to be completed.

At the time of writing, Sector 5 has entered into the final stage of manufacturing ("Sector Assembly"). Due to the technical complexities and the First Of A Kind (FOAK) manufacturing activities, there is a considerable risk on potential schedule slippages until actual completion of the first sector (Sector 5) and its consequent propagation to the remaining 4 sectors.

In addition, the Covid-19 pandemic can continue affecting the fabrication schedule.

To transport the sectors, the manufacturing of the Transportation Frame Covers will be completed and the Transportation Frame and Lifting Frames will be delivered to the manufacturing sites.

Procurement Activities

Provisions will be made for the transportation of the sectors to the ITER site, resolution of non-conformities (if required), possible incentive schemes for 24/7 operations, inspectors and additional ANB support and the possibility to add specialized resources to the project. Contractual options for the Main VV contract may be released, as needed.

In case the risk of not reaching the contractual tolerances materializes, F4E may be requested to contribute to the resolution of the non-conformity by IO.

Specific Contracts for support activities, like follow-up Inspectors, Documentation Support, Engineering and Analysis, Project Management support etc… will continue to be issued depending on the project needs.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU15.1A.16440	IPL > Delivery of Sector 9 by EU-DA to ITER Site	Q2 2022	GB25	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel
EU15.1A.3091120	S9 Machining of PS2 completed	Q1 2022	Predecessor of GB25	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel

EU15.1A.3091140	S9 all segments on final assembly jig	Q2 2022	Predecessor of GB25	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel
EU15.1A.3091160	S9 Machining of PS1 completed	Q1 2022	Predecessor of GB25	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel

EXPECTED RESULTS

The main expected results for this action are:

1. Delivery of Sector 4 to ITER site
2. Delivery of Sector 9 to ITER site
3. Delivery of Sector 3 to ITER site
4. Delivery of Sector 2 to ITER site

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel	13.66900	83.46600

Sub-action 3. In Vessel – Blanket

Sub-action 3	**In Vessel - Blanket**

Blanket First Wall project

Progress of Work

In 2022, both contractors of the Blanket First Wall Series (OMF-900) will continue the manufacturing activities of the first wall panels for qualification, and a first re-opening of competition is foreseen. The procurement of main raw materials (Beryllium and CuCrZr) will continue to be implemented through task orders. These materials are being provided as free issue items to the Suppliers in charge of FW Panels manufacturing. In support of the main procedure OMF-900, material characterisation activities will be carried out through task orders and options of the OMF-1082. Since the OMF-900 is a cost-plus fee type of contract, audits will be performed under the OFC-1094.

In parallel, a series of tests will be performed on the Full-Scale Prototypes and Alternative Design Mock-Ups (ADMUs) manufactured under contracts OPE-443 such as High Heat Flux (HHF) testing under the contracts OPE-319 and OMF-1033. The manufacturers of full scale prototypes (OPE-443) will perform additional activities through planned options to the mock-ups (e.g. UT after HHF, FAT, dimensional check, etc.).

In 2022, the manufacturing of standard parts will also start, after the eventual successful completion of the tendering phase of this procedure.

Procurement Activities

In 2022, the main procurement activities foreseen as part of the FW series manufacturing are the signature of task orders for the procurement of Beryllium and CuCrZr materials, and the first reopening of the OMF-900 to manufacture a batch of First Wall Panels after successful completion of the production line and the qualification phase. Task Orders are planned to be signed to procure Helium Leak Testing services and High Heat Flux Testing services for First Wall components. A new task order for material

characterization and related option in support to the OMF-900 will be signed. In addition, specific task orders for audit services of the cost-plus fee type of contract OMF-900 are planned. Options to perform inspection and testing activities to the ADMU may be executed. In addition, resources needed to support the follow-up of the FW panels production will be insourced through specific task orders. The procurement of standard parts for the FW series production will be signed. Finally, specific task orders for additional analysis and FSP metrology are also foreseen.

Blanket Cooling Manifolds project

Progress of Work

In 2022, the main activities will be the start of the qualification phase and of the manufacturing of the first pipe bundles of three 10-degree sectors (Task 1 of OMF-1080). Additionally, Task 7 –procurement of connector helicoflex seal & circlip kits and V-band flanges (COTS)- and Task 8 –procurement of 316L material (piping)- will be launched shortly after.

Procurement Activities

In 2022, the main procurement activity is the completion of the negotiation with tenderers leading to the award of multiple framework contracts covering all eight tasks of the Blanket Cooling Manifolds series production. In 2022, several lots for Task 1 (several suppliers in parallel), a specific contract for Task 7 and a specific contract for Task 8 will be signed. Furthermore, additional resources will be needed and will be insourced through task orders.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope description	Forecast Achievement Date	Type of Milestone	PA/ITA
EU15.2A.12100	Task Order Signed for Task 1 - Qualif. and Manuf. of 1st Pipe Bundles	Q1 2022	WP22 objective	PA 1.6.P6.EU.01 Blanket Manifolds
EU.16.01.100330	MS2.A.2 Final Acceptance of the Production Line	Q4 2022	Predecessor of GB37	PA 1.6.P1A.EU.01 Blanket First Wall
EU.16.01.207500	Task Order Signed for Procurement of CuCrZr (Series) (TO#02) - LOT 1	Q3 2022	WP22 objective	PA 1.6.P1A.EU.01 Blanket First Wall
EU.16.01.208600	Contract Signed for Procurement of Standard Parts	Q3 2022	WP22 objective	PA 1.6.P1A.EU.01 Blanket First Wall

EXPECTED RESULTS

The main expected results for this action are:

1. Start of manufacturing activities of the 30 Deg Sector Pipe Bundles under Blanket Cooling Manifold PA.
2. Final acceptance of the production line (Task 1 of the FW Series)
3. Signature of Task order for the procurement of CuCrZr (Series)
4. Signature of Contract for the procurement of standard parts.

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 1.6.P1A.EU.01 Blanket First Wall	0.50000	0.70000
PA 1.6.P6.EU.01 Blanket Manifolds	0.15000	0.40000

Sub-action 4. In Vessel – Divertor

Sub-action 4	In Vessel – Divertor

Cassette Body project

Progress of Work

In 2022 both contractors of the Divertor Cassette Body Series will continue the manufacturing activities and the first Cassette Bodies will be ready to be delivered to ITER IO. After the re-opening of competition for the remaining Cassette Bodies, the contractor(s) will start in parallel to procure the needed materials for this part of the scope. The focus will also be given to the continuation of the manufacturing activities of the contract OPE-1036 related to the fabrication of the transition pieces and remote handling flanges. Concerning the contract OPE-1112 of Ancillary Items of Pins Sleeves and Links of the CB Series, the procurement of material and the engineering phase will start.

Procurement Activities

In 2022 the main activity foreseen will be the signature of the contract OPE-1112 of Ancillary Items of Pins Sleeves and Links of the CB Series. An amendment for rework of the Cassette Body Prototype is foreseen so that the prototype can be upgraded to comply with the criteria of the Cassette Body Series. Furthermore, additional resources (inspectors for non-destructive testing, welding, metrology, etc.) will be needed and will be insourced through task orders.

Inner Vertical Target project

Progress of Work

In 2022, the additional scope of the contract OPE-138 concerning the fabrication of additional PFUs with new W grade and qualified electron beam welded tube to tube transition is expected to be completed. After delivery of the IVT Prototype to IO in 2021, the high heat flux (HHF) testing and the subsequent characterization will be performed. On OMF-567 Lots 1 and 2, the preliminary integration of prototypes and test assemblies will be performed and followed by the HHF testing and the Prototypes' final integration and acceptance tests. After the completion of the Full Scale Prototype of OMF-567-03 and the related final acceptance tests, this prototype will also be shipped to IO for assembly trials.

In 2022, the tendering activities for the Inner Vertical Target series production will continue until the signature of several framework contracts.

Procurement Activities

In 2022 the main activities foreseen will be to complete the negotiated procedure and sign several framework contracts for the Inner Vertical Target series production.

In order to cover the needs for the Plasma Facing Units HHF testing beyond the agreement with IO to endorse some of these tests, a task order will be signed from the framework contract OMF-1033.

Additional resources and inspectors will be needed to closely follow up the fabrication of the Prototypes and to prepare the IVT series contract. These needs are planned to be insourced through task orders.

Divertor Rails project

Progress of Work

In 2022 the preparation of the documentation for the signature of the PA for Divertor Rails will be carried out.

Procurement Activities

N/A

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope description	Forecast Achievement Date	Type of Milestone	PA/ITA
EU17.01.1057000	HP - Send of the Hot He Leak Test (M_CB#01_S25)	Q3 2022	WP22 objective	PA 1.7.P1.EU.01 Cassette Body
EU17.01.1066900	HP - Send of the Hot He Leak Test (M_CB#03_S25)	Q4 2022	WP22 objective	PA 1.7.P1.EU.01 Cassette Body
EU17.03.1040	< IPL PA 1.7.P2E.EU.01 APFC Signed	Q2 2022	Predecessor of GB49	PA 1.7.P2E.EU.01 Divertor Toroidal and Radial Rails
EU17.2B.140500	Contract Signed for IVT Pre-Series and Series (Lot-1)	Q4 2022	Predecessor of GB45	PA 1.7.P2B.EU.01 Inner Vertical Target
EU17.2B.86650	HP - Send to IO the report of the Final dimensional check of the Prototype - OPE-567-03-01	Q1 2022	WP22 objective	PA 1.7.P2B.EU.01 Inner Vertical Target

EXPECTED RESULTS

The main expected results for this action are:

1. Completion of the manufacturing of the first Cassette Bodies, particularly CB#01 and CB#03 (OMF-444 Lot 3)
2. Signature of Framework Contract for Inner Vertical Target (IVT) Production Line and Pre-Series
3. Completion of the second Inner Vertical Target full-scale prototype (OMF-567 Lot 3)
4. Signature of Divertor Rails PA 1.7.P2E.EU.01

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 1.7.P1.EU.01 Cassette Body	0.09000	0.65000
PA 1.7.P2B.EU.01 Inner Vertical Target	0.02500	3.14000

Action 5. Remote Handling

Action 5	Remote Handling

Divertor Remote Handling System (DRHS)

Progress of Work

The focus will be given to the Final Design activities via two main development lines that will run in parallel: one for the Cassette Multifunctional Mover (CMM) and the other one for the Cassette Toroidal Mover (CTM). Final design activities will be accompanied with prototyping and laboratory test in some areas.

Procurement Activities

For both of the main development areas and the complementary activities, specific contracts will be launched through Remote Handling (RH) and Engineering Unit framework contracts.

Cask and Plug Remote Handling System (CPRHS)

Progress of Work

Activities are organized in two parallel development lines. One focuses on the first assembly casks that are first plasma components, the other one focuses on the nuclearized cask variants. Focus will be given to the final design development and preparation for the manufacturing of the full scope of the first plasma systems. Final design activities will be accompanied with prototyping in some areas. Non-first plasma nuclearized casks will be continuing on the preliminary design development.

Procurement Activities

For both of the main development areas and the complementary activities, specific contracts will be launched through Remote Handling (RH) and Engineering Unit framework contracts.

Neutral Beam Remote Handling System (NBRHS)

Progress of Work

Activities are organized by subsystems and prioritized by their delivery needs for the different assembly stages. Main focus is given to the Monorail crane system that is first plasma item. Final design development and preparation for manufacturing of the Monorail crane system will continue, other non-first plasma systems will continue preliminary design developments towards design review. Final design activities will be accompanied with prototyping and laboratory test in some areas.

Procurement Activities

For the different development areas and the complementary activities, specific contracts will be launched through Remote Handling (RH) and Engineering Unit framework contracts. Contracts are also planned to be signed for final design and manufacturing.

In-vessel viewing system (IVVS)

Progress of Work

Main focus will be given to the final design development to move towards the design review and preparation for the manufacturing. Final design activities will be prepared/accompanied by prototyping and laboratory test in some areas.

Procurement Activities

For the different development areas and the complementary activities, specific contracts will be launched through Remote Handling (RH) and Engineering Unit framework contracts.

Common activities (transversal)

Progress of Work

Engineering support and expert activities will be performed for the four main operational activities, where needed. Complementary RH technology related design activities, qualification and prototyping will be carried out with a great focus on the field of control system, radiation hard technologies like electronics and cameras. Activities will be implemented (design and tests) aiming at manufacturing of first components (e.g. rad hard cameras and electronics) to be integrated in the RH systems.

Procurement Activities

Specific contracts will be launched through Remote Handling (RH) and Engineering Unit framework contracts in order to carry out supporting activities for the four main operational procurement and for complementary RH technology related design activities, qualification and prototyping. Grant amendment will be supporting the complementary developments at DTP2 site. Contracts are also planned to be signed in some areas.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU23.03.14057020	EU CPRHS FDR Machine Assembly 1 Items meeting completed	Q3 2022	Predecessor of GB40	PA 2.3.P3.EU.01 Cask and Plug Remote Handling System
EU23.03.902905	Task Order Signed for (577-02-03) Manufacturing of Casks for MA-1 for CPRHS	Q3 2022	GB32	PA 2.3.P3.EU.01 Cask and Plug Remote Handling System
EU23.05.00520	Final Design of Monorail crane (Incl. other first priority items) Hold Point released	Q3 2022	Predecessor of GB42	PA 2.3.P5.EU.01 Neutral Beam Remote Handling System
EU57.01.52550	EU IVVS FDR 1 meeting Completed (probe)	Q4 2022	Predecessor of GB47	PA 5.7.P1.EU.01 In-Vessel Viewing System

EXPECTED RESULTS

The main expected results for this action are:

1. Preparation for the final design review meetings of DRHS CTM.
2. Preparation of Task order signature for manufacturing of first assembly casks of CPRHS.
3. Preparation for the final design review meetings of first-plasma NBRHS.

4. Preparation for the manufacturing of FOAK probe for IVVS.		
TARGET		
The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):		
	Yearly value	Cumulative value
PA 2.3.P2.EU.01 Divertor Remote Handling System	0.80000	2.20000
PA 2.3.P3.EU.01 Cask and Plug Remote Handling System	1.30000	2.10000
PA 2.3.P5.EU.01 Neutral Beam Remote Handling System	1.01974	1.63974
PA 5.7.P1.EU.01 In-Vessel Viewing System	1.18000	3.38000

Action 6. Cryoplant and Fuel Cycle

Action 6	**Cryoplant and Fuel Cycle**

Progress of Work

Fuel cycle

In the frame of the PA for leak detection and localization system, contracts for the procurement of the Leak Detection and localization systems will focus on qualification, design activities and launching the procurement of long lead items. Task Order for instrumentation and control for Detection systems is planned.

The type A radwaste treatment and storage system is expected to be transferred to IO.

In the frame of the PA for REMS (Radiological and Environmental Monitoring Systems), the contract for design and manufacturing of 1st plasma equipment will continue with the completion of final design and start of manufacturing. Task Orders related to Design activities of REMs for Tokamak will continue and additional TOs under on-going Framework contracts will be launched. Signature of 2nd PA amendment for the procurement of REMS for Tokamak activities is expected.

The level of manufacturing activities in the field of vacuum pumping will remain high:

• For the Torus and Cryostat Cryopumping System, the production of the eight cryopumps will continue and the first one of those cryopumps will be delivered.

• For MITICA and Neutral beam Cryopumps, the manufacturing and factory acceptance testing of the MITICA Cryopump will be completed.. The task order for the MITICA Cryopump assembly tooling and installation of the Mitica Cryopump will continue.

• For Front End Cryopump Distribution System, the Cryojumpers will be manufactured and delivered, the eight Cold Valve Boxes will be manufactured and delivered, a Task order for first of a kind cabinets will be closed and contract for series manufacturing of these cabinets will be placed. Contracts for neutral beam cold valve boxes and cryolines, cryojumpers and Johnston couplings will be placed and final design activities will start. Tendering activities for Neutral Beam cabinets will start.

Specific Contracts for support activities like Inspectors, Documentation Support, Engineering and Analysis, Project Management support etc, will continue to be issued depending on the project needs

Procurement Activities

- Contract signed for Manufacturing and Delivery of Neutral Beam Cryolines, Cryojumpers and Johnston Coupling for Cold Valve Boxes
- Contract Signed for Manufacturing and Delivery of Neutral Beam Cold Valve Boxes (including PCR001038 impact)
- Contract Signed for Manufacturing and Testing of Cabinets for Front End Cryodistribution system and Torus and Cryostat cryopumps
- Instrumentation and control for Leak Detection systems.

Cryoplant

Progress of Work

The commissioning of the LN2 Plant and Auxiliary Systems located in the Cryoplant building at Cadarache will be pursued. Each component of the Cryoplant will be started up according to a pre-defined sequence and testing campaigns will be carried out in order to check the performance and compliance with the operational requirements of all the equipment (compressors, cold boxes, helium and nitrogen tanks, quench tanks, dryers, heaters, quench line header, ancilliary systems) successively.

Specific Contracts for support activities like Inspectors, Documentation Support, Engineering and Analysis, Project Management support etc. will continue to be issued depending on the project needs.

Procurement Activities

Amendments for existing contracts may be signed.

WORK PROGRAMME OBJECTIVES				
Milestone ID	**Scope Description**	**Forecast achievement date**	**Type of milestone**	**PA**
EU31.01.10261	IPL > Delivery of First Torus & Cryostat Cryopump by EU-DA to ITER Site	Q4 2022	GB33	PA 3.1.P1.EU.03 Torus and Cryostat Cryopumps
EU31.01.12098	IPL > Delivery of T&C FECDS and Cryojumpers 5-8 (4 no.) Batch 2 by EU-DA to IO	Q4 2022	GB28	PA 3.1.P1.EU.02 Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box

EU31.01.30480	NP - Manufacturing and Testing Completed - MITICA Cryopump Assembly	Q2 2022	Predecessor of GB50	PA 3.1.P1.EU.04 Neutral Beam Cryopumps
EU31.03.26160	M.19 - Final Design Meeting of Primary & Cryostat Leak Detection System	Q3 2022	Predecessor of GB35	PA 3.1.P3.EU.01 Primary and Cryostat Leak Detection System
EU31.03.40280	Mechanical design of Cryostat Remote Leak Detection System completed	Q1 2022	Predecessor of GB18	PA 3.1.P3.EU.01 Primary and Cryostat Leak Detection System

EXPECTED RESULTS

The main expected results for this action are:

1. Torus and cryostat cryupumps: Pre-assembly cryopanels 1 and 2 started
2. Front end cryodistribution system: Factory acceptance test of Cold Valve Boxes 1 to 8 completed
3. Mitica and neutral beam cryopumps: Assembly and testing step 1 for MITICA cryopumpcompleted
4. Leak detection and localization system: Start of manufacturing design activities of Leak Detection systems
5. Radiological environmental systems: Final Design review Beryllium and Environmental monitors completed.
6. LN2 and auxiliary systems: Test LN2 plant refrigerator Compressor 1 in Area 51 completed.

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 3.1.P1.EU.03 Torus and Cryostat Cryopumps	0.00000	1.00000
PA 3.1.P1.EU.04 Neutral Beam Cryopumps	0.66000	1.20000
PA 3.1.P1.EU.01 Warm Regeneration Lines	0.00000	0.20000
PA 3.1.P1.EU.02 Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box	0.25996	0.61199
PA 3.1.P3.EU.01 Primary and Cryostat Leak Detection System	0.70000	1.40000
PA 3.1.P3.EU.01 Primary and Cryostat Leak Localisation System (phase II - 1st Amendment)	0.15000	0.15000
PA 3.2.P5.EU.01 Water Detritiation System – Tanks	0.00000	3.25200
PA 3.4.P1.EU.01 Liquid Nitrogen Plant and Auxiliary Systems	1.70507	25.98117
PA 6.4.P1.EU.01 for Design of REMS	0.30000	0.36000

Action 7. Antenna & Plasma Engineering

Action 7	**Antennas and Plasma Engineering**

ANTENNAS

Ion Cyclotron Antenna

No activities of design are foreseen in 2022.

PCR-001271 has been approved for the IC procurement scope transfer to IO. The estimated cost has been agreed at a ceiling price of 50.3 Meuros (2021), which is composed of 23.13 Meuros of cash contribution planned for 2021 and 26.16 Meuros of credit return.

Electron Cyclotron (EC) Upper Launcher and ex-vessel waveguides (Upper and equatorial launcher)

Progress of work

In 2022 PA activities will continue based on the single functional specifications PA Annex B which is planned to be signed in Q4-2021.

The main action is the signature of the Technical Integrator framework contract and task order 1 and corresponding works. An Intermediate Design Review (Pre-FDR) is planned early in 2022 to review latest designs and their validation, and collect feedback from a panel of experts, with the aim to provide a complete package of information to the Technical Integrator early on in the contract (expediting knowledge transfer and ramp-up of design activities, anticipating issues and improving supplier focus). The Technical Integrator will work on the resolution of Upper Launcher functional, manufacture and assembly issues and industrialization of the design of the remaining components in-vessel and ex-vessel, towards Final Design Review in 2023, and covering e.g. system engineering and integration, design, validation by engineering, analyses and prototyping, qualification, requirements management.

Additional Task Orders for the Integrator Framework contract will be signed, covering the remainder of the scope series production, assembly and testing.

Task Order 1 for the Isolation Valves framework contract will also be signed, covering manufacturing of the isolation valve prototypes and design and validation progress of isolation valve towards FDR in 2023.

The main challenges will be timely placement of the contracts and monitoring and control of the execution of the works under the contracts to ensure timely progress of the technical activities consisting mainly of design, validation and qualification via engineering, prototyping and analysis of the Upper Launcher and Ex-Vessel Waveguides towards FDR in 2023.

Procurement activities

The two main Task Orders to be signed are the Task Order 1 for the Integrator Framework Contract[5] and the Task Order 1 for the Isolation Valves Framework contract as mentioned above.

The first task order of the Technical Integrator framework contract is foreseen to include resolution of new Upper Launcher design issues and industrialization of the remaining components designs, up to FDR and manufacturing designs, as well as manufacture of some components (e.g. blanket shield modules, mirrors, material procurement, etc.) and assembly and testing of the EC Upper Launchers.

Series fabrication of the diamond disks will continue.

[5] At the time of writing the Work Programme, there is a high probability that this commitment is postponed from 2021 to 2022. The budget is nevertheless allocated to year 2021.

Contracts are also foreseen for the testing of diamond disks and validation of other mm-wave components.

And other contracts are foreseen in support of these main activities (e.g. engineering, design, analyses, resources, inspectors, prototyping), most of them specific contracts under existing frameworks.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	ITA/PA
EU52.01.2001282	Completion of Initial Optical Design Refinement	Q4 2022	Predecessor of GB46	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher
EU52.01.2001312	Completion of UL Plug Architecture & I/F Definition	Q3 2022	Predecessor of GB46	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher
EU52.01.422055	ADP #2 TO 729-02: Series production of Diamond Disks for EC Windows	Q2 2022	WP22 objective	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher
EU52.01.460060	Task Order Signed for Manufacturing of Isolation Valve prototypes and FDR documentation	Q1 2022	WP22 objective	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher

EXPECTED RESULTS

The main expected results for this action are:

1. Completion of UL Plug architecture and interface definition
2. Completion of the initial optical refinement for the Upper Launcher
3. Signature of Task Order for Manufacturing of Isolation Valve prototypes and FDR documentation
4. Manufacturing completed for the first 40 Diamond Disks

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher	1.27935	2.25635

PLASMA ENGINEERING & OPERATIONS

ITER Operations

In 2022, the activities under ITER Operations will focus on setting up and implement a tri-partite collaboration between F4E, Eurofusion and IO for preparatory work for first plasma and Tokamak systems commissioning. This will be implemented mainly via expert contracts and specific support contracts, to be placed in the year.

Plasma Engineering

Procurement Activities

A relevant part of the PE activity responds to (often urgent) requests and hence it is difficult to plan in advance.
As for 2021, Plasma Engineering Studies and Engineering Support for PE and Antennas will mainly be not credited through PAs.

In 2022, Plasma engineering activities will focus on scenario preparation for first plasma and specific simulations and code development as needed. Transversal support to F4E procurement remains in the Plasma Engineering scope, and will be implemented via engineering contracts as required.

Electron Cyclotron Control System

Progress of Work

The Electron Cyclotron Control System development follows a staged approach. The delivery and installation of ECPC Stage 2 (the Gyrotron Commissioning Components (GCC) plant control system) took place in 2021. In 2022 the activity will focus on the integration of the system with the ITER CODAC environment and with the available local units. In 2022 the the design activities of ECPC Stage 3 (First Plasma EC plant control system) and of the Subsystem Control Unit of the Upper Launcher will continue in preparation to the FDR.

Procurement Activities

The main activities for 2022 will regard the support to IO for the integration of the ECPC Stage 2 with the CODAC environment and the available local controllers..

FALCON

Progress of Work

The FALCON facility will support the F4E projects in 2022 by testing components and prototypes as needed. This will include testing of the VAT valve and of the Diamond Window prototypes for the EC-Launcher project, support to BA procurement for JT60-SA, support to the F4E gyrotrons project and preparation for the testing of the pre-series gyrotron procured by DTT in the frame of the DTT-F4E common procurement.

Contracts are also foreseen for procurement of instrumentation and EC components for the ITER GCC.

Procurement Activities
Maintenance of the facility is foreseen with adaptations to the control system aimed at supporting operation of prototypes linked to the F4E gyrotrons procurement for ITER.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	ITA/PA
EU52.05.211470	Contract Signed for FDR preparation for EC Plant Control System (Stage 3)	Q4 2022	WP22 objective	PA 5.2.P1B.EU.01 Electron Cyclotron Control System
EU52.01.1002340	Delivery & ADP Approval for GCC RF Load	Q4 2022	WP22 objective	ITA (C52TD57FE) Procurement of Instrumentation and spare parts for EC

EXPECTED RESULTS

The main expected results for this action are:

1. Integration of the ECPC Stage 2 control system to prepare for operation of Gyrotron Commissioning Components.
2. Preparation for FDR of the EC-Upper Launcher local controller.

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 5.2.P1B.EU.01 Electron Cyclotron Control System	0.05000	1.10000

Action 8. Neutral Beam and EC Power Supplies and Sources

Action 8	Neutral Beam and EC Power Supplies and Sources

Electron Cyclotron (EC) Gyrotrons, Power Sources and Power Supplies (PS)

Progress of Work

EU EC Power Supplies

- The Manufacturing and Factory Acceptance Tests of the UNITS 4 to 8 of the EU EC Power Supply will be completed

- Installation and commissioning of the EU EC Power Supply system will continue
- Commissioning and site acceptance tests of the EU EC Power Supply of UNIT 1 will be completed
- Technical Follow-up of the EC Power Supplies will continue

EU EC Gyrotrons

- The evaluation of the offers to the Call for Tender of the EU Gyrotrons will be completed.
- The framework contracts for the joint procurement of F4E and DTT Gyrotrons will be signed.
- The task order for F4E Gyrotrons will be prepared

Procurement Activities

Electron Cyclotron Power Supplies:

- Options will be released for the main contract for the procurement of the EC Power Supplies and specific contracts for technical supervision.
- Specific contract for on site expert technical support will be foreseen

Electron Cyclotron (EC) Gyrotrons:

- The framework contracts for the joint procurement of F4E and DTT Gyrotrons will be signed.

Neutral Beam

Progress of Work

- MITICA Beam Source – manufacturing for the part of the sub-assemblies will be completed and factory assembly will progress
- MITICA Beam Line Components – manufacturing of sub-assemblies will proceed as planned and assembly of main components (NED, ERID, CAL) will start together with instrumentation integration
- NBTF Assembly - MITICA rotating platform and drying system will be transferred to IO
- NBTF Control System (CODAS) - MITICA instrumentation, control, diagnostic and assembly contracts will progress

Procurement Activities

- Specific contracts will be signed for the NB Test Facility, namely for NBTF Control System, Interlock and Safety and for PRIMA Assembly.
- Specific contracts for technical support in the area of Neutral Beam components will be signed.
- MITICA Beam Line Component and Beam Source: supporting tasks and release of options for the final acceptance tests and delivery to RFX PRIMA site will be implemented

Neutral Beam for ITER – Cadarache

Progress of Work

- NB Vessels: procurement activities up to contract signature will be performed and manufacturing design will start
- Drift-Duct: procurement activities will start
- Absolute Valve: pre-procurement activities will continue
- PMS and ACC Coils: PA preparatory activities will continue up to PA signature and procurement activities will start
- General Assembly and Tooling: preliminary design activities for Specific Tooling and preparatory activities for HNB General Assembly (PA Stage 2) will be performed
- NB Power Supplies: Detailed design activities will be completed for high voltage deck and manufacturing activities will start for most power supplies

Procurement Activities

- NBI-1&2 Vessels contract will be signed
- NB Tooling NBI Assembly Phase II contract will be signed
- Specific contracts will be signed for technical follow-up
- NB Power Supplies: Some options will be released, mainly for spare and tests. In addition, the procurement of the ACCCPS will start, subject to timely availability of technical specification from IO

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU52.02.12660	Signature of F4E-OMF-1108-01 for European Gyrotrons Procurement FWC	Q1 2022	Predecessor of GB48	PA 5.2.P3.EU.01 Electron Cyclotron Gyrotrons
EU52.04.12761	Procurement of the MHVPS Transformer for 52HV12 (AAG Set#8) Completed	Q2 2022	Predecessor of GB48	PA 5.2.P4.EU.01 Electron Cyclotron High Voltage Power Supply
EU53.04.111000	Contract Signed for NBI-1&2 Vessels	Q3 2022	WP22 objective	PA 5.3.P4A1.EU.01 Heating Neutral Beam Drift Duct + NB Vessel + Absolute Valve
EU53.06.08510	NP - Start of Manufacture of EU-HVD1 & EU-Bushing of IHNB-1 & IHNB-2 (first items)/MRR Closure	Q3 2022	Predecessor of GB30	PA 5.3.P6.EU Neutral Beam Power Supply
EU53.06.447392	Start of Manufacturing of AGPS-CS of IHNB-1 for Inverters	Q2 2022	Predecessor of GB27	PA 5.3.P6.EU Neutral Beam Power Supply

EXPECTED RESULTS

The main expected results for this action are:

1. NB Vessels contract signature
2. NB Tooling contract signature
3. ECPS Commissioning completed of set #1 at ITER site
4. MITICA BLC ERID Component Assembly completed
5. MITICA Beam Source Manufacturing completed
6. Design activities for AGPS, GRPS and HVD1 of ITER units completed

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
PA 5.2.P4.EU.01 Electron Cyclotron High Voltage Power Supply	3.94800	11.18072
PA 5.3.P6.EU Neutral Beam Power Supply	0.40000	16.71000
PA 5.3.P9.EU.01 Neutral Beam Test Facility Components	0.93000	19.18000

Action 9. Diagnostics

Action 9	**Diagnostics**

Progress of Work

The Diagnostics Programme will continue during 2022 with the manufacture of several components or systems for delivery to ITER, mostly for First Plasma. These include mainly in-vessel supports, in-divertor electrical services, vacuum vessel feedthroughs, cable installation templates for the bolometer diagnostic, fission chambers for the radial neutron camera diagnostic, inner vessel coils and divertor coils.

Several Diagnostics systems and subsystems will complete their design activities with approval of the final design review, including the first plasma port and ex-vessel components for the equatorial visible/IR wide angle viewing system, the port plug mounted bolometer cameras, the port plug radial neutron camera components and the sensor head and electronics for the Diagnostics Pressure Gauges.

The design of all remaining Diagnostics systems and subsystems will also progress, both under the on-going Framework Partnership Agreements and under industrial design contracts, as will the design of ITER port structures and the integration of Diagnostics into the ports.

Procurement Activities

Procurement activities will focus mainly on two areas: placement of manufacturing task orders under framework contracts for the production of components for delivery to ITER and procedures for the completion of the design of less mature Diagnostics systems. These will be complemented with contracts and task orders for the production and testing of prototypes and task orders for the provision of industrial expertise and for engineering analysis, as well as amendments of on-going grants or specific contracts if necessary. In-sourcing of personnel is foreseen to support the Programme during 2022, as is the use of Inspectors for manufacturing contracts and Experts in specialist areas, including in support of design reviews.

Manufacturing contracts

The Diagnostics Programme will launch during 2022 task orders under existing manufacturing framework contracts of several Diagnostics subsystems needed for First Plasma.

The Diagnostics Programme will launch as well Framework contracts for manufacturing of remaining components of the Diagnostics systems and for manufacture, assembly and test of the port systems.

Design contracts

The Diagnostics Programme will also launch procurement procedures during 2022 to complement or to finalize the design work for several Diagnostics, including the Vacuum Vessel and Divertor bolometer cameras and the core plasma Thomson scattering system.

Finalisation of the design work for the equatorial visible/IR wide-angle viewing system design in the non-First Plasma ports may be launched, as an alternative, under a Grant.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU55.01.0001180	ADP Approval for CON Procurement and Delivery for Bespoke Instrumentation Hardware	Q4 2022	Predecessor of GB39	PA 5.5.P1.EU.01 Diagnostics - Magnetics Electronics & Software
EU55.06.68040	Kick-off Meeting for Feedthroughs for Tokamak Services	Q2 2022	Predecessor of GB36	PA 5.5.P1.EU.18 Diagnostics - Tokamak Services
EU55.06.68320	ITER Dept Review & Approval of Final Tech Specs for Task Order for Feedthroughs & IO Concurrence Review	Q1 2022	Predecessor of GB36	PA 5.5.P1.EU.18 Diagnostics - Tokamak Services
EU55.16.10875	Integrated system FAT v1.0	Q4 2022	Predecessor of GB39	PA 5.5.P1.EU.01 Diagnostics - Magnetics Electronics & Software

EXPECTED RESULTS

The main expected results for this action are:

1. Delivery of inner vessel coils and divertor coils.
2. Completion of final design for the equatorial visible/IR wide angle viewing system for the First Plasma port
3. Completion of final design for the mechanical platforms for diagnostics Inner Vessel Coils.
4. Completion of final design for the port plug mounted bolometer cameras.
5. Completion of final design for the port plug radial neutron camera (RNC) components.
6. Completion of final design for the sensor head and electronics of the Diagnostics Pressure Gauges.

TARGET		
The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):		
	Yearly value	Cumulative value
PA 5.5.P1.EU.02-16-17-19 Diagnostics – Magnetics	0.28855	0.87368
PA 5.5.P1.EU.03 Diagnostics – Bolometers	0.08850	0.20650
PA 5.5.P1.EU.07 Diagnostics - Pressure Gauges	0.19160	0.38320
PA 5.5.P1.EU.18 Diagnostics - Tokamak Services	0.28307	1.28893
PA 5.5.P1.EU.15 Diagnostics - Radial Neutron Camera/Gamma Spectrometer	0.13769	0.27538
PA 5.5.P1.EU.08 Diagnostics - CPTS 55.C1	0.00000	0.00000
PA 5.5.P1.EU.09 Diagnostics - Low Field Side Collective Thomson Scattering	0.17218	0.34436
PA 5.5.P1.EU.04 Diagnostics - Core-Plasma Charge Exchange Recombination Spectrometer	0.41100	0.41100
PA 5.5.P1.EU.06 Diagnostics - Equatorial Visible/Infrared Wide-Angle Viewing System	0.23448	0.35172
PA 5.5.P1.EU.10-11-12-13-14 Diagnostics - Port Engineering Systems	1.38681	2.88488
PA 5.5.P1.EU.01 Diagnostics - Magnetics Electronics & Software	0.00000	0.50000

Sub-action 10. Test Blanket Module

Sub-action 10	Test Blanket Module

Progress of Work

The Preliminary Design and Safety Analysis activities for TBM Sets and Ancillary Systems will continue.

The consultancy of an Agreed Notified Body will continue as well as the handling and storage of EUROFER and other steel products.

The activities for the development of TBM Industrial Feasibility and Fabrication Technologies will continue.

The collaboration with EUROfusion and EFLs will continue.

The definition and codification of EUROFER design limits in RCC-MRx design and construction code will resume.

Procurement Activities

It is planned to sign Task Orders and contracts for the start or the continuation of the following activities:

- Preliminary Design of TBM Sets, of Ancillary Systems and of the related Safety Analyses and studies;
- Consultancy of an Agreed Notified Body;
- Proof of the TBM-sets fabrication and assembly processes feasibility;
- Handling and Storage of EUROFER and steel materials;
- Definition and codification of EUROFER design limits in RCC-MRx;
- The transport of EUROFER and other materials/products to and from the storage facility.

In addition, specific contracts for support activities like engineering and analysis, experts, project management support and system engineering management may be issued depending on the project needs.

Moreover, if requested and approved by the TBM-Project Team Steering Committee, a cash contribution will be transferred to IO in order to execute TBM-PT activities common to several ITER Members.

The Test Blanket Module procurement plan is not in response to PA or ITA but to the TBM Arrangements (TBMAs).

All activities are not credited.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU56.01.1238780	TO 03 Signed for Safety Analyses for HCPB TBS PD	Q2 2022	WP22 objective	NA
EU56.01.1242745	Contract Signed for FwC for EUROFER design limits codification in RCC-MRx	Q1 2022	WP22 objective	NA
EU56.01.89050	Signature of TO 06 for FWC ANB Consultancy	Q3 2022	WP22 objective	NA
EU56.02.1240080	TO3 Signed for Handling, Cutting Storage Services for Steel Products related to the EU TBMs	Q4 2022	WP22 objective	NA

EXPECTED RESULTS

The main expected results for this action are:

1. Perform the Preliminary Design activities for WCLL TBS needed for the PD readiness workshop with IO
2. Perform the Preliminary Design activities needed for HCPB TBS, in collaboration with KO-DA, needed for the PD readiness workshop with IO
3. Transmission to IO of the first set of consolidated data in view of the update of the Preliminary safety Report

Target credit NA

Action 11. Site and Buildings and Power Supplies

Action 11	Site and Buildings and Power Supplies

Progress of Work

Construction works will be focused on advancing the construction of the medium voltage distribution buildings (B44, B45, B46 and B47) and the Tritium Building civil works (B14) up to the roof and to deliver it painted until level L2.

The Control building (B71 Non PIC part) and the Fast Discharge Resistor building (B75) will be delivered.

The installation of HVAC, Electrical & Handling Equipment in the Heating building (B15) will be completed and the Load center LC04 will be operational.

The preliminary design for the Hot Cell Complex will be progressed.

Execution design, qualification activities and procurement of buildings services for the Tokamak Complex will progress.

Procurement Activities

Contracts to be signed by 2022 include:

TB20: Doors Installation Tritium Building (B14). Tender process launched in Q2 2021, will be awarded in Q2 2022.

TB21: Electrical and Mechanical work for Tokamak Complex and surrounding Buildings- planned contract signature Q1 2022

TB22: Civil, Architectural, Finishing and Retrofitting Works - planned remaining lots contract signature Q1-Q2 2022

Specific contracts will be signed under ongoing framework support services and works contracts. This includes, for example, Facility Management, Site Security and Reception Services, Structural analysis, Building HMI Development, Engineering and Contract Management Consultancy Services (with special respect to cost and schedule assessment) and consultancy for advice on interpretation of French Regulatory Law 2012.

Changes and exercise of options to the ongoing services and construction contracts in relation with PCRs, input data delays, and re-allocation of scope between contracts, will be implemented through amendments to the ongoing contracts in line with the provisions of the Financial Regulation.

Cash contribution will cover the ITER site host agreement and the ITER Site Services Agreement.

WORK PROGRAMME OBJECTIVES				
Milestone ID	**Scope Description**	**Forecast achievement date**	**Type of milestone**	**PA**

EU62.05.26311	NPC - Notice to Commence construction of MV Distribution Bldg LC/1A (46)	Q1 2022	Predecessor of GB24	AUX BUILDINGS D&B TB13
EU62.05.26611	NPC - Notice to Commence construction of MV Distribution Bldg LC/2B (47)	Q1 2022	Predecessor of GB26	AUX BUILDINGS D&B TB13
EU62.05.272720	Construction of Cryoline Bridge (between B52 & B11) Completed	Q2 2022	GB57	AUX BUILDINGS D&B TB12
EU62.05.570	IPL > Control Building (71 non PIC part) RFE (RFE #14)	Q2 2022	GB34	MAIN MILESTONES
EU62.604260	Construction of 2 Bus-Bar Bridges (between B32 &74 and B33 &74) Completed	Q4 2022	GB58	AUX BUILDINGS D&B TB12

EXPECTED RESULTS

The main expected results for this action are:

1. Deliver of Control building non PIC part.
2. Construction completed of the Cryoline Bridge allowing the connection between Cryoplant Coldbox Building (B52) and the Tokamak building (B11)
3. Construction of Bus bar bridges between Magnet Power Conversion Building 1 and 2 (B32 and B33) with the Diagnostic building (B74) allowing the future DC connection from the Magnet building to the Tokamak complex.
4. Commencement of construction of Medium Voltage Load Centre for The emergency building distribution (B46 and B47)

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kIUA (CAS):

	Yearly value	Cumulative value
MAIN MILESTONES	0.00000	5.01601
COMMON	3.76527	63.50892
TOKAMAK COMPLEX	6.07454	82.04967
AUX BUILDINGS TB03/TB04	8.05104	77.05364
AUX BUILDINGS D&B TB05	0.00000	15.00156
AUX BUILDINGS D&B TB06	0.00000	9.66842
AUX BUILDINGS D&B TB07	0.00000	6.40420
AUX BUILDINGS TB09/TB10	0.00000	0.00000
AUX BUILDINGS D&B TB12	4.02207	10.54769
AUX BUILDINGS D&B TB13	0.91200	0.91200
LOAD CENTERS	1.02150	5.88950
INTERCONNECTING ACTIVITIES	19.20704	22.62932
AUX BUILDINGS D&B TB17	0.00000	0.00000
COMMON CONTRACTUAL ACTIVITIES	0.00000	42.79000

PA 6.2.P2.EU.06 Headquarters Building	0.00000	13.85000

Action 12. Cash Contributions

Action 12	Cash Contributions

Cash Contribution to IO

This action covers the EURATOM contribution that F4E[6] shall deliver to ITER International Organisation (IO) in cash (10%) and in-kind (90%) for the construction of ITER facility in accordance with ITER Agreement[7].

The present Work Programme includes the cash contribution to IO due by F4E for the following year N+1. The whole amount is committed in advance based on estimates of the IO draft budget N+1 and under the terms approved by ITER Council[8].

Cash Contribution to Japan[9]

The action also covers the transfer of procurement responsibility from EURATOM to Japan under the supervision of ITER Organization in accordance with ITER Agreement. This is financed through a cash contribution from EU to Japan paid by F4E. The amount is committed in advance based on the provisions set out in the agreement with Japan (Annex C of PA for the Cadarache NB power supplies). An update of the schedule of payments is provided by the Japanese Domestic Agency (JA DA) twice a year.

WORK PROGRAMME OBJECTIVES[10]

Milestone	Scope Description	Forecast achievement date	Type of milestone	PA
Cash to IO	Yearly Commitment	Q4 2022	WP22 objective	NA
Cash to Japan	Commitment for PA 5.3.P6.JA.02 - 2022	Q1 2022	WP22 objective	5.3.P6.JA.02 NB - HNB Power Supply (NB#1Cadarache)

6 F4E is the European Domestic Agency that manages the EURATOM contribution to the ITER project.

7 Article 8 "Resources of ITER Organization" (ITER Agreement 2006)

8 According to Article 9 of ITER Agreement, the ITER Project Resource Management Regulations (PRMR Regulations) shall govern the administration of the resources of the ITER Organization. It provides a detailed description of the applicable rules for contributions in kind, cash income, commitments and payments for the ITER Organization. The final figures are approved or modified by the ITER Council.

9 At the time of writing the Work Programme, there is a risk that the activity corresponding to PA 5.3.P6.JA.02 is postponed from 2021 to 2022. The budget is nevertheless allocated to year 2021 where the probability of implementation is higher at the time of writing the document.

10 The figures committed under F4E Work Programme 2022 represent the cash contributions due for 2023 to IO and JA DA.

EXPECTED RESULTS
The expected result for this Action is to pay to IO the contribution as agreed by the ITER Council and to Japan as defined in the schedule for the relevant credits assigned to JA DA for those components transferred by the EU to them. As far as the cash to IO is concerned, the target for 2022 is to commit the cash contribution for 2023 according to the decisions due to be taken by the ITER Council in November 2022. Target credit NA

Action 13. Technical Support Activities

Action 13	Technical Support Activities

The procurement of the supporting activities is mainly performed through Framework contracts and specific contracts.

Technical Support to In-Kind Procurement

Engineering Support activities
The Engineering Unit during 2022 will continue supporting the ITER Departments Programmes (and to a limited extend the BA department) by providing them technical expertise in the key domains of engineering and fusion technologies.

The unit will provide technical expertise in the following areas:

Design office activities, Technical Data Management, System Design, Mechanical Engineering, Analysis: Mechanical, Structural Dynamics, Civil engineering, Fluid Dynamics, Electro Magnetism, Nuclear Analyses; Design Codes and Standards; Electrical Engineering; Instrumentation and Control; CODAC; Metrology, Material and Fabrication and Assembly Integration and Validation (AIV).

Beyond the preparation of task orders, the procurement activities in the Engineering Unit will be mainly focused on renewing Framework Contracts, for adapting the level of support to the needs of the Programmes.

Nuclear Safety

Progress of Work

The scope includes the oversight of the implementation of all nuclear safety requirements by F4E and its contractors. The Nuclear Safety activities also provides support to the project teams involved in PIC/PIA (Protection Important Components/Activities) to ensure compliance with the necessary regulation. This includes support to nuclear safety management, identification of optimum positions for key nuclear safety issues, review of relevant documentation and nuclear safety inspections in F4E suppliers' premises.

The Nuclear Safety Unit also organizes workshops, seminars and other activities to raise and re-inforce the nuclear safety awareness within F4E.

Procurement Activities

A framework contract will be signed for the continuation of the Nuclear Safety support on inspections. All other activities will be implemented through Task Orders under existing framework contracts and the new one.

Task Orders under existing framework contracts to reinforce the supply of Services for Nuclear Safety Compliance will be issued for the Nuclear Safety activities.

F4E will be supported by experts on on-site inspections services and on Nuclear Safety code standards, funded by F4E through expert contracts.

Quality Assurance and Quality Control

Progress of Work

The scope includes the support to project teams to ensure that the F4E quality requirements are correctly implemented and managed for the F4E contribution to ITER. In particular, support is provided in both domains of Quality Assurance (QA) and Quality Control (QC).

As for QA, support aims at ensuring that F4E's QA processes are properly followed in the development of the different ITER projects and in line with the F4E Quality Management Policy. As for QC, the support to the projects will be provided in the follow-up and control of the activities performed by F4E's contractors.

Procurement Activities

Task Orders under existing framework contracts will be issued for both the QA and QC activities.

CE Marking

Progress of Work

The scope includes the support to F4E Project Teams in providing assessments and reviews, for each PBS, of the compliance with CE marking directives & regulations (mainly Pressure Equipment Directive, Machinery Directive, Low Voltage Directive, Electromagnetic Compatibility Directive, Explosion Protection and Construction Product Regulation).

Procurement Activities

Task Orders under existing framework contracts will be issued for the CE Marking activities.

Systems Engineering

Progress of Work

The scope includes the development and implementation of Systems Engineering practices, processes and tools and to support their correct deployment by the Project Teams. To cover this scope, external manpower is contracted across several areas, including Requirements Management and Verification (RMV) with emphasis on Verification, Design and Manufacturing Readiness Reviews, Interface Management, and other Systems Engineering topics.

Procurement Activities

Task Orders under existing framework contracts will be issued to continue to support the F4E Project Teams both in Barcelona and in Cadarache.

Office of the Chief Engineer

Progress of Work

The Office of the Chief Engineer supports the Head of ITER Programme Department with respect to the scope of the EU in-kind components for ITER and in representing F4E towards the ITER Organisation. Among the main tasks are: the interaction with IO on the project technical baseline, including change control, and participation to the Configuration Control Boards, the management of transversal technical issues impacting several PTs, the coordination of F4E participation to ITER Independent Reviews and working groups focused on technical matters and the assurance of consistency, adequacy and maturity in relevant Design Reviews.

Procurement Activities

Task Orders under existing framework contracts will be issued to continue to complement the in-house Configuration Management and Issues Management capabilities with expert support from specialized companies.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.ES.01.8320	Contract Signed for Engineering Support Contract LOT 1	Q2 2022	WP22 objective	All
EU.ES.01.8380	Contract Signed for Engineering Support Contract LOT 2	Q2 2022	WP22 objective	All
EU.PM.3051650	Published Call for Tender for FWC F4E-OMF-(TBD) for Quality Control - Inspectors for ITER Project (2023-2026)	Q4 2022	WP22 objective	All
EU.PM.3076660	TO 35.1 signed for RMVDB Validation and DB management	Q1 2022	WP22 objective	All
EU.PM.3105110	Contract signed for Support in the area of Technical Integration for 2022	Q3 2022	WP22 objective	All

EXPECTED RESULTS

The main expected results for this action are:
1. Implementation of the framework contract F4E-OMF-xxxx which will provide Fusion for Energy with framework contracts in the field of Engineering Support, Provision of Metrology Services and Provision of Metrology Equipment, Qualification by test.

2. Signature of a new Framework contract to continue to provide support services in the area of Nuclear Safety inspection.

3. The expected result for the activities in Nuclear Safety, Quality Assurance & Quality Control, CE Marking and System Engineering is to provide the requested support to all Project Teams on these matters.

4. The expected result for the activities performed by the Office of the Chief Engineer is to provide the requested support to the Head of the Department and to all Project Teams on the matters described in the Scope of Work.

In general, the target for 2022 is to contribute in achieving the cumulative credit forecasted for each action in this WP2022 thanks to the support granted to the work under each specific action.

Transportation

Transportation

During 2022, Engineering Unit/Transportation will be in charge of the management, on the F4E side, of technical aspects of the joint procurement with IO for the transportation of ITER components to the site in Cadarache. The scope includes the transportation of all ITER Components from the port/airport of entry (Fos or Marignane) to ITER site.
During 2022, this activity will mainly cover transportation of NON EU loads between Fos and Cadarache (EU-leg). The main cost driver is for Highly Exceptional Loads (HEL) that follow the dedicated ITER itinerary.
In 2022 focus will be again put on the optimization of the number of HELs and the related number of convoys, this jointly with IO, all DA's and Daher.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.PM.4022095	Task Order Signed for TO 16 for Convention 4 for Real Convoys for Gendarmerie Services	Q2 2022	WP22 objective	All
EU.PM.4022215	Task Order Signed for TO 17 for Convention 4 for Real Convoys for Gendarmerie Services	Q4 2022	WP22 objective	All

EXPECTED RESULTS

1. Transportation of Highly Exceptional Loads amongst others, EU & JA-DA TF coils, US CS Coils and EU & KO-DA VV-sectors between Maritime Port of Marseille and ITER site.

2. Gendarmerie Task Orders to escort the HEL convoys

3.Task Orders for Management fees and for component transportation with contractor Daher will be signed.

Target Credit NA

Other Technical Support Activities

Programme Management

Progress of Work

The main focus of Programme Management is on performance monitoring and reporting, preparation of the annual and multi-annual programme planning documents, scheduling support, change control, the maintenance and update of the cost situation, the continuous improvement of the risk registers in all project areas, increased standardization of reporting within the organization, the implementation of the Internal Compliance Programme for export control. Overall project management support and support to the use and maintenance of specific tools to support project and program management are also included.

Procurement Activities

One or more framework contracts will be signed for the continuation of the supply of Project Performance Management Support.

Task Orders under existing framework contracts and the new one(s) will be issued to continue to support the F4E Project Teams at Barcelona and Cadarache or at suppliers' premises.

Other Expenditures

Progress of Work

A general provision is foreseen for consultancy services (e.g. participation to specific committees, support/advice to F4E Management, technical support, management retreat, support on business process management and definition and documentation management system support, etc.) as well as provision for interim management services, operational missions, insurance and audit.

This part also includes the provision of ICT support (hardware, software and services) for the specific benefit of the operational activities.

Logistic and legal support to operational activities is also included.

Procurement Activities

The above scope will be implemented mainly by issuing Task Orders under existing framework contracts.

Operational Support services

Progress of Work

A general provision is foreseen for operational support to F4E Programme Teams in Pre-procurement (this covers Business Intelligence & Market Analysis) and Procurement areas and Commercial contract management.

Procurement Activities

The above scope will be implemented mainly by issuing Task Orders under existing framework contracts.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.PM.3076190	Contract Signed of FWC F4E-OMF-(TBD1) for PPM Support (2022-2025)	Q2 2022	WP22 objective	All
EU.PM.3092200	TO 07 F4E-OMF-0895 Lot 2 signed for Risk Management Senior Support (3th cont. TO 01)	Q2 2022	WP22 objective	All

EXPECTED RESULTS

1. Signature of one or more new framework contracts to continue to provide support services in the area of Project Performance Management Support.

2. Signature of the required Task Orders in order to support the Project Teams.

3. The expected result is to provide the requested support to F4E and all Project Teams on matters concerning Programme management.

4. The expected result is to provide the requested support to all Project Teams on matters concerning additional services (i.e. logistics, ICT, legal, etc.).

The target for 2022 is to manage the F4E operative processes and to contribute in achieving the cumulative credit forecasted for each action in this WP2022 thanks to the support granted to the work under each action, and support the teams to deliver within time and budget.

Action 14. Broader Approach

Action 14	Broader Approach

JT-60SA

Progress of Work

The implementation of activities for the Operation/Enhancement phase of the project will continue. These activities include the procurement of critical spare parts and engineering services for EU already supplied systems and components, and selected machine enhancements and diagnostics in collaboration with EUROfusion (including maintenance and assistance to on-site assembly and commissioning).

Procurement Activities

Critical contracts for the integration of cassette bodies, the High Heat Flux (HHF) and Normal Heat Flux (NHF) elements of the JT-60SA actively cooled Divertor[11], several studies and procurements for the enhancements of the power supply systems and the cryoplant will also be launched in 2022. The activities under the responsibility of F4E are carried out through task orders of existing/new framework contracts or existing/new supply and service contracts. F4E will be continuously supported by experts, and on-site health and safety services to ensure safe operations, funded respectively by F4E through expert contracts and specific contracts. Cash contributions on specific QST Call for Funds, covering EU Contribution to operation, maintenance and assembly will also be made.

IFMIF/EVEDA

Progress of Work

In 2022 the LIPAc (Linear IFMIF Prototype Accelerator) operation at Rokkasho will focus on demonstrating the expected performances required for beam operations at high duty cycle of all the accelerator subsystems except the superconducting part (cryomodule) whose assembly will be carried out in parallel on Rokkasho site by a European company under F4E responsibility.

Procurement Activities

Additional contracts will have to be placed for demonstrating the operation and for optimizing the maintainability of the accelerator and subsequently the beam availability. Activities for the preparation of the LIPAc accelerator in its final configuration for the forthcoming operation phases will continue in 2022. F4E will be continuously supported by experts, and on-site health and safety services to ensure safe operations, funded respectively by F4E through expert contracts, specific contracts, and Agreements of Collaboration with European Institutes. Cash contributions as contribution to Common Fund and Common Expenses will also be made.

IFERC

Progress of Work

The IFERC project comprises three activities, CSC (Computer Simulation Centre), REC (Remote experimentation Centre and DEMO design and R&D):

The CSC objective is to provide high power computer (HPC) resources for JA and EU scientists in order to advance simulation studies for ITER, JT-60SA and fusion reactors in general (e.g. DEMO). CSC will foster collaboration research projects between JA and EU by sharing computer resources and by further jointly developing state-of-the art models.

REC activities focus on the implementation of the remote collaboration tools agreed with JT-60SA, ITER, and the IFMIF-EVEDA LIPAc accelerator. The collaboration under the ITER BA agreement will continue to advance test technologies for remote experiments and data transfer, including remote CODAC application testing, remote data access, live data viewing for ITER, fast data transfer, and secure remote connection.

In the DEMO design activities, priority will be given to activities directly relevant for ITER and JT-60SA exploitation, such as plasma scenario development, divertor and power exhaust, breeding blanket and tritium extraction and removal. The objective of activities in fusion materials R&D will be to continue to support ITER in issues related to Tritium retention in first

[11] At the time of writing the Work Programme, there is a high probability that the commitment for the Supply of JT-60SA actively cooled Divertor HHF elements Stage 1 is postponed from 2021 to 2022. The budget is nevertheless allocated to year 2021.

wall materials, and to contribute to the materials database for future reactors such as DEMO, which will be in part validated in a future IFMIF type installation. All activities will be performed in collaboration with EUROfusion.

Procurement Activities

There are contracts to be placed for preparation of remote participation rooms for tests with BA Projects and ITER, and testing activities. F4E will be supported by experts, funded by F4E through expert contracts. Cash contribution will also be made as EU contribution to the Project Team.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.BA.01.25080	Contract placement for the integration of cassette bodies, HHF and NHF elements of the JT-60SA actively cooled Divertor	Q1 2022	WP22 objective	JT-60SA - Divertor
EU.BA.01.28220	Delivery of Polychromators for JT-60SA Thomson Scattering	Q3 2022	WP22 objective	JT-60SA – Thomson Scattering
EU.BA.01.28260	Delivery of 10 divertor cryopump units	Q2 2022	WP22 objective	JT-60SA – Cryopumps
EU.BA.01.13520	LIPAC Injector Spare parts completed	Q2 2022	WP22 objective	IFMIF - LIPAc Activities
EU.BA.01.27580	Refurbished PSYS and new parts with documentation	Q2 2022	WP22 objective	IFMIF - LIPAc Activities
EU.BA.01.27600	Completion of the SRF Linac assembly in the Joint Research Building	Q4 2022	WP22 objective	IFMIF - LIPAc Activities
EU.BA.01.25300	Supply of equipment for tests with BA Projects and ITER, and establishment of control room	Q4 2022	WP22 objective	IFERC-REC

EXPECTED RESULTS

The main expected results for this action are:

JT-60SA:

1. Delivery of Massive Gas Injection valves
2. Integration of the pellet launching system
3. Approval of First Design Report for the Supply of the Second Electron Cyclotron Range of Frequency Power Supply system
4. Completion of factory tests for the Error Field Correction Coils
5. Delivery of Thomson Scattering primary optics

IFMIF/EVEDA

1. Procurement of injector spare parts of the LIPAc accelerator completed
2. Procurement of spare parts for the radio frequency power supply to ensure maintenance and availability completed
3. Work plan for upgraded radio frequency power supply with solid state technology
4. Completion of the Erosion/Corrosion Engineering design,
5. Completion of beam commissioning at 5 MeV at high duty cycle

IFERC

1. Completion of functional test Remote Data Access to ITER Data Base under the collaboration REC-IO
2. Completion of manufacturing of Irradiation rigs for the R&D on the Neutron Irradiation experiments of Breeding Functional Materials for the DEMO R&D

3. Complete T analysis of JET-ILW-3 tiles and dusts and summarize T inventory data
4. Identification of Power exhaust R&D issues for tokamak experiments for DEMO Design activities
5. Supply of high performance computer resources and analysis and support of simulation projects

TARGET

The target of 2022 is the achievement of a cumulative value expressed in kBAUA[12] (CAS):

	Yearly value	Cumulative value
Cash contribution JT-60SA 2022 (CASH02)*	5.262	17.837
Pellet injector (PEINJ)*	3.000	3.000
Actively Cooled Divertor (DIV1)*	10.000	10.000
ECRH Transmission (ECRHWG)*	3.000	3.000
EF Correction Coils (EFCC PS)	1.790	2.864
Divertor Cryopumps (CRPUM)	2.140	2.340
Massive Gas Injection System (MGI)*	0.100	0.100
Thomson Scattering (TOSCA)	3.650	6.070
Supply of the Second ECRF Power Supply system (ECRFPS2)	1.257	1.257
Spare Parts of the LIPAc Injector (AF02-2)	0.500	0.500
RF Power System (AF06-2)	0.730	0.730
Design feedback for Neutron Source (ED06-2)*	0.440	0.440
Lithium Target Enhancement (LF06-2)*	0.110	0.110
Common Expenses*	0.150	0.600
Common Fund*	1.560	5.000
On-site Personnel (AF10-2)	3.100	3.100
Demo design activities	1.172	2.983
Structure material development for in-vessel components	0.469	1.194
Database for material corrosion	0.117	0.298
Neutron irradiation experiment of breeding functional materials	0.351	0.894
Tritium technology for collection and inventory evaluation	0.234	0.596

[12] *Procurement Arrangements not yet signed are marked with an **

CSC-EU*	0.300	0.700
REC-EU*	0.350	0.800
Project Team - EU staff*	0.220	0.623
Project Team - EU Common Expenses*	0.050	0.150

WP_TABLE 1 WORK PROGRAMME 2022 BUDGET SUMMARY

Budget article		Original Work Programme Commitment appropriations (EUR)
3 1	ITER construction including site preparation	569,331,726.00
3 2	Technology for ITER	4,339,492.00
3 3	Technology for Broader Approach & DEMO	41,009,373.00
3 5	External Support Activities	24,156,472.00
3 6	Other Operational expenditure	5,801,600.00
Total Title III of the Budget		**644,638,663.00**
4 1	ITER construction from ITER host state contribution	143,800,000.00
4 2	Activities linked to ITER Organization	17,190,000.00
4 3	Other earmarked expenditure	
Total Title IV of the Budget		**160,990,000.00**
Total amount available for the operational expenditure		**805,628,663.00**

Work Programme		2022 Work Programme Commitment appropriations (EUR)		
		Grants	Procurement	Cash
3 1 + 4 1 + 4 2 + 4 3	Expenditure in support of ITER Construction	3,236,677.00	419,080,814.00	308,004,235.00
	Sub total ITER construction + RF	**730,321,726.00**		
3 2	Design and R&D in support of ITER, not credited	0.00	4,189,492.00	150,000.00
	Sub total technology for ITER	**4,339,492.00**		
3 3	Expenditure in support of Broader Approach	0.00	38,654,373.00	2,355,000.00
	Sub total Technology for Broader Approach and DEMO	**41,009,373.00**		
3 5	External Support Activities	0.00	24,156,472.00	0.00
	Sub total External Support Activities	**24,156,472.00**		
3 6	Other Expenditure	0.00	5,801,600.00	0.00
	Sub total Other Expenditure	**5,801,600.00**		
Totals Operational Expenditure		***3,236,677.00***	***491,882,751.00***	***310,509,235.00***
		805,628,663.00		

WP_Table 1 . Work Programme Budget Summary

WP_TABLE 2 INDICATIVE VALUE OF FINANCIAL RESOURCES FOR THE ACTIONS IN WP2022

Action #	Action	Budget WP2022
1	Magnets	5,887,034
2,3,4,10*	Main Vessel*	112,527,825
5	Remote Handling	16,691,822
6	Cryoplant & Fuel Cycle	8,479,232
7	Antennas and Plasma Engineering	4,354,175
8	Neutral Beam and EC Power Supplies and Sources	32,305,159
9	Diagnostics	21,342,879
11	Site and Buildings and Power Supplies	226,426,063
12	Cash Contributions	308,004,235
13	Technical Support Activities	28,237,365
14	Broader Approach	41,372,873
	Total	**805,628,663**

*The sub-actions of Vacuum Vessel, In-Vessel Blanket, In-Vessel Divertor and Test Blanket Module are presented merged in one single line due to commercial sensitive information.

WP_Table 2 . Financial Resources per action

WP_TABLE 3 - 2022 MAIN PROCUREMENT ACTIVITIES (PER ACTION)

Action		Type of contract	Signature
Magnets			
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Vacuum Vessel			
CA08763	Commitment and Task Order Signed - F4E-OMF-789-WT-B22 for 1 VV Resident Inspectors	SC-PServ	Q4
CA08828	Commitment and Task Order Signed - F4E-OMF-789-WT-A22 for 1 VV Resident Inspectors	SC-PServ	Q4
CA09565	Commitment and Task Order Signed - F4E-OMF-789-MG-A22 for 1 VV Resident Inspectors	SC-PServ	Q2
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
In Vessel- Blanket			
CA01638	TO 02 OPE-319-01 High Heat Flux Testing for FW Pre-Series	SC-PServ	Q4
CA05646	TO 1 for FwC BCM (OMF-1080) - Qualification and Manufacturing of 1st Pipe Bundles	SC-PSupply	Q1
CA08355	TO 03 Procurement of Beryllium (Series)	SC-PSupply	Q3
CA08358	TO 02 Procurement of CuCrZr - LOT 1	SC-PSupply	Q3
CA08363	TO 03 Material Characterization (Series)	SC-PServ	Q4
CA08364	Contract for Procurement of Standard Parts	PSupply	Q3
CA09286	TASK 3.X for FW Series Fabrication (Manufacturing of Series Panels) - Reopening #1	PSupply	Q4
CA09864	Task Order for Resources 2022-2023	SC-PServ	Q1
CA11610	TO 02 Procurement of CuCrZr - LOT 2	SC-PSupply	Q3
CA11700	TO 8 for FwC BCM (OMF-1080) - Procurement of 316L ITER grade raw material	SC-PSupply	Q1
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
In Vessel- Divertor			
CA00883	IVT Pre-Series Production LOT 1 SC#01	SC-PSupply	Q3
CA05618	TO-02 OMF-1033-02 signed for HHF Tests for Stage 2 Prototypes - IVT	SC-PServ	Q2

CA08583	IVT Pre-Series Production LOT 2 SC#01	SC-PSupply	Q3
CA08813	OPE-1112 Contract for Pins Sleeves and Links of CB series	PSupply	Q1
CA09605	TO-20.01 OMF-0937-01 Signed for Resident Inspector for WTO-Welding	SC-PServ	Q4
CA09606	TO-19.01 OMF-0937-01 Signed for Resident Inspector for WTO-NDT	SC-PServ	Q2
CA10808	TO-56.01 OMF-TBD signed for Documentation Management Support (2022-2024)	SC-PServ	Q4
CA10809	TO-60.01 OMF-TBD signed for Welding Engineer (2022-2024)-IVT	SC-PServ	Q4
CA10810	TO-08.01 OMF-TBD signed for NDE Engineer (2022-2024) - IVT	SC-PServ	Q4
CA11574	TO-32.01 OMF-0937-01 Signed for Resident Inspector -IVT (cont. TO-32)	SC-PServ	Q1
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Remote Handling			
CA05585	Contract signed for Final Design Phase BLT and BSRHE for NBRHS	PSupply	Q4
CA06590	Task Order Signed for Manufacturing for IVVS	SC-PSupply	Q4
CA08385	Task Order (577-02-03) for Manufacturing of Casks for MA-1 for CPRHS	SC-PSupply	Q3
CA10459	CON for 2022 TELBOT Developments CS	PSupply	Q1
CA11079	Task Order Signed for Final Design Phase 3 (CMM) for DRHS	SC-PSupply	Q3
CA11591	TO for Engineering Insourcing Contract Control Sys 2022	SC-PServ	Q4
CA11689	Task Order Signed for Final Design Phase 2 for IVVS	SC-PSupply	Q2
CA11756	Task Order for Engineering Insourcing Contract (D. Guerra, P. Cohi, TS-3) CPRHS 2022	SC-PServ	Q4
CA11775	Contract signed for Manufacturing of first-priority items for NBRHS	PSupply	Q3
CA11776	Task Order for Engineering Insourcing Contract NBRHS 2022 - A. Merino, JL Fernandez, Hyo Hwan	SC-PServ	Q4
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Cryoplant and Fuel Cycle			
CA06390	Contract Signed for Manufacturing and Delivery of NB CVBs	PSupply	Q2
CA10704	I&C Leak Detection	SC-PSupply	Q3

CA11743	Contract Signed for Manuf. and Testing of Cabinets for T&C FECDS and TCCS	PSupply	Q3
CA11745	FECDS: Contract signed for Manufacturing and Delivery of NB Cryolines, Cryojumpers and JC for CVBs	PSupply	Q1
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Antenna and Plasma Engineering			
CA01421	TO signed for Manufacturing of Isolation Valve prototypes and FDR documentation	SC-PSupply	Q1
CA04680	TO signed for Inspectors for UL&EW 2022	SC-PServ	Q1
CA10639	TO signed for mm-wave testing of Window and Valve prototypes	SC-PServ	Q2
CA10965	Task Order 01 Signed for Design Finalization, Manufacturing & Assembly of the EC UL Port Plug	SC-PSupply	Q1
CA11053	Task Orders for In-sourcing UL&EW 2022	SC-PServ	Q3
CA11140	Contract Signed for Support to F4E procurement & ITER Operation Preparation	PServ	Q3
CA11900	Contract Signed for Preparation for 1st Plasma	PServ	Q3
CA11906	Task Order Signed for FALCON Maintenance	PSupply	Q3
CA07035	Contract Signed for FDR preparation for EC Plant Control System (Stage 3)	PServ	Q3
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Neutral Beam and EC Power Supplies and Sources			
CA01674	Specific Contract signature for- TO#05 MITICA CODAS, Interlock and Safety	SC-PSupply	Q1
CA04443	Task Order Signature for PRIMA#4 Assembly	SC-PSupply	Q2
CA06559	Task order for activities to cover Engineering and Qualification WP2022	PServ	Q4
CA06567	Contract Signed for NBI-1&2 Vessels	PSupply	Q3
CA09817	Procurement of ACCPS for HNBs	PServ	Q2
CA11035	Contract signature for NB tooling NBI 1&2 Phase II	PServ	Q2
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Diagnostics			
CA09322	Task Order Signed for TO25Bis for In-source personnel under OMF-0871	SC-PServ	Q1

CA10336	Task Order signed for Task Order for Design and Manufacturing of Bespoke Bolometer Electronics	SC-PServ	Q3
CA10399	Contract Signed for CXRS Experts Contract - support contract	SC-PServ	Q3
CA10424	Task Order Signed for In-source personnel under OMF-0871-01-01-45 Part IV (BIS)	SC-PServ	Q3
CA10541	Task Order Signed for MfG PP EP12	SC-PServ	Q3
CA10652	Task Order Signed for Procurement and delivery of Bolometer Software	SC-PServ	Q3
CA10695	Task Order Signed for Bolometers DIV/VV Cameras Design	SC-PServ	Q1
CA10813	Task Order signed for manufacturing of Feedthroughs	SC-PServ	Q2
CA11216	Task Order Signed for Front-End components (Waveguides, Mirrors & Horns)	SC-PSupply	Q3
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Test Blanket Module			
CA06814	Task Order Signed for Preliminary Design of TBMs set	SC-PServ	Q1
CA06840	Task Order Signed for Preliminary Design of TBMs set	SC-PServ	Q4
CA06844	TO 03 Signed for HCPB Ancillary Systems PD	SC-PServ	Q1
CA07112	TO 05 signed for ANB Consultancy TBM box Qualification	SC-PServ	Q1
CA08657	TO 02 signed for Ancillary Systems WCLL PD	SC-PServ	Q2
CA08658	TO 03 Signed for Safety Analyses for TBS Preliminary Design	SC-PServ	Q1
CA09803	TO 02 for Proof of the TBM-sets fabrication and assembly processes feasibility	SC-PServ	Q1
CA10939	TO#01 for WCLL TBM Set PD & FD	SC-PServ	Q2
CA10943	TO#01 for WCLL Safety Analysis PD & FD	SC-PServ	Q2
CA10946	TO#01 for EUROFER Codification Database	SC-PServ	Q1
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Site and Buildings and Power Supplies			
CA05655	TB22 - Commitment for Completion and Final Fittings Works - TO#02 - for 2023	SC-PSupply	Q4
CA05726	TB09 - Commitment for Hot Cell Complex Integrated Contract HCC	PServ	Q2

CA07218	Site Security and Reception Services for the ITER Site 2023 signed (from 12/22 to 12/23)	SC-PServ	Q4
CA08418	TO#03 for FWC-OFC-1006 for Eng, Contract & Claim Management consultancy services	SC-PServ	Q1
CA09387	TO#03 for FWC for the H&S Joint Procurement for 2022-2023	SC-PServ	Q1
CA10232	TOs for AMF-0796 Eng & contract management consultancy services with special respect to cost and schedule assessm. 2022	SC-PServ	Q4
CA10260	Future activities to cover BIPS provision for Engineering Services WP2022	SC-PServ	Q4
CA10866	OMF-0871-02-01 for Civil Engineering Support for TSS in 2022	SC-PServ	Q2
CA11154	TB21 - Commitment for Multi-trade contracts for the Tokamak Complex - TO#01	SC-PSupply	Q1
CA11235	Host agreement HCC for 2022	PServ	Q2
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Supporting Activities			
CA06461	Commitment 2022 - Global transportation of HEL NON-EU ITER components	SC-PServ	Q4
CA06462	TO for Management fees 2023	SC-PServ	Q4
CA06463	Commitment 2022 - Global transportation of CEL-CL ITER components	SC-PServ	Q4
CA07540	Task Order Signed for TO 16 for Convention 4 for Real Convoys	SC-PServ	Q2
CA08977	2022 Commitments and Budget Reserves for Legal Services charged against Operational Budget	SC-PServ	Q4
CA09708	Commitment 2022 for Operational Missions	PServ	Q4
CA10066	TO 35.1 OMF-TBD1-01-XX SE Senior Support #4 (cont. TO 35 OMF-0783)	SC-PServ	Q1
CA10756	ICT - Commitments 2022 for Software maintenance fees (Software licences specific to the ITER project)	SC-PServ	Q4
CA11144	Task Orders for PPMs Cost Control Support FW series production 2023-2024 (5 Senior Cost Controllers SUPP 01) [2 years]	SC-PServ	Q4
CA11814	TO XY OMF-1115-01 for FP Diagn., BIPS I&C, Add. Heating and Real Time Software Support Activities	SC-PServ	Q4
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A
Broader Approach			
CA10366	Hardware for enhancements for the cryoplant	PSupply	Q1
CA10373	QPC enhancement - Hardware	PSupply	Q1

CA10375	SCMPS enhancement -Hardware	PSupply	Q1
CA10379	ECRH PS Spare Parts and Maintenance Support	PServ	Q3
CA10433	Development of solid state amplifiers	PSupply	Q1
CA11577	Supply of JT-60SA actively cooled Divertor - integration of casette bodys, HHF and NHF elements	PSupply	Q1
CA11810	TOxx OFC-0620 for LIPAc control system on site support	SC-PServ	Q1
CA11811	Upgrade of the LIPAc Control system	PSupply	Q3
Provision for amendments, claims, reimbursement, indexation and late interest		N/A	N/A

Table 3 . Main procurement activities per action

WP_TABLE 4 – PLAN FOR GRANTS

2022 GRANTS

Grant Agreements Reference	Expected date of Signature	Forecasted value to be committed	Duration	Counterpart (Leader Company)	Short Description
Not known	Q2 2022	€3,136,677.00	66 months	*Not known*	Diagnostics: Contract Signed for Completion of the WAVS Design in EP#3, 9 and 17
GRT-901	Q1 2022	€100,000.00	3 months	VTT Technical Research Centre of Finland Ltd	Remote Handling: Amendment for RDA Improvements
Total		**€3,236,677.00**			

ON-GOING GRANTS[13]

Grant Agreements Reference	Actual date of Signature	Committed Value	Duration	Counterpart (Leader Company)	Short Description
F4E-FPA-327-07 (PMS-DG)	20/02/2020	€2,011,797.00	50 months	Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile- ENEA	Development of the Final Design and Prototyping
F4E-FPA-328-07 (PMS-DG)	19/12/2016	€213,734.00	27 months	Wigner Research Centre for Physics, Hungarian Academy of Sciences	Prototype Testing And Updating Of Design Documentation
F4E-FPA-364-06	22/10/2018	€1,390,426.00	42 months	Max-Planck-Gesellschaft zur Forderung der Wissenschaften e.V. — Max-Planck-Institut fur Plasmaphysik (IPP)	Development of the Design and Critical Prototyping
F4E-FPA-375-02	12/07/2013	€984,080.00	87 months	Instituto Superior Tecnico	Coordination Support Office
F4E-FPA-375-04	27/07/2015	€977,401.00	44 months	Instituto Superior Tecnico	R&D And Prototyping For In-Vessel Components (PPR Gaps 4 & 6)
F4E-FPA-375-05	30/09/2015	€735,830.00	57 months	Instituto Superior Tecnico	R&D For In-Port-Plug Components (PPR Gaps 3&5)
F4E-FPA-375-06	26/03/2019	€429,362.00	22 months	Instituto Superior Tecnico	Design of PPR In-Vessel Sub-System and Testing
F4E-FPA-384-04 (DG)	28/11/2017	€394,444.00	37 months	Max-Planck-Gesellschaft zur Forderung der Wissenschaften e.V. — Max-Planck-Institut fur Plasmaphysik (IPP)	Open Call For Proposals: Framework Partnership Agreement: Diagnostic Development and Design: Bolometers
F4E-FPA-384 (DG)- 05	30/07/2018	€1,498,654.00	36 months	Max-Planck-Gesellschaft zur Forderung der Wissenschaften e.V. — Max-Planck-Institut fur Plasmaphysik (IPP)	Development of the Design and Prototyping
F4E-FPA-393 (DG)- 05	23/05/2018	€1,306,364.00	39 months	Danmarks Tekniske Universitet	Development of the Design and Critical Prototyping
F4E-FPA-407-04 (DG)	22/09/2017	€4,317,928.00	48 months	Commissariat à l'énergie atomique	Development Of The Design And Prototyping: Equatorial Visible/Infrared Wide Angle Viewing System
F4E-FPA-408 (DG)- 04	19/04/2018	€3,982,402.38	31 months	Forschungszentrum Julich Gmbh	F4E-FPA-408-SG04 Development Of The Design And Prototyping Of The Core-Plasma Charge Exchange Recombination Spectrometer
F4E-GRT-154	17/11/2011	€812,138.26	118 months	Forschungszentrum Julich Gmbh	Hih Heat Flux of FW Mock-ups before and after Irradiation including Transportation
F4E-GRT-553	09/07/2014	€2,562,993.00	89 months	Ecole Polytechnique Federale de Lausanne	Design, Development and Validation of the European Gyrotron
F4E-GRT-0901-01	09/03/2018	€1,505,442.00	51 months	VTT Technical Research Centre of Finland Ltd	Development And Integration Of 3D Machine Vision, Hlcs Modules And Genrobot at DTP 2

[13] Any 2021 Grant that was included in the original WP2021 but was not signed by the cut-off date of 31st March 2021 is not reflected in this table. Grants that were not known when the original WP2021 was drafted and that would be signed following a related WP2021 amendment are not listed neither.

F4E-GRT-0974-01	20/12/2018	€249,986.00	28 months	Tuotekehitys Oy Tamlink	Prototyping And Testing Of Hydraulic Digital Valves For The Divertor Remote Handling System
Total		**€23,372,981.64**			

WP_Table 4 . Plan for grants[14]

[14] The Commission guidelines require to produce two additional tables covering Service Level agreement and Contribution Agreements. These are not displayed since F4E has no Service Level agreement nor Contribution Agreements under operational expenditure.

WP_TABLE 5 TIME OF CALL FOR THE PROCUREMENT PLAN

Indicative number, type of contract and timeframe for launching the procurement procedures.

Procurement Procedures	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
P Serv - Contract	3	5	3	6	2	3
P Supply - Contract	2	11	9	1	6	2
Pserv - Specific Contracts	23	44	43	31	31	87
PSupply - Specific Contracts	3	10	8	3	10	2

WP_Table 5 . Indicative number and type of contracts per quarter

NB:

- During the implementation of the Work Programme activities, F4E may identify the need for new calls, group more activities in a single call or split one activity in more calls. This will in any case be performed preserving the scope and objective presented in WP2022.
- When a call for tender is not defined yet, the call is indicatively assigned to 6 months before the signature of the contract.
- For the specific contract, as they do not have call for tender, the table refers to its signature date.

ESSENTIAL SELECTION, AWARD CRITERIA AND UPPER FUNDING LIMITS FOR GRANTS

With regard to grant actions referred to in this Work Programme, the essential selection and award criteria are:

Essential Selection Criteria

- The applicants' technical and operational capacity: professional, scientific and/or technological competencies, qualifications and relevant experience required to complete the action.
- The applicants' financial capacity: stable and sufficient sources of funding in order to maintain the activity throughout the action.

Essential Award Criteria

- Relevance and quality of the proposal with regard to the objectives and priorities set out in this Work Programme and in the relevant call for proposals.
- Effectiveness of the implementation as well as of the management structure and procedures in relation to the proposed action.
- Cost-effectiveness and sound financial management, specifically with regard to F4E's needs and objectives and the expected results.

With regard to the specific action, more details will be provided in the call for proposals. Thresholds and weighting for the essential and additional award criteria will also be indicated in the call for proposals.

A proposal which does not fulfill the conditions set out in the Work Programme or in the call for proposals shall not be selected. Such a proposal may be excluded from the evaluation procedure at any time.

The timetable and indicative aggregated amounts for the actions are defined in this Work Programme.

Upper funding Criteria

With the entry into force of the recast F4E Financial Regulation and Implementing Rules on 1st January 2016, the following upper funding limits apply for grants:

1.	Research, technological development and demonstration activities	40%
2.	Purchase/manufacturing of durable equipment or assets and of ancillary services approved by the Joint Undertaking as necessary to carry out such activities	100%
3.	Coordination and support actions, including studies	100%
4.	Management activities, including certificates on the financial statements, and other activities not covered by paragraphs 1 and 2	100%

List of Tables