

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 it¹ (hereinafter "the Statutes") and in particular Article 9 (a) thereof, last amended on 10 February 2015² 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 2021/281³;

HAVING REGARD to the Financial Regulation of Fusion for Energy⁴ 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) 2019/715⁵ 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 2023-2027 (F4E_D_ 2WZTGT) of Fusion for Energy annexed to this Decision is hereby adopted.

Article 2

The Governing Board hereby delegates to the Director of Fusion for Energy the power to make non-substantial

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.

F4E_D_2WZTGT v2.3

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, 2 December 2022.

For the Governing Board

Dr. Carlos AlejaldreChair of the Governing Board

[Signed electronically in IDM]

For the Secretariat

Raymond Monk

Acting Secretary of the Governing Board

[Signed electronically in IDM]

Annex: Single Programming Document 2023-2027



Single Programming Document

Years 2023-2027 F4E_D_2WZTGT

Single Programming Document 2023-2027

Fusion for Energy

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Single Programming Document 2023-2027

Foreword

Welcome to Fusion for Energy's (F4E) Single Programming Document for the period 2023-2027!

This will be one of the most challenging periods for F4E. For ITER, F4E will contribute to the

reinforcement of the integration between ITER Organisation and F4E. It must finish most of the buildings

and deliver, among others, all the superconducting magnets and the vacuum vessel sectors. This is

necessary to complete the first stage of ITER construction, start the integrated commissioning and

produce the first plasma.

At the same time F4E 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, F4E will put the knowledge gained from its projects to the use of the next phase of

its mission - preparing Europe for the construction of a demonstration fusion reactor. Supporting 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.

Jean-Marc Filhol

Acting 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+4 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 22/02/2021.1

The reference date for the planning information in the present document is end of March 2022.

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

ITER²

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 EUROfusion³.

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

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¹ MFF figures were updated in May 2022.

² Info on ITER can be found on www.iter.org and https://f4e.europa.eu/understandingfusion/iter.aspx

³ 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 the most significant part 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 Organization 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 2037⁴
- 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.

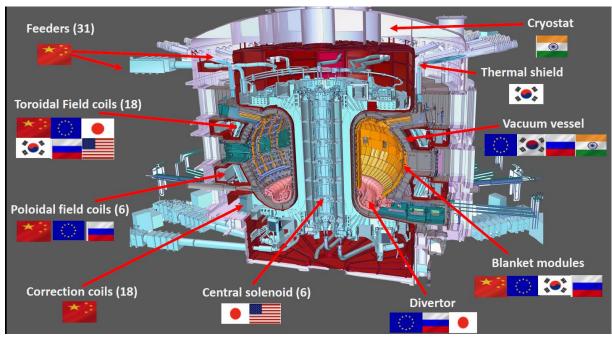
ITER Construction Phase	Overall cost IC- 29 (kIUA)	EU share (kIUA)	EU share already released (kIUA)			
In-kind	2847.25	1108.30	500.13			
In-kind cash to Japan	NA	227.65	189.06			
In-cash	4898.95	2185.48	1099.44 ⁵			
Total	7746.2	3521.43	1788.64			

SPD_table 1. Summary table of European contribution to ITER (Reference IC-29 contribution end of December 2021)

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⁴ 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.

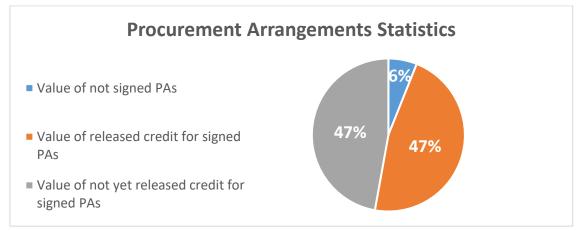
⁵ This figure includes the cash contribution for a value 1,035.24 kIUAs increased by the "short in-kind contribution" (in-cash from staff secondments to IO and in-cash from ITAs) for a value of 64.21kIUAs.



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 March 2022)

CASH CONTRIBUTION TO ITER ORGANIZATION

F4E is the European Domestic Agency (EU DA) managing the EURATOM participation to the ITER Project. F4E delivers to ITER International Organization (IO) in-kind contributions and annual in cash contribution in accordance with the ITER Agreement⁶ and under the terms approved by ITER Council⁷. By the end of April 2022, F4E has provided 1,035.24 kIUA credits (excluding "short in-kind contribution") to ITER Organization in the form of cash contributions to ITER Construction Phase.



SPD_figure 4. Ratio cash paid to IO versus total expected cash contribution (status end March 2022)

CASH CONTRIBUTION TO JAPAN

According to the ITER Agreement, 10% of in-kind procurement arrangements (PA) equivalent to 227.65183 kIUA credits shall be transferred from Euratom to Japan under the supervision of the ITER Organization⁸. This is financed through cash contribution paid by F4E (EU DA) to Japanese Domestic Agency (JA DA).

In 2021 F4E has signed with QST⁹ a Memorandum of Understanding (MoU) for the transfer of 20.29600 kIUA credits corresponding to 53.26 % of the Procurement Arrangement 5.3.P6.JA.02 (Neutral Beam Power Supply) and the corresponding commitment of EUR 38 648 906.

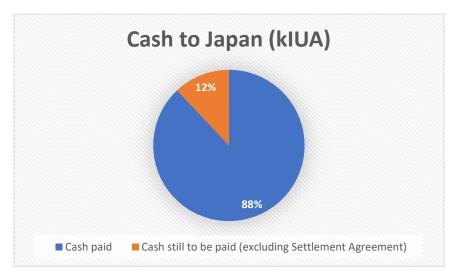
F4E provides a yearly payment based on progress reports and according to the agreed payment schedule.

⁶ Article 8 "Resources of ITER Organization" (ITER Agreement 2006)

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.

⁸ Decision 12 of Interim ITER Council, Tokyo, 11-12 July 2007 on transfer of procurement responsibilities from Euratom to Japan

⁹ The National Institutes for Quantum Science and Technology (QST) as Japanese Domestic Agency (JA DA). The Japanese share of Procurement Package 5.3.P6 is equal to 41.36 %



SPD_figure 5. Cash paid to Japan / cash still to be paid to Japan (status end March 2022)

(excluding settlement agreement 10)

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

ITER Director General Dr Bernard BIGOT, who was often described as the "soul of the ITER project", unexpectedly passed away in May 2022. Dr Bernard BIGOT transformed the project by putting in place a "one-team project culture" between the seven parties. His strong leadership and full commitment to ITER will be missed.

During an extraordinary ITER Council in September 2022, Pietro Barabaschi was appointed as the new ITER Organization Director-General and started his appointment on 16th of October.

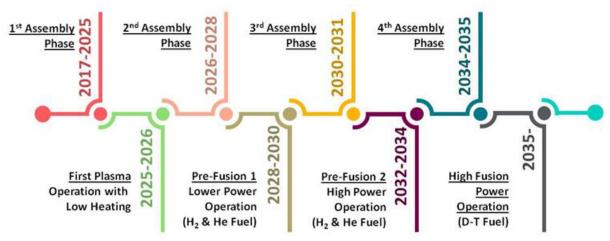
The F4E schedule baseline for period 2023-2027 complies with the ITER master schedule Baseline approved in 2016 leading to First Plasma in December 2025 as adjusted by the Revised Construction Strategy.

The new ITER Baseline for the ITER Project, as presented in June 2022, shows the First Plasma date in November 2028. Even though this baseline shows a more realistic approach, the schedule has not yet been approved and the new First Plasma date still needs to be finally agreed. The recently appointed new IO DG has not yet communicated when he will be in a position to present a new baseline to the ITER Council.

As of the end of March 2022, the EU has achieved a total of 23 IC and GB milestones out of a total of 57. 4 milestones are at risk of experiencing delays with respect to the agreed quarter. 18 milestones show some delays; in some cases these delays will be cancelled once the new Required Arrival Dates (RAD) are implemented into the baseline. The remaining 12 IC and GB milestones are on track.

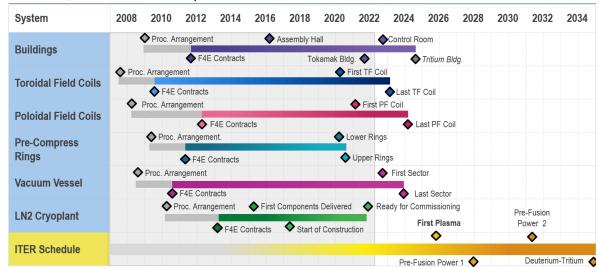
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excluding settlement agreement signed in 2015 between EU and Japan, under which F4E committed an additional cash contribution to Japan, equivalent to seventy-five million euros valued at 10 February 2014.

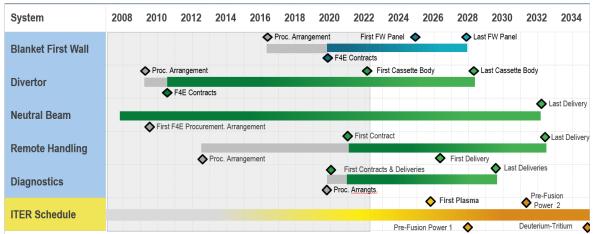


SPD_figure 6. Detail of the Staged Approach

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 2022)



SPD_figure 8. Top level schedule for other Systems (end of March 2022) Note that dates are under review with IO for schedule re-planning and that Tritium building & Hot Cell shall be added.

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 (Phases I and II).¹¹

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

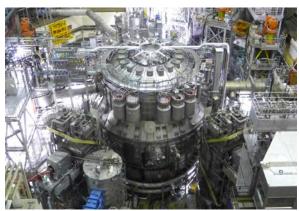
			Phases I and II) EU Scope March 2027			
Actions	Name	Name Commitment Of which committed				
14-	Satellite Tokamak (JT-60SA)	486.31	273.81	256.44		
Broader Approach	IFMIF/EVEDA	203.33	177.69	152.92		
	IFERC	135.98	127.35	119.76		

SPD table 2. Correspondence between Actions, WBS and WP ref for BA¹²

¹¹ Not all PAs are signed yet.

¹² All BA Phase I credits except for 0.5kBAUA (foreseen by March 2022) are expected to be achieved by the end of 2021.





JT-60SA – 2nd March 2022 first glow discharge plasma (RF driven) obtained

JT-60SA Jan 2021 Machine during Magnets Energisation

SPD_figure 9 .JT-60SA



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):

Starting on mid-September 2020 the integrated commissioning of the machine had progressed steadily. From January 2021 all coils systems were progressively energised. EU-supplied toroidal field coil (18 coils, 7-m height each, among the largest superconducting magnets to date) were the first to reach full current (25.7 kA) on 2 March 2021, producing the design toroidal field of 2.25 Tesla on tokamak major radius. The maximum value was reached in steps, monitoring the coils parameter. Eventually full field was kept for more than 1 hour. Taking advantage of the presence of magnetic field a first glow discharge plasma (RF driven) was obtained. While integrated commissioning was approaching completion, on 9 March 2021, during the high voltage energization of the Equilibrium Field Coil #1 (a circular magnet of about 12 m diameter and about 30 tons weight, produced by Mitsubishi Electric), a rapid increase in the power supply current was observed, followed by an increase in the cryostat pressure, and the helium cooling circuit pressure. After a few-minutes delay the safety rupture discs, protecting the helium cooling circuit opened and the helium gas was discharged, partially, into the torus hall. The incident did not produce any harm to personnel, limited direct damages to the device, but has serious consequences on the schedule of the project.

After warming up all the superconducting coils, the visual inspection inside the cryostat found that the insulation of both terminals of the EF1 coil had signs of local carbonization (attributed to a double fault to ground resulting is a coil short-circuit). The discharge of the energy stored in the coil sustained the arc, even if the power supplies protection had promptly intervened. This produced a few small holes of helium piping (local melting) which caused the pressurized helium leak.

It was immediately evident that repair and insulation reinforcement had to extend to the damaged EF1 coil terminal joints, but also to other EF and CS coils terminal joints with the same design. Extensive and time-consuming experimental tests have progressively revealed that a considerable part of the high voltage insulations (mainly those made manually on-site) did not guarantee its performance in so-called Paschen conditions.

In normal operating conditions the cryostat vacuum (about 10-5 Pa) prevents Paschen-type discharges, but EF1 incident has brought renewed attention to the fact that the cryostat vacuum, alone, should not be relied on to prevent discharges. Such discharges can potentially cause permanent damage to the insulation and a non-negligible risk of short circuits at the coil's terminals, with potentially unrecoverable damage to the machine. This analysis has led to the conclusion that an extensive repair action had to be implemented to reduce, as much as possible, this risk.

The rest of year 2021 has been largely devoted to find appropriate technical solutions, considering technical risks involved and constrains of execution, in the limited cryostat space. This requires substantially more time that originally estimated. The original scope of repair was completed by June 2022 but additional repair areas have been identified for which quantification of cost and schedule is ongoing.

While the incident has been an obstacle in the, otherwise smooth, commissioning of JT-60SA, on the positive side, it is allowing fixing potentially dangerous defects, to develop repair test and repair techniques with potential use in other machines and notably ITER. In fact, implementing the 'Tri-Partite Agreement' established among F4E, QST and ITER Organization (IO), IO was constantly provided with detailed information with a mutually beneficial collaboration.

During 2021, F4E (in collaboration with EU laboratories, as part the EUROfusion consortium) provided continuous support and expertise (including remote services from the industrial

contractor, which originally procured the cryoplant and the power supplies). After the incident, the support of EU experts was provided by several EU laboratories (IPP-W&X, KIT and CEA).

While test and repair activities was carried out, at JT-60SA site, several activities in Europe were steadily progressing (also thanks to the cooperation with a number of EUROfusion laboratories). They include a number of diagnostics (Thomson Scattering, Fast Ion Loss Detector, VUV divertor spectrometer), additional power supplies (Error Field Correction Coils Power Supplies and the second set of ECRF System Power Supplies), in-vessel components (Divertor Cryopumps Actively Cooled Divertor) auxiliary systems (Pellet Launching System, Massive Gas Injection, the ECRH Transmission lines).

IFMIF/EVEDA:

In July 2021, after three years of work, including two years of installation of all components, in difficult conditions due to the travel restrictions imposed by the COVID-19 outbreak, a major step in the development of the LIPAc project was completed: The accelerator was able to produce, transport, and accelerate at 5 MeV 10-mA proton and 20-mA deuteron beams in line with the beam dynamic requirements in the third (out of four) configuration of the machine, referred to as phase B+ configuration. 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 2022.

As the accelerator is growing and more subsystems need to be controlled, a new central control room was built in 2020 in collaboration with the IFERC/REC project to run operation in complement of the local control. It was fully commissioned in 2021 and has successfully been used since then (cf. SPD_figure 11). Furthermore, due to the impossibility for the EU experts and contractors to travel to Japan a safe ICT environment was developed in collaboration with the IFERC/REC project so that experts can have a remote access to the LIPAc data as well as operator interfaces, and be part of the operation and maintenance activities.

In parallel, the refurbishment and improvement of key subsystems based on the operational feedback have started, and are planned to be deployed after the completion of the primary objectives of the IFMIF/EVEDA programme. After these objectives have been achieved, LIPAc will be also used as a test stand, to test new equipment, beam operation strategies, improve and demonstrate reliability of key subsystems, as well as train scientists, engineers, and operators, in order to support the design, construction and operation of the future neutron source facilities like DONES and A-FNS.

The Procurement Arrangements for the Fusion Neutron Source engineering design activities and the Lithium Target Facility engineering validation activities covering the activities for 2021-2025 have been defined, in collaboration with EUROfusion, and signed in 2021. Their implementation by both implementing agencies aim 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. The use of LIPAc as a testing facility is also considered for design validation studies.



SPD figure 11 . IFMIF/EVEDA - View of the LIPAc local (left) and central control room (right).

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 ITER 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 25 M€ budget (2008 value) for DONES was foreseen as of 2024 for a period of 4 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 2023-2027

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. 2023-2027). 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 22/02/2021¹³. The F4E budget is mainly funded by EURATOM members (mainly through the European Commission) and France (additional host state funding).

Discussions are on-going with the United Kingdom (UK) and Switzerland (CH) concerning their participation in Fusion For Energy. These discussions could result in additional contributions to the F4E Budget.

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.

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¹³ MFF figures were updated in May 2022.

Human Resources challenges

The entry into service of the new F4E Director is expected during the first quarter of 2023 and will likely trigger a transition period towards a number of new priorities and readjustments.

The large number of selections, to be initiated as a result of the establishment plan reinforcement authorised by the budget authority, will impact the vacancy rate and is also likely to constitute burden on the regular activities oof the services as a result of the expected reassignment of staff.

Natural turnover of middle and senior managers will further add to the destablisation mentioned above.

Implementation of the change agenda started in 2021. The magnitude and scope of the envisioned changes will continue to tie-up resources in 2023. Roll out of the different changes is also likely to have a destabilizing impact in terms of mainstreaming and adjusting to the new processes and ways of working.

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.

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 2022.

1. PROJECT EVOLUTION

1.1 ITER

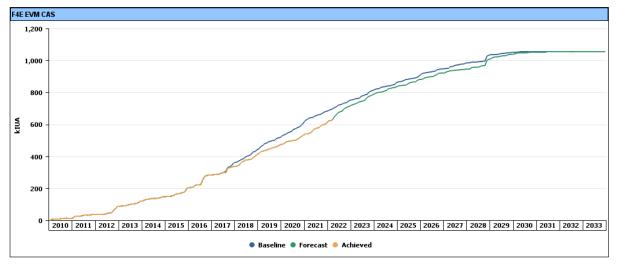
F4E is operating within the classical project 'iron triangle' of time, cost and quality, with quality interpreted in the general sense of achieving all the project scope objectives. This requires a continual balance of prioritisations made at management level, and in the daily work of all the staff.

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 Organization 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. 12 shows the ITER credit achieved until end of March 2022, and the forecast, compared to the 2016 baseline.



SPD_figure 12. 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 2022 (kIUA)	Achieved Credit (kIUA)	Released Credit (kIUA)	2023	2024	2025	2026	2027	2028+
Number	Name	697.68103	627.37302	522.83854	72.34386	48.31430	45.87543	40.80237	23.84738	110.29349
Action 1	Magnets	159.51681	159.91681	144.94681	8.79900	2.39500	0.00000	0.00000	0.00000	0.00000
Sub-action 2	Vacuum Vessel	84.48529	63.33700	41.36700	10.89535	0.00000	0.00000	0.00000	0.00000	0.00000
Sub-action 3	In Vessel- Blanket	0.30000	0.30000	0.20000	0.55000	1.39600	10.82900	7.36300	2.29101	21.73000
Sub-action 4	In Vessel- Divertor	3.67500	3.67500	3.62000	0.00000	1.01500	3.75000	3.99000	5.51000	7.69500
Action 5	Remote Handling	10.46974	4.70000	2.90000	1.90000	2.90000	4.32000	3.95974	3.35000	17.97081
Action 6	Cryoplant and Fuel Cycle	30.65013	30.38013	26.69154	6.16434	1.72660	1.52223	0.60000	0.45319	0.00000
Action 7	Plasma Engineering & Operations	1.15000	1.05000	0.50000	0.00000	0.05000	0.10000	0.05000	0.10000	0.00000
Action 8	Heating & Current Drive	41.62854	42.57254	32.23700	7.67232	8.30305	8.15316	7.40595	3.25358	5.63878
Action 9	Diagnostics	5.53503	3.78716	3.65861	3.09854	1.78955	3.31452	6.87878	2.82960	5.82830
Action 11	Site and Buildings and Power Supplies	360.27050	317.65438	266.71758	33.26431	28.73910	13.88652	10.55490	6.06000	51.43060

^{*}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).

SPD_table 3 . Credit per Action¹⁴

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 related reviews could be competence of either ITER Organization 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.

¹⁴ **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 2022",

Figures in column Achieved Credit correspond to "Total achieved credit at the end of March 2022".

Figures in column Released Credit correspond to "Total released credit at the end of March 2022".

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. The return of experience of the activities following the EF incident has indicated the need for F4E to take a wider role for on-site maintenance & repair in support of QST, in the overall interest of the project. 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 2022, 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 continue to 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 15. 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.

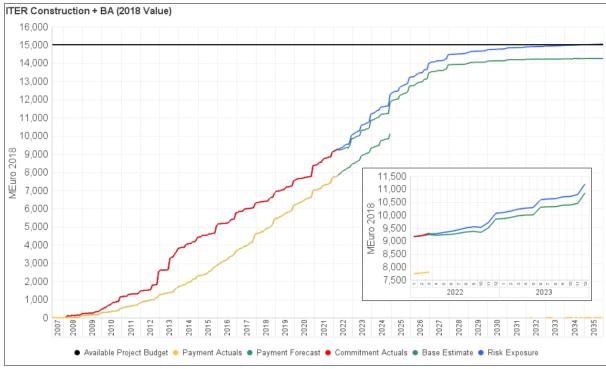
¹⁵ Management / Governance Assessment of EUROfusion & Industry Engagement, 11/07/2016, Ernst & Young

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 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 2022.



SPD figure 13. 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 select 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 the 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"
EVM-CAS SPI (fix 2018) 16	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 the ITER Council and the 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).

¹⁶ A new EVM-CAS indicator will start being used once the new ITER Project baseline is approved at the ITER Council.

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 2027 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 2025. Some of them are also partially conducted as part of the BA effort.

2.5 Annual objectives

In addition to the multiannual objectives, 5 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 ¹⁷
Annual M-SPI	Reach a minimum SPI value 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.

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

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¹⁷ Targets are defined in the Project Plan under section "Objectives and KPIs"

"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 years¹⁸.

The REP 2023-2027 is aligned to the EURATOM contribution for 2023 set by Council Decision (2021)281 amending F4E constituent act ¹⁹, decreased by EUR 180 000 000 in commitments and EUR 50 000 000 in payments during EU budgetary procedure ²⁰ and the corresponding reduction of the ITER Host State Contribution for 2023 by EUR 45 000 000 in commitments. This plan foresees reinforcement of F4E establishment plan by 25 posts, of which 10 additional temporary agents and 15 contract agents converted into temporary agents.

FINANCIAL RESOURCE ESTIMATES PLAN

The EURATOM contribution to F4E for the whole period 2021 to 2027 amounts to EUR 5 614 million of which EUR 5 560 million (in current prices) authorised by the last amendment to F4E Constituent act in 2021²¹ and in line with the 2023 EC Statement of Estimate published in June 2022²².

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, retroactive from 1st January 2021 and for the remaining lifetime of the project has been formally agreed in July 2022²³ between the Commission and France, therefore the figures of the ITER Host State contribution are reviewed in the Final SPD 2023-2027.

Additional contribution from United Kingdom (UK) is foreseen under F4E budgetary structure, currently without financial impact. The legal basis is the Trade and Cooperation agreement with UK signed in December 2020 with EU. The actual programmes that UK will participate in (incl. ITER project) are to be set out via a Joint Declaration to this agreement in a separate protocol that is not adopted yet.

¹⁸ Article 32 of the F4E Financial Regulation and Communication from the Commission on the Guidelines for Programming Documents for decentralised agencies

¹⁹ Council Decision (2021)281 amending F4E constituent act (2007)198 and laying down EURATOM contribution to F4E for 2021-2027.

²⁰ Joint conclusions on the general EU Budget 2023 pending the final adoption of the EU budgetary authority

²¹ 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)

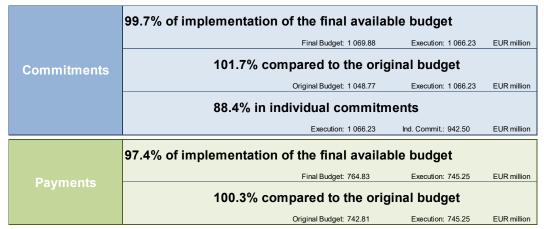
²² COM (2022) 400 Statement of Estimates of the European Commission

²³ Contribution financière française à la construction d'ITER: Lettre du Haut Représentant Français pour ITER (formal exchange of letters on 17 June 2022 and 29 July 2022 between France and the European Commission).

1. Overview of the past and the current situation

1.1. Execution of Budget 2021

In 2021, F4E has implemented its budget with the continuous execution of contracts for in-kind deliveries to the ITER and the Broader Approach projects.



SPD_Figure 14 Execution of 2021 Budget

In commitment appropriations, F4E made use of global commitments, amounting to EUR 123.74 million. EUR 114.34 million are linked to three procurement procedures. EUR 9.39 million are to be cancelled. From the EUR 114.34 million linked to the three procurement procedures, EUR 65.80 million have been signed in the first quarter of 2022 (EUR 48.92 million for Task Order 1 Antennas EC UL Port Plug, EUR 7.40 million for the Amendment 24 of the Main Vessel contract and EUR 9.48 million for the Amendment 8 of TB04²⁴). The remaining amount of EUR 48.54 million is covering part of the Amendment 10 of TB04, which is still under negotiations and its signature is planned by the end of 2022.

In payment appropriations, EUR 7.00 million remained non executed, equivalent to one percent. The amount of VAT paid on contracts and not yet reimbursed by Members Tax Authorities to F4E was EUR 14.58 million at the 31/12/2021. Together with the fund reservation for the payment of January salaries, it created a deficit in treasury preventing 100% execution of the budget.

1.2. Budget 2022

The F4E Governing Board adopted the Original Budget 2022 in December 2021. The Original Budget is aligned with the Euratom contribution to F4E set in the EU general Budget 2022.

A first amendment to F4E Budget 2022 was adopted by the Governing Board on its meeting in July 2022 with the purpose to approve, (i) the increase in the ITER Host State contribution by EUR 14.950 million in commitments only, corresponding to the balance due for the ITER Host State contribution 2007-2020, (ii) the miscellaneous revenue of EUR 5 000 cashed by 30 April 2022 linked to recovery on F4E operational contract.

²⁴ TB04 contract: Mechanical and electrical installations for Tokamak complex and surrounding buildings

A second amendment to F4E Budget 2022 is proposed to the Governing Board for its meeting in December 2022 with the purpose to approve, (i) the increase in the EURATOM contribution by EUR 14.685 million in commitments and payments, coming from the European fusion research programme, (ii) Reduction of budget needs of EUR 106.7 million impacting the EURATOM contribution in operational payment appropriations, (iii) the miscellaneous revenue of EUR 151 570.20 cashed by 30 September 2022 linked to recoveries and liquidated damages on F4E operational contracts.

2. FINANCIAL OUTLOOK FOR 2023 - 2027

2.1. Assumptions

For the period 2023-2027, the figures for EURATOM contribution to F4E are in line with the last amendment to F4E Constituent act in 2021 further decreased for 2023 by EUR 180 000 000 in commitments and EUR 50 000 000 in payments during EU budgetary procedure²⁵. A corresponding decrease of EUR 45 000 000 of ITER Host State Contribution in 2023 is also included.

The figures of the ITER Host State contribution are reviewed in accordance with the new methodology of calculation agreed between Euratom and France. The figures are indicative and subject to the final outcome of the respective budgetary procedures of the F4E contributors.

The F4E administrative expenditure for 2023 will be covered by the dedicated EURATOM contribution, by the membership contributions to the Joint Undertaking and by transfers from operational budget to administrative budget. The forecast for F4E administrative expenditure 2023 is based on the following main assumptions:

- Staff reinforcement of F4E establishment plan by 25 TA posts in line with the EC Proposal for EURATOM contribution to F4E,
- Annual salary adjustment²⁶ for 2023: 2.0% based on cost of living in Brussels as reference with a correction coefficient for Spain,
- Vacancy rate in 2023: 3.0%,
- Inflation coefficient on other administrative expenditure: 2.0%,
- Other salary factors: allowances, annual travel expenses, promotions, advancements in step,
- The Employer's pension contribution to the EU pension scheme as per the guidance from the EC central services.

The F4E operational budget for 2023 is based on the EURATOM contribution for the MFF 2021-2027, the contributions from the ITER Host state and the F4E members for 2023.

The main F4E operational activities in 2023 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 2023 will be spent for the provision of the cash contribution to ITER due for year 2024, followed by the Buildings and Power supplies for the ITER site in Cadarache, In Vessel, Neutral

²⁵ Joint conclusions on the general EU Budget 2023 pending the final adoption of the EU budgetary authority

²⁶ Includes already Salary adjustment for 2022 of 6.9% (2.4 % intermediate indexation + 4.5 % annual indexation from July 2022) based on cost of living in Brussels as reference with a correction coefficient for Spain.

Beam and EC Power supplies and Sources, Vacuum Vessel, Cryoplant and Fuel Cycle, Antennas and Magnets.

The present SPD reflects substantial changes of medium-term cash needs of the ITER Organization as included in the proposal for draft budget 2023 submitted to MAC-34 meeting for approval by IC-31 and the interim budget for the years 2024 from IC-30.

It shall be noted that the F4E operational activities in 2023 foresees potential preparatory activities related to the F4E participation to the Technology for DONES. The figures provided in the present SPD are preliminary assuming that a decision to proceed with DONES will take place by early 2023.

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. By the end of September 2022, the amount of EUR 115.66 million²⁷ of commitment appropriations was cancelled that F4E plans to make available before the end of this MFF period.

For years 2024-2027, the figures are indicative and subject to the outcome of the respective budgetary procedures of the F4E contributors (EURATOM, ITER Host State and Members).

The tables below show the Estimates of Revenue and Expenditure for the next five years, from 2023 to 2027, the execution for 2021 and the current budget 2022, including Amendment 2 to Budget 2022 proposed to F4E Governing Board. The explanatory notes of the Estimates for revenue and expenditure are provided in the annexes.

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²⁷ the details are provided in the Annex

2.2. Estimate of Revenue in Commitment Appropriations for next five years

REVENUE	2021		2022		2023		2024		2025		2026		2027		
Commitment appropriations (EUR)	Execution	Estimated Budget available AM2	Forecast	VAR 2022/21	Budget	Forecast	VAR 2023/22	Planned needs	VAR 2024/23	Planned needs	VAR 2025/24	Planned needs	VAR 2026/25	Planned needs	VAR 2027/26
1 REVENUE FROM FEES AND CHARGES															
2. EU CONTRIBUTION	857,957,197	718,675,514	718,675,514	-16.2%	832,855,385	832,855,385	15.9%	798,433,130	-4.1%	682,123,579	-17.1%	848,184,592	19.6%	659,021,051	-28.7%
Administrative (To Title 1 and 2) Operational (To Title 3) Recovery from previous years administrative Recovery from previous years operational	62,483,826 794,649,197 824,174	65,043,221 652,623,722 1,008,571	65,043,221 652,623,722 1,008,571	4.1% -17.9%	65,347,477 766,781,095 726,813	65,347,477 766,781,095 726,813		73,558,500 724,874,630	i .	75,747,000 606,376,579		78,349,000 769,835,592	3.3% 21.2%	79,430,000 579,591,051	1.4% -32.8%
3 THIRD PARTIES CONTRIBUTION	190,683,100	165,450,574	165,450,574	-13.2%	185,792,669	185,792,669	12.3%	155,168,623	-16.5%	134,081,812	-15.7%	172,796,497	22.4%	118,809,740	-45.4%
Of which ITER Host State contribution Of which Membership contribution Of which United Kingdom contribution	184,700,000 5,983,100	158,750,574 6,700,000	158,750,574 6,700,000		178,492,669 7,300,000	178,492,669 7,300,000	12.4% 9.0%	147,068,623 8,100,000		125,681,812 8,400,000	-17.0% 3.6%	164,196,497 8,600,000	23.5% 2.3%	110,009,740 8,800,000	-49.3% 2.3%
4 MISCELLANOUS REVENUE	12,091	156,570	156,570												
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	626,032	3,081,912	3,081,912												
9 BIS UNUSED APPROPRIATIONS FROM PREVIOUS YEARS - MADE AVAILABLE AGAIN														115,664,569	
TOTAL REVENUE	1,049,278,420	887,364,570	887,364,570	-15.4%	1,018,648,054	1,018,648,054	14.8%	953,601,753	-6.4%	816,205,391	-16.8%	1,020,981,089	20.1%	893,495,360	-14.3%
ADDITIONAL REVENUE	20,602,356	107,078,257	107,078,257	419.7%	11,853,982	50,578,600	-88.9%	13,113,000	10.6%	13,000,000	-0.9%	13,000,000		13,000,000	
Revenue from ITER Organization Revenue from ITER Organization carried over Other Assigned Revenue Recoveries Recoveries carried over	15,107,843 3,825,307 1,399,516 236,528 33,162	92,801,475 14,231,772 41,856 3,154	92,801,475 14,231,772 41,856 3,154	514.3%	11,853,982	11,853,982 38,724,618	-87.2%	13,113,000	10.6%	13,000,000	-0.9%	13,000,000		13,000,000	
TOTAL REVENUE AVAILABLE	1,069,880,776		994,442,827	-7.1%	1,030,502,036	1,069,226,654	3.6%	966,714,753	-6.2%	829,205,391	-16.6%	1,033,981,089	19.8%	906,495,360	-14.1%

Note 1: the 2021 figures for the third parties contribution differs from the Draft Budget request 2023 because the carried over are presented separately in the REP (cf. 9 unused appropriations from previous years)

SPD_Table 4 . Revenue in Commitment Appropriations for 2021-2027

Note 2: the figures for the ITER Host State contribution are updated as the new calculation methodology is agreed between France and Euratom

Note 3: the 2024-2027 breakdown is only indicative subject to the outcome of the budget procedure

Note 4: F4E plans to reintroduce whenever needed the amount of EUR 115.66 million of commitment appropriations cancelled by the end of September 2022

2.3. Estimate of Revenue in Payment Appropriations for next five years

REVENUE	2021		2022				2023		2024		2025		2026		2027	,
Payment appropriations	Execution	Estimated Budget available AM2	Estimated Budget available AM2 (including admin carry over)	Forecast	VAR 2022/21	Budget	Forecast	VAR 2023/22	Planned needs	VAR 2024/23	Planned needs	VAR 2025/24	Planned needs	VAR 2026/25	Planned needs	VAR 2027/26
1 REVENUE FROM FEES AND CHARGES																
2. EU CONTRIBUTION	607,601,868	597,940,017	597,940,017	597,940,017	-1.6%	669,883,574	669,883,574	12.0%	720,078,500	7.5%	778,247,000	7.5%	768,349,000	-1.3%	623,330,000	-23.3%
Administrative (To Title 1 and 2)	62,483,826	65,043,221	65,043,221	65,043,221	4.1%	65,347,477	65,347,477	0.5%	73,558,500	12.6%	75,747,000	2.9%	78,349,000	3.3%	79,430,000	1.4%
Operational (To Title 3)	544, 293, 868	531,752,975	531,752,975	531,752,975	-2.3%	598, 161, 525	598, 161, 525	12.5%	646,520,000	8.1%	702,500,000	8.0%	690,000,000	-1.8%	543,900,000	-26.9%
Recovery from previous years administrative	824,174	1,008,571	1,008,571	1,008,571		726,813	726,813									
Recovery from previous years operational		135,251	135,251	135,251		5,647,759	5,647,759									
3 THIRD PARTIES CONTRIBUTION	135,083,100	155,500,000	155,500,000	155,500,000	15.1%	150,700,000	150,700,000	-3.1%	149,600,000	-0.7%	153,400,000	2.5%	156,100,000	1.7%	152,400,000	-2.4%
Of which ITER Host State contribution	129, 100, 000	148,800,000	148,800,000	148,800,000	15.3%	143,400,000	143,400,000	-3.6%	141,500,000	-1.3%	145,000,000	2.5%	147,500,000	1.7%	143,600,000	-2.6%
Of which Membership contribution	5,983,100	6,700,000	6,700,000	6,700,000	12.0%	7,300,000	7,300,000	9.0%	8,100,000	11.0%	8,400,000	3.6%	8,600,000	2.3%	8,800,000	2.3%
Of which United Kingdom contribution																
4 MISCELLANOUS REVENUE	12,091	156,570	156,570	156,570												
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	3,535,437	1,384,900	6,171,068	6,171,068												
TOTAL REVENUE	746,232,497	754,981,487	759,767,655	759,767,655	1.2%	820,583,574	820,583,574	8.7%	869,678,500	6.0%	931,647,000	6.7%	924,449,000	-0.8%	775,730,000	-19.2%
ADDITIONAL REVENUE	18,598,361	92,909,146	92,939,620	92,939,620	399.6%	10,472,768	40,666,675	-88.7%	11,980,000	14.4%	12,500,000	4.2%	12,500,000	0.0%	12,500,000	0.0%
Revenue from ITER Organization	5,319,009	85,811,196	85,811,196	85,811,196	1513.3%	10,472,768	10,472,768	-87.8%	11,980,000	14.4%	12,500,000	4.2%	12,500,000	0.0%	12,500,000	0.0%
Revenue from ITER Organization carried over	11,610,147	6,315,804	6,315,804	6,315,804		· ·	30, 193, 907									
Other Assigned Revenue	1,399,516	736,528	736,528	736,528												
Recoveries	236,528	41,856	41,856	41,856												
Recoveries carried over TOTAL REVENUE AVAILABLE	33,162 764,830,858	3,763 847,890,634	34,236 852,707,275	34,236 852,707,275	10.9%	831,056,342	861,250,249	-2.0%	881,658,500	6.1%	944,147,000	6.6%	936,949,000	-0.8%	788,230,000	-18.9%
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Note 1: the 2021 figures for the miscellanous revenue differs from the Draft Budget request 2023 because the REP make the distinction between the budgeted miscellaneous revenue and the recoveries (cf. additional revenue, recoveries and recoveries carried over)

SPD_Table 5 . Revenue in Payment Appropriations for 2021-2027

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Note 2: The figures for the ITER Host State contribution are indicative and need to be agreed with France following the new calculation methodology agreed between France and Euratom

Note 3: the 2024-2027 breakdown is only indicative subject to the outcome of the budget procedure.

Note 4: administrative carry over amounts 4 816 641.52 euros, of which 30 473.55 are carry over of internal assigned revenue

2.4. Expenditure in Commitment Appropriations for next five years

	2021		2022			2023		2024		2025		2026		2027	
EXPENDITURE In Commitment Appropriations (EUR)	Execution	Estimated Budget available AM2	Forecast	VAR 2022/21	Budget	Forecast	VAR 2023/22	Planned needs	VAR 2024/23	Planned needs	VAR 2025/24	Planned needs	VAR 2026/25	Planned needs	VAR 2027/26
Total Title 1 & Title 2 Administrative Expenditure	62,252,671	74,354,699	77,517,329	19.44%	73,374,290	78,747,750	-1.32%	81,658,500	11.29%	84,147,000	3.05%	86,949,000	3.33%	88,230,000	1.47%
Title 1 Staff Expenditure	54,043,446	64,870,899	68,040,620	20.0%	62,658,400	67,767,500	-3.4%	70,406,000	12.4%	72,515,000	3.0%	74,921,000	3.3%	75,790,000	1.2%
Salaries & allowances	48,422,828	58,169,240	61,359,000	20.1%	55,232,000	58,758,000	-5.0%	61,365,000	11.1%	63,306,000	3.2%	65,530,000	3.5%	66,214,000	1.0%
Establishment plan posts	37,504,469	44,587,290	46,829,000	18.9%	43,500,000	46,330,000	-2.4%	48, 382, 000	11.2%	50,089,000	3.5%	51,838,000	3.5%	52,396,000	1.1%
External staff	10,918,359	13,581,949	14,530,000	24.4%	11,732,000	12,428,000	-13.6%	12,983,000	10.7%	13,217,000	1.8%	13,692,000	3.6%	13,818,000	0.9%
Expenditure relating to Staff recruitment	569,031	814,000	676,000	43.1%	836,500	834,000	2.8%	812,000	-2.9%	828,000	2.0%	844,000	1.9%	861,000	2.0%
Mission expenses	250,771	382,000	450,000	52.3%	647,000	1,700,000	69.4%	1,700,000	162.8%	1,734,000	2.0%	1,769,000	2.0%	1,804,000	2.0%
Socio-medical infrastructure	522,000	504,000	532,000	-3.4%	531,900	575,500	5.5%	592,000	11.3%	604,000	2.0%	616,000	2.0%	629,000	2.1%
Training	789,331	676,620	676,620	-14.3%	850,000	887,000	25.6%	887,000	4.4%	905,000	2.0%	923,000	2.0%	941,000	2.0%
External Services	630,000	960,000	960,000	52.4%	580,000	960,000	-39.6%	960,000	65.5%	979,000	2.0%	999,000	2.0%	1,019,000	2.0%
Receptions, events and representation	125	10,000	6,000	7900.0%	10,000	10,000	0.0%	10,000	0.0%	10,000	0.0%	10,000	0.0%	10,000	0.0%
Social welfare	30,600	66,000	62,000	115.7%	50,000	65,000	-24.2%	66,000	32.0%	67,000	1.5%	68,000	1.5%	69,000	1.5%
Other Staff related expenditure	2,828,760	3,289,040	3,319,000	16.3%	3,921,000	3,978,000	19.2%	4,014,000	2.4%	4,082,000	1.7%	4,162,000	2.0%	4,243,000	1.9%
Title 2 Infrastructure and operating expenditure	8,209,225	9,483,800	9,476,709	15.5%	10,715,890	10,980,250	13.0%	11,252,500	5.0%	11,632,000	3.4%	12,028,000	3.4%	12,440,000	3.4%
Rental of buildings and associated costs	1,264,547	1,499,000	1,736,000	18.5%	1,632,000	2,051,000	8.9%	2,056,000	26.0%	2,098,000	2.0%	2,140,000	2.0%	2,183,000	2.0%
Information, communication technology and data broc.	4,098,169	4,120,000	4,108,000	0.5%	4,981,750	4,986,750		5,235,000		5,496,000		5,770,000	5.0%	6,058,000	5.0%
Movable property and associated costs	208,847	375,000	176,000	79.6%	387,840	492,500	3.4%	460,000	18.6%	469,000	2.0%	478,000	1.9%	487,000	1.9%
Current administrative expenditure	1,636,021	1,846,000	1,825,564	12.8%	2,138,100	1,930,000	,	1,942,500		1,980,000		2,020,000	2.0%	2,061,000	2.0%
Postage / Telecommunications	393,800	547,000	561,000	38.9%	738,500	605,000	ŧ .	639,000	-13.5%	652,000		665,000	2.0%	678,000	2.0%
Meeting expenses	347,594	543,000	518,735	56.2%	533,000	608,000	-1.8%	611.000	14.6%	623,000	2.0%	636,000	2.1%	649,000	2.0%
Running costs linked to operational activities	33,162	0.10,000	30.474	00.270	000,000	000,000	1.070	0.1,000	111070	020,000	2.070	000,000	2.170	0.0,000	2.070
Information and publishing	14.500	38.000	30.810	162.1%	38,700	40.000	1.8%	40.000	3.4%	41.000	2.5%	42.000	2.4%	43.000	2.4%
Studies Studies	14,000	00,000	00,010	102.170	00,700	40,000	1.070	40,000	0.470	41,000	2.070	42,000	2.470	40,000	2.470
Other infrastructure and operating expenditure	212.586	515.800	490.126	142.6%	266,000	267.000	-48.4%	269.000	1.1%	273.000	1.5%	277.000	1.5%	281.000	1.4%
Total Title 3 & Title 4 Operational Expenditure	1,003,980,164	920,088,128	707,027,359	-8.4%	957,127,746	889,887,314		885,056,253		745,058,391		947,032,089	27.1%	818,265,360	
Title 3 Operational expenditure	801,969,408	651,222,395	476,886,244	-18.8%	766,781,095	660,816,045	17.7%	724,874,630	-5.5%	606,376,579	-16.3%	769,835,592	27.0%	695,255,620	-9.7%
ITER construction including site preparation	764,056,846	586,288,928	411.952.777	-23.3%	671,627,305	565.662.255	14.6%	578,271,400	-13 9%	489,358,079	-15.4%	640.942.092	31.0%	539,470,620	-15.8%
Technology for ITER and DEMO	5.394.624	4,609,578	4.609.578		6,136,511	6,136,511		13.803.230		6,618,500		19.593.500	196.0%	44.785.000	
Technology for Broader Approach	10.061.287	23.242.854	23.242.854		58.101.587	58.101.587	1	73.000,000		47.800.000		46.000.000	-3.8%	46,900,000	2.0%
Technology for DONES	10,001,207	20,242,034	20,242,034	101.070	2.000.000	2.000.000		34.800.000	-	37.600,000		38.300.000	1.9%	39.100.000	2.0%
External Support Activities	16,951,293	29,669,424	29,669,424	75.0%	18,738,413	18,738,413	1	20,000,000		20,000,000		20,000,000	0.0%	20,000,000	0.0%
Other Operational Expenditure	5,505,358	7,411,611	7,411,611	34.6%	10,177,279	10,177,279		5,000,000		5,000,000		5,000,000	0.0%	5,000,000	0.0%
Title 4 Earmaked Expenditure	202,010,756	268,865,733	230,141,115		190,346,651	229,071,269		160,181,623		138,681,812		177,196,497	27.8%	123,009,740	-30.6%
ITER construction- from ITER host state contribution	185,326,032	161,832,486	161,832,486	-12.7%	178,492,669	178,492,669	10.3%	147,068,623	-17.6%	125,681,812	-14.5%	164,196,497	30.6%	110,009,740	-33.0%
Tasks from ITER Organization	15,285,209	107,033,247	68,308,629	600.2%	11,853,982	50,578,600	-88.9%	13,113,000	10.6%	13,000,000	-0.9%	13,000,000	0.0%	13,000,000	0.0%
Other Earmarked expenditure	1,399,516														
TOTAL EXPENDITURE	1,066,232,834	994,442,827	784,544,687	-6.7%	1,030,502,036	968,635,064	3.6%	966,714,753	-6.2%	829,205,391	-14.2%	1,033,981,089	24.7%	906,495,360	-12.3%

 ${\it SPD_Table~6}\ .\ {\it Expenditure~in~Commitment~Appropriations~for~2021-2027}$

2.5. Expenditure in Payment Appropriations for next five years

	2021		2022	2			2023		2024		2025		2026		2027	
EXPENDITURE In Payment Appropriations (EUR)	Execution	Estimated Budget available AM2	Estimated Budget available AM2 (including admin carry over)	Forecast (including carry over)	VAR 2022/21	Budget	Forecast	VAR 2023/22	Planned needs	VAR 2024/23	Planned needs	VAR 2025/24	Planned needs	VAR 2026/25	Planned needs	VAR 2027/26
Total Title 1 & Title 2 Administrative Expenditure	60,262,540	74,354,699	79,171,341	82,303,497	23.4%	73,374,290	78,747,750	-1.3%	81,658,500	11.3%	84,147,000	3.0%	86,949,000	3.3%	88,230,000	1.5%
Title 1 Staff Expenditure	53,338,789	64,870,899	66,225,958	69,395,678	21.6%	62,658,400	67,767,500	-3.4%	70,406,000	12.4%	72,515,000	3.0%	74,921,000	3.3%	75,790,000	1.2%
Salaries & allowances	48,511,549	58,169,240	58,218,046	61,407,806	19.9%	55,232,000		-5.0%	61,365,000	11.1%	63,306,000	3.2%	65,530,000	3.5%	66,214,000	1.0%
Establishment plan posts	37,504,469	44,587,290	44,587,290	46,829,000	18.9%	43,500,000	46,330,000	-2.4%	48,382,000	{ I	50,089,000	3.5%	51,838,000	3.5%	52,396,000	1.1%
External staff	11,007,080	13,581,949	13,630,755	14,578,806	23.4%	11,732,000	12,428,000	-13.6%	12,983,000		13,217,000	1.8%	13,692,000	3.6%	13,818,000	0.9%
Expenditure relating to Staff recruitment	486,789	814,000	912,073	774,073	67.2%	836,500	834,000	2.8%	812,000	-2.9%	828,000	2.0%	844,000	1.9%	861,000	2.0%
Mission expenses	146,398	382,000	515,579	583,579	160.9%	647,000	1,700,000	69.4%	1,700,000	162.8%	1,734,000	2.0%	1,769,000	2.0%	1,804,000	2.0%
Socio-medical infrastructure	466,229	504,000	621,712	649,712	8.1%	531,900	575,500	5.5%	592,000	11.3%	604,000	2.0%	616,000	2.0%	629,000	2.1%
Training	627,565	676,620	1,165,135	1,165,135	7.8%	850,000	887,000	25.6%	887,000	4.4%	905,000	2.0%	923,000	2.0%	941,000	2.0%
External Services	557,062	960,000	1,032,938	1,032,938	72.3%	580,000	960,000	-39.6%	960,000	65.5%	979,000	2.0%	999,000	2.0%	1,019,000	2.0%
Receptions, events and representation	0	10,000	10,125	6,125		10,000	10,000	0.0%	10,000	0.0%	10,000	0.0%	10,000	0.0%	10,000	0.0%
Social welfare	33,581	66,000	95,100	91,100	96.5%	50,000	65,000	-24.2%	66,000	32.0%	67,000	1.5%	68,000	1.5%	69,000	1.5%
Other Staff related expenditure	2,509,618	3,289,040	3,655,251	3,685,212	31.1%	3,921,000	3,978,000	19.2%	4,014,000	2.4%	4,082,000	1.7%	4,162,000	2.0%	4,243,000	1.9%
Title 2 Infrastructure and operating expenditure	6,923,750	9,483,800	12,945,383	12,907,818	37.0%	10,715,890	10,980,250	13.0%	11,252,500	5.0%	11,632,000	3.3%	12,028,000	3.3%	12,440,000	3.3%
Rental of buildings and associated costs	1,242,315	1,499,000	1,850,201	2,087,201	20.7%	1,632,000	2,051,000	8.9%	2,056,000	26.0%	2,098,000	2.0%	2,140,000	2.0%	2,183,000	2.0%
Information, communication technology and data proc.	3,567,886	4,120,000	6,001,493	5,989,493	15.5%	4,981,750	4,986,750	20.9%	5,235,000	5.1%	5,496,000	5.0%	5,770,000	5.0%	6,058,000	5.0%
Movable property and associated costs	216,674	375,000	506,163	307,163	73.1%	387,840	492,500	3.4%	460,000	18.6%	469,000	2.0%	478,000	1.9%	487,000	1.9%
Current administrative expenditure	1,202,567	1,846,000	2,437,921	2,417,485	53.5%	2,138,100	1,930,000	15.8%	1,942,500	-9.1%	1,980,000	1.9%	2,020,000	2.0%	2,061,000	2.0%
Postage / Telecommunications	302,596	547,000	707,156	721,156	80.8%	738,500	605,000	35.0%	639,000	-13.5%	652,000	2.0%	665,000	2.0%	678,000	2.0%
Meeting expenses	188,862	543,000	748,892	724,627	187.5%	533,000	608,000	-1.8%	611,000	14.6%	623,000	2.0%	636,000	2.1%	649,000	2.0%
Running costs linked to operational activities	2,688		30,474	30,474												
Information and publishing	7,209	38,000	45,648	38,458	427.1%	38,700	40,000	1.8%	40,000	3.4%	41,000	2.5%	42,000	2.4%	43,000	2.4%
Studies	, , ,	,					.,		.,		,,,,,		,		-,	
Other infrastructure and operating expenditure	192,953	515,800	617,436	591,762	167.3%	266,000	267,000	-48.4%	269,000	1.1%	273,000	1.5%	277,000	1.5%	281,000	1.4%
Total Title 3 & Title 4 Operational Expenditure	684,985,313	773,535,934	773,535,934	740,209,872	12.93%	757,682,052	782,502,499	-2.05%	800,000,000	5.59%	860,000,000	7.50%	850,000,000	-1.16%	700,000,000	-17.65%
Title 3 Operational expenditure	545,993,873	530,487,506	530,487,506	527,355,351	-2.8%	603,809,284	598,435,824	13.8%	646,520,000	7.1%	702,500,000	8.7%	690,000,000	-1.8%	543,900,000	-21.2%
ITER construction including site preparation	521,657,389	489,346,377	489,346,377	486,214,221	-6.2%	547,009,284	541,635,824	11.8%	572,120,000		621,000,000		615,000,000		447,900,000	
Technology for ITER and DEMO	3,486,161	7,000,000	7,000,000	7,000,000	100.8%	5,300,000	5,300,000	-24.3%	6,500,000	22.6%	9,700,000	49.2%	7,400,000	-23.7%	13,900,000	87.8%
Technology for Broader approach	7,408,183	13,129,961	13,129,961	13,129,961	77.2%	31,000,000	31,000,000	136.1%	33,900,000	9.4%	33,500,000	-1.2%	25,300,000	-24.5%	36,000,000	
Technology for DONES						500,000	500,000		9,000,000	, ,	13,300,000	-	17,300,000		21,100,000	
External Support Activities	10,564,536	15,010,560	15,010,560	15,010,560	42.1%	15,000,000	15,000,000		20,000,000		20,000,000	0.0%	20,000,000	0.0%	20,000,000	
Other Operational Expenditure	2,877,605	6,000,608	6,000,608	6,000,608	108.5%	5,000,000	5,000,000	-16.7%	5,000,000	0.0%	5,000,000	0.0%	5,000,000	0.0%	5,000,000	0.0%
Title 4 Earmarked expenditure	138,991,439	243,048,428	243,048,428	212,854,521	74.9%	153,872,768	184,066,675	-36.7%	153,480,000	-0.3%	157,500,000	2.6%	160,000,000	1.6%	156,100,000	-2.4%
ITER construction- from ITER host state contribution	127,715,100	150,184,900	150,184,900	150,184,900	17.6%	143,400,000	143,400,000	-4.5%	141,500,000	-1.3%	145,000,000	2.5%	147,500,000	1.7%	143,600,000	-2.6%
Tasks from ITER Organization	10,613,351	92,127,000	92,127,000	61,933,093	768.0%	10,472,768	40,666,675	-88.6%	11,980,000	14.4%	12,500,000	4.3%	12,500,000	0.0%	12,500,000	0.0%
Other Earmarked expenditure	662,988	736,528	736,528	736,528												
TOTAL EXPENDITURE	745,247,852	847,890,634	852,707,275	822,513,368	13.8%	831,056,342	861,250,249	-2.0%	881,658,500	6.1%	944,147,000	7.1%	936,949,000	-0.8%	788,230,000	-15.9%

SPD_Table 7 . Expenditure in Payment Appropriations for 2021-2027

HUMAN RESOURCE ESTIMATES PLAN

HUMAN RESOURCES – OUTLOOK FOR 2023 – 2027

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. 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.

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.

Following the request from Fusion for Energy for staff reinforcement in the Strategic Resource Plan 2021-2027, the Commission has granted 10 new Temporary Agents positions and 15 conversions of

Contract Agent posts into Temporary Agents posts. This reinforcement is effective from 2023 and must be followed by a reduction of 15 FTEs (9 Temporary Agents and 6 Contract Agents) before 2027. In addition, the Commission accepted the conversion of 5 CA FG II into 5 CA FG III.

2. Short-term employment.

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 have been filled using non-renewable short-term contracts not exceeding 4 years.

Some of these positions were returned to the Commission in 2019 and 2020. The phasing out of the remaining positions (18 TA and 13 CA posts) was planned in the period 2024-2026. However, the latest agreement for the staff reinforcement from 2023 will allow for the conversion of a part of those posts into long-term posts.

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	on and its eve	olution, overvi	ew of all cate	gories of staff		
	Actually filled as of 31.12.2020	Authorised under 2021 EU budget	Actually filled as of 31.12.2021	Authorised under 2022 EU budget	Requested in 2023 ⁽¹⁾	Envisaged in 2024	Envisaged in 2025	Envisaged in 2026	Envisaged in 2027 ^[2]
Subtotal FO/TA	275	280	273	280	305	305	305	305	296
Subtotal CA	160	170	166	170	155	155	155	155	149
Subtotal SNE	2	3	2	7	7	7	7	7	7
TOTAL	437	453	441	457	467	467	467	467	452
[1] 10 new AD posts [2] 15 posts to be ret			addition, 15 CA p	osts are conver	ted into TA pos	ts			

SPD table 8. 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 2023

This Work Programme 2023 offers an overview of the objectives of the European Joint Undertaking for ITER and the Development of Fusion Energy (F4E) for 2023 and also identifies the financial decisions for the actions that are planned to be carried out in 2023 with the available budget.

It covers the work on both ITER and Broader Approach (BA) according to the tasks entrusted to the organization.

The WP2023 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 2023 in terms of achieved credit for ITER in kind deliveries.

	Action*	Baseline to end March 2022 (kIUA)	Achieved Credit (kIUA)	Released Credit (kIUA)	2023
Number	Name	697.68103	627.37302	522.83854	72.34386
Action 1	Magnets	159.51681	159.91681	144.94681	8.79900
Sub-action 2	Vacuum Vessel	84.48529	63.33700	41.36700	10.89535
Sub-action 3	In Vessel- Blanket	0.30000	0.30000	0.20000	0.55000
Sub-action 4	In Vessel- Divertor	3.67500	3.67500	3.62000	0.00000
Action 5	Remote Handling	10.46974	4.70000	2.90000	1.90000
Action 6	Cryoplant and Fuel Cycle	30.65013	30.38013	26.69154	6.16434
Action 7	Plasma Engineering & Operations	1.15000	1.05000	0.50000	0.00000
Action 8	Heating & Current Drive	41.62854	42.57254	32.23700	7.67232
Action 9	Diagnostics	5.53503	3.78716	3.65861	3.09854
Action 11	Site and Buildings and Power Supplies	360.27050	317.65438	266.71758	33.26431

^{*} 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).

SPD_table 9²⁸: Expected 2023 results in terms of discharge of Euratom obligations to ITER (status: end of March 2022)

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²⁸ **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 2022".

Figures in column **Achieved** Credit correspond to "Total achieved credits at the end of March 2022".

Figures in column Released Credit correspond to "Total released credits at the end of March 2022".

Figures in columns 2023 correspond to the "Credits to be achieved in year 2023".

WP2023 Executive summary

The work programme 2023 is mostly focused on the following activities (FP-relevant areas are shown):

- Magnets (FP): In 2023 it is expected to deliver the last TF Coil and PF Coil #4 to IO. PF Coil #3 will be under the final stages of production, ready to be delivered in early 2024.
- Vacuum Vessel (FP): All major contracts have been signed and manufacturing activities are nearing completion, all Sector deliveries are currently planned to be completed before the end of 2023. 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 (BFW) project, the most important activities in 2023 are the continuation of the implementation of BFW series production, including the first reopening of competition for the BFW Series and the award of task orders for the procurement of CuCrZr and Beryllium materials.

For Blanket Cooling Manifold project, the main activities in 2023 are the progress of the first task orders of the Blanket Cooling Manifold series, in particular those activities related to the qualification and manufacturing of 1st batch of pipe bundles.

Divertor Systems (non-FP): For the Divertor Inner Vertical Target (IVT) project, the main activities will be the signature of the second specific contract 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.

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, following the Procurement Arrangement signature, activities will proceed as soon as a Technical Project Officer is appointed for the launch of the procedure for the series production.

• 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), MITICA cryopump, Torus and Cryostat Cryopumping System and Cold Valve Boxes of Front-end Cryopump Distribution system needed for 1st plasma will be delivered; the contract preparation activities for Neutral Beam Cold Valve boxes will take place; Leak Detection and Localization systems will focus on design and manufacturing activities; preparation activities for the PA amendment signature of the Procurement for manufacture for Heating Neutral Beam and Diagnostic Neutral Beam Cryopumps will continue.

In the area of REMS (Radiation and Environmental Monitoring Systems), design and procurement activities will continue. For Tritium Plant the preparation activities of the PA for Water Detritiation System and the PA for Isotope Separation System will continue.

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

Plasma Engineering and operations (partly FP):

Operations and Plasma Engineering: Continue the development of a framework for the participation of F4E to system assembly and commissioning in ITER.

Continue preparation for EU participation to the ITER Operation Phase (Integrated commissioning, Operation, maintenance and Upgrades as well as scientific and technical experimentation). This will be done in close collaboration with our legal services, and with the support of external experts and F4E staff. This activity will be in close collaboration with EUROfusion, especially regarding experimentation and specific commissioning. The collaboration and advisory role of the Unit with DG-ENER in relation to ITER exploitation will also continue.

Plasma engineering activity will continue, related to modelling and simulation based on as-built Tokamak systems (magnets and magnetic sensor reconstruction, vacuum vessel, tolerance for blanket installation...). This activity will be implemented in close collaboration with other F4E teams and with IO and by placing specific contracts with Laboratories and engineering companies.

EC Plant Control and FALCON (partly FP): Regarding the EC Control scope, the EC plant Control System (ECPC) will start operation for the integrated commissioning of the ITER gyrotrons and Task orders to support ECPC operation and to design the EC Launcher local controller will be signed. The FALCON facility will continue the activity of testing components of the EC launcher, the support to the F4E procurement of gyrotrons and its role as a mock-up for the development of concepts for the management of ITER operation and control.

• Heating and Current Drive (partly FP):

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

The manufacturing, testing and deliveries of all Main and Body HV Power Supplies sets will be completed. Installation and commissioning of the units will proceed at ITER site.

The contract for the manufacturing of the EU Gyrotrons will be signed and the design activities will progress.

NB Test Facility (NBTF) at RFX-Padua:

At the NB test facility, activities towards the start of MITICA operations with the assembly and commissioning of components will proceed. MITICA Interlock and Safety systems development will continue, following the completion of the design activities.

MITICA Beam Line Components (BLC) manufacturing will continue as planned and assembly will start

MITICA Beam Source assembly and factory testing will be completed.

MITICA Diagnostics manufacturing will be completed and installation activities will progress in line with the integration of components and auxiliaries.

MITICA Assembly: activities will proceed for starting of in vessel installation preparatory activities

NB for ITER at Cadarache:

[PA 53-01] - The Specific Tooling contract for the HNB Assembly will be signed and preliminary design will progress.

[PA 53-02] – For the ITER units of the Beam Source the pre-PA and pre-procurement activities will progress, in collaboration with the IO.

[PA 53-04 and 53-05] - Subject to timely availability of technical specifications from IO, PMS and ACCC PA will be signed and relevant procurement will start. Pre PA and pre-procurement activities for Absolute Valve will proceed, in agreement with IO.

[PA 53-06] - Subject to timely consolidation of external interfaces and revision of technical requirements with IO, manufacturing will proceed for most Neutral Beam power supplies systems for ITER and preparation for delivery to ITER site for some of them (Acceleration Grid Power Supply Conversion System and Residual Ion Dump Power Supplies).

In the area of Electron Cyclotron Upper Launchers (ECUL), task order 2 for Integrator Framework including the scope for the manufacturing and assembly of ex-vessel systems will be signed in 2023. Task order for the manufacturing of the isolation valves will also be signed in 2023. In addition, contracts and task orders for support to manufacturing and industrial inspection will be signed.

- Diagnostics (partly FP): Manufacturing activities for several diagnostic components and systems will continue and part of these will be delivered, most of those being essential for First Plasma. Design of all remaining Diagnostics systems will progress and some of these will complete their design activities, with approval of the final design review. Procurement activities will focus mainly on the placement of framework contracts for manufacture of Second Plasma components and port engineering of six diagnostics ports, as well as task orders within these framework contracts and existing framework contracts for manufacture of First Plasma components and design of Second plasma components. Placement of a grant for the completion of the design of the equatorial visible/IR wide-angle viewing system is also envisaged.
- Test Blanket Systems (non-FP, non-in-kind contribution): The activities will focus on the preliminary design and first step of the final 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 would continue as well as the needed EUROFER procurement. 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 continue. Some activities could be executed under the ITER TBM Project Team Funding scheme. The collaboration with EUROfusion will continue in the R&D area. The collaboration with Korean DA is expected to continue in the area of the Helium Cooled TBM system.
- Site, Buildings and Power Supplies: Construction works will be focused on delivering the Tritium building (B14) available for IO equipment installation up to L3 level including the painting works, the Control building (B71 Non PIC part), the RF Heating building (15) including annexes, the Fast Discharge Resistor building (B75), the NB power supply building (B34) and the Busbar Bridges. To advance on the procurement of the HVAC system and Building services for the Tokamak complex Building (B11, B14 and B74) and to progress on the installation, test &commissioning of the cargo lift in the Tokamak building (B11) and the construction of the NB High Voltage Power supply Building (B37). The Emergency Power supply buildings (44-45-46-47) and the Load centers LC01, LC02, LC09, LC15 and LC16, will be close to Ready for use status and the Hot Cell Preliminary Design phase will be launched.
- Cash contribution: The activities in 2023 will focus on the commitment of the agreed cash contribution for 2024.
- 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.
- 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 2023 will be based on the Project Plans expected to be agreed by the BA Steering Committee in spring 2022

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.

See details of the Work Programme 2023 in the annexes to Work Programme.

Section V. Other information

1. Barcelona Office Building Policy

#	Name	Location		JRFAC EA(in r			RENTA	AL CO	NTRACT		Host country (grant or	g
	and type		Office space		Total	RENT (€/year)	Duration of the contract	Type	Breakout clause Y/N	Conditions attached to the breakout clause (if applicable)	• • •	present value(€)
1	TDL B3	Barcelona	9000	750	9750	0€*	Long term rent lease agreement until 2042 Short term rent lease agreements for additional space covered by the Host State as of 01/01/2022.		Y	no longer applicable	Rent paid by Spain for 9750 m2	N/A
T	OTAL					0€						

^{*} Community charges will still be imputed to F4E budget.

SPD_table 10 . F4E building

In accordance with the 2007 Host Agreement, Spain (Host State) shall provide F4E with 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, before, 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, for which the Host State would also cover the refurbishment costs. In May 2016, the long-term agreement was signed between Spain, the building owner, and F4E.

Following the mandate given by the GB to the Host State/F4E Working group in 2021, an agreement was reached on the terms of the refurbishment of F4E premises, which has been split into two phases:

- a) the refurbishment of the additional office space allocated to F4E, which has been finished in 2022 and funded by the Host State;
- b) to be followed by the refurbishment of all other floors assigned to F4E, including the ground floor, also funded by Spain. F4E will contribute with 20% of the costs, while Spain will pay for the remaining 80%, as agreed at the December 2021 GB meeting.

Once the refurbishment of the cafeteria will be finalised, an annual expenditure for the operation of the cafeteria will be charged on F4E budget. The possibility of a subsidy is also considered to keep a competitive price level for the meals.

As a result of the discussions of the same working group, the Spanish authorities agreed to take charge of the rent (from 1 January 2022 and until the finalisation of the refurbishment) of the additional office modules F4E had been renting to secure space for the staff occupying the floors being refurbished.

2. Privileges and immunities

Joint	Privileges granted to staff	
undertaking privileges	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 11 . Privileges and Immunities

3. Environment management

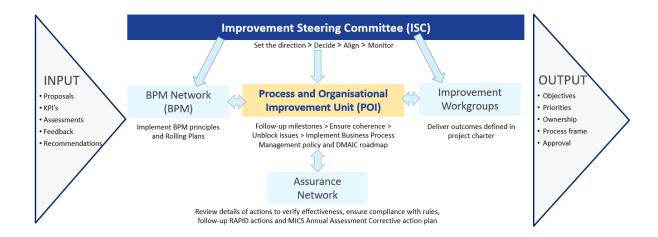
Fusion for Energy shares the same headquarters building in Barcelona with several companies; therefore, the room for manoeuvre to reduce its impact on the environment is limited and EMAS registration difficult. However, after the Host State's decision to fix F4E's permanent premises at its current location, F4E will be in a position to explore the feasibility of an EMAS certification. It should be noted that premises hosting F4E already benefit from a LEED (Leadership in Energy and Environmental Design) certification that demonstrates the high environmental quality of the building; F4E collaborates on a regular basis with the Building Management to maintain this certification and improve its overall environmental score.

4. Strategy for achieving efficiency gains and synergies

F4E Improvement framework

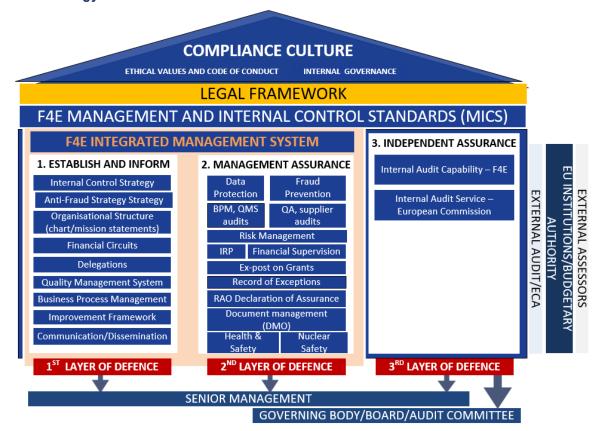
F4E is fully committed to continuous improvement and manages its corporate improvement projects triggered by a Senior Management decision which is then implemented through its various committees and networks. In 2016, F4E set up an Improvement Steering Committee (ISC) to provide a dedicated forum to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

The ISC together with the Senior Management Meeting (SMM) and the Project Steering Meeting (PSM) form the internal governance strategy and decision-making bodies of F4E. The SMM is the main decision-making body of F4E, and the PSM scope covers 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) 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 antifraud strategy



F4E D 2WZTGT

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 on the internationally recognised COSO framework.

The F4E Management and Internal Control Standards (MICS) 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 MICS 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) <u>ESTABLISH AND INFORM</u>: 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) <u>INDEPENDENT ASSURANCE</u> The internal auditor (IAS) and the IAC, who provide the governance bodies and the senior management with risk-based and objective assurance, advice and insight and help the Joint Undertaking to accomplish its objectives by bringing a systematic, disciplined approach in order to evaluate and improve the effectiveness of risk management, control and governance processes.

The F4E Internal Control Strategy, which was updated last year, 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 Anti-Fraud (OLAF) and Ethics Officer promoted and coordinated the implementation of the F4E Anti-Fraud Strategy and the accompanying Anti-Fraud Action Plan covering the period 2020 through 2023.

The Anti-Fraud and Ethics Officer monitors the execution of the actions foreseen in the Anti-Fraud Action Plan for the year under review by means of targeted communications, individual meetings with action owners as well as transversal compliance-oriented meetings and meetings of the Audit Committee.

The implementation of actions arising from audit recommendations, corporate risk actions and other sources as well as the Anti-fraud Action Plan is systematically monitored through a dedicated

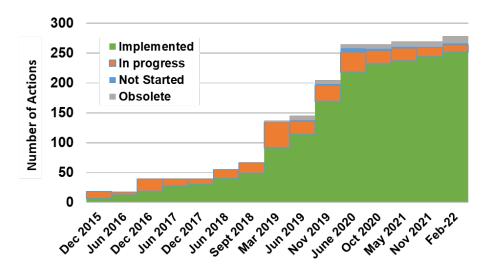
database (RAPID) which details the scope of each action, the action owner and the target date for its implementation.

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 2021, the overall percentage of completed Corporate Actions increased from 90% to 93% despite the addition of five new actions. F4E completed all remaining actions in response to the Ad-Hoc Group on Nuclear Safety.

At its meeting on 9-10 December 2021, F4E's Governing Board took note of the status of the implementation of action plans and those declared as completed.



SPD Figure 15: Evolution of the implementation of F4E's corporate level actions

In line with 2010 Council decision, an Assessment of F4E is performed on an annual basis. The 2022 Annual Assessment focusses on Human Resources and risk management.

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.²⁹

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 Organization (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 Research³⁰ is to provide a framework in order to carry out activities which aim to complement the <u>ITER</u> project and accelerate the development of <u>fusion energy</u>. F4E has been formally designated by Euratom as the implementing agency to discharge its commitments for the implementation of the Broader Approach Activities vis-àvis Japan. In this capacity, F4E cooperates with Japan on 3 projects:

- a) IFMIF/EVEDA, JT60SA and IFERC. IFMIF/EVEDA (Engineering Design and Engineering Validation Activities) aims at producing a detailed, complete and fully integrated engineering design of the IFMIF facility (see Section 1.c below) and all data necessary for future decisions on the construction, operation, maintenance, and decommissioning;
- b) the project on the International Fusion Energy Research Centre (IFERC); and
- c) the project on the Satellite Tokamak Programme including
 - i. the participation in the upgrade of the Tokamak experimental equipment owned by the Japanese Implementing Agency to an advanced superconducting Tokamak (hereinafter referred to as the Advanced Superconducting Tokamak); and
 - ii. the participation in its exploitation, to support the exploitation of ITER and research towards DEMO by addressing key physics issues for ITER and DEMO;
 - iii. 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

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

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.

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. The IFMIF/DONES (Demo Oriented NEutron Source) is a simplified version of IFMIF with one particle accelerator instead of 2. Its primary goal is for testing, validation and qualification of the materials to be used in future fusion power plants like DEMO.

c. 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. The Programme falls under the ITER Agreement as "any other activities that are necessary to achieve its [i.e. the ITER Organization's] 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 is also negotiating – in close cooperation with the Commission – a partnership arrangement with the Korean Domestic Agency (ITER Korea) paving the way for an F4E-ITER Korea Arrangement with the ITER Organization for joint supply of the Helium Cooled Ceramic Pebble (HCCP) Test Blanket Module System for the operation of the ITER machine.

d. Supervision of F4E

The objectives of F4E cooperation with third countries and international organisations are clearly defined in its Statutes as outlined above.³¹ 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

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³¹ 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.

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.

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.

4. Relations with the Russian Federation following the Russian aggression in Ukraine

The EU has condemned the Russian Federation's military aggression of Ukraine in violation of international law and has responded with restrictive measures, severing most ties with the Russian Federation, including in the area of research and innovation.

Against this background, F4E is working in close cooperation with Euratom (represented by the Commission) to determine the course of action regarding two existing agreements with Russian entities. Equally, F4E is refraining from entering into any new agreements with Russian entities.

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List of Acronyms

ASN	Autorité de Sûreté Nucléaire (French Nuclear Regulator)
BA	Broader Approach
BAUA ³²	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
НСРВ	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
	<u>l</u>

 $^{^{\}rm 32}$ 1,000 BAUA equal to 678,000 EUR (value 5 May 2005).

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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 ³³	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

 $^{^{33}}$ 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

SPD2023 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 2022 (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 2027 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.

Action	PA	Baseline to end March 2022 (kIUA)	Achieved Credit (kIUA)	Released Credit (kIUA)	2023	2024	2025	2026	2027	2028+
		697.68103	627.37302	522.93026	72.34386	48.31430	45.87543	40.80237	23.84738	110.29349
	PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets	79.07800	75.97800	65.00800	3.55400	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
Action 1 Magnets	PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6	25.22000	28.72000	24.72000	5.24500	2.39500	0.00000	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 PA 1.5.P1A.EU.01 Vacuum Vessel Vessel Main Vessel		84.48529	63.33700	41.36700	10.89535	0.00000	0.00000	0.00000	0.00000	0.00000
Sub-action 3 In Vessel-	PA 1.6.P1A.EU.01 Blanket First Wall	0.10000	0.10000	0.00000	0.50000	0.50000	9.80000	5.60000	2.00000	21.73000
Blanket	PA 1.6.P6.EU.01 Blanket Manifolds	0.20000	0.20000	0.20000	0.05000	0.89600	1.02900	1.76300	0.29101	0.00000
	PA 1.7.P1.EU.01 Cassette Body	0.56000	0.56000	0.53000	0.00000	0.92000	1.33000	1.14000	1.52000	0.57000

Sub-action 4 In Vessel- Divertor	PA 1.7.P2B.EU.01 Inner Vertical Target	3.11500	3.11500	3.09000	0.00000	0.09500	2.42000	2.85000	3.99000	7.12500
	PA 2.3.P2.EU.01 Divertor Remote Handling System	1.80000	1.40000	0.00000	0.00000	0.20000	0.40000	0.70000	0.32000	6.40000
Action 5 Remote Handling	PA 2.3.P3.EU.01 Cask and Plug Remote Handling System	3.80000	0.80000	0.80000	1.60000	2.10000	2.00000	1.80000	0.90000	8.08768
Action 5 Remote Handling	PA 2.3.P5.EU.01 Neutral Beam Remote Handling System	1.78974	0.30000	0.30000	0.00000	0.00000	0.62000	1.05974	1.03000	2.91000
	PA 5.7.P1.EU.01 In-Vessel Viewing System	3.08000	2.20000	1.80000	0.30000	0.60000	1.30000	0.40000	1.10000	0.57313
	PA 3.1.P1.EU.03 Torus and Cryostat Cryopumps	1.00000	1.00000	0.00000	3.81341	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 3.1.P1.EU.04 Neutral Beam Cryopumps	0.54000	0.54000	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	0.35203	0.07660	0.18336	0.07660	0.00000	0.00000	0.15319	0.00000
Action 6 Cryoplant and Fuel Cycle	PA 3.1.P3.EU.01 Primary and Cryostat Leak Detection System	0.70000	0.70000	0.00000	0.70000	1.00000	1.30000	0.00000	0.00000	0.00000
	PA 3.1.P3.EU.01 Primary and Cryostat Leak Localisation System (phase II - 1st Amendment)	0.15000	0.00000	0.00000	0.15000	0.35000	0.05000	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	24.27610	22.98294	0.65757	0.00000	0.00000	0.00000	0.00000	0.00000
	PA 6.4.P1.EU.01 for Design of REMS	0.18000	0.06000	0.00000	0.00000	0.30000	0.17223	0.60000	0.30000	0.00000
Action 7 Plasma Engineering and Operations	PA 5.2.P1B.EU.01 Electron Cyclotron Control System	1.15000	1.05000	0.50000	0.00000	0.05000	0.10000	0.05000	0.10000	0.00000
	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
Action 8 Heating and Current Drive	PA 5.2.P4.EU.01 Electron Cyclotron High Voltage Power Supply	6.51700	8.49100	6.51700	0.00000	0.00000	1.16300	0.00000	0.00000	0.00000
	PA 5.3.P6.EU Neutral Beam Power Supply	16.56000	16.56000	14.56000	3.40000	1.00000	4.60000	2.12200	0.00000	2.80371

	PA 5.3.P9.EU.01 Neutral Beam Test Facility Components	18.23000	17.20000	11.16000	1.92000	4.20000	0.50000	0.00000	0.00000	0.00000
	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher	0.32154	0.32154	0.00000	2.35232	1.85305	1.59016	3.74893	1.21856	0.00000
	PA 5.5.P1.EU.02-16-17-19 Diagnostics - Magnetics	0.55313	0.71368	0.58513	0.03145	0.00000	0.04705	0.00000	0.00000	0.00000
	PA 5.5.P1.EU.03 Diagnostics - Bolometers	0.11800	0.00000	0.00000	0.38351	0.23600	0.88501	0.73751	0.58974	0.00000
	PA 5.5.P1.EU.07 Diagnostics - Pressure Gauges	0.19160	0.19160	0.19160	0.19160	0.00000	0.55563	0.00000	0.00000	0.01907
	PA 5.5.P1.EU.18 Diagnostics - Tokamak Services	0.88298	0.56796	0.56796	0.53229	0.00000	0.48585	0.15572	0.22263	0.00000
	PA 5.5.P1.EU.15 Diagnostics - Radial Neutron Camera/Gamma Spectrometer	0.27538	0.13769	0.13769	0.07868	0.07868	0.00000	0.29506	0.29506	0.94421
	PA 5.5.P1.EU.08 Diagnostics - CPTS 55.C1	0.00000	0.00000	0.00000	0.88840	0.00000	0.85286	0.20188	0.67518	0.88842
Action 9 Diagnostics	PA 5.5.P1.EU.09 Diagnostics - Low Field Side Collective Thomson Scattering	0.34436	0.17218	0.17218	0.00000	0.17218	0.22957	0.37879	0.02296	0.00000
	PA 5.5.P1.EU.04 Diagnostics - Core-Plasma Charge Exchange Recombination Spectrometer	0.00000	0.00000	0.00000	0.41100	0.61650	0.00000	0.89049	0.68499	0.82197
	PA 5.5.P1.EU.06 Diagnostics - Equatorial Visible/Infrared Wide- Angle Viewing System	0.23448	0.11724	0.11724	0.26379	0.58619	0.14655	0.70344	0.11724	0.76205
	PA 5.5.P1.EU.10-11-12-13-14-21 Diagnostics - Port Engineering Systems	2.43510	1.38681	1.38681	0.00000	0.00000	0.00000	3.51589	0.22180	2.39258
	PA 5.5.P1.EU.01 Diagnostics - Magnetics Electronics & Software	0.50000	0.50000	0.59172	0.31782	0.10000	0.11200	0.00000	0.00000	0.00000
	MAIN MILESTONES	20.64000	18.84000	0.00000	1.64000	2.46000	0.00000	0.00000	0.00000	0.00000
	COMMON	59.95196	53.92865	51.84060	2.73863	0.94000	3.99152	3.59152	0.00000	5.33810
Action 11 Site and	TOKAMAK COMPLEX	89.71718	82.43272	69.23727	8.57082	19.27686	2.52900	6.96338	0.00000	0.00000
Buildings and Power Supplies	AUX BUILDINGS TB03/TB04	62.00716	58.73916	58.43916	0.54346	0.00000	0.00000	0.00000	0.00000	0.00000
	AUX BUILDINGS D&B TB05	15.25156	14.30000	14.30000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	AUX BUILDINGS D&B TB06	9.62922	8.79000	5.83000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

AUX BUILDINGS D&B TB07	6.74850	6.74850	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	6.06000	36.40250
AUX BUILDINGS D&B TB12	13.05351	0.60000	0.00000	11.81640	1.45624	0.00000	0.00000	0.00000	0.00000
AUX BUILDINGS D&B TB13	0.00000	0.00000	0.00000	4.74000	2.87000	0.00000	0.00000	0.00000	0.00000
LOAD CENTERS	4.45300	4.30800	3.66800	3.21500	1.09600	5.26600	0.00000	0.00000	0.00000
INTERCONNECTING ACTIVITIES	22.10921	12.32735	0.72835	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
AUX BUILDINGS D&B TB17	0.06920	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	0.64000	2.10000	0.00000	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 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).

PP_table 1. Credits per Procurement Arrangement

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 2022 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 Committee¹.

The assembly of the facility has been completed by March 2020. The integrated commissioning allowed to start the energization of the superconducting magnets by January 2021. At the beginning of March 2021 the Toroidal Field Coils (the most relevant EU contribution) reached full current and design toroidal field. Taking advantage of the maxim toroidal field a ECRH plasma was obtained on 2nd March 2021.

While the operation of integrated commissioning was approaching successful completion, on 9th March 2021, an incident happened during the final energization test of the EF1 coil. The incident has serious consequences on the schedule of the project.

After warming up the superconducting coils and inspection inside the cryostat, it was found that the terminals of the EF1 coil were damaged by a double short to ground. It was soon understood that extensive investigation would be needed, in order to determine whether other areas of the tokamak insulation were weak and might need repair. Extensive experimental tests have progressively revealed that the high voltage insulations (primarily those made with manual techniques on-site), did not always guarantee its performance in so-called Paschen conditions. Such Paschen-type discharges may cause permanent damage to the insulation and a risk of short circuits at the coil's terminals with unrecoverable damage to the machine. This analysis has led to the conclusion that an extensive repair action had to be implemented to reduce this risk.

The development of the inspection and repair plan and its execution in the constrained cryostat space requires substantially more time that originally estimated, and it is now expected that it will not be completed before May 2022.

A first plasma, demonstrating machine functionality with prudent parameters, might be achieved shortly after completion of integrated commissioning. Under such success-oriented hypotheses we could achieve this first plasma as early as October 2022. Though very difficult to quantify a contingency, the date of first plasma may be, possibly delayed 4 months till February 2023. So the window for achievement of first plasma can be estimated between October 2022 and February 2023.

The period of April 2023 – March 2027 in BA Phase II covers the completion of repairs and integrated commissioning/ operation of the facility as well as machine enhancements of the JT-60SA device.

While waiting the completion of the integrated commissioning, the Experiment Team has been partially established, by appointing the Experiment Leaders and the Topical Group Leaders.

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.

¹ The Project Plans for the BA Phase II (from 2023-2027) for all three projects are to be approved by the Broader Approach Steering Committee in April 2022

For the period up to March 2027 the total commitment for the EU corresponding amounts to 486.31 kBAUA. (From April 2020-March 2027 - 249.9 kBAUA).

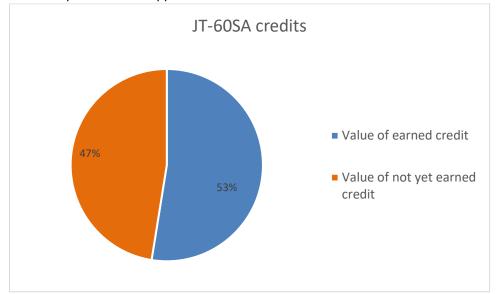
The sharing of activities with Japan, which leads to this associated total credited budget, has been agreed in principle by the parties in early 2021 and received formal approval by the BA Steering Committee in the form of endorsement of the document: 'Satellite Tokamak Program Project Plan for BA Phase II'. The latest version of the Project Plan implements the 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).
- 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.

It is noted that in a limited number of cases, recent block of contracts established with Russian Federation entities will produced delays due to necessity to find alternatives for procurement of critical components

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, maintenance&repair and support to EU on-site personnel in support.



PP_figure 1. JT-60SA: percentage of earned/not yet earned credits for BA (Phases I & II) (Status April 2022)

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. It has been followed by the successful completion of the first stage of the phase B+ (test of the complete LIPAc accelerator apart from the SRF Linac replaced by a drift line). The aim of the phase B+ is to operate a 125-mA D+ beam at 5 MeV in Continuous wave mode for at least 30 minutes, so that the design of these components will be fully validated. The two other stages of the phase B+ will continue over the whole year 2022. The cryomodule, which will be assembled in parallel, is planned to be integrated in the beam line in 2023. The LIPAc accelerator will be at that point fully completed in its final configuration. From 2023 to at least 2025, the LIPAc commissioning will be then implemented starting at low DC and low intensity, to reach 9-MeV with a 125-mA deuteron beam meeting the beam characteristics requirements in continuous wave. The full demonstration of the IFMIF accelerator concept will be then completed. In the meantime, over the period 2023-2027, 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, in order to test new equipment, train scientists, engineers, and operators, and optimize the beam operation strategies until the safe and regular operation of the future Fusion Neutron Source facilities such as DONES and A-FNS.

After the delivery in 2020 of the work plans to be implemented by both implementing agencies from 2021 to 2025, the corresponding procurement Arrangements for the Fusion Neutron Source engineering design activities and the Lithium Target Facility engineering validation activities covering the activities for 2021-2025 have been defined, in collaboration with EUROfusion, and signed in 2021. 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. It is planned to continue these activities beyond the completion of the running procurement arrangements, namely beyond 2025, but the scope is yet to be defined by both implementing agencies, and will depend on the decisions that will be made for the DONES and A-FNS projects.

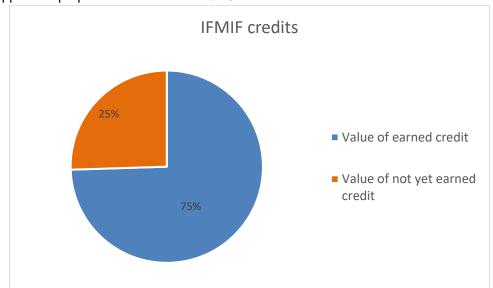
In addition to the above activities, F4E is engaged with EUROfusion for the preparation of the necessary supporting documents for deciding and starting the IFMIF-DONES project (building a scaled down IFMIF plant with number of accelerators reduced from 2 to 1). If decided within the EU and at international level with Japan, we expect the construction of this facility to start after 2021.

For the period up to March 2027 the total commitment for the EU corresponding amounts to 203.33 kBAUA. (From April 2020-March 2027 - 55.30 kBAUA).

The sharing of activities with Japan, which leads to this associated total credited budget, was agreed 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 (Phases I & II)

(Status April 2022)

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 concentrates on 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 is 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).

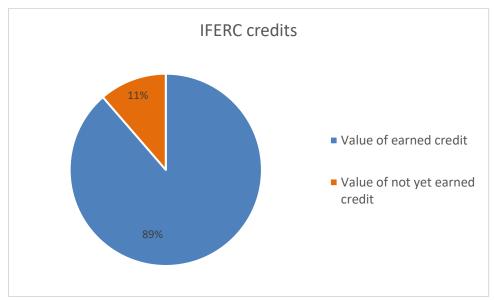
The Remote Experimentation Centre in Rokkasho aims to facilitate broad participation of scientists into ITER experiments. In BA phase I, the remote experimentation room was procured, and remote experimentation techniques were tested on existing machines, such as JT-60SA, JET and WEST. In BA phase II, the activities 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 up to March 2027 the total commitment for the EU corresponding amounts to 132.97 kBAUA. (From April 2020-March 2027 – 20.42 kBAUA).

The sharing of activities with Japan, which leads to this associated total credited budget, was agreed 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 (Phases I & II) (Status April 2022)

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				
EVM-CAS SPI (fix 2018) ²	SPI above a defined value	No target defined for the time being following the decision of the December 2022 Governing Board.				
Overall Costs	Cost estimation for ITER + Broader Approach for period up to 2027 should be less than the total budget available for this period.	Approach for period up to 2027 should				

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 2022 as well as all modifications of quarters of completions agreed by ITER Council/Governing Board until that date.

² A new EVM-CAS indicator will start being used once the new ITER Project baseline is approved at the ITER Council. The associated target will be defined at that point.

IC/GB Reference	Programme	Milestone	Type of Milestone	Agreed Quarter	Forecast Date of Achievement	PA	PA Deliverable
IC02/GB00	SITE, BUILDINGS AND 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 AND 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 AND 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 AND 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 AND 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 AND 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 AND 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

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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 AND 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 AND 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	19/09/2022	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	22/07/2024	3.1.P3.EU.01	Leak detection and Localisation System
GB19	SITE, BUILDINGS AND POWER SUPPLIES PROJECT TEAM	Buildings: Cryoplant Compressor Building (51) RFE (RFE #8B)	GB	Q3 2021	30/06/2022	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 AND POWER SUPPLIES PROJECT TEAM	Buildings: Construction of Cryoplant Coldbox Building (52) Completed	GB	Q1 2023	30/09/2022	6.2.P2.EU.05	Building Construction
GB22	ANTENNAS UNIT	EC UL: Manufacturing of 1st batch of Diamond Disks for EC Upper Launcher 1 finished	GB	Q3 2023	Achieved	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)

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GB2	23	MAGNETS UNIT	TF Coil: Seventh EU TF Coil delivery to site	GB	Q1 2022	29/04/2022	1.1.P1A.EU.01	10 Toroidal Field (TF) Magnet Windings
IC64/0	GB24	SITE, BUILDINGS AND POWER SUPPLIES PROJECT TEAM	Buildings: Medium Voltage distribution LC1A Ready for Equipment	IC	Q4 2022	31/01/2024	6.2.P2.EU.05 4.1.Pn.EU	Building Construction & Steady-State Electrical Network and Pulsed Power Electrical Network Installation
GB2	25	VACUUM VESSEL UNIT	VV: Delivery of Sector 9 by EU-DA to ITER Site	GB	Q2 2021	03/07/2023	1.5.P1A.EU.01	Vacuum Vessel: 5 sectors
GB2	26	SITE, BUILDINGS AND POWER SUPPLIES PROJECT TEAM	Buildings: Medium Voltage Distribution Building LC/2B (47) RFE (RFE #10)	GB	Q3 2023	31/01/2024	6.2.P2.EU.05 4.1.Pn.EU	Building Construction
GB2	27	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	02/04/2024	5.3.P6.EU.01	NB Power Supply
GB2	28	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	Q2 2023	04/04/2023	3.1.P1.EU.02	Front-End Cryopump distribution
GB2	29	ANTENNAS UNIT	EC UL: Manufacturing of 1st batch of Waveguides for EC Upper Launcher 1 finished	GB	Q2 2025	30/04/2025	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)
GB3	30	NEUTRAL BEAM & EC POWER SUPPLIES AND SOURCES UNIT	NB&PS: Start of Installation of High Voltage Dec 1 of Neutral Beam Injector -1	GB	Q2 2025	28/05/2025	5.3.P6.EU.01	NB Power Supply
GB3	32	REMOTE HANDLING UNIT	Remote Handling: Task Order Signed for Manufacturing for Cask and Plug Remote Handling System (CPRHS)	GB	Q3 2022	12/09/2023	2.3.P3.EU.01	15 Cask and Plug RH systems
GB3	33	CRYOPLANT & FUEL CYCLE UNIT	Cryo&FC: Delivery of First Torus & Cryostat	GB	Q2 2023	06/04/2023	3.1.P1.EU.03	Cryopumps: 6 Torus and 2 Cryostat Cryopumps
IC90.2/	/GB34	SITE, BUILDINGS AND POWER SUPPLIES PROJECT TEAM	Buildings: B71 North ready for IO Installation	IC	Q2 2022	30/09/2022	6.2.P2.EU.05	Building Construction

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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	26/02/2025	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	28/06/2024	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	Q3 2025	30/05/2025	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	13/07/2023	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	03/03/2026	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	12/06/2026	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	05/01/2027	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	26/04/2023	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	Q1 2025	17/03/2025	1.7.P2B.EU.01	Divertor inner vertical targets
GB46	ANTENNAS UNIT	EC UL: Delivery 1st EC Upper Launcher from EU-DA to IO	GB	Q1 2026	27/03/2026	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)

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GB47	REMOTE HANDLING UNIT	In Vessel Viewing System Unit #1 Delivered to ITER Site	GB	Q4 2024	23/04/2027	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	26/01/2026	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	22/06/2027	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	11/12/2030	3.1.P1.EU.04	Cryopumps for the Neutral Beam system (ITER and MITICA)
IC43/GB51	SITE, BUILDINGS AND 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	20/01/2023	1.1.P1A.EU.01	10 Toroidal Field (TF) Magnet Windings
IC32/GB55	SITE, BUILDINGS AND 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 AND POWER SUPPLIES PROJECT TEAM	Buildings: Cryoline Bridge available for installation of systems	IC	Q2 2022	29/09/2022	6.2.P2.EU.05	Building Construction
IC91.1/GB58	SITE, BUILDINGS AND POWER SUPPLIES PROJECT TEAM	Buildings: Busbar Bridge available for installation of systems	IC	Q4 2022	30/06/2023	6.2.P2.EU.05	Building Construction
IC59.1/GB59	SITE, BUILDINGS AND 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 AND 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 2022).

Multiannual objectives for the Test Blanket Module (TBM)

The work carried out on the Test Blanket Module (TBM) Systems 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, has reorganized in 2018 the TBM programme as follows:

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

A detailed implementation plan, developed in 2018, has been approved by the F4E Governing Board. A multi-annual programme plan for the joint execution of the TBM Systems programme in collaboration with EUROfusion has been signed in 2019.

In parallel, following the 2018 decision of the ITER council to reduce the number of TBM ports in ITER, negotiation have been started in 2019 with Korean DA for establishing a partnership agreement between F4E and KO-DA for the joint design, development and procurement of an Helium-Cooled TBM system (HCCP). It is expected that this partnership agreement will enter into force in 2022. It will then replace the HCPB TBM Systems.

The following milestones of the TBM programme 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 (HCCP) TBS Preliminary Design Review (PDR)	Q4 2023
TBM05	10-Test Blanket Module	WCLL TBS and HCPB (HCCP) TBS Final Design Review (FDR)	Q1 2026
TBM06	10-Test Blanket Module	Signature of FD and procurement of WCLL and HCPB (HCCP) ancillary systems	Q3 2026
TBM07	10-Test Blanket Module	Signature of procurement of WCLL TBM and HCPB (HCCP) TBM sets	Q3 2026
TBM08	10-Test Blanket Module	Delivery of WCLL and HCPB (HCCP) ancillary systems to ITER site	Q4 2029
ТВМ09	10-Test Blanket Module	Delivery of WCLL and HCPB (HCCP) TBM sets to ITER site	Q4 2030

PP table 3. Multiannual objectives of the TBM project

Multiannual objectives for the Broader Approach

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 2022-2027 for all three projects³.

Related PA (BA)	Description	Baseline Achievement Date - Year	Credit Allocation (kBAUA)
Power Supplies Spare Parts – Part 1 (PSSP01)	Power Supplies Maintenance Support	2021	2.306
EF Correction Coils (EFCC PS)	Design and Procurement of the Error Field Correction Coils - Approval of First Design Report	2021	1.074
Thomson Scattering (TSCC)	Fabrication and Tests - Optical fibres	2021	2.420
Thomson Scattering (TSCC)	Fabrication and Tests – delivery of all other hardware and support during installation	2023	3.770
ECRH PS Spare Parts (ECPSSP01)	Electro Cyclotron Resonance Heating – Approval of First Design Report	2023	1.257
ECRH PS Spare Parts (ECPSSP01)	Electro Cyclotron Resonance Heating - 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
Pellet injector (PEINJ)*	Delivery of fueling source	2023	1.460
Pellet injector (PEINJ)*	Delivery of Pacing Source, Delivery of Centrifuge and Drift Tube and Integrated Test in Europe and acceptance on site	2023	4.380
Cryopumps (CRPUM)	Divertor cryopumps - delivery on site – (10 units)	2023	1.500
EF Correction Coils (EFCC PS)	Design and Procurement of the Error Field Correction Coils – Approval of Report on Factory Tests	2022	1.074
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
ECRH Transmission (ECRHWG)*	Electro Cyclotron Resonance Heating Transmission lines – Delivery of components Part 1	2023	5.128
ECRH Transmission (ECRHWG)*	Electro Cyclotron Resonance Heating Transmission lines – Delivery of components Part 2 and approval on-site	2024	7.692
Actively Cooled Divertor Part 1(DIV-1)*	High Heat Flux Elements 1 st stage	2023	2.720
Actively Cooled Divertor Part 1(DIV-1)*	High Heat Flux Elements 2 nd stage	2025	9.030
Actively Cooled Divertor Part 2 (DIV-2)*	Normal Heat Flux Elements and Cassettes	2025	16.969
Actively Cooled Divertor Part 3 (DIV-3)*	Integration of Casettes, Normal and high Heat Flux Elements	2026	14.318
ECRH PS (ECPSSP02)	Electro Cyclotron Resonance Heating – Procurement of 2 PS	2026	5.106
Cryoplant (CRENH01)	Enhancement of Cryoplant Performance	2024	2.789
Cryoplant (CRENH01)	Enhancement of Cryoplant Performance	2025	1.489

PP_table 4 . Multiannual objectives JT-60SA

³ The Project Plans were approved by the BA Steering Committee in April 2022.

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	2024	1.800
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 (AF6-2)	RF Power System – Refurbished PSYS (protection system)	2022	0.390
RF Power System (AF6-3)	RF Power System - Enhancement pre-series	2024	1.470
RF Power System (AF6-4)	RF Power System - Enhancement RFQ series	2027	7.740
Control System (AF8-3)	Control System – maintenance of hardware and software – year 2024	2024	1.580
Control System (AF8-3)	Control System – maintenance of hardware and software – year 2025	2025	0.810
LF Enhancement (LF6-2)	LF Enhancement: Li Loop, Purification System & Safety Part 1	2025	3.800
LF Enhancement (LF6-2)	LF Enhancement: Li Loop, Purification System & Safety – Part 2	2027	1.600
FNS Engineering Design (ED6-2)	Technical reports Part 1	2025	3.800
FNS Engineering Design (ED6-2)	Technical reports Part 2	2025	1.600

PP_table 5. Multiannual objectives IFMIF/EVEDA

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	Supply of the implementing plan for the ITER Remote Experimentation Centre	Achieved	0.050
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 2023	2023	0.200
REC-EU	Supply of the equipment for tests of remote experiment with ITER and the support of remote experiments for the ITER Remote Experimentation Centre	2023	0.200

PP_table 6. Multiannual objectives IFERC

Multiannual objectives for DEMO

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
Annual M-SPI	Reach a minimum SPI value by end of the year	SPI≥0.8
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	95% implementation of commitment
Annual payment	Implement a defined percentage of Payment Appropriations by end of the year	95% 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

GB milestone Achieved Date - GB milestone Foreseen Date

Equation 2: EVM-CAS SPI fix 2018 baseline

 $\frac{\text{EV}}{\text{PV}} = \frac{\text{Achieve credit (IUA)}}{2018 \text{ fix baseline credit to date (IUA)}}$

Equation 3: Overall Costs

Cost estimation for "ITER + Broader Approach"

Total budget available for "ITER + Broader Approach"

Annual KPI:

Equation 4: Annual M-SPI

 $\frac{\text{Number of milestones with Status} = \text{Completed}}{\text{Number of milestones with reference date}} \leq \text{Current month}$

Equation 5: Annual budget

Actual commitment executed to date + remaining commitment planned to be executed between date and year's end

Latest approved annual commitment budget

Equation 6: Annual payment

Actual payment executed to date +
remaining payment which is planned to be executed between date and year's end
Latest approved payment appropriation for the year

Equation 7: Quality

F4E NCRs open for more than 12 months

Total F4E NCRs open

Equation 8: Vacancy rate

Number of vacant posts

Total authorised posts in the Establishment Plan (FO, TA and CA)

Equation 9: Turnover rate

Number of departures

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

• EVM-CAS SPI fix 2018

No RAG status defined until there is a multi-annual target agreed by the Governing Board.

Overall costs

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

Annual M-SPI

Green	SPI ≥ 0.80
Amber	0.80 > KPI ≥ 0.60
Red	KPI < 0.60

• 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	0.95 ≤ KPI
Amber	0.90 ≤ KPI < 0.95
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< td=""></kpi<0.07<>
Red	KPI ≥ 0.07

Detailed break-down of credits for the period April 2020-March 2027 for **Broader Approach**

Title	BA EU Commitment kBAUA
Enhancements in-kind	
In-vessel Components	67.594
Heating & CD Systems	14.906
Plasma Diagnostics	12.148
Cryogenic	4.278
Magnet and Power Supply	4.650
Control System	0.700
Other Tokamak Systems	0.300
EU on-site personnel	8.000
Operation / Maintenance / Assembly	
Consumables	90.066
EU on-site personnel support and Project Team Cost	1.400
Maintenance & Assembly	17.358
Replacement parts	21.300
IT infrastructure	5.000
Others	2.200
JT-60SA (Total)	249.900
Fusion Neutron Source	5.600
Lithium Target Facility	5.600
LIPAc-Injector	1.800
LIPAc-SRF Linac	3.340
LIPAc-RF Power System	8.240
LIPAc-Control System	2.590
Common Expenses (Europe)	1.300
Common Fund (Europe)	12.130
On site personnel (Europe)	14.700
IFMIF/EVEDA (Total)	55.300
DEMO Design	7.665
DEMO R&D	7.669
CSC	1.600
REC	1.600
Project Team	1.890
IFERC (Total)	20.424

PP_table 8 . Detailed break-down of credits for the period April 2020-March 2027 for Broader Approach 4

⁴ As not all PAs are signed the PAs have been summed up based on topics, to show the total credit values planned up to March 2027

Action number	Action name	PMP delivery status
		No PMP forecasted since
Action 1	Magnets	Programme is finishing
Sub-action 2	Vacuum Vessel	Delivered
Sub-action 3 & 4	In Vessel - Blanket and Divertor	Delivered
Action 5	Remote Handling	Delivered
Action 6	Cryoplant and Fuel Cycle	Delivered
Action 7	Plasma Engineering & Operations	Q1 2023
Action 8	Heating and Current Drive	Delivered
Action 9	Diagnostics	Delivered
Sub-action 10	Test Blanket Module	Q1 2023

PP_table 9 . State of play on Project Management Plans preparation

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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 2027,
- Estimates of expenditure in payments according to detailed Payment Forecasts for 2022 and 2023 and estimates based on commitment needs until 2027.

1. Assumptions of the Resource Estimates Plan

The REP is based on the general assumptions introduced in the Single Programming Document 2023-2027 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
 - o Membership contributions from members other than EURATOM
 - o Possible United Kingdom contribution
- Additional Revenues, for tasks requested by ITER Organization, from Other Assigned Revenue (Japan/UP#10), and from recoveries,
- Utilisation of unused commitment appropriations
- 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 contribution to F4E 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 Statement¹ accompanying the Council Decision (2021) 281, which can be further adjusted during the annual budgetary procedures based on updated EC Statement of Estimates and final approval by EU budgetary Authority.

1.1.2. ITER Host State Contribution (IHS)

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 the total European participation to the construction of ITER. New principles and methodology to calculate the French contribution is established in the exchange of letter² from 2022, with retroactive effect in 2021. It is calculated on the EURATOM contribution to F4E minus the domains of exclusion as agreed in the exchange of letter and defined as follows:

- Administrative expenditure,
- Test Blanket Modules cost,
- DONES cost,
- Broader Approach cost,
- The Transportation cost.

Compared to the 2011 agreement³, covering the period until the end of 2020, this new methodology is no longer limited in time and covers the remaining lifetime of the project.

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.

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

² Contribution financière française à la construction d'ITER : Lettre du Haut Représentant Français pour ITER (formal exchange of letters on 17 June 2022 and 29 July 2022 between France and the European Commission).

³ 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).

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. Possible 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 Commission⁴. For the time being, as the foreseen Protocol between the EU and the UK is not adopted, UK is not associated to the ITER project and does not contribute to F4E's budget.

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

The revenue from the ITER Organization (IO) 5 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.

1.1.5. Implementation of unused commitment appropriations

The F4E Financial Regulation foresees the possibility to make the unused appropriations⁶ available again as revenue in subsequent budgetary years according to the F4E operational needs. This financial mechanism does not apply to the assigned revenue received from ITER Host State (France) and from ITER Organization and to F4E administrative expenditure as they follow specific rules. The table below gives the global overview of the commitment appropriations cancelled and made available again since 2007.

⁴ Trade Cooperation Agreement between United Kingdom and European Commission signed on 25 December 2020.

⁵ 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

⁶ according to Chapter 2 of F4E Financial Regulation (Principle of annuality), the unused appropriations at the end of each year are cancelled, as well as the de-commitments (cancellation of budgetary commitments).

Commitment Appropriations Current Value MEUR	2007-2013 FP VII	B-2014 Executed	B-2015 Executed	B-2016 Executed	B-2017 Executed	B-2018 Executed	B-2019 Executed	B-2020 Executed	B-2021 Executed	B-2022 Budget AM2	TOTAL
Cancelled	473.337	287.204	55.843	6.234	36.517	5.500	9.321	6.132	1.212	-	881.297
Made available again	9.760				96.000	120.007	149.170	390.697	-	-	765.633
Total CA still to be made available again	463.577	750.781	806.623	812.857	753.374	638.866	499.018	114.453	115.665	115.665	115.665

Financial table 1 Implementation of unused commitment appropriation

By the end of 2020, F4E successfully executed the amount available for re-use since 2008, except for the last de-commitments done during the last quarter of 2020 and achieved the objective of the full implementation of the allocated budget for the period 2007-2020.

By the end of September 2022, EUR 115.66 million have been cancelled, the main ones being (i) a decommitment of EUR 88.7 million on TB04 contract in December 2021 linked to the descoping and transfer of activities to other contracts, (ii) a de-commitment of EUR 2.8 million for the transportation of LN2 Plant committed at contract award but finally not due by the supplier and (iii) a de-commitment of EUR 1.9 million on the PF coils contract following IO DG Decision to remove from the scope of the contract the pre-installed jumpers.

1.1.6. 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 2021 this service in-kind amounts to EUR 3.3 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 Agreement⁷,

⁷ Final Report of Negotiations on ITER Implementation, 1 April 2006 (Attachment 2 C)

- B. EURATOM contribution to the Broader Approach (BA) activities, in accordance with the BA Agreement with Japan⁸,
- 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. <u>Technology projects</u> that cluster the R&D activities necessary for ITER and Broader Approach:
 - (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 Earmarked 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.
- 2. Other appropriations accrued from Third parties to specific items of expenditure, other than ITER Organization, in accordance with Article 4 (2) of F4E Constituent Decision, Article 12 (1) (e) of the F4E Statutes, mainly activities with other Domestic Agencies within the ITER project.

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⁸ Broader Approach Agreement F4E D 22FTK5

1.3. Monitoring of implementation of Expenditure in Commitment Appropriations (current value)

The table below shows the expenditure for the period 2007-2027. The figures provided beyond 2020 are based on the last amendment to F4E Constituent act⁹ from 2021, with the exception of the 2023 budget with reduced EURATOM contribution by EUR 180 000 000 with EUR 45 000 000 subsequent reduction of the ITER host state contribution.

Current Value MEUR		< 2007	Total	2014	2015	2016	2017	2018	2019	2020	Total	Total	
	Current Value MEUR	Final Execution	2007-2013	Executed	Executed	Executed	Executed	Executed	Executed	Executed	2014-2020	2007-2020	
	ITER Construction	42.129	3,033.205	553.750	348.752	382.511	459.588	604.605	619.184	769.366	3,737.757	6,770.962	
က္	Technology		48.092	16.007	14.008	12.901	14.552	11.354	5.650	20.092	94.565	142.657	
Appropriations	Technology for ITER		27.499	9.521	6.740	6.694	4.606	7.790	1.433	0.777	37.562	65.061	
oria	Technology for Broader Approach	***************************************	20.592	6.486	7.268	6.207	9.946	3.565	4.218	19.315	57.003	77.596	
o d	Technology for DONES		-									-	
	Other Expenditure		5.296	1.571	2.340	1.868	4.242	5.923	12.882	16.740	45.565	50.861	
ent	F4E Administration		183.982	42.625	44.028	47.669	52.361	55.388	56.630	59.223	357.925	541.907	
Commitment	F4E Total Budget	42.129	3,270.575	613.954	409.128	444.948	530.743	677.271	694.345	865.422	4,235.811	7,506.387	
Ē	Tasks from ITER Organization		-	-	1.078	13.422	1.403	3.158	20.661	10.191	49.913	49.913	
ŏ	Other Earmarked expenditure											-	
	F4E Total Expenditure	42.129	3,270.575	613.954	410.205	458.370	532.146	680.430	715.006	875.614	4,285.724	7,556.300	
		2021	2022	2023	2004						1		
			2022	2023	2024	2025	2026	2027	Total	Total			
	Current Value MEUR	Executed	Budget AM2	Budget	Planned needs	Planned needs	2026 Planned needs	Planned needs	2021-2027	Total <2007-2027			
	Current Value MEUR		Budget		Planned	Planned	Planned	Planned					
60		Executed	Budget AM2	Budget	Planned needs	Planned needs	Planned needs	Planned needs	2021-2027	<2007-2027			
tions	ITER Construction	949.383	Budget AM2 748.121	Budget 844.068	Planned needs 725.340	Planned needs 615.040	Planned needs 805.139	Planned needs 649.480	2021-2027 5,336.571	<2007-2027 12,149.662			
priations	ITER Construction Technology	949.383 15.437	Budget AM2 748.121 27.852	844.068 70.781	Planned needs 725.340 121.603	Planned needs 615.040 92.019	Planned needs 805.139 103.894	Planned needs 649.480 130.785	2021-2027 5,336.571 562.371	<2007-2027 12,149.662 705.027			
propriations	ITER Construction Technology Technology for ITER	949.383 15.437 5.383	748.121 27.852 4.610	844.068 70.781 6.652	Planned needs 725.340 121.603 13.803	Planned needs 615.040 92.019 6.619	Planned needs 805.139 103.894 19.594	Planned needs 649.480 130.785 44.785	2021-2027 5,336.571 562.371 101.445	<2007-2027 12,149.662 705.027 166.505			
t Appropriations	ITER Construction Technology Technology for ITER Technology for Broader Approach	949.383 15.437 5.383	748.121 27.852 4.610	844.068 70.781 6.652 62.129	Planned needs 725.340 121.603 13.803 73.000	Planned needs 615.040 92.019 6.619 47.800	Planned needs 805.139 103.894 19.594 46.000	Planned needs 649.480 130.785 44.785 46.900	5,336.571 562.371 101.445 309.126	<2007-2027 12,149.662 705.027 166.505 386.722			
	ITER Construction Technology Technology for ITER Technology for Broader Approach Technology for DONES	949.383 15.437 5.383 10.054	748.121 27.852 4.610 23.243	844.068 70.781 6.652 62.129 2.000	Planned needs 725.340 121.603 13.803 73.000 34.800	Planned needs 615.040 92.019 6.619 47.800 37.600	Planned needs 805.139 103.894 19.594 46.000 38.300	Planned needs 649.480 130.785 44.785 46.900 39.100	5,336.571 562.371 101.445 309.126 151.800	<2007-2027 12,149.662 705.027 166.505 386.722 151.800			
	ITER Construction Technology Technology for ITER Technology for Broader Approach Technology for DONES Other Expenditure	949.383 15.437 5.383 10.054	748.121 27.852 4.610 23.243 37.081	844.068 70.781 6.652 62.129 2.000 30.425	Planned needs 725.340 121.603 13.803 73.000 34.800 25.000	Planned needs 615.040 92.019 6.619 47.800 37.600 25.000	Planned needs 805.139 103.894 19.594 46.000 38.300 25.000	Planned needs 649.480 130.785 44.785 46.900 39.100 25.000	5,336.571 562.371 101.445 309.126 151.800 189.864	<2007-2027 12,149.662 705.027 166.505 386.722 151.800 240.725			
Commitment Appropriations	ITER Construction Technology Technology for ITER Technology for Broader Approach Technology for DONES Other Expenditure F4E Administration	949.383 15.437 5.383 10.054 22.358 62.253	748.121 27.852 4.610 23.243 37.081 74.355	844.068 70.781 6.652 62.129 2.000 30.425 73.374	Planned needs 725.340 121.603 13.803 73.000 34.800 25.000 81.659	Planned needs 615.040 92.019 6.619 47.800 37.600 25.000 84.147	805.139 103.894 19.594 46.000 38.300 25.000 86.949	Planned needs 649.480 130.785 44.785 46.900 39.100 25.000 88.230	5,336.571 562.371 101.445 309.126 151.800 189.864 550.966	<2007-2027 12,149.662 705.027 166.505 386.722 151.800 240.725 1,092.873			
	ITER Construction Technology Technology for ITER Technology for Broader Approach Technology for DONES Other Expenditure F4E Administration F4E Total Budget	949.383 15.437 5.383 10.054 22.358 62.253 1,049.431	748.121 27.852 4.610 23.243 37.081 74.355 887.410	844.068 70.781 6.652 62.129 2.000 30.425 73.374 1,018.648	Planned needs 725.340 121.603 13.803 73.000 34.800 25.000 81.659 953.602	Planned needs 615.040 92.019 6.619 47.800 37.600 25.000 84.147 816.205	Planned needs 805.139 103.894 19.594 46.000 38.300 25.000 86.949 1,020.981	Planned needs 649.480 130.785 44.785 46.900 39.100 25.000 88.230 893.495	5,336.571 562.371 101.445 309.126 151.800 189.864 550.966 6,639.772	<2007-2027 12,149.662 705.027 166.505 386.722 151.800 240.725 1,092.873 14,188.288			

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 2 Annual Expenditure in Commitment Appropriations (current value)

OUNCIL 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)

2. Additional information

Budget outturn and cancellation of appropriation

The budget outturn 10 for 2021 is amounting EUR 6.374 million.

Budget outturn	2019	2020	2021
Revenue actually received (+)	728 796 686.37	795 296 133.07	749 680 274.96
Payments made (-)	734 351 750.46	796 738 752.83	742 421 341.74
Carry-over of appropriations (-)	21 374 150.95	15 178 745.76	13 254 482.16
Cancellation of appropriations carried over (+)	910 116.73	933 726.90	708 926.68
Adjustment for carry over of assigned revenue appropriations from previous year (+)	26 853 065.07	16 832 766.00	11 643 308.35
Exchange rate differences (+/-)	- 9 792.63	- 1 305.53	17 886.33
Adjustment for negative balance from previous year (-)			
Total	824 174.13	1 143 821.85	6 374 572.42

Financial_table 3 Budget Outturns for the years 2019, 2020 and 2021

¹⁰ 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.

F4E_D_2WZTGT v2.3

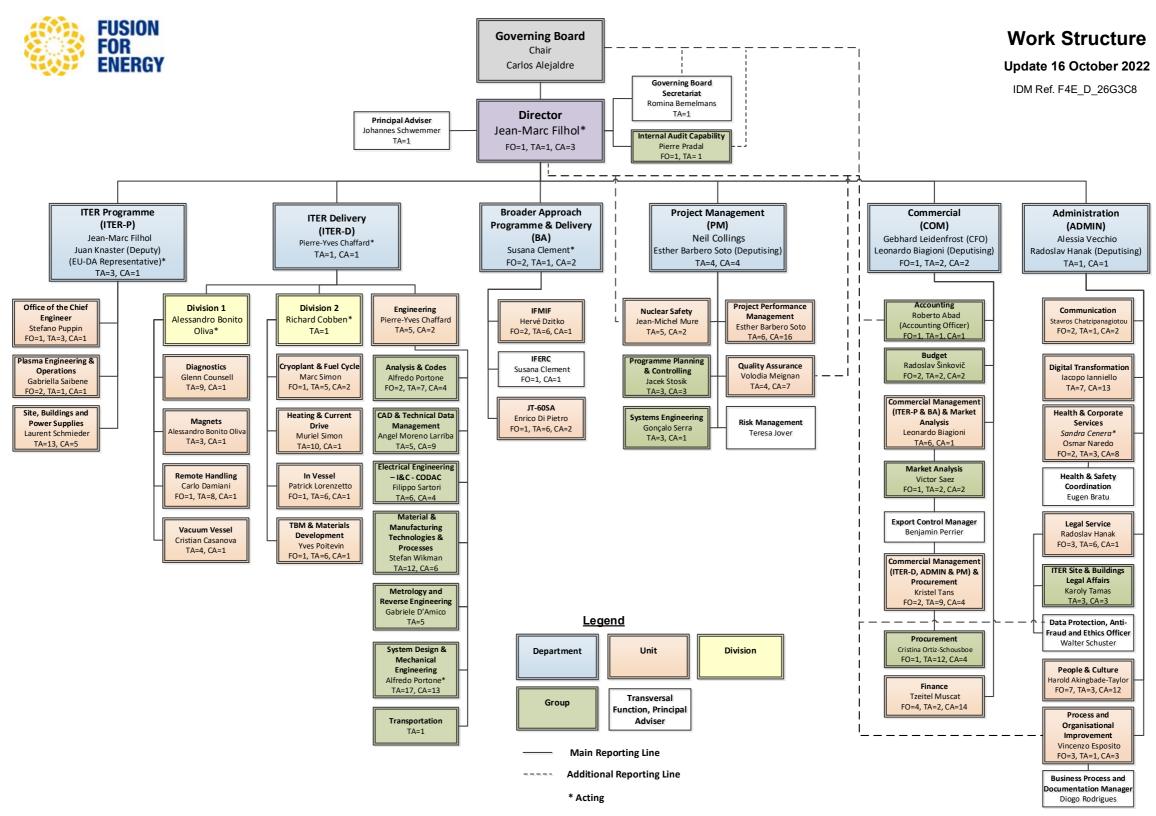
Single Programming Document 2023-2027

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SPD2023_ANNEXES TO HR REP

1. Organization chart



<u>Disclaimer</u>: This chart is for information purposes only and does not infer any rights

2. Human Resources per action 2023-2027

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 2027 reflects the return of 15 posts that F4E had obtained as part of the agreement reached with the Commission in mid-March 2022. The return of these posts to the Commission may be done by a non-renewal of employment contracts of the staff employed on short term positions. In practice, this means that the ramp down for some of these posts will be sooner than 2027.

Annex II: Ressources allocation per activity 2022-2027

Action #	Action # Action			2022			2023			2024				2025				2026				
Action #	Action	FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Budg	get allocated	FO/TA	CA/SNE	Bud	get allocated	FO/TA	CA/SNE	Budget allocated	FO/TA	CA/SNE	Bud	iget allocated
1	Magnets	11.9	7.4	€ 8,148,228	11.0	6.2	€ 6,727,721	9.5	4.3	€	722,559	9.5	4.3	€	-	9.5	4.3	€ -	9.3	4.1	€	11,633,416
2,3,4,10*	Main Vessel	57.5	35.0	€ 89,868,145	62.5	30.6	€ 166,897,558	63.2	31.8	€	106,609,791	64.0	33.1	€	208,078,113	64.0	33.0	€ 36,610,635	62.7	32.6	€	81,888,689
5	Remote Handling	29.1	18.1	€ 9,701,489	33.6	17.1	€ 20,241,263	33.8	17.3	€	7,425,625	34.0	17.5	€	31,946,521	34.0	17.5	€ 23,101,012	32.6	16.4	€	13,000,552
6	Cryoplant & Fuel Cycle	18.3	10.5	€ 8,514,072	19.8	10.4	€ 13,536,532	20.2	11.0	€	4,394,577	19.6	10.1	€	13,966,277	19.7	10.3	€ 60,362,089	19.2	10.0	€	57,306,551
7	Plasma Engineering & Operations	4.9	3.4	€ 872,572	5.3	3.1	€ 2,307,115	5.4	3.2	€	1,564,899	5.4	3.2	€	2,066,967	5.4	3.2	€ 3,253,790	5.1	3.0	€	1,792,006
8	Heating and Current Drive	47.0	23.1	€ 10,895,403	52.4	21.5	€ 127,045,977	53.2	22.5	€	79,686,483	53.4	22.8	€	24,250,514	53.4	22.8	€ 81,094,958	51.5	21.5	€	-
9	Diagnostics	32.7	16.0	€ 21,826,016	37.1	15.9	€ 16,719,545	37.9	16.9	€	23,307,058	38.1	17.2	€	33,418,146	38.1	17.2	€ 31,551,007	36.9	16.5	€	42,933,460
11	Site and Buildings and Power Supplies	33.7	28.4	€ 207,854,599	36.7	25.9	€ 195,432,469	35.3	23.7	€	290,820,406	35.0	23.2	€	73,116,859	35.0	23.2	€ 294,455,924	34.3	22.7	€	97,668,347
12	Cash Contributions	0.8	1.6	€ 240,446,686	0.9	1.5	€ 205,185,634	0.9	1.5	€	277,426,662	0.9	1.5	€	269,546,729	0.9	1.5	€ 314,710,500	0.9	1.4	€	253,511,755
13	Technical Support Activities	20.1	14.2	€ 29,546,657	20.8	11.4	€ 34,194,805	20.8	11.4	€	21,805,600	20.3	10.7	€	15,441,204	20.2	10.6	€ 18,884,330	19.4	10.0	€	173,622,716
14	Broader Approach	24.0	19.5	€ 23,662,778	24.9	18.6	€ 58,101,587	24.8	18.4	€	71,292,593	24.8	18.4	€	73,227,062	24.8	18.4	€ 83,007,845	24.0	17.7	€	84,907,868
Sui	b-total Ressource allocation per activity	280.0	177.0	€ 651,336,646	305.0	162.0	€ 846,390,205	305.0	162.0	€ 8	885,056,253	305.0	162.0	€	745,058,391	305.0	162.0	€ 947,032,089	296.0	156.0	€	818,265,360
	nming from cancelled appropriations to be entered in of revenue and expenditure of the following financial Art.12.1 FR			€ 171,173,522			€ 100,947,036															
Reserve stemming from appropriations corresponding to external assigned revenue from ITER IO as per Art.12.2.4.b FR				€ 97,577,960			€ 9,790,505															
Total Budget		280.0	177.0	920,088,128	305.0	162.0	957,127,746	305.0	162.0		885,056,253	305.0	162.0		745,058,391	305.0	162.0	947,032,089	296.0	156.0		818,265,360

Notes/assumptions:

- 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.
- 2022 figures correspond to the budget allocated for the Work Programme amendmend 2 (excluding the reserves).
- 2023 figures corresponds to the budget allocated for the Work Programme (excluding the reserves).
- 2024-2027 figures are generated by applying a correction to the Estimate in Year value
- The figures within are very preliminary, generated using high level assumptions. As agreed during December 2020 GB, F4E 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.
- 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.
- Figures exclude Risk Exposure.
- Operation Phase is included.
- Following the latest confirmation of the staff reinforcement from 2023, the HR figures reported in the Single Programming Document 2023-2027 have been modified accordingly
 - The staff reinforcement agreement foresees from 2023 the grant of 10 new TA posts and the conversion of 15 CA posts into TA
 - 9 TA posts and 6 CA posts are to be returned in 2027
 - 7 SNE post during the whole period
 - 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 2022-2027

3. HR Quantitative

3.1. Statutory staff, SNE and other staff

Human Resources	Year 2021			Year 2022	Year 2023 ⁽²⁾	Year 2024	Year 2025	Year 2026	Year 2027 ⁽³⁾
ESTABLISHMENT PLAN POSTS	Authorised Budget	Filled as of 31/12/2021	Occupancy rate (%) ⁽¹⁾	Authorised Budget	Requested staff	Envisaged staff	Envisaged staff	Envisaged staff	Envisaged staff
Administrators (AD)	243	229	94%	238	256	256	256	256	253
Assistants (AST)	37	44	119%	42	49	49	49	49	43
Assistants/Secretaries (AST/SC)	-	-	-	-	-	-	-	-	-
TOTAL ESTABLISHMENT PLAN POSTS	280	273	98%	280	305	305	305	305	296
EXTERNAL STAFF	FTE corresponding to the authorised budget	Executed FTE as of 31/12/2021	Execution Rate %	FTE corresponding to the authorised budget	Requested FTE	Envisaged FTE	Envisaged FTE	Envisaged FTE	Envisaged FTE
Contract Agents (CA)	170	157.6	93%	170	155	155	155	155	149
Seconded National Experts (SNE)	3	2.0	65%	7	7	7	7	7	7
TOTAL EXTERNAL STAFF	173	159.5	92%	177	162	162	162	162	156
TOTAL STAFF	453	432.5	95%	457	467	467	467	467	452
Structural Service Providers		28							
External Service Providers ⁽⁴⁾		365							
Interim staff		11.3							
[1] The occupancy rate of Assistants in 2 certification procedures. [2] 10 new TA posts granted following F4				onverted into AST	. In addition,	2 AST posts	were conver	rted into AD	to allow fo
Finally, we apply the conversion of 15 CA	A posts into TA, a	s part of the same re	quest.						
[3] Return of 9 TA posts as per agreement	of the Commission	on services in mid-M	arch 2022. The nu	mber of returned A	AD and AST i	s only indica	tive.		
[4] Figure reported in the Strategic Resour	rce Plan 2021-2027	presented to AMC	in June 2021 (data	as at December 20	021)				

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

	lan in	Year				Year	2022		Year	2023	Year	2024	Year	2025	Year	2026	Year	2027
on gro grade	Authorise	ed Budget		illed as of 2/21	Authorise	ed Budget	Amended	Budget ⁽¹⁾	Envisa	aged ⁽²⁾	Envis	saged	Envis	aged ⁽³⁾	Envis	aged ⁽⁴⁾	Envis	aged ⁽⁵⁾
Function group and grade	Permanen t posts	Temporar y posts	Permanen t posts	Temporar y posts	Perm. Posts	Temp.	Perm. Posts	Temp.	Perm. Posts	Temp.	Perm. Posts	Temp.	Perm. Posts	Temp.	Perm. Posts	Temp.	Perm. Posts	Temp.
AD 16																		
AD 15		1		1		1		1		1		1		1		1		1
AD 14	5	3	3		3	1	3	1	4	3	5	3	4	4	4	4	5	5
AD 13	13	10	6	4	7	5	7	5	7	9	7	10	7	11	6	13	6	12
AD 12	14	21	10	20	10	23	11	23	11	24	11	27	10	31	11	37	10	45
AD 11	2	29	4	16	3	22	2	21	3	24	3	32	4	39	5	45	8	52
AD 10		33	1	32	5	37	5	37	3	49	4	52	5	53	3	51		44
AD 9		42	8	63	6	54	5	58	4	50	2	42	0	41		41		42
AD 8	1	33	1	18	1	29	1	26		24		26	0	20	1	12	1	6
AD 7	2	21		26	2	20	3	20	1	20	1	14	1	14		16		15
AD 6	1	12	1	15		9		9		19		16		11		6		1
AD 5																		
AD TOTAL	38	205	34	195	37	201	37	201	33	223	33	223	31	225	30	226	30	223
AST 11	6		1		1		1		2		2		3		3		3	
AST 10			1		3		3		2		3		2		2		2	
AST 9	4	1	2		1	1	1	1	2	1	1	1	2	2	2	3	3	4
AST 8	1	2	2			2		2	1	3	1	4		4		5		7
AST 7		5	1	2	1	6	1	6	1	7	1	9	1	10	2	9	1	8
AST 6		9		12	1	8	1	8		9		7		8		10		10
AST 5		8	4	5	2	12	2	11	3	11	4	10	4	8	3	5	3	1
AST 4		1	1	7	1	2	2	3	1			1		1		2		1
AST 3			1	5	1					6		5		4		3		
AST 2																		
AST 1																		
AST TOTAL	11	26	13	31	11	31	11	31	12	37	12	37	12	37	12	37	12	31
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	0	0
TOTAL	49	231	47	226	48	232	48	232	45	260	45	260	43	262	42	263	42	254
GRAND TOTAL Note: The requested	posts for 20		forecasts for		25 2026 a		2: re calculat		ng to the n		ates of An			05 ulations	3	05	2	96

HR_table 3. Multi-annual staff policy Plan 2023-2027 - Staff in Establishment Plan

Amended Establishment Plan as per F4E request to the Governing Board by written procedure in April 2022

Conversion of 1 FO AD post into TA AD in view of the departure of one official in 2021

Conversion of 5 short term AD posts into AST made in FIFI 2022 / SPD 2022, to align with actual allocation of posts.

^[2] Reinforcement 25 new TA posts, including 10 new posts and the conversion of 15 CA into TA: 14 AD6, 4 AD8, 1 AD9 and 6 AST3 as part of the request of the Strategic Resource Plan Conversion of 3 FO AD post into TA AD in view of the departures of one official in 2021 and another two in 2022

^[3] Conversion of 2 FO AD post into TA AD in view of the departure of two officials in 2024

^[4] Conversion of 1 FO AD post into TA AD in view of the departure of one official in 2025

^[5] Return of 9 TA posts as per agreement of the Commission services in mid-March 2022. The number of returned AD and AST is only indicative.

B. External personnel

Contract agents	FTE corresponding to the authorised budget 2021	Executed FTE as of 31/12/2021	Headcount as of 31/12/2021 ⁽¹⁾	FTE corresponding to the authorised budget 2022	FTE corresponding to the authorised budget 2023 ⁽²⁾	FTE corresponding to the authorised budget 2024	FTE corresponding to the authorised budget 2025	FTE corresponding to the authorised budget 2026	FTE corresponding to the authorised budget 2027 ⁽³⁾	
Function Group IV	97	94.2	100	97	88	88	88	88	85	
Function Group III	50	51.1	52	50	49	49	49	49	48	
Function Group II	23	12.3	14	23	18	18	18	18	16	
Function Group I	-	-	-	-	-	-	-	-	-	
TOTAL	170	157.6	166	170	155	155	155	155	149	
Seconded National Experts	FTE corresponding to the authorised budget 2021	Executed FTE as of 31/12/2021	Headcount as of 31/12/2021	FTE corresponding to the authorised budget 2022	FTE corresponding to the authorised budget 2023	FTE corresponding to the authorised budget 2024	FTE corresponding to the authorised budget 2025	FTE corresponding to the authorised budget 2026	FTE corresponding to the authorised budget 2027	
TOTAL	3	2.0	2	7	7	7	7	7	7	
[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] 9 FGIV and 6 FGIII are converted into TA in order to align with the request of F4E included in the SRP 21-27 In addition, 5 CA FGII posts are converted into FGIII [3] Return of 6 CA posts as per agreement of the Commission services in mid-March 2022. The number of returned FGII, FGIII and FGIV is only indicative.										

HR table 4. Multi-annual staff policy Plan 2023-2027 - 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
Human Resources	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 Department¹.
- AD14 for the F4E Director.

E. Recruitment forecasts 2023 following retirement/mobility

Below are the selections expected for 2023 according to the information available.

Ioh title in the Agency	Type of co	ntract	TA/O	fficial	CA
Job title in the Agency	(Official, TA	or CA)	J	oup/grade of nt internal	Dogguitmont
	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	-	9-14	9	-
Head of Department	FO/TA	=	12-14	12	-
Senior Technical Officer	FO/TA		8-12	8	-
Senior Technical Officer	TA	ı	8-12	8-9	-
Senior Technical Officer	TA	ı	8-12	8-9	-
Senior Technical Officer	TA	ı	8-12	8-9	-
Senior Technical Officer	TA	ı	8-12	8-9	-
Senior Technical Officer	TA	ı	8-12	8-9	-
Technical Officer	TA	=	5-12	6	-
Technical Officer	TA	=	5-12	6	-
Technical Officer	TA	=	5-12	6	-
Technical Officer	TA	=	5-12	6	-
Technical Officer	TA	-	5-12	6	-

HR_table 6. Recruitment forecast

SPD2023 Annexes to Human Resource Estimates Plan

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.

4. HR Qualitative

4.1. Implementing Rules on recruitment policy

Implementing rul	es 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%20C A%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/Articl e_2f.pdf
Middle management	Model decision C(2018)2542	x			Decision of the Administration and Management Committee of F4E on middle management staff (13 June 2018).	https://f4enet13.f4eda.local/ourorganisa tion/SiteAssets/Pages/OurOrg/AMC%20 middle%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/AM C%20decision%20type%20of%20post%20 final%20signed.pdf

HR_table 7. Adopted Implementing Rules

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 implementi ng 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	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	https://f4enet.f4eda.local/ourorganisation/SiteAssets/Pages/OurOrg/87.pdf

HR_table 8. Adopted Implementing Rules

C. Reclassification of TA / promotion of officials

	Recl	assification (of Temporar	y Agents / Pr	omotion of C	Officials	
Grades	Year 2017	Year 2018	Year 2019	Year 2020 ⁽¹⁾	Year 2021 ⁽²⁾	Actual average over 5 years	Average over 5 years (Annex IB SR)
AD05	3.7					3.7	2.8
AD06	2.4	5.2	2.7	3.2	3.3	3.4	2.8
AD07	2.3	2.3	2.6	2.5	2.3	2.4	2.8
AD08	3.0	2.8	3.1	2.9	3.1	3.0	3
AD09	3.1	2.8	4.0	3.4	4.4	3.5	4
AD10	4.4	5.1	3.9	3.9	3.7	4.2	4
AD11		5.5	4.3	4.0	4.8	4.7	4
AD12		10.9		11.8	11.0	11.2	6.7
AD13			8.0	10.0	9.0	9.0	6.7
AST1							3
AST2	4.0		3.0			3.5	3
AST3	3.3	3.1	2.5	3.0	3.2	3.0	3
AST4	2.8	2.5	4.0	4.3	3.9	3.5	3
AST5	2.0		3.2	3.4	3.7	3.1	4
AST6	3.0	2.0		3.5		2.8	4
AST7			3.0			3.0	4
AST8			4.0			4.0	4
AST9							N/A
AST10 (Senior Assistant)		_	7.0		_	7.0	5

⁽¹⁾ The average in grade AD6 as a result of the final list of 2021 promotions (3,2) had not been updated in the SPD 2022 (3.1)

HR_table 9. Reclassification of TA / promotion of officials

⁽²⁾The grades AD6, AD9 and AST3 have been amended according to the final list of 2021 promotion and reclassification exercise

D. Reclassification of contract agents

			Reclassification	of Contract Staff	
Function Group	Grade	Staff in activity at 01.01.2020	How many staff members were reclassified in 2021*	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
	17	3			Between 6 and 10 years
	16	22	3	5.01	Between 5 and 7 years
CA IV	15	37	3	4.00	Between 4 and 6 years
	14	31	7	3.19	Between 3 and 5 years
	13	4			Between 3 and 5 years
	12	1			
	11	14	1	6.01	Between 6 and 10 years
CA III	10	22			Between 5 and 7 years
	9	14	1	5.22	Between 4 and 6 years
	8				Between 3 and 5 years
	7	4			
CA II	6	6			Between 6 and 10 years
CAII	5	3	1	5.51	Between 5 and 7 years
	4	1			Between 3 and 5 years
CAI	2				Between 6 and 10 years
CAI	1				Between 3 and 5 years
Tota		162	16		

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.

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

Staff distribu	tion per type of con	tract, cat	egory an	d gende	r at 31.12	.21			
		Official		Temporary Agents		Contract Agents		Grand Total	
		Staff	%	Staff	%	Staff	%	Staff	%
Female	Administrator	11	23.4%	45	19.9%			56	12.8%
	Assistant	8	17.0%	10	4.4%			18	4.1%
	FGII, FGIII, FGIV					88	53.0%	88	20.0%
	Total female	19	40.4%	55	24.3%	88	53.0%	162	36.9%
Male	Administrator	23	48.9%	150	66.4%			173	39.4%
	Assistant	5	10.6%	21	9.3%			26	5.9%
	FGII, FGIII, FGIV					78	47.0%	78	17.8%
	Total male	28	59.6%	171	75.7%	78	47.0%	277	63.1%
Grand Total		47	100%	226	100%	166	100%	439	100%

HR_table 11. Gender representation Officials, AT and AC on 31/12/2021

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

Gender evolution of Senior and Middle Managers												
	20	16	20)20	2	021						
	Number	,,,		%	Numbe r	%						
Female Managers	3	11%	5	16%	6	19%						
Male Managers	25	89%	27	84%	25	81%						
Total	28 100%		32	100%	31	100%						
	2016											
	20	16	20)20	2	021						
	Number	% %	Numbe r	% %	Numbe r	021 %						
Female Senior Managers			Numbe		Numbe							
Female Senior Managers Female Middle Managers	Number	%	Numbe r	%	Numbe r	%						
	Number 0	% 0%	Numbe r 1	% 3%	Numbe r 1	% 3%						
Female Middle Managers	Number 0 3	% 0% 11%	Numbe r 1 4	% 3% 12.5%	Numbe r 1 5	% 3% 16.1%						

HR_table 12. Gender evolution of Senior and Middle management

4.4. Geographical balance

The table below provides the geographical distribution as at 31.12.2021 based upon the filled in posts on 31.12.2021 (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 - AS	ST + CA FGI / II / 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	7	2.1%	10	9.1%	17	3.9%
British	8	2.4%	4	3.6%	12	2.7%
Bulgarian	3	0.9%	1	0.9%	4	0.9%
Croatian	1	0.3%		0.0%	1	0.2%
Czech	2	0.6%	2	1.8%	4	0.9%
Dutch	5	1.5%		0.0%	5	1.1%
Estonian	1	0.3%		0.0%	1	0.2%
Finnish	3	0.9%	1	0.9%	4	0.9%
French	68	20.7%	18	16.4%	86	19.6%
German	9	2.7%	6	5.5%	15	3.4%
Greek	6	1.8%	3	2.7%	9	2.1%
Hungarian	6	1.8%		0.0%	6	1.4%
Irish	5	1.5%	2	1.8%	7	1.6%
Italian	61	18.5%	20	18.2%	81	18.5%
Lithuanian		0.0%	3	2.7%	3	0.7%
Maltese	1	0.3%		0.0%	1	0.2%
Polish	5	1.5%		0.0%	5	1.1%
Portuguese	10	3.0%	1	0.9%	11	2.5%
Romanian	10	3.0%	1	0.9%	11	2.5%
Slovak	1	0.3%		0.0%	1	0.2%
Spanish	113	34.3%	38	34.5%	151	34.4%
Swedish	4	1.2%		0.0%	4	0.9%
TOTAL	329 100%		110	100%	439	100.0%

HR_table 13. Nationalities of staff

B. Evolution over 5 years of the most represented nationality

Most represented	2016		Most represented	2021	
nationalities	Number	%	nationalities	Number	%
Spanish	123	30%	Spanish	151	34%
Italian	85	20%	French	86	20%
French	74	18%	Italian	81	18%
British	24	6%	Belgian	17	4%
Belgian	21	5%	German	15	3%
German	20	5%	British	12	3%
Total F4E	415		Total F4E	439	

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 25 international schools of which 22 in the area of Barcelona and 3 in Cadarache (France).

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

HR_table 15. Service Level Agreements with International schools

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SPD2023 ANNEXES WORK PROGRAMME 2023

1. DEFINITIONS, ASSUMPTIONS AND SUPPORTING INFORMATION TO WP2023

The 2023 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 2023, detailed objectives, expected results and target for each WP Action.

Main assumptions

The following assumptions are considered as the basis of the Work Programme 2023:

- The F4E schedule used for the preparation of this document is the one submitted to IO at the end of March 2022¹.
- 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 2023 (WP_table 1) reflects the current status of the draft budget for the 2023 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 action 2 Vacuum Vessel, action 3 In-Vessel Blanket, action 4 In-Vessel Divertor and action 7 Plasma Engineering & Operations and action 8 Heating & Current Drive that include updates from end of September 2022.

- 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 WP2023 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 2023 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 2023. 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 nonconformities (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 needed². 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 cooperation agreement
- vii. Provisions for specific cash compensations to IO required in case of transfer of activities from F4E to IO approved by the ITER Management Advisory Committee.

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

- (b) **Annual objectives** defined as the achievement on time of the following milestones:
 - i. ITER Council/Governing Board (IC/GB) milestones in 2023;
- 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 as the annual M-SPI reaching a minimum value.³
- (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 2023. 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 Euros⁴. 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 WP2023. 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 2023 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 2023 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 For Action 12 Cash Contributions, Action 13 Technical Support Activities and Action 14 Broader Approach Annual M-SPI is not applicable. Action 14 Broader Approach will use the achievement of cumulative kBAUA as target.

⁴ The threshold has been selected so to be in line with the FR.

F4E_D_2WZTGT v2.3

- iv. The plan may cover some activities moved from previous years into WP2023 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
Annual M-SPI	SPI above defined value
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:

Annual M-SPI

 $\frac{\textit{Number of milestones with Status} = \textit{Completed}}{\textit{Number of milestones with reference date}} \leq \textit{Current month}$

Annual budget

Actual commitment executed to date + remaining commitment planned to be executed between date and year's end

Latest approved annual commitment budget

3. LIST OF WP2023 ACTIONS

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 may 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 2023, the last TF Coil will be delivered to IO and the last contract related to TF Coils PA will be completed.

Procurement Activities

Amendments and/or options for existing contracts may be signed (i.e., 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 ensure a proper production follow up until the end of the contract.

Poloidal Field Coils

Progress of Work

PF Coil #4 will be completed and delivered to IO. In parallel, the production of the last PF Coil (PF Coil #3) will advance with the Winding Pack impregnation and the final assembly, in preparation for the final Cold Test.

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 Achieveme nt Date	Type of Milestone	PA/ITA
EU11.1A.11820	IPL > Delivery of TF18 (EU 10) by EU-DA to ITER Site	Q1 2023	WP23 objective	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)	Q1 2023	GB54	PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets
EU11.3B.01140	IPL > Delivery of PF4 Coil by EU-DA to IO	Q2 2023	WP23 objective	PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6
EU11.3B.571190	PF3 WP VPI Completed	Q3 2023	WP23 objective	PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6
EU11.3B.571210	PF3 Final Assembly Completed	Q4 2023	WP23 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 10th TF Coil to IO.
- 2. Closure of the last TF Coil PA contract.
- 3. Delivery of PF Coil #4 to IO.
- 4. PF Coils Building de-commissioning of some tooling and management of Building partial handover to IO.

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Sub-action 2. Vacuum Vessel

Sub-action 2	Vacuum Vessel
Main Vessel	
Progress of Work	

The manufacturing of Vacuum Vessel will continue. 2 of the 5 sectors are in final assembly phase. The last 3 sectors are finalising welding activities at the segment level and will enter into final assembly phase.

To transport the sectors, the manufacturing of the Transportation Frame Covers will continue and the Transportation Frame and Lifting Frames will be stored until needed for delivery 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 continuation of incentive schemes and/or other actions for schedule stabilization, 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 on-site 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 achieve ment date	Type of milestone	PA
EU15.1A.3093980	S9PS4 - Machining Complete	Q2 2023	Predecessor of GB25	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel
EU15.1A.3104560	Sector 5 - Bolted ribs and IWS blocks innstallation complete	Q1 2023	Predecessor of GB16	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel
EU15.1A.3104580	Sector 5 - Outer shell welding complete	Q3 2023	Predecessor of GB16	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel
EU15.1A.3104860	S9 PS4_RT inspection & evtl. corresponding repairs completed	Q4 2023	Predecessor of GB25	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel

EXPECTED RESULTS

The main expected results for this action are:

- 1. Sector 5 Completion of Outer Shell welding
- 2. Sector 4 Completion of Outer Shell welding
- 3. Sector 9 PS4 Outer Shell fully repaired
- 4. Sector 3 PS4 shipped from ENSA to WTO
- 5. Sector 2 PS4 Outer Shell welding completed

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Sub-action 3. In Vessel – Blanket

Sub-action 3 In Vessel - Blanket

Blanket First Wall project

Progress of Work

In 2023, both contractors of the Blanket First Wall (FW) 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 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 contracts OMF-900-01 and -03, material characterisation activities will be carried out through task orders and contract OMF-1082. Since the OMF-900s are cost-plus fee contracts, audits will be performed under the OFC-1094.

In parallel, a series of High Heat Flux (HHF) and Hot Helium Leak (HHL) testing will be performed on Full-Scale Prototypes, Alternative Design Mock-Ups (ADMUs) and other mockups as a part of qualification and development activities, including the ones foreseen to qualify a new grade of beryllium. Activities on FW repair techniques will continue.

In 2023, the manufacturing of standard parts will also start, after the successful completion of the on-going tendering phase of this procedure.

Procurement Activities

In 2023, 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 FW 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 (HFF) Testing services for First Wall components. Given the current geopolitical situation, alternative solutions may have to be put in place by F4E, should HHF testing in Russia be not possible in a timeframe compatible with FW Series production schedule. In addition, specific task orders for audit services of the cost-plus fee contracts OMF-900s are planned. Options to perform inspection and testing activities to the ADMUs may be executed. Material characterisation activities and additional analyses will be carried out through task orders and contract OMF-1082. A new procedure could be launched should the FW repair techniques not continue with the FW manufacturers. 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. Signature of a contract for qualification of additional HIP / Solution Annealing Heat Treatment is planned. Options related to the procurement of standard parts for the FW series production may be released.

Blanket Cooling Manifolds project

Progress of Work

In 2023, the main activities will be the start of the qualification phase and of the manufacturing of the first pipe bundles of two 10-degree sectors (Task 1 of OMF-1080), of the procurement of

connectors helicoflex seal & circlip kits and V-band flanges (Task 7 of OMF-1080) and of the procurement of 316L material piping (Task 8 of OMF-1080).

Procurement Activities

In 2023, Task Orders of the main framework contract OMF-1080 for the series production could be signed should the current crisis and resource allocation prevent to sign them in 2022. Other Task Orders will be signed for analyses of the prototype support design, testing and other transportation and qualification activities. Additional resources will be needed and will be insourced through task orders.

WORK PROGRAMME OBJECTIVES				
Milestone ID	Scope description	Forecast Achieveme nt Date	Type of Milestone	PA/ITA
EU15.2A.12115	Manufacturing Inspection Plan approved for Task 1.A	Q2 2023	WP23 objective	PA 1.6.P6.EU.01 Blanket Manifolds
EU16.01.100860	HP Process qualification - Readiness review for series manufacturing	Q1 2023	GB37	PA 1.6.P1A.EU.01 Blanket First Wall
EU16.01.228210	Task Order Signed for Procurement of CuCrZr (Series) (TO#03)	Q3 2023	WP23 objective	PA 1.6.P1A.EU.01 Blanket First Wall
EU16.01.83100	MS3.A.3 - PPRR3 / MRR - OMF- 900 LOT 1 Approved	Q1 2023	WP23 objective	PA 1.6.P1A.EU.01 Blanket First Wall
EU16.01.83960	MS3.A.3 - PPRR3a / MRR - OMF- 900 LOT 3 Approved	Q2 2023	WP23 objective	PA 1.6.P1A.EU.01 Blanket First Wall

EXPECTED RESULTS

The main expected results for this action are:

- 1. Manufacturing inspection Plan of the Task 1A of Blanket Cooling Manifolds approved, after effective signature of Framework Contracts and first Task Orders in 2022.
- 2. Process qualification readiness review for series manufacturing, corresponding to the achievement of GB milestone 37
- 3. Task Order signed for the procurement of CuCrZr, raw material for the OMF-900 contract.
- 4. Pre-Production Readiness Review 3 (Lot 1) and Pre-production Readiness Review 3a (Lot 3) approved.

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Sub-action 4. In Vessel – Divertor

Sub-action 4	In Vessel – Divertor
Cassette Body pr	oject

Progress of Work

In 2023 both contractors of the Divertor Cassette Body (CB) Series will continue the manufacturing activities. After the re-opening of competition for the remaining Cassette Bodies in 2021, the contractor will continue to procure the needed materials for this part of the scope

and will continue the manufacturing activities. The focus will also be given to the continuation of the engineering and 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 continue.

Procurement Activities

In 2023 the main activities foreseen will be the release of options and indexation related to the CB series fabrication and TCWS & RH Flanges. Furthermore, additional resources (resident inspectors for non-destructive testing, welding, metrology, etc.) will be needed and will be insourced through task orders. Commitment for transportation of the prototype is planned. A task order is to be signed for the purchase of metrology equipment for Cassette Body.

Inner Vertical Target project

Progress of Work

In 2023, 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. The high heat flux (HHF) testing and the subsequent characterization will be performed. On OMF-567 the prototypes will be completed after the completion of HHF tests.

In 2023, the IVT Series production activities will start after the signature of the first specific contracts, particular focus will be on engineering, construction of the production lines, and procurement of materials. External support on Ultrasonic testing will be provided during the qualification and production phases of the IVT Series.

Procurement Activities

In 2023 the main activity foreseen is the signature of the second specific contract for the IVT series. Release of options related to the IVT Series are planned.

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. Commitments for transportation of prototypes and test assembly are also planned (either through cash contribution to IO or under the manufacturing contracts). Given the current geopolitical situation, alternative solutions may have to be put in place by F4E, should HHF testing in Russia be not possible in the timeframe compatible with the IVT Series procurement schedule.

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

Divertor Rails project

Progress of Work

In 2023 following the Procurement Arrangement signature, activities will proceed as soon as a Technical Project Officer is appointed for the launch of the procedure for the series production

Procurement Activities

Resources will be insourced through specific task orders and/or expert contracts for technical specifications and contract signature preparation.

WORK PROGRAMME OBJECTIVES				
Milestone ID	Scope description	Forecast Achievement Date	Type of Milestone	PA/ITA
EU17.01.1169340	HPC - Approval of Final Reports of the Transition Pieces 61-120 (M_TP (61-120)_15)	Q3 2023	WP23 objective	PA 1.7.P1.EU.01 Cassette Body
EU17.01.1227460	MRR for CBLV Stage II Approved (MSII_CBLV_S13)	Q2 2023	WP23 objective	PA 1.7.P1.EU.01 Cassette Body
EU17.2B.140310	OMF-1139-02-01 Signed for IVT Pre-Series and Series Stage I - OMF-1139-02-01	Q3 2023	WP23 objective	PA 1.7.P2B.EU.01 Inner Vertical Target
EU17.2B.566420	QA Plan approved for OMF-1139- 01-01	Q2 2023	WP23 objective	PA 1.7.P2B.EU.01 Inner Vertical Target

EXPECTED RESULTS

The main expected results for this action are:

- 1. Approval of final reports of the Transition Pieces (OPE-1036), after manufacturing and testing, prior to storage and shipment the components.
- 2. Manufacturing Readiness Review approved for Cassette Body Lower Vertical, before start of manufacturing and testing these components.
- 3. Signature of the second specific contract for the Inner Vertical Target Series contract.
- 4. Approval of the Quality Plan of the first specific contract for the Inner Vertical Target Series contract.

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Action 5. Remote Handling

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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. Contracts are also planned to be signed for final design and manufacturing.

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 and final 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 manufacturing and testing 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	Q2 2023	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 2023	GB32	PA 2.3.P3.EU.01 Cask and Plug Remote Handling System
EU23.05.14054900	Final design of Monorail crane Phase 2 start	Q2 2023	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 2023	Predecessor of GB47	PA 5.7.P1.EU.01 In-Vessel Viewing System

EXPECTED RESULTS

The main expected results for this action are:

- 1. Tendering the DRHS FwC for Design, Manufacturing of CTM, CMM and Tooling
- 2. Preparation for the final design review meeting of CPRHS MA-1 system
- 3. Signature of Task Order for Manufacturing of CPRHS MA-1 system
- 4. Final design development of NBRHS first plasma system
- 5. Preparation for the final design review meeting of IVVS Measurement system

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Action 6. Cryoplant and Fuel Cycle

Action 6 Cryoplant and Fuel Cycle

Fuel cycle

Progress of Work

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 focus on 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 may be signed. Preparation activities for specific Framework contract for REMS Tokamak are planned.

For vacuum pumping:

For the Torus and Cryostat Cryopumping System, the manufacturing of the eight cryopumps will continue.

For MITICA and Neutral beam Cryopumps, the manufacturing and factory acceptance testing of the MITICA Cryopump will continue. Preparation activities for the PA amendment signature of the Procurement for manufacture for Heating Neutral Beam and Diagnostic Neutral Beam Cryopumps will continue.

For Front End Cryopump Distribution System, the eight Cold Valve Boxes will be manufactured and delivered, First of a kind cabinets will be manufactured and contract for series manufacturing of these cabinets will be placed. Contracts for cryolines, cryojumpers and Johnston couplings will be placed and final design activities will start.

For Neutral Beam cabinets, TOs under on-going Framework contracts may be signed.

For Leak detection and localization system, qualification and final design activities will continue and manufacturing will start. For instrumentation and control (I&C) activities, Task Order for I&C for Detection systems will run and additional TOs under on-going Framework contracts may be signed.

Procurement Activities

- Contract signed for Manufacturing and Delivery of Neutral Beam Cryolines Cryojumpers and Johnston Coupling for Cold Valve Boxes⁶,
- Contract signature of Neutral Beam cold valve boxes (via an amendment to an existing contract or a new specific contract).
- Contract Signed for Manufacturing and Testing of Cabinets for Front End Cryodistribution system and Torus and Cryostat cryopumps
- Amendment to an existing contract may be signed

⁶ At the time of writing the Work Programme, there is a possibility that these commitments are anticipated from 2023 to 2022. The budget is nevertheless allocated to 2023.

At the time of writing the Work Programme, there is a possibility that this commitment is postponed from 2022 to 2023. The budget is nevertheless allocated to 2022.

- Task order to an existing Framework contracts may be signed.
- 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
- Cash transfer to IO of cabling activities for Front end cryodistribution system and Torus and cryostat distribution system.⁸

Cryoplant

Progress of Work

The commissioning of the LN2 Plant and Auxiliary Systems located in the Cryoplant building at Cadarache will be pursued.

Procurement Activities

- Amendments to existing contracts may be signed.
- 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.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievem ent date	Type of milestone	PA
EU31.01.10261	IPL > Delivery of First Torus & Cryostat Cryopumps by EU-DA to ITER Site	Q2 2023	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	Q2 2023	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 2023	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	Q2 2023	Predecessor of GB35	PA 3.1.P3.EU.01 Primary and Cryostat Leak Detection System

EXPECTED RESULTS

The main expected results for this action are:

- 1. First Torus and Cryostat cryopumps delivered.
- 2. Cryojumpers of Front end cryodistribution systems delivered.
- 3. Mitica Cryopump manufactured.
- 4. Final Design of Helium Leak Localization closed.
- 5. Design Optimization proposal for REMs- Tokamak available

⁸ At the time of writing the Work Programme, there is a possibility that this commitment is postponed from 2022 to 2023. The budget is nevertheless allocated to 2022.

6. Commissioning LN2 compressors and coldboxes completed

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Action 7. Plasma Engineering & Operations

Action 7	Plasma Engineering & Operations
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ITER Operations

The activities preparation of ITER operation will focus on preparation for longer term actions (for ITER integrated commissioning and operation) as well as some short-term actions (for system commissioning and assembly phases)

The preparation of the F4E contribution to the organization of ITER Operation (collaboration framework with IO and the ITER parties, EU representation) includes contributing to the definition of the EU position in the definition of the ITER Operation organisation as well as setting up in F4E of framework for personnel assignment and of F4E coordinating mechanisms

This will be implemented mainly by internal activities, 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 2022, Plasma Engineering Studies and Engineering Support for PE and Antennas will mainly be by not credited activities, implemented via ITAs.

In 2023 the activities will focus on supporting IO in the technical preparation of ITER Operations (Mainly First Plasma)

This will include support to the planning of the integrated commissioning for first plasma, 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. In 2022 the activity focused on the integration of the ECPC stage 2 system with the ITER CODAC environment. In 2023 the main activities will regard the preparation for the operation of the Gyrotron Commissioning Components by completing the integration of the ECPC Stage 2 with the Gyrotron Subsystem Control Units and with the auxiliaries needed for the operation of the RF sources.

The detailed design of ECPC Stage 3 (First Plasma EC plant control system) and of the Subsystem Control Unit of the Upper Launcher are delayed because of the delay of their predecessor activities, namely the integrated commissioning of the First Plasma (FP) Gyrotrons and the completion of the design of the FP upper launcher. Our activities will be pushed forward of a similar amount of their predecessors.

Procurement Activities

In 2023 the procurement will mainly regard insourcing of resources to perform the control system integration activities and supply of prototypes and spares.

FALCON

Progress of Work

The FALCON facility will support the F4E projects in 2023 by testing components and prototypes as needed. This will include testing of the VAT valve and of the Diamond Window prototypes as soon as they are delivered to Lausanne (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.

Procurement Activities

Maintenance contracts for the facility are foreseen with adaptations to support the testing of the valve and window prototypes and procurement of new parts for components affecting the facility availability and performance (i.e. dummy loads).

WORK PROGRAMME OBJECTIVES						
Milestone ID	Scope Description	Forecast achievement date	Type of milestone	ITA/PA		
EU.01.PE.6102850	Contract Signed for Support to ITER Operations Part I	Q2 2023	WP23 objective	F4E Task for Plasma Engineering		
EU52.05.1000820	Task Order Signed for FDR preparation for EC-UL-SCU	Q4 2023	WP23 objective	PA 5.2.P1B.EU.01 Electron Cyclotron Control System		

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. Provide support to ITER preparation for First Plasma as planned and contribute to/coordinate the definition of the EU/F4E role during the ITER operation phase.

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Action 8. Heating & Current Drive

Action 8 Heating & Current Drive

Electron Cyclotron (EC) Gyrotrons, Power Sources and Power Supplies (PS) Progress of Work:

EU EC Power Supplies

- Manufacturing and Factory Acceptance Tests of the Units 7 and 8 of the EU EC Power Supply system will be completed
- · Installation and commissioning will continue
- · Site acceptance tests will continue
- Technical Follow-up of the EU EC Power Supplies system will continue

EU EC Gyrotrons

 Preparation activities for the EU Gyrotrons specific contract signature will be finalized and design activities will progress

Preparation activities for the contract for the support to the EU Gyrotrons procurement be completed

Procurement Activities

Electron Cyclotron (EC) Power Supplies:

· Supporting activities will be foreseen

Electron Cyclotron (EC) Gyrotrons:

- The specific contract for EU Gyrotrons procurement will be signed.
- The Technical Support contract for the EU Gyrotrons will be signed

Neutral Beam Test Facility, Padua:

Progress of Work

- MITICA Beam Source will be delivered to the NBTF.
- MITICA Diagnostics fabrication and most of the assembly will be completed
- MITICA Beam Line Components manufacturing of sub-assemblies will proceed, and assembly of main sub-components of NED, ERID and CAL will start together with instrumentation integration
- NBTF Assembly MITICA cryopump assembly tool will be delivered and tested
- NBTF Control System (CODAS) MITICA instrumentation, control and diagnostic contracts activities will progress

Procurement Activities

- Specific contracts will be signed for the NB Test Facility within PRIMA Assembly.
 Framework
- Specific contracts for technical follow up 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 of materials and manufacturing design will proceed up to the contract signature
- Beam Sources and Beam Line Components Pre-procurement activities and PA preparation will progress
- Drift-Duct: procurement activities will proceed towards contract signature, subject to timely PA signature
- · Absolute Valve: pre-PA and procurement activities will proceed
- PMS and ACC Coils: Tendering preparatory activities for contract signature will proceed, subject to timely PA signature
- NB Power Supplies: Detailed design activities for ISEPS will start. Manufacturing activities for RIDPS and AGPS-CS will be completed and delivery to ITER site will be prepared. High voltage deck manufacturing activities will start

Procurement Activities

- NB assembly Specific Tooling contract will be signed
- NB Vesels contrac will be signed
- Specific contracts will be signed for technical follow-up of the HNB components
- NB Power Supplies: some options will be released, in accordance with the contract implementation status

Ion Cyclotron Antenna

No activities of design are foreseen in 2023.

Following agreement between F4E and IO, the IC antenna procurement scope was transferred through a Level-0 PCR (#1271) from the original share of F4E, without contractual impact, since the PA had not yet been signed.

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

Progress of work

In 2023, PA activities will continue based on the single functional specifications PA Annex B, which was updated in Q4-2021 with the remaining 95% PA scope.

The main actions by the Technical Integrator for 2023 are the design finalization of the Exvessel Waveguides and Upper Launcher Systems towards the Final Design Review in Q3 and Q4 2023 respectively, followed by manufacturing design activities. Task Order 2 for the Technical Integrator framework will be signed in 2023 covering the manufacturing and

assembly of the Ex-vessel Systems, as well as the manufacturing of the remaining UL sub-Systems.

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

The design, validation, manufacturing of the isolation valve prototypes and valve qualification is expected to be started in 2023.

The main challenges will be timely placement of the contracts and monitoring and control of the execution of the works (including a cost+fee section) 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

PA activities:

The Framework Contract and Task Order 1 for the Isolation Valves Framework Contract will be signed, covering manufacturing of the isolation valve prototypes and design and validation activities.

In addition, the main Task Order to be signed is the Task Order 2 for the Integrator Framework Contract.

The second task order of the Technical Integrator framework contract is foreseen to include the manufacturing and assembly of the ex-vessel systems (Diamond Window units, Waveguides, Mitre Bends, Cooling System and Auxiliaries) for both the Upper and Equatorial launchers. The task order will also include the manufacturing of the remaining UL systems.

Series fabrication of the diamond disks will continue during 2023. Contracts are also foreseen for the testing of diamond disks and validation of other mm-wave components.

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 achieve ment date	Type of milestone	PA		
EU52.02.11780	M17 - Signature of Specific Contract 1 F4E-OMF-1108-01 for European Gyrotrons Procurement	Q1 2023	Predecessor of GB48	PA 5.2.P3.EU.01 Electron Cyclotron Gyrotrons		
EU52.04.23065	IPL > Delivery of ECPS 52HV12 (AAG Set #8) to ITER Site by EU- DA (GB43)	Q2 2023	GB43	PA 5.2.P4.EU.01 Electron Cyclotron High Voltage Power Supply		

EU53.06.08530	NP - Start of Manufacture of EU- HVD1 & EU-Bushing of IHNB-1 & IHNB-2 (last items)/MRR Closure	Q2 2023	Predecessor of GB30	PA 5.3.P6.EU Neutral Beam Power Supply
EU53.TF.4443820	Assembly of ERID panels completed and tested (B4000000) - (M67)_ MITICA ERID	Q1 2023	WP23 objective	PA 5.3.P9.EU.01 Neutral Beam Test Facility Components
EU52.01.2001322	Completion of Mechanical Redressing of UL Body - Phase 1	Q2 2023	Predecessor of GB46	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher
EU52.01.2002865	FDR Ex-vessel Meeting	Q3 2023	Predecessor of GB29	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher
EU52.01.3000010	Option 1 Signed for TO1 for Design Finalization, Manufacturing & Assembly of the EC UL Port Plug	Q2 2023	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 2023	WP23 objective	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher

EXPECTED RESULTS

The main expected results for this action are:

- 1. HNB Assembly Tooling contract signature
- ECPS set #1 site acceptance test completed at ITER site
 MITICA BLC main sub-components of ERID, NED and CAL manufacturing completed
 MITICA Beam Source delivered
- 5. Manufacturing completed for AGPS & RID PS
- 6. ISEPS detailed design started
- 7. HVD-1 manufacturing started
- 8. Award Notification for NBTF PRIMA#4 Assembly
- 9. Signature of the specific contract for the EU Gyrotrons10. Completion of phase 1 of mechanical redressing of the UL Body
- 11. FDR Kick off meetings for both UL and EW systems to be completed
- 12. Signature of Task Order 2 for the Integrator framework contract for the manufacturing and assembly of the EW Systems (including the remaining UL systems)
- 13. Optical testing to be completed for 26 diamond disks

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Action 9. Diagnostics

Action 9	Diagnostics

Progress of Work

The Diagnostics Programme will continue during 2023 with the manufacture of several components or systems for delivery to ITER, mostly for First Plasma. These include mainly invessel supports, vacuum vessel feedthroughs, the equatorial port plug 12 wide angle viewing system components and front-end components of the collective Thomson scattering system and fission chambers for the radial neutron camera. Some of them will be delivered within the year.

Several Diagnostics systems and subsystems will complete their design activities with approval of the final design review, including the tokamak services in-divertor components, the equatorial port plug 12 wide angle viewing system ex-vessel components, cameras and electronics, and the port plug mounted bolometer cameras and bolometer sensors.

The design of all remaining Diagnostics systems and subsystems will also progress, both under task orders within existing design framework contracts and framework partnership agreements, as well as under a design grant that will cover the completion of the design of the equatorial visible/IR wide-angle viewing system for equatorial ports 3, 9 and 17. The design of ITER port structures and the integration of Diagnostics into the ports will be finalized by completing all the built to print drawings prior to manufacture.

Procurement Activities

Procurement activities will focus mainly on the placement of framework contracts for manufacture of Second Plasma components and port engineering of six diagnostics ports, as well as task orders within these framework contracts and existing framework contracts for manufacture of First Plasma components and design of Second plasma components. Placement of a grant for the completion of the design of the equatorial visible/IR wide-angle viewing system is also envisaged.

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 (including specific grants) and contracts (including specific contracts) as necessary. In-sourcing of personnel is foreseen to support the Programme during 2023, as is the use of Inspectors for manufacturing contracts and Experts in specialist areas, including in support of design reviews.

	WORK PROGRAMME OBJECTIVES					
Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA		
EU55.01.1000120	IPL > Delivery of Electronics and Software for Magnetics by EU- DA to IO ITER Site	Q3 2023	GB39	PA 5.5.P1.EU.01 Diagnostics - Magnetics Electronics & Software		
EU55.06.107080	< Approval of Manufacturing Readiness Review for Feedthroughs components	Q4 2023	Predecessor of GB36	PA 5.5.P1.EU.18 Diagnostics - Tokamak Services		
EU55.06.697420	IPL > Delivery of In-vessel clips, clamps and junction boxes for VV Sector 2 (Batch 10) by EU- DA to IO ITER site	Q4 2023	WP23 objective	PA 5.5.P1.EU.18 Diagnostics - Tokamak Services		
EU55.09.102790	Preliminary Design Review Meeting for CPTS components (PDR Meeting)	Q3 2023	WP23 objective	PA 5.5.P1.EU.08 Diagnostics - CPTS 55.C1		
EU55.13.908830	Manufacturing Readiness Review Meeting for MfG PP EP12 (MRR Meeting)	Q4 2023	WP23 objective	PA 5.5.P1.EU.06 Diagnostics - Equatorial Visible/Infrared		



EXPECTED RESULTS

The main expected results for this action are:

- 1. Completion of final design for part of tokamak services in-divertor components.
- 2. Completion of final design for the equatorial port plug 12 visible/IR wide-angle viewing system ex-vessel components, cameras and electronics.
- 3. Completion of final design for the bolometer port plug mounted cameras and bolometer sensors.
- 4. Deliveries of tokamak services in-vessel supports.
- 5. Deliveries of in-vessel electrical feedthroughs
- 6. Delivery of electronics and software for magnetics.

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Sub-action 10. Test Blanket Module

Sub-action 10	Test Blanket Module

Progress of Work

The Design and Safety Analysis activities for TBM Sets and Ancillary Systems will continue for the preliminary design and the first step of the final design.

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 the TBM sets Industrial Feasibility and Fabrication Technologies will continue. EUROFER semi-finished products will be procured.

The collaboration with EUROfusion and EFLs will continue.

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

Procurement Activities

It is planned to launch procurement procedures for the start or the continuation of the following activities among others:

- Preliminary and first step of the Final 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;
- EUROFER semi-finished products;
- 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, system engineering management and in-sourced staff 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 Systems procurement plan is not in response to PA or ITA but to the TBM Arrangements (TBMAs).

No activities are credited.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achieveme nt date	Type of milestone	PA
EU56.01.1227620	Final Acceptance Data Package (ADP) F4E-OFC-0950-01-03 Approved by F4E Technical Responsible Officer (TRO)	Q2 2023	WP23 objective	NA
EU56.01.1232120	F4E-OFC-0950-03-02 - Acceptance Data Package 2 (ADP) Completed	Q2 2023	WP23 objective	NA
EU56.01.1238080	TO 01 Preliminary Design of Water Cooled Lead Lithium (WCLL) Ancillary Systems Completed	Q1 2023	WP23 objective	NA
EU56.01.1259280	F4E-OFC-0950-02-03 Acceptance Data Package (ADP) Approved by F4E Technical Responsible Officer (TRO)	Q2 2023	WP23 objective	NA
EU56.01.81260	OMF-1070-01-01 Acceptance Data Package 2 (ADP) Completed	Q4 2023	WP23 objective	NA
EU56.02.1240040	ADP 2 Approved of TO2 for Handling, Cutting Storage Serv for Steel Products related to the EU TBMs	Q2 2023	WP23 objective	NA

EXPECTED RESULTS

The main expected results for this action are:

- 1. Perform the Preliminary Design activities for WCLL TBS needed for the Preliminary design review with IO.
- 2. Perform the Preliminary Design activities needed for HCPB (HCCP) TBS, in collaboration with KO-DA, needed for the Preliminary design review with IO.

Transmission to IO of the consolidated set of data in view of the update of the ITER Preliminary safety Report.

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

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 deliver the Tritium building (B14) available for IO equipment installation up to L3 level including the painting works.

The procurement of the HVAC system and Building services for the Tokamak complex Building (B11, B14 and B74) will advance.

The Control building (B71 Non PIC part), the RF Heating building (15) including annexes, the Fast Discharge Resistor building (B75), the NB power supply building (B34) and the Busbar Bridges will be delivered.

The installation, test &commissioning of the cargo lift in the Tokamak building (B11) and the construction of the NB High Voltage Power supply Building (B37) will progress

The Emergency Power supply buildings (44-45-46-47) and the Load centers LC01, LC02, LC09, LC15 and LC16, will be close to Ready for use status and the Hot Cell Preliminary Design phase will be launched.

Procurement Activities

Contracts to be signed by 2023 include:

TB22: Civil, Architectural, Finishing and Retrofitting Works - planned remaining lots contract signature Q1 2023

Engineering and design for the Hot Cell Complex.

TB24 - IP Diesel Generator. Contract signature Q4 2023

Specific contracts will be signed under ongoing framework support services and works contracts. This includes, for example, TB21 and TB22 Task Orders, 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.

Specific cash compensation to IO as required in case of transfer of some activities from F4E to IO.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achieve ment date	Type of milestone	PA
EU62.05.580	IPL > Construction of Control Building (71 non PIC part) Completed	Q4 2023	WP23 objective	MAIN MILESTONES
EU62.05.620	IPL > Construction of Fast Discharge & Switching Network Resistor Building (75) Completed	Q3 2023	WP23 objective	MAIN MILESTONES
EU62.604260	Construction of 2 Bus-Bar Bridges (between B32 &74 and B33 &74) Completed	Q2 2023	GB58	AUX BUILDINGS D&B TB12
EU62.704855	Weathertight MV Distribution Bldg LC/2B (47)	Q3 2023	Predecessor of GB26	AUX BUILDINGS D&B TB13
EU62.704890	Weathertight MV Distribution Bldg LC/1A (46)	Q3 2023	Predecessor of GB24	AUX BUILDINGS D&B TB13

EXPECTED RESULTS

The main expected results for this action are:

- 1. Construction completed of the control Building (71 non PIC part).
- 2. Construction completed on the Fast Discharge & Switching Network Resistor Building (75)
- 3. Construction completed of the 2 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. Natural weather elements (like rain and wind) are not able to penetrate into the interior of the building LC/2B (47) and LC/1A (46).

TARGET

The target for 2023 is "Annual M-SPI ≥ 0.8"

Action 12. Cash Contributions

Action 12	Cash Contributions
Cash contribution to IO	

This action covers the EURATOM in-cash contribution that F4E⁹ shall deliver to ITER International Organisation (IO) in cash (10 %) together with its contribution in-kind (90%) for the ITER project in accordance with ITER Agreement¹⁰.

SPD2023 Annexes to Annual Work Programme

⁹ F4E is the European Domestic Agency that manages the EURATOM contribution to the ITER project.

¹⁰ Article 8 "Resources of ITER Organization" (ITER Agreement 2006)

The present Work Programme includes the cash contributions 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 11.

Cash Contribution to Japan

The action also covers the transfer of procurement responsibility from EURATOM to Japan under the supervision of the ITER Organization in accordance with ITER Agreement. This is financed through a cash contribution from EU to Japan paid by F4E. An update of the schedule of payments is provided by the Japanese Domestic Agency (JA DA) twice a year.

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

Cash Contributions to ITER WP23 Q4 2023 NA Organization 2024 objective

The expected result for this Action is to pay to IO the cash 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.

EXPECTED RESULTS

As far as the cash to IO is concerned, the target for 2023 is to commit the cash contribution for 2024 according to the decisions due to be taken by the ITER Council in November 2023.

Annual M-SPI NA

EUCC.01.260

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

Progress of Work:

The Engineering Unit during 2023 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:

¹¹ 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.

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).

Procurement Activities:

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. Task Orders under existing framework contract 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 Nuclear Safety expertise, funded by F4E through expert contracts. All other activities will be implemented through Task Orders under existing framework contracts or purchase orders.

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

A framework contract will be signed for the continuation of Quality Assurance, Quality Control and Supervision Support Inspectors for the ITER Project. Task Orders under existing framework contract and the new one 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 contract 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 already in force under existing framework contract will 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 already in force under existing framework contracts will continue to complement the in-house Configuration Management, Technical Integration and Issues Management capabilities with expert support from specialized companies. No new Task Orders are foreseen to be issued in 2023.

WORK PROGRAMME OBJECTIVES					
Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA	
EU.ES.02.95280	FWC Signed for Prov. of Eng. Sup. in the area of	Q3 2023	WP23 objective	All	

	Electromagnetic and Electromechanical			
EU.ES.02.95640	FWC OMF-TBD for Provision of Support in the Area of Nuclear Analysis signed	Q4 2023	WP23 objective	All
EU.NS.01.39640	Specific Contract signed under FwC F4E-OMF-1110-01 for Nuclear Safety Support at F4E BCN and at F4E CDR	Q4 2023	WP23 objective	All
EU.PM.3080540	Technical deliverables for 1st year System Engineering Support of Specific contract F4E-OMF-1127-01-01 approved	Q3 2023	WP23 objective	All

EXPECTED RESULTS

The main expected results for this action are:

- 1. Implementation of the framework contract which will provide Fusion for Energy with framework contracts in the field of Electromagnetic and Electromechanical Analysis, Qualification by test, Area of Nuclear Analysis and Neutronics and Thermo Hydraulics and Fluid Dynamics.
- 2. Signature of a new Framework contract to continue to provide support services in the area of Nuclear Safety inspection.
- 3. Signature of a new Framework contract to continue to provide support services in the area of Quality Assurance, Quality Control and Supervision Support Inspectors for the ITER Project.
- 4. The expected result for the activities in Nuclear Safety, Quality Assurance & Quality Control, CE Marking and Systems Engineering is to provide the requested support to all Project Teams on these matters.

In general, the target for 2023 is to contribute in achieving the cumulative credit forecasted for each action in this WP2023 thanks to the support granted to the work under each specific action.

5. 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 2023 is to keep safeguarding the EURATOM's investment in ITER while achieving the cumulative credit forecasted for each action in this WP2023 thanks to the support granted to the work under each specific action.

Transportation

Transportation

Progress of work:

During 2023, 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 2023, 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 2023 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.

Procurement activities:

Task Orders for Transportation of Highly Exceptional Loads between Maritime Port of Marseille and ITER site. Gendarmerie Task Orders to escort the HEL convoys and Task Orders for Management fees and for component transportation with contractor Daher will be signed.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.TR.132520	Task Order Signed for TO 18 for Convention 4 for Real Convoys for Gendarmerie Services	Q2 2023	WP23 objective	All
EU.TR.132700	Task Order Signed for TO 19 for Convention 4 for Real Convoys for Gendarmerie Services	Q4 2023	WP23 objective	All

EXPECTED RESULTS

- 1. Transportation of Highly Exceptional Loads amongst others, EU & JA-DA TF coils, US
- CS Coils and EU VV-sectors between Maritime Port of Marseille and ITER site.
- 2. Gendarmerie Task Orders to escort the HEL convoys and
- 3. Task Orders for Management fees and for component transportation with contractor Daher will be signed.

Other Technical Support and Administrative 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

A framework contract will be signed for the continuation of the supply of Risk Management Support Services.

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

Administration (IT, POI, LSU, CSU)

Progress of Work

A general provision is foreseen for technical support activities, including operational consultancy, legal, logistics and assurance services, improvement and change projects related to technical processes or documentation management system of technical documents. The action also includes operational meetings, missions as well as hardware and software tools used for the direct benefit of the operational projects.

Procurement Activities

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

Commercial (Finance, Insurance, CMP & CMM)

Progress of Work

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

This part also includes insurances.

Procurement Activities

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

Insurances will be mainly implemented via reimbursement of IO according to the Agreement on provision of insurance services signed 20/07/2020 . For insurances not falling in the scope of this scheme, such as decennial insurance for buildings, complement to F4E Third Party Liability, they are procured or renewed by F4E directly.

WORK PROGRAMME OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.PM.3101620	Specific contract signed under FwC F4E- OMF-1220 for Cost Control Support (cont. F4E-OMF-0895-LOT-01-25)	Q2 2023	WP23 objective	All
EU.PM.3147780	Framework Contarct signed for Risk Management Support (2023-2027)	Q4 2023	WP23 objective	All
EU.PM.3115560	Task Order for IV OMF-1220 Junior Planning Support Divertor Projects (cont. of TO17 0895-Lot3) - 2 years firm part signed	Q2 2023	WP23 objective	All

EXPECTED RESULTS

- 1. Signature of a new framework contract to continue to provide support services in the area of Risk Management Support.
- 2. On time signature of the required Task Orders in order to support the Project Teams.
- 3. Provide high quality Project Management Support Services to all Project Teams.
- 4. The expected result for 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, POI, etc.) and to provide the requested support to all Project Teams on Operational Support Services and Insurance.

The target for 2023 is to manage the F4E operative processes and to contribute in achieving the cumulative credit forecasted for each action in this WP2023 thanks to the support granted to the work under each action, and support the teams to deliver within time and budget.

Annual M-SPI NA

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). F4E is expected to take a larger role for machine on-condition maintenance and repair.

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, the Electron Cyclotron Resonance Heating (ECRH) transmission lines and accessories, several studies and procurements for the enhancements of the power supply systems and the cryoplant will also be launched in 2023. 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. FWCs supporting on-site activities will be used also for general on-condition maintenance and repair activities. Specific Contracts for support activities like engineering and analysis will be issued depending on the project needs. 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 2023 the LIPAc (Linear IFMIF Prototype Accelerator) activities at Rokkasho will focus on completing the assembly of the superconducting part (cryomodule) of the LIPAc accelerator and preparing the beam line for its integration into it. The assembly will be carried out on Rokkasho site by a European company under responsibility of F4E. After the assembly in the clean room has been completed, the cryomodule will be moved to the accelerator vault, in the LIPAc building, for the final steps of the assembly, the integration into the beam line and then the checkout tests. The LIPAc accelerator will be then in its final configuration for the last stages of the beam operation campaigns aiming at demonstrating the nominal performance of the

LIPAc accelerator. In parallel, the enhancement activities for the LIPAc injector, Control System and RF Power system of the RFQ will be carried out to improve their maintainability, reliability, and availability. The enhanced subsystems are planned to be deployed after the completion of the LIPAc primary goal, namely, full demonstration of the IFMIF accelerator concept for a fusion neutron source (acceleration and transport of a 9-MeV, 125-mA deuteron beam meeting the beam characteristics requirements in continuous waves), and will aim to demonstrate both the reliability and availability required for the future Fusion Neutron Source.

Procurement Activities

Contracts will have to be placed for the enhancement of the key LIPAc subsystems and components such as the injector, the RF power system and the control systems, as well as 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 2023. 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 a multi annual programme plan signed with EUROfusion. 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 fosters collaboration research projects between JA and EU by sharing computer resources and by further jointly developing state-of-the art models. A collaboration with ITER for high priority simulation projects will continue.

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 continues 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 is given to activities 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 is 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 are 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 and specific 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.01.23360	Placement of the contract for the Injector upgrade	Q3 2023	WP23 objective	LIPAc Enhancement - Injector
EU.BA.01.25080	Contract placement for the integration of cassette bodies, HHF and NHF elements of the JT-60SA actively cooled Divertor	Q2 2023	WP23 objective	Divertor for Operation Phase 3
EU.BA.01.25100	Release of Stage 2 for Supply of the Solid State Amplifier prototype for RFQ	Q3 2023	WP23 objective	LIPAc Enhancement - RF Power System
EU.BA.01.27600	Completion of the SRF Linac assembly in the Joint Research Building	Q4 2023	WP23 objective	LIPAc Activities
EU.BA.01.28220	Delivery of Polychromators for JT- 60SA Thomson Scattering	Q2 2023	WP23 objective	Thomson Scattering
EU.BA.01.35860	Remote participation tests REC- IFMIF	Q4 2023	WP23 objective	Collaborative activities with JT- 60SA, ITER, and the IFMIF/EVEDA LIPAc accelerator
EU.BA.01.36040	Error field correction coils acceptance on-site tests	Q2 2023	WP23 objective	Error Field Correction Coils

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 12
- Approval of First Design Report for the Supply of the Second Electron Cyclotron Range of Frequency Power Supply system
- 4. Delivery on site Error Field Correction Coils power supplies

IFMIF/EVEDA

- 1. Delivery of the report for the 5 MeV and CW beam commissioning phase.
- 2. Completion of the cryomodule assembly
- 3. Delivery of Work plan for the upgraded RFQ radio frequency power supply with solid state technology
- 4. Technical Report on Estimation of tritium release in Fusion Neutron Source plant during incidents/accidents, and evaluation of tritium stability in solid/liquid lithium
- 5. Technical report on defining the experimental programme to be executed in the 1:1 pilot plant

IFERC

1. Investigation of methods of live data monitoring with an acceptable delay in REC under the collaboration REC-IO (Live data viewing of ITER Operation status in REC)

2. Establish remote computer access for remote participants in LIPAc activities

¹² Depending on sanctions applied to the Russian Federation

- 3. Identification of Irradiation Facility on the Neutron Irradiation experiments of Breeding Functional Materials for the DEMO R&D
- 4. Complete collection of data (1st version) of Material Property Handbook for Breeding Blanket structural materials SSTT guidelines on the development structural material for fusion DEMO in-vessel components
- 5. Complete initial simulation studies of pumping for He ash, impurity and fuel gases for DEMO Design activities (Divertor and Power exhaust)
- 6. Supply of high performance computer resources and analysis and support of simulation projects

TARGET

The target of 2023 is the achievement of a cumulative value expressed in kBAUA 13 (CAS):

	Yearly value	Cumulative value
Cash contribution JT-60SA 2023 (CASH02)*	2.200	15.892
Power supply spare parts (PSSPOS)	0.114	2.840
On-site support for integrated commissioning (OSSPSE)	1.200	1.200
Pellet injector (PEINJ)*	3.000	3.000
Actively Cooled Divertor (DIV1) *	4.440	4.440
ECRH Transmission (ECRHWG)*	1.200	1.200
EF Correction Coils (EFCC PS)	0.716	3.580
Electrical components	1.500	2.000
Cryogenic spare parts	0.600	1.800
Divertor Cryopumps (CRPUM)	1.370	1.500
Massive Gas Injection System (MGI)	0.100	0.100
Thomson Scattering (TOSCA)	3.770	6.190
Supply of the Second ECRF Power Supply system (ECRFPS2)	1.257	1.257
RF Power System (AF06-2)	0.100	0.730
RF Power System (AF06-3)	0.600	0.600
SRF Linac (AF04-2)	2.540	2.940
Design feedback for Neutron Source (ED06-2)*	0.660	0.880
Lithium Target Enhancement (LF06-2)*	0.440	0.550
Common Expenses	0.200	0.700
Common Fund	2.050	7.150
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

 $^{^{\}rm 13}$ Procurement Arrangements not yet signed are marked with an *

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
CSC-EU*	0.200	0.600
REC-EU*	0.350	0.530
Project Team - EU staff*	0.220	0.623
Project Team - EU Common Expenses*	0.050	0.200

WP_Table 1 Work Programme 2023 Budget Summary

Budget Summary of the 2023 Work Programme

	Budget article	Work Programme Commitment appropriations (EUR)
3 1	ITER construction including site preparation	671,627,305.00
3 2	Technology for ITER	6,136,511.00
3 3	Technology for Broader Approach & DEMO	58,101,587.00
3 4	Technology for DONES	2,000,000.00
3 5	External Support Activities	18,738,413.00
3 6	Other Operational expenditure	10,177,279.00
	Total Title III of the Budget	766,781,095.00
4 1	ITER construction from ITER host state contribution	178,492,669.21
4 2	Activities linked to ITER Organization	11,853,982.00
4 3	Other earmarked expenditure	
	Total Title IV of the Budget	190,346,651.21
To	otal amount available for the operational expenditure	957,127,746.21

	Work Programme	Work Programme Commitment appropriations (EUR)			
		Grants	Procurement	Cash	
-	Expenditure in support of ITER Construction	3,516,178.00	652,083,570.21	206,374,208.00	
+ 4 3	Sub total ITER construction + RF		861,973,956.21		
3 2	Design and R&D in support of ITER, not credited		6,136,511.00		
	Sub total technology for ITER		6,136,511.00		
3 3	Expenditure in support of Broader Approach		45,256,587.00	12,845,000.00	
	Sub total Technology for Broader Approach and DEMO		58,101,587.00		
3 4	Technology for DONES		2,000,000.00		
0.	Sub total Technology for DONES		2,000,000.00		
3 5	External Support Activities		18,738,413.00		
	Sub total External Support Activities		18,738,413.00		
3 6	Other Expenditure		10,177,279.00		
	Sub total Other Expenditure	10,177,279.00			
	Totals Operational Expenditure		734,392,360.21	219,219,208.00	
			957,127,746.21		

WP_Table 1 . Work Programme Budget Summary

WP_Table 2 Indicative Value of Financial Resources for the actions in WP2023

Action #	Action	Budget WP2023
1	Magnets	6,727,721
2,3,4,10*	Main Vessel*	166,897,558
5	Remote Handling	20,241,263
6	Cryoplant & Fuel Cycle	13,536,532
7	Plasma Engineering & Operations **	2,307,115
8	Heating & current drive ***	127,045,977
9	Diagnostics	16,719,545
11	Site and Buildings and Power Supplies	195,432,469
12	Cash Contributions	205,185,634
13	Technical Support Activities	34,194,805
14	Broader Approach	58,101,587
	Sub-Total Budget WP	846,390,205
	Reserve stemming from cancelled appropriations to be entered in the estimate of revenue and expenditure of the following financial years as per Art.12.1 FR	100,947,036
	Reserve stemming from appropriations corresponding to external assigned revenue from ITER IO as per Art.12.2.4.b FR	9,790,505
	Total Budget	957,127,746

^{*}The Sub-actions 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

^{** &}quot;Antennas Project" is transferred into renamed "Action 8 Heating & Current Drive"
*** " Action 8 - Heating & Current Drive" includes "Neutral Beam Project" and "Antennas Project"

WP_Table 3 - 2023 Main Procurement Activities (PER Action)

Action	Type of contract	Signature	
Magnets			
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
Vacuum Vessel			
CA13115	Commitment and TO Signed for Option 1 for Engineering Support for the VV Programme (2022-2023)	SC-PServ	Q4
CA13117	Commitment & TO signed for F4E-OMF-1153-01-XX for Option 1 for Mechanical Analysis Support for VV	SC-PServ	Q4
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
In Vessel- Blank	et .		
CA09286	TASK 3.X for FW Series Fabrication (Manufacturing of Series Panels) - Reopening #1	PSupply	Q2
CA08355	TO 03 Procurement of Beryllium (Series)	SC-PSupply	Q2
CA11609	TO 03 Procurement of CuCrZr	SC-PSupply	Q2
CA13007	Task Order for Testing of Task 1 supports	SC-PSupply	Q2
CA13069	Task Order Resources - Resident 23/24	SC-PServ	Q3
CA11616	Task Order for Auditors TO#04 - LOT 1	SC-PServ	Q1
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
In Vessel- Divert	or		
CA08583	OMF-1139-02-01 Signed for IVT Pre-Series Production	SC-PSupply	Q2
CA05618	TO-01 OMF-1033-02 signed for HHF Tests for IVT	SC-PServ	Q1
CA10811	TO-02 OMF-1033-02 signed for HHF Tests for IVT	SC-PServ	Q1
CA11555	TO-XY OMF-ABC signed for Metrology Support for IVT Series	SC-PServ	Q1
CA10722	TO-14.01OMF-0878-01signed for Metrology 2023 for CB Series Stage 1 (cont. TO-14)	SC-PServ	Q1
CA09566	TO-21.01 OMF-TBD-01 signed for Metrology Support (cont. TO-21)	SC-PServ	Q1
CA12829	Task Order WW.01 OMF-1321 Signed for Resident Inspector at Monoblocks' Supplier for IVT Series - 2023-2025	SC-PServ	Q4

CA12831	Task Order WY OMF-1321 Signed for Resident Inspector at Monoblocks' Supplier for IVT Series - 2023-2025	SC-PServ	Q3	
CA09829	Task Order XX OMF-1321-01 Signed for Resident Inspector for IVT Series	SC-PServ	Q2	
CA12950	Task Order ZZ OMF-1321-01 signed for Resident Inspector for IVT Series	SC-PServ	Q4	
Provision for amer	ndments, claims, reimbursement, indexation and late interest	N/A	N/A	
Remote Handlin	ng			
CA08385	Task Order (577-02-03) for Manufacturing and Installation of Casks for MA-1 for CPRHS	SC-PSupply	Q3	
CA05584	Task Order (577-02-04) for Final Design MA-2 + Preliminary Design LTM + Final Design LTM for CPRHS	SC-PSupply	Q3	
CA10459	CON for 2023 TELBOT Developments CS	PSupply	Q3	
CA12217	Task Order (Ansaldo) signed for Preliminary & Final design of BLT and VOS	SC-PServ	Q4	
CA11592	TO for Engineering Insourcing Contract Control Sys 2023	SC-PServ	Q4	
CA11584	Task Order Signed for 2023 (1087-01) GTD Master Arm Development	SC-PSupply	Q2	
CA10457	Task Order Signed for 2023 (1087-01) DRHS CTM CS Readiness for Integration	SC-PSupply	Q2	
CA11731	Task Order for Engineering Insourcing Contract (TS-4 & TS-5) CPRHS 2022	SC-PServ	Q2	
CA11730	Task Order for Engineering Insourcing Contract (TS-6) CPRHS 2023	SC-PServ	Q2	
Provision for amer	ndments, claims, reimbursement, indexation and late interest	N/A	N/A	
Cryoplant and F	uel Cycle			
CA11745	FECDS: Contract signed for Manufacturing and Delivery of NB Cryolines, Cryojumpers and JC for CVBs	PSupply	Q1	
CA11743	Contract Signed for Manuf. and Testing of I&C Cabinets for T&C FECDS and TCCS	PSupply	Q1	
Provision for amer	ndments, claims, reimbursement, indexation and late interest	N/A	N/A	
Plasma Engineering & Operations				
CA12372	Contract Signed for Support to ITER Operations Part I	PServ	Q2	
CA12375	Contract Signed for Support to ITER Operations Part II	PServ	Q2	
CA08260	Contract Signed for Plasma Engineering Studies Part I	PServ	Q2	
CA13233	Contract Signed for Plasma Engineering Studies Part II	PServ	Q4	

CA13229	Task Order Signed for FDR preparation for EC-UL-SCU	SC-PServ	Q4
CA11906	Task Order Signed for FALCON Maintenance	PSupply	Q3
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
Heating and Cur	rent Drive		
CA01421	TO Signed for Manufacturing of Isolation Valve prototypes and FDR documentation	SC-PSupply	Q3
CA06567	Contract Signed for NBI-1&2 Vessels	PSupply	Q1
CA07031	Signature of European Gyrotrons Procurement	PSupply	Q1
CA11035	Contract signature for NB tooling NBI 1&2 Phase II	PSupply	Q1
CA12859	Signature of PRIMA#04 Assembly	SC-PSupply	Q3
CA11785	Task Order Signed for Neutral Beam Components Follow-Up 2023	SC-PServ	Q2
CA11877	Engineering Support Activities (CAD Support)	SC-PSupply	Q1
CA07649	Commitment for Technical Support of Neutral Beam Components for 2024-25	SC-PServ	Q4
CA13137	Engineering Support for HNB Control	SC-PServ	Q2
CA10966	Task Order 02 Signed for Manufacturing & Assembly of the EW Systems / Remaining UL Systems	SC-PSupply	Q2
CA04670	TO signed for Inspectors for UL&EW 2023 Prototyping&Qualification	SC-PServ	Q2
CA12994	TO signed for Inspectors for UL&EW 2023 EW&Launcher	SC-PServ	Q1
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
Diagnostics			
CA06112	Specific Contract Signed for Final Design + BTP CPTS	SC-PServ	Q3
CA11216	Task Order Signed for Front-End components (Waveguides, Mirrors & Horns)	SC-PSupply	Q1
CA11178	Task Order signed for DPG Electronics and Power Supplies and Coding, FAT & Integration under OFC-1087	SC-PServ	Q2
CA10337	Task Order Signed for Integration of Bolometer I&C	SC-PServ	Q2
CA10541	Task Order Signed for MfG PP EP12	SC-PServ	Q1
CA06792	Support for manufacturing, instalation and commissioning of Bolometer Diagnostic	PSupply	Q2

CA06771	Task Order Signed for Development of CODAC for CPTS Plant Controller Design	SC-PServ	Q2
CA12957	Task Order Signed for External Providers Services (2023)	PServ	Q1
CA10407	Contract Signed for Support for Manufacturing and Assembly for CTS	SC-PServ	Q3
CA05664	Task Order Signed for Development of Mfg Specs for RNC port-interspace/cell components	SC-PServ	Q2
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
Test Blanket Mo	dule		
CA09804	TO 03 for Proof of the TBM-sets fabrication and assembly processes feasibility	SC-PServ	Q3
CA08690	Eurofer Procurement (TBM Box Qualification)	PSupply	Q3
CA12118	TO for Safety Analyses for HCCP TBS Completion of PD & Final Design	SC-PServ	Q4
CA10939	TO#01 for WCLL TBM Set PD & FD	SC-PServ	Q1
CA10943	TO#01 for Safety Studies in support of TBSs PD & FD	SC-PServ	Q2
CA12701	Execution of TO 05 for Preliminary Design of HCPB Ancillary Systems	SC-PServ	Q3
CA06877	TO1 for PbLi loop Final Design and Procurement	SC-PServ	Q3
CA13204	TO 5 Preliminary Design of the HCPB-TBM Set Part 4 (PD documentation preparation)		Q2
CA12148	TO1 for WCLL TES Final Design and Procurement	SC-PServ	Q3
CA12158	TO1 for HCCP TES Final Design and Procurement	SC-PServ	Q3
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
Site and Building	gs and Power Supplies		
CA12854	TB21 - TO#XX Commitment for B11/B74 Re-allotment partial omission of Tokamak Options 1 & 2 from (TB04)	SC-PSupply	Q2
CA12853	TB21 - TO#02 Commitment for B11/B74 Re-allotment partial omission of Tokamak Options 1 & 2 from (TB04)	SC-PSupply	Q1
CA05726	TB09 - Commitment for Hot Cell Complex Engineering Support (HCC)	PServ	Q3
CA13185	TB24 - Commitment for Contract for TB24	PSupply	Q4
CA11154	TB21 - TO#03 Commitment for Multi-trade contracts for the Tokamak Complex. (Missing items SDB/Cables)	SC-PSupply	Q2
CA12365	TO#03 for AFC-1224 for Legal Representation during adjudication proceedings (TB04) LS	SC-PServ	Q4

CA12406	TB22 - Commitment for Secondary structural works - TO#02 Lot B	SC-PSupply	Q3
CA10261	Future activities to cover BIPS provision for Engineering Services WP2023 TSS	SC-PServ	Q4
CA12402	TB22 - Commitment for Primary structural works - TO#02 Lot A	SC-PSupply	Q3
CA12414	TB22 - Commitment for Roofing, Cladding - TO#02 Lot D	SC-PSupply	Q3
Provision for amend	dments, claims, reimbursement, indexation and late interest	N/A	N/A
Supporting Activ	ities		
CA06465	Commitment 2023 - Global transportation of HEL NON-EU ITER components	SC-PServ	Q4
CA08978	2023 Commitments and Budget Reserves for Legal Services charged against Operational Budget	SC-PServ	Q4
CA12555	Option for TO 01 OMF-1115-01 for FP Diagn., BIPS I&C, Add. Heating and Real Time Software Support Activities	Option/Stage	Q1
CA06468	TO for Management fees 2024	SC-PServ	Q4
CA13092	ICT- Commitments for Software maintenance fees (Software licences specific to the ITER project) 2023	SC-PServ	Q4
CA09709	Commitment 2023 for Operational Missions	PServ	Q4
CA13170	TO 18 for Convention 4 for Real Convoys for Gendarmerie Services	SC-PServ	Q2
CA11119	TO YY for IV OMF-1220 PPM Senior Cost Control FW Panels (cont. TO 05 OMF-895-01-02) - 2 years firm part signed		Q1
CA06073	TO for Engineering & CAD Transversal Support (except Metrology) 2023	SC-PServ	Q4
CA06083	TO for Engineering Analysis (except Nuclear Data & Non Credited activities) - 2023	SC-PServ	Q4
Provision for amen	dments, claims, reimbursement, indexation and late interest	N/A	N/A
Broader Approac	h		
CA11577	Supply of JT-60SA actively cooled Divertor - integration of casette bodys, HHF and NHF elements	PSupply	Q2
CA11921	Supply of JT-60SA actively cooled Divertor HHF elements Stage 2	PSupply	Q2
CA10368	ECRH Waveguides	PSupply	Q1
CA12638	Procurement ECRH Loads	PSupply	Q1
CA10366	Hardware for enhancements for the cryoplant	PSupply	Q1
CA11132	TO for LIPAc injector enhancement	SC-PSupply	Q3

CA10379	ECRH PS Spare Parts and Maintenance Support	PServ	Q3
CA10902	Diamond windows for the transmission line		Q1
CA13159	On-condition maintenance of the machine	PServ	Q1
CA13160	PServ	Q1	
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

2023 GRANTS

Grant Agr Refer		Expected date of Signature	Forecasted value to be committed	Duration	Counterpart (Leader Company)	Short Description
Not kr	nown	Q1 2023	€3,116,178.00	Not known	Not known	Diagnostics: Grant Signed for Completion of the WAVS Design in EP#3, 9 and 17
GRT-	901	Q2 2023	€400,000.00	12 months	VTT Technical Research Centre of Finland Ltd	Remote Handling: Amendment for Validation, calibration and upgrade of GR platform
Total			€3,516,178.00			

ON-GOING GRANTS¹⁴

Grant Agreements Reference	Date of Signature	Committed Value	Duration (in months)	Counterpart (Leader Company)	Short Description	
F4E-FPA-327 (PMS-DG)-07	20/02/2020	€2,081,637.00	50	AGENZIA NAZIONALE PER LE NUOVE TECN	FPA-327-07_Development of the Final Design and Prototyping	
F4E-FPA-364-06	22/10/2018	€1,390,426.00	50	MAX-PLANCK- GESELLSCHAFT ZUR FORDERU	Development of the Design and Critical Prototyping	
F4E-FPA-375-02	12/07/2013	€984,080.00	87	INSTITUTO SUPERIOR TECNICO*	FPA-375: SG02_CA01812_COORDINATION SUPPORT OFFICE	
F4E-FPA-384 (DG)-05	30/07/2018	€2,286,133.00	56	MAX-PLANCK- GESELLSCHAFT ZUR FORDERU	F4E-FPA-384-SG05 Development of the Design and Prototyping	
F4E-FPA-407-04 (DG)	22/09/2017	€4,574,345.69	51	COMMISSARIAT A L ENERGIE ATOMIQUE E	DEVELOPMENT OF THE DESIGN AND PROTOTYPING: EQUATORIAL VISIBLE/INFRARED WIDE ANGLE VIEWING SYSTEM	
F4E-GRT-553	09/07/2014	€2,562,993.00	89	ECOLE POLYTECHNIQUE FEDERALE DE LAU	DESIGN, DEVELOPMENT AND VALIDATION OF THE EUROPEAN GYROTRON	
F4E-GRT-0901-01	09/03/2018	€1,611,591.00	64	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY*T	Development and integration of 3D Machine Vision, HLCS modules and GENROBOT at DTP2	
F4E-GRT-0974-01	20/12/2018	€318,186.00	50	TUOTEKEHITYS OY TAMLINK*	PROTOTYPING AND TESTING OF HYDRAULIC DIGITAL VALVES FOR THE DIVERTOR REMOTE HANDLING SYSTEM	
F4E-GRT-1146-01	25/07/2021	€2,054,373.00	48	COMMISSARIAT A L ENERGIE ATOMIQUE E	Completion of the design of Equatorial Wide Angle Viewing System (EP-WAVS) in EP12 and post-design technical support	
Total		€17,863,764.69				

WP_Table 4. Plan for grants 15

¹⁴ Any 2022 Grant that was included in the original WP2022 but was not signed by the cut-off date of 31st March 2022 is not reflected in this table. Grants that were not known when the original WP2022 was drafted and that would be signed following a related WP2022 amendment are not listed neither.

¹⁵ 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 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023
P Serv - Contract	5	2	3	4	3	3
P Supply - Contract	5	8	12	4	3	1
Pserv - Specific Contracts	29	60	26	23	17	35
PSupply - Specific Contracts	8	11	4	13	8	0

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 WP2023.
- 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%

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