PSD & DSD Project Board
April 1-2, 2025, Garching

Preparation of the Workplan Extension 2026/27

Gianfranco Federici

This presentation contains main elements of the strategy described in document Steps towards the Extension Work Plan 2026-27 - 2S7QUW supported by the Bureau

Acknowledge great support PMU Core Management and of all Administration Department. Thanks also to John Holden

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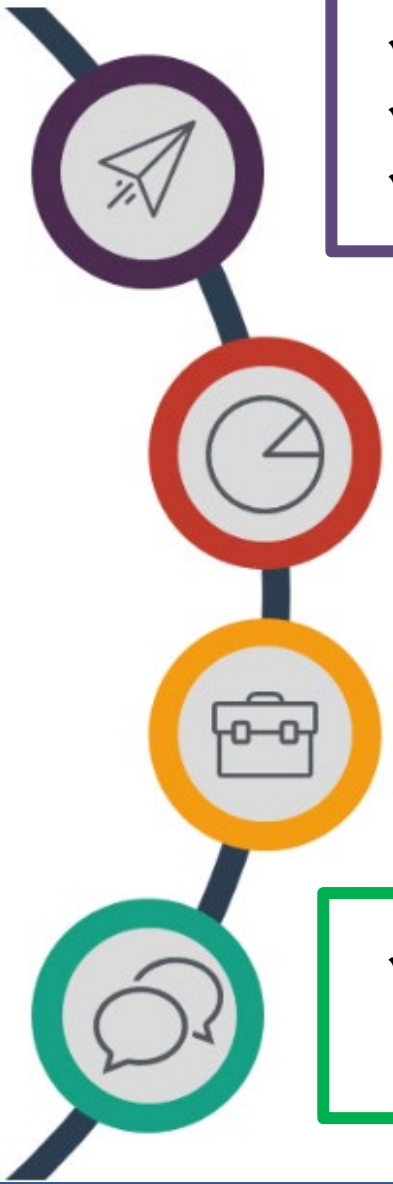

- ✓ Context and timeline
- ✓ EC Guidelines WP extension and funding
- ✓ Transitioning specific activities to the PPP by 2026

- ✓ Reorganization of PMU and Work Packages

- ✓ Budget envelope and cost saving goals
- ✓ Overview of cost savings (to date) and rationale

- ✓ Programmatic elements and priorities PSD and DSD (M. Wischmeier, F. Jenko)

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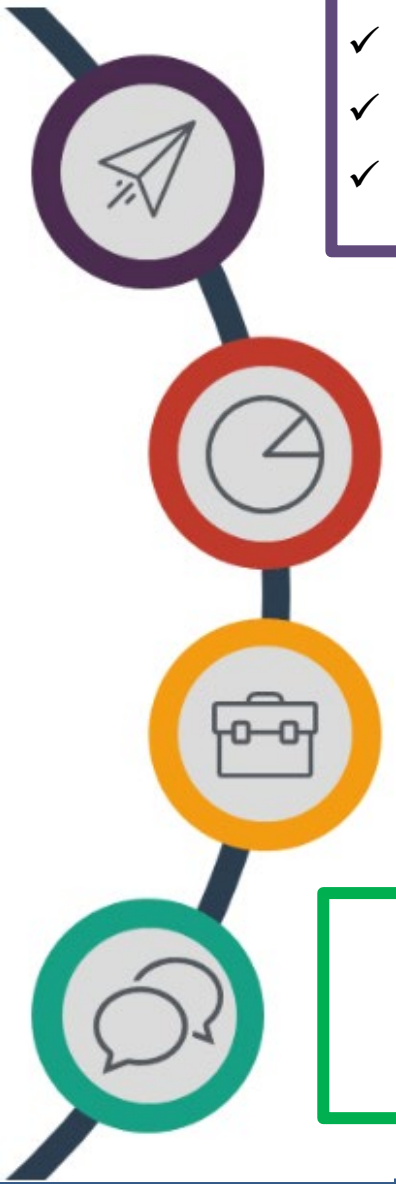


- ✓ Context and timeline
- ✓ EC Guidelines WP extension and funding
- ✓ Transitioning specific activities to the PPP by 2026

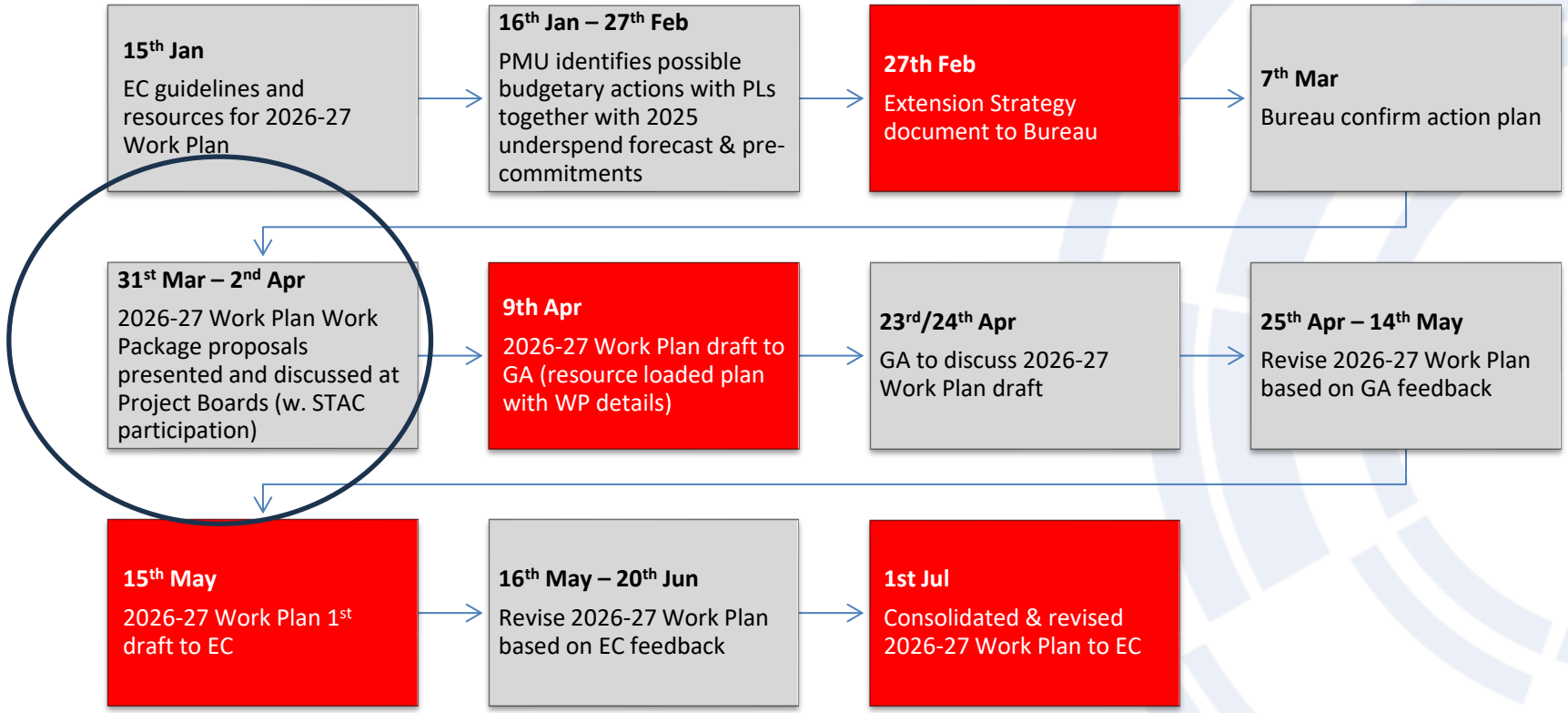
Context:

- **EUROfusion is faced with this budget cut and associated recommendations by the EC to streamline the programme, reprioritise activities, address inefficiencies and remove duplications.**
- The budget cut that the programme is facing is something that we cannot change, avoid, or position as a possible negotiation tactic for the future.
- There is a fundamental misunderstanding of what is perceived to be „a cut in the Science programme" vis-à-vis of a "transfer of technology task from EUROfusion to the PPP".
- PPP is not meant as taking over the work so far done within the EUROfusion Technology programme with additional industrial funds. Implement tasks necessary on the way to fusion power which require substantial industrial involvement and leadership and cannot be implemented within the current EF funding framework.
- Thus, the proposed cuts in the Technology program have a character that is not fundamentally different from those in the Science programme.

➔ we need to find our strengths in difficult times and ready to abandon the "comfort zone" otherwise we become isolated or irrelevant.

Timeline

- We need to have a **reasonable resource loaded Extension Work Plan** prepared for submission to the EC in 7 weeks, which must be presented, discussed and consented to by the GA in a month's time.



- **This must be done without knowing the exact evolution, timescales, and specifics of the establishment of a PPP and what project activities they will assume responsibility for.**

EC Recommendations/ Guidelines

The following recommendations and proposals were provided by the EC 15/1/2025:

1. **Streamlining EUROfusion Work Packages (WPs):** Consolidate current 26 WPs by:
   - Merge overlapping activities (e.g., WP TE-SA; WP ENR-PRD).
   - Restructure WPs that are overly complex or unclear (e.g., WP PrIO and WP PMU).
   - Discontinue those that no longer provide significant scientific value (e.g., WP PES, WP BOP, …).
   - Avoid double funding in activities also financed through direct collaboration with F4E or IO (e.g., IFMIF DONES, support to ITER (e.g., NBTF), and Broader Approach activities). A clear strategy should be defined with F4E and/or IO.
   - The (pre-) conceptual design of the VNS should be coordinated across all related activities and, if deemed appropriate, carried out under a single dedicated WP.

2. **Transitioning Specific Activities to the PPP by 2026:**
   - Identify WPs and activities suitable for integration into the forthcoming Co-Programmed PPP, focusing on stronger engineering than scientific research areas (e.g., VNS design activities once mature, magnet development, BB standardisation for future fusion plants, remote maintenance, safety and environment, selected aspects of training and education, and technology transfer).
   - First calls expected in Q2 2026 should aim to establish a stable and predictable ecosystem for industrial innovation.

3. **Establishing a New WP for Inertial Confinement Fusion (ICF):**
   - Create a dedicated WP for ICF with an appropriate budget allocation for 2026–2027.
   - Should focus on the conceptual design of a direct-drive, shock-ignition ICF facility, in line with the roadmap of the HiPER+ initiative.

EC Financial Guidelines

✓ **1+2 Budget Overview**

M€/y	2026	2027
Max EC contribution (55%)	140 (+ unspent 2021-2025)	
Expected payment	100 (70 + 30 – tbc – unspent)	70

✓ **3** A **<u>further budget</u>** (~80-100M€) for the upcoming PPP and innovation actions, including the EIC WP

✓ First call for this PPP*, expected in Q2 2026

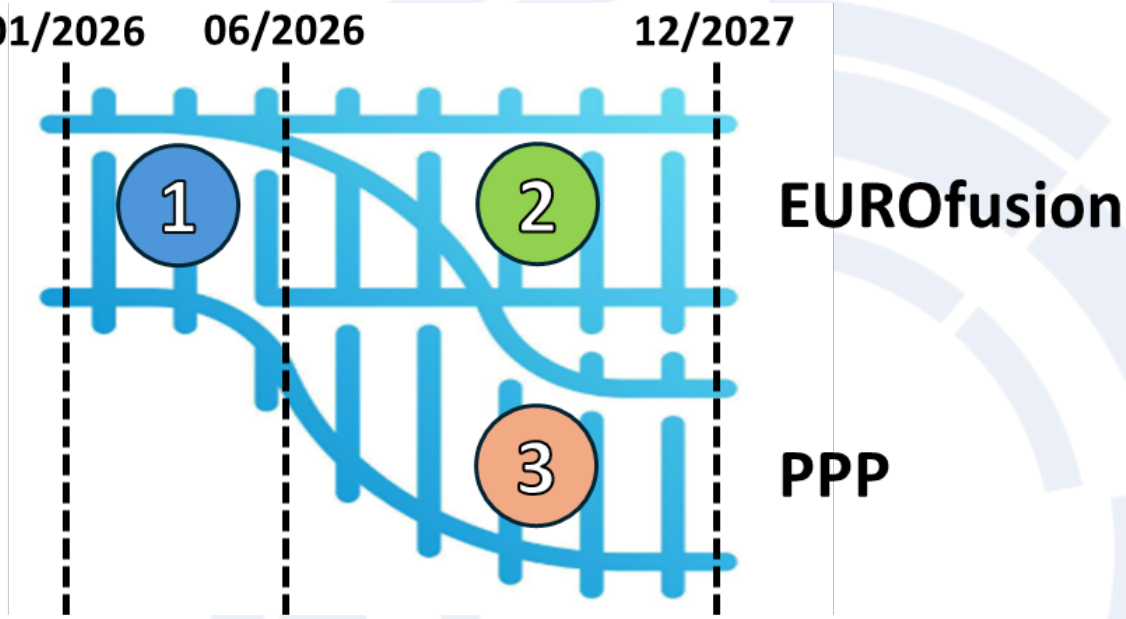
✓ Please be aware that the PPP is not meant as taking over the work so far done within the EF Technology programme with additional industrial funds. Rather, it is meant to allow the realization of additional tasks necessary on the way to fusion power which require substantial industrial involvement and leadership and cannot be implemented within the current EF funding framework,

- **WE ARE NOT SITTING IN THE DRIVE SEAT HERE ! Only thing we can do is to establish the best possible relationship with the GO4Fusion consortium to promote our future role in the new set-up**

*Note that the PPP calls will offer a 100% funding rate for eligible EF labs

Transitioning Specific Activities to the PPP by 2026

- Technology-based and project-oriented activities should be structured to facilitate their transfer to the industry-led PPP.
- Activities should be structured (in FTD) to allow their partial transfer to the PPP, involving the utilisation of critical testing and qualification facilities that remains in EUROfusion, together with the broad technology R&D activities will remain in EF.



- Design and Design Integration **(DID)** including DCT and WPDES (should transit as system design integrator in the industry-led PPP, **but continue until then in EF**).
- Relevant high TRL R&D on breeding blanket, fuel cycle, divertor, magnet, remote maintenance and materials should go to the PPP.

Criteria for transitioning need to be better defined.

Inertial Confinement Fusion

- ✓ FEG report emphasises the need to support alternative fusion concepts such as ICF.
- ✓ EC recommends a (new) WPICF with an appropriate budget allocation for 2026–2027.
- ✓ We need to look into this seriously! We cannot answer yes, but not now!
- ✓ Several meetings were organized to understand the scope of work – competent people and in good faith
- ✓ Scope of work: Feasibility study/ conceptual design of a direct-drive, shock-ignition ICF facility, in line with the roadmap of the HiPER+ initiative.
- ✓ Very large workforce composed of many scientists distributed in many laboratories around Europe
- ✓ Our assessment is that the execution foreseen scope of work would be rather difficult in a work package environment: calls, selection, IMS, resources, deliverables, reporting, PBs, STAC
- ✓ Not familiar with EUROfusion tools, procedures, timeline constraints
- ✓ **Use an ENR environment as the best compromise for 2026-27 (~20 FTE ~2.5 M€)**
- ✓ **Suggest to 1) help PI familiarize with EF admin and technical rules and involve/ report in PBs and STAC; 2) include one ICF independent expert in STAC to closely monitor and review this special ENR.**

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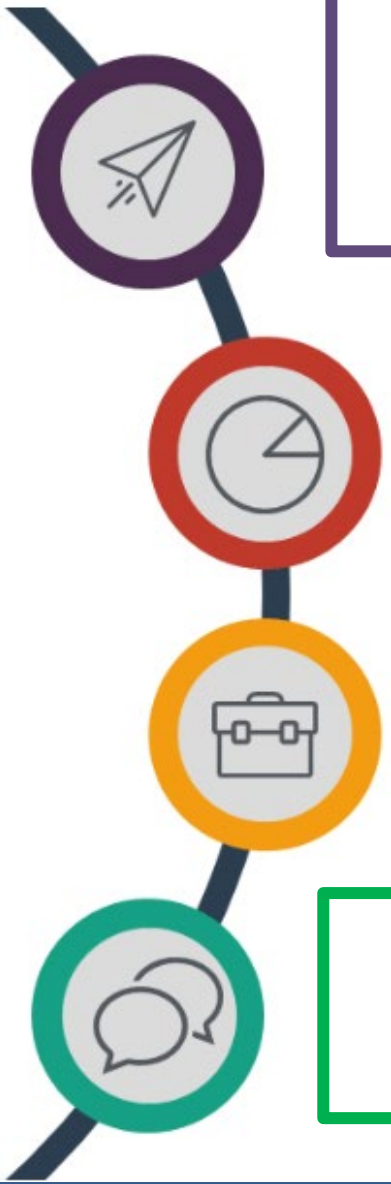


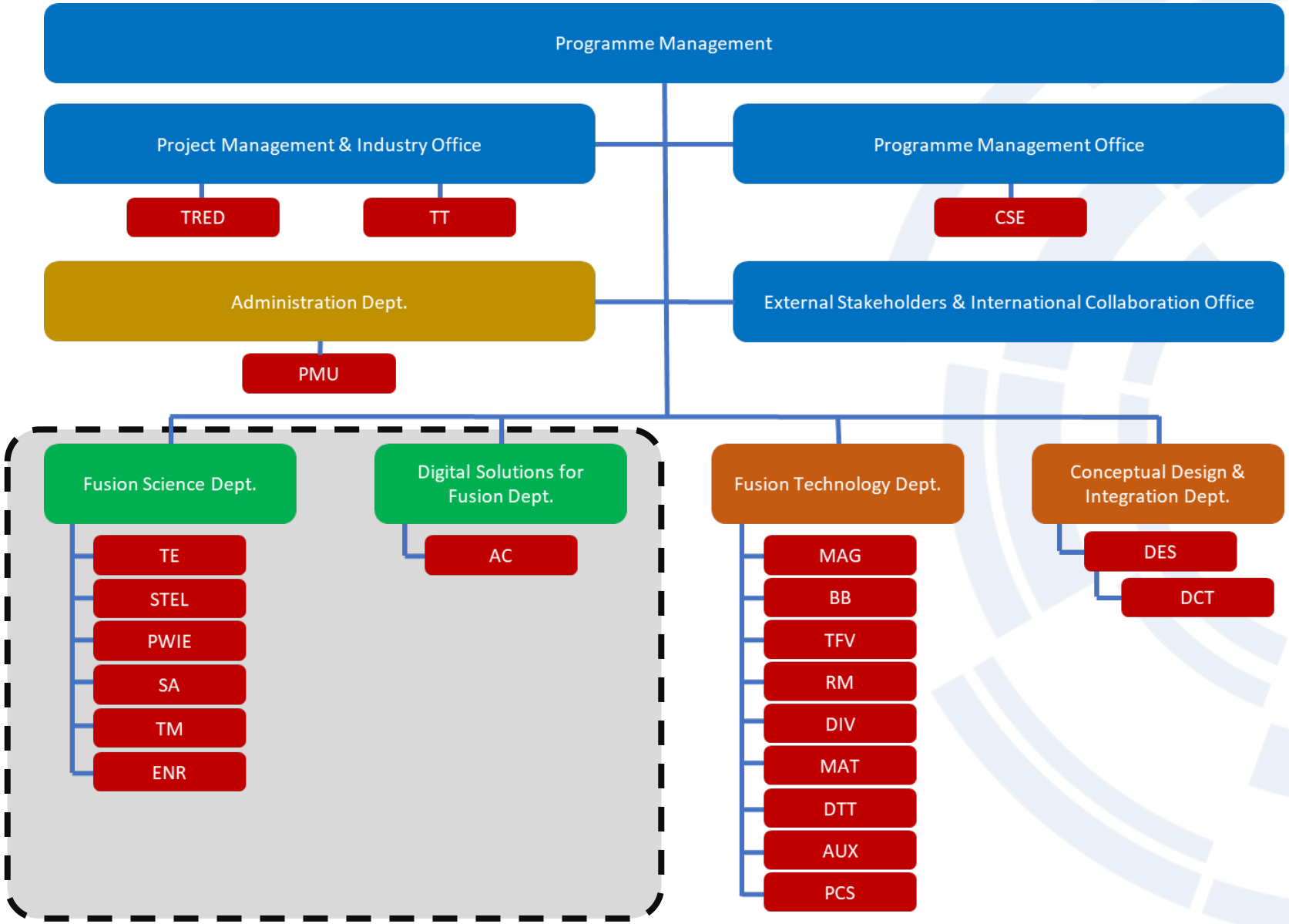
- ✓ Reorganization of PMU and Work Packages

WP consolidation rationale

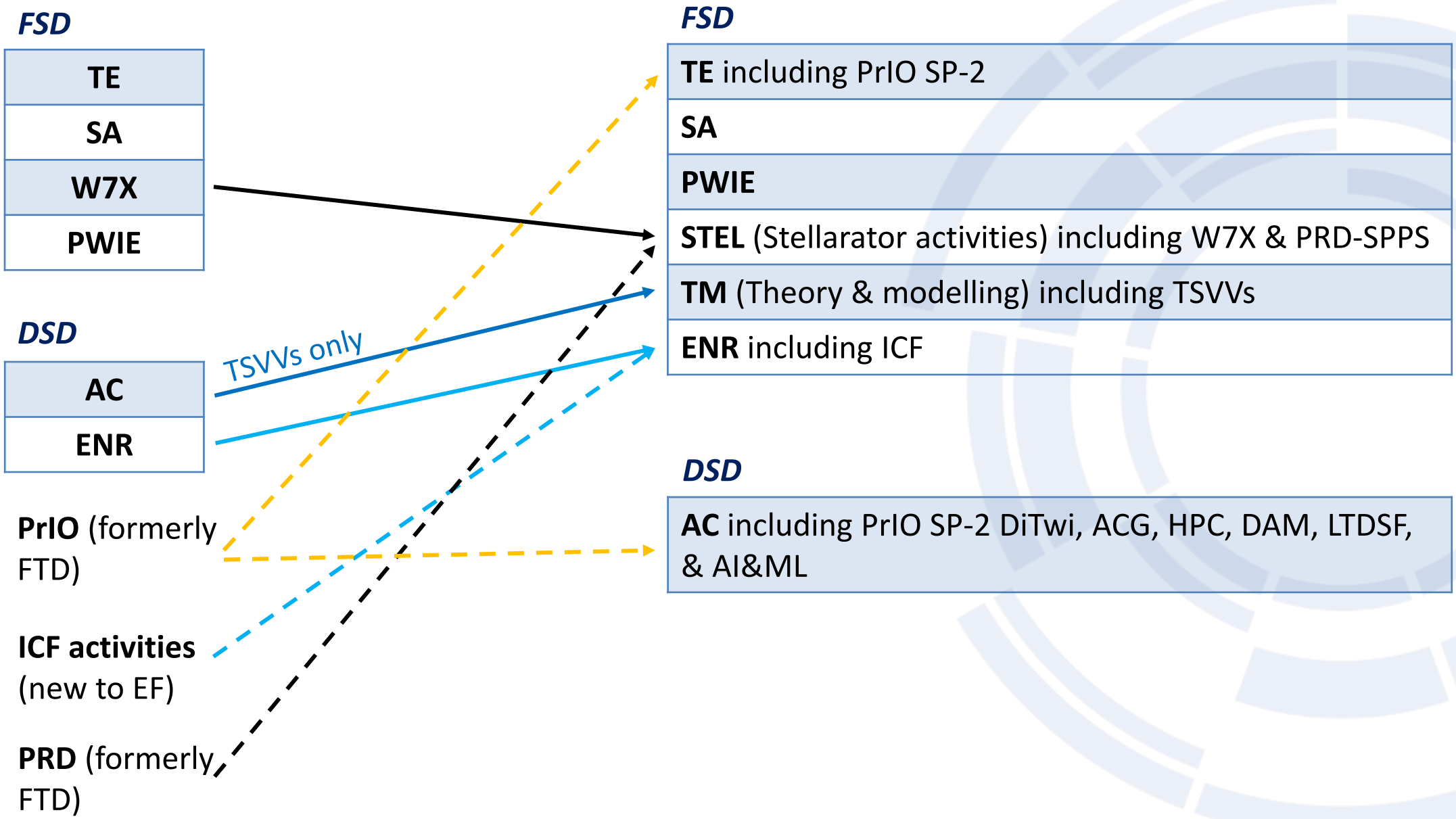
NB: Restructuring driven by European Commission recommendations

- **Improve departmental focus, particularly for DSD**
- **Merge overlapping activities/avoid duplications.**
  - WPDES will absolve WPSAE, neutronics analysis and DCT (from WPPMU).
  - Establish a new WPAUX Auxiliary Systems, merging WPDC & WPHCD, also reducing focus on relatively mature technologies.
  - Establish a new WPPCS Power Conversion Systems, merging WPBOP & WPPES, also reducing focus on relatively mature technologies.
  - Establish a new WPTM Theory & Modelling to combine most TSVVs
- **Restructure Work Packages (WPs) to reduce fragmentation or are overly complex.**
  - Development of innovative technologies/solutions will be managed directly in the relevant technology WPs under the responsibility of the relevant PLs, instead of in a standalone WPPRD (to be discontinued).
  - Improve the effectiveness and increase visibility of our collaboration with ITER. WPPrIO will be discontinued and the tasks implemented directly in the relevant WPs and coordinated by two high-profile Experts (one for Physics and one for Technology). They will mobilise, depending on the nature of the task, the proper competences and minimise risk of fragmentation and duplications of activities.
  - Establish WPSTEL Stellarator Activities to combine PRD SPPS activities with WPW7X to address effort to consolidate the design basis of stellarator plants
- **Avoid double-funding of activities**
  - WPAUX will manage the deployment of NBTF resources and WPMAT will manage the deployment of DONES resources (WPENS to be discontinued). EF provides support to the projects making available professional staff (including secondments to Padova and Granada) up to an agreed ppy ceiling.
- **Dedicated WP for important task for better management of financial commitment**
  - Establish a dedicated WPDTT Divertor Tokamak Test to manage the divertor procurement activities.
- **Establish a new WP for Inertial Confinement Fusion (ICF)**
  - Work stream for ICF outlined and merged with corresponding activities in WPENR, building upon the results of Enabling Research projects.
  - Contacts with the ICF community are established to clarify the scope of work.

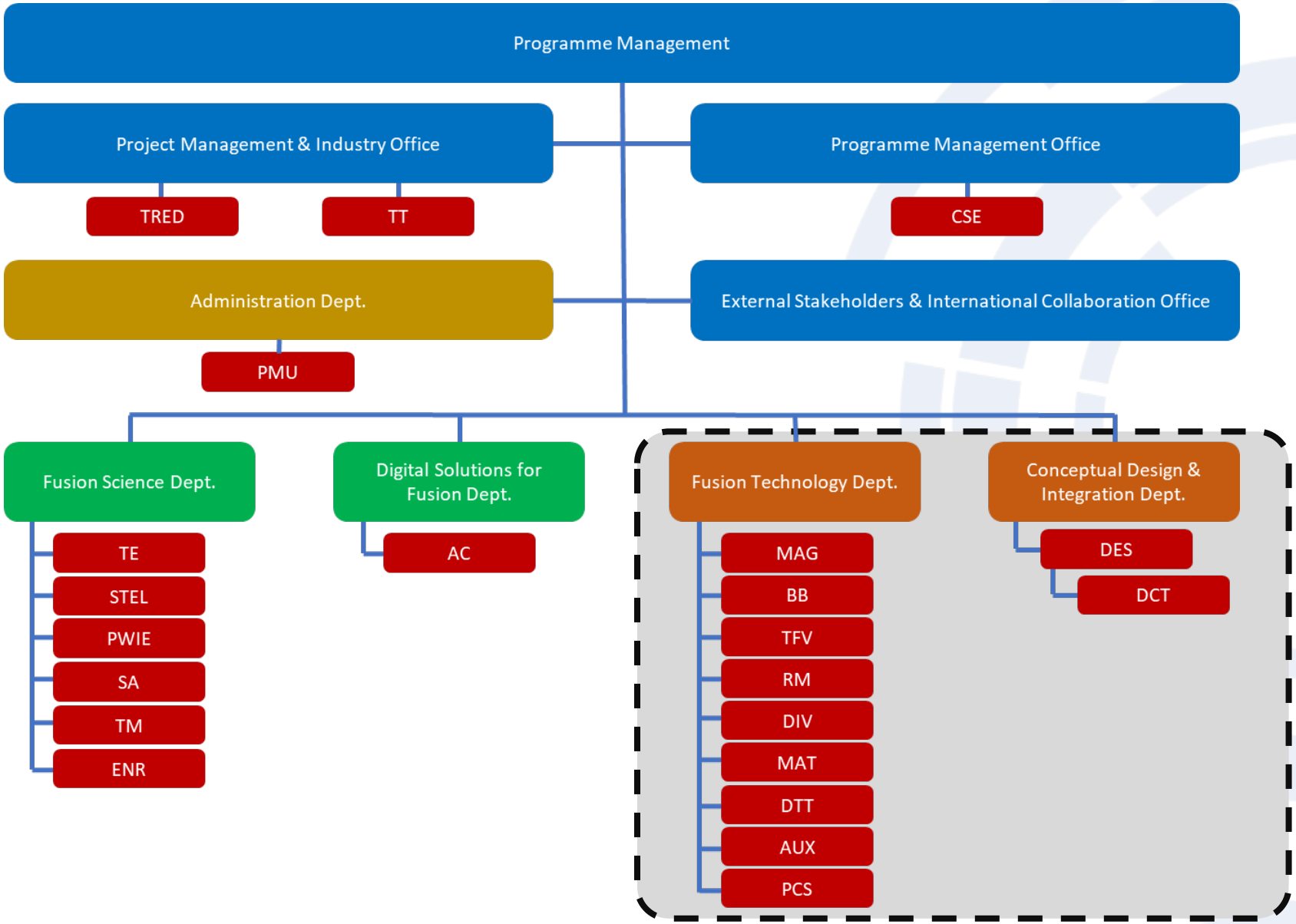
Revised PMU & WP organisation



WP consolidation

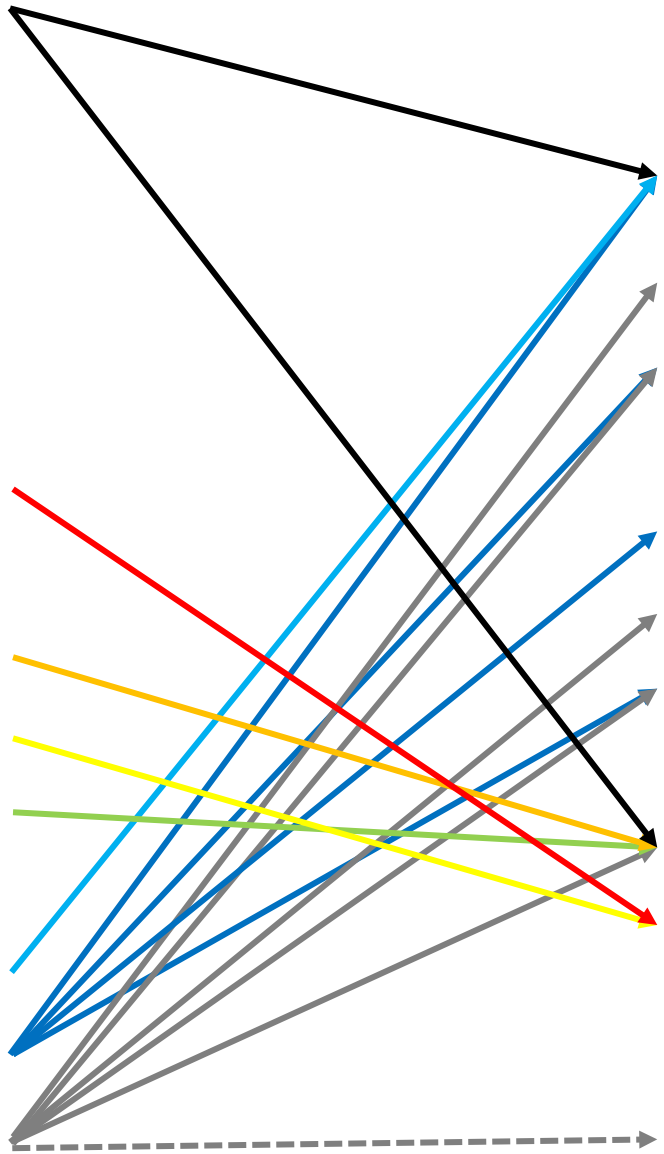


Revised PMU & WP organisation



WP consolidation

PrIO
DES
MAG
BB
TFV
RM
PES
DIV
HCD
BoP
DC
MAT
SAE
ENS
PRD



DES includes DCT, SAE, ENS engineering & PrIO SP-5 (ITER support on neutronics, nuclear waste & safety)
MAG includes PRD-MAG
BB includes PRD-BB & ENS medium flux irrad. Module
TFV
RM includes ENS RH equipment design & validation
DIV includes PRD-LMD
MAT includes PRD-MAT & ENS
DTT (Divertor Test Tokamak)
AUX (Aux. Systems) includes DC, HCD, PRD-HCD, PrIO SP-3&4
PCS (Power Conversion Systems) includes BOP & PES

STEL (in Fusion Science Dept.) includes PRD-SPPS

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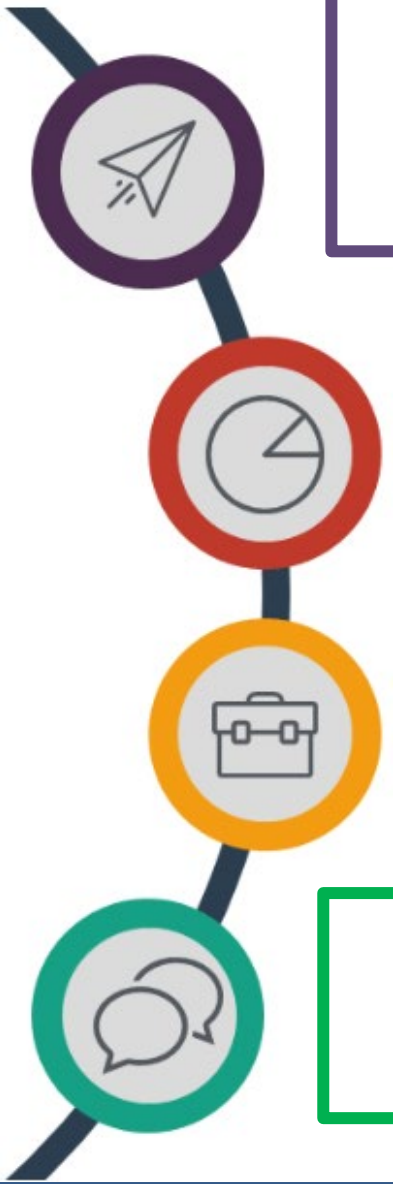


- ✓ Budget envelope and cost saving goals
- ✓ Overview of cost savings (to date) and rationale

Budget envelope: 1st projection

Bureau Meeting on 7th March 2025

First projection of the 2026-27 budget presented at the Bureau = ~ 248.5M€.

This did not consider financial impact on the rationalisation of the work packages (aggregation and reduction of scope) proposed in the strategy document and it did not include resources for the new WP ICF.

Committed budget for 2026-27 = ~43.8M€.

It includes FP8 commitments (PEX Projects AUG, WEST and FZJ), HPC costs, DTT budget, irradiation contract under WPMAT, Remote Handling facility, TE Enhancement projects, ERG and EEG launched in previous years and still running in 2026-27.

Unspent budget 2021-25 ~43.1M€.

ALL FIGURES ARE EC CONTRIBUTION (55%)

Budget Pre-commitments

Committed budget for 2026-27: ~43.8M€ (EC Contribution).

		M€ EC55%	
FP8	PEX Projects (AUG, WEST, FZJ)	4.4	Depreciation and PM costs for projects delayed
FP9	HPC	12.25	New HPC
FP9	DTT	16.63*	Reduction of overall contribution
FP9	MAT Subcontr. N Irradiation	1.41	Transport costs
FP9	BBRH facility	3.47	Investment launched in 2024
FP9	TE Enhancement projects	2.33	Projects launched in 2024
FP9	TRED-TRA	2.79	ERG-EEG launched in previous years
FP9	Long Term Data Storage	0.55	Action launched in 2025

Budget Unspent

Unspent budget 2021-25 ~43.1M€ (EC contribution).

Major items >1M€	M€ (EC55%)
EFPL reserve	21.4
HPC	6.8
PMU/DCT staff, CoU, Host Support, Publications costs	4.1
TE (AUG op./campaigns)	1.7
MAT (subcontr., irradiation & PM)	1.6
AC (LTDS & ACH)	1.5
TRED-TRA	1.1

Estimate updated after the Bureau: 43.8M€.

Unused resources also in BOP, PES, TFV, BB, HDC, PrIO, ENS, and other WPs

1st Budget projection

First projection (including EPFL) amount to **248.5M€ EC** against an available budget of ~**183.1M€** (140M€ from EC + 43.1M€ unspent). **Shortfall 65.4M€**

	Sum of Total Resources (k€)	Sum of Cons. Contr. (CC)	Sum of EC (Commission Contr.)
FP8 Commitment	8,001	2,574	4,401
New Task	372,084	214,448	204,646
FP9 Commitment	71,714	52,867	39,442
Grand Total	**451,799**	**269,889**	**248,490**

- The calculation of 204.6M€ EC for new tasks in the 2026-27 work plan is based on the yearly average budget (2/5 of EC in 2021-25 without UK) of all WPs.
- The average does not include funds for new investments (WL, STEAM, HELOKA-US, DIPAK, DTT, BBRH), PEX, TE Enhancements, HPC.
- WPPMU, INCO, TT, COMM reduced (closer to actual)
- WPTRED-TRA forecast for 10 ERG and 15 EEG tbd
- WPTRED-EDU as in 2025
- Resources for ICF not included

Budget Tokamaks and Stellarator Operation

- At the Bureau Meeting it was discussed the level of the Budget for the operation of Tokamaks and Stellarator
- Depending on assumption on machine operation time for EUROfusion the shortfall varies from 66M€ to 80M€ !
- It was proposed to increase the Budget in the projection from **22.1M€ EC** (2/5 of EC contr. in 2021-25) **to 30M€ EC**
- Under this assumption ~8M€ EC had to be added to the budget projection, bringing the overall budget to 256.5M€ (**Shortfall 73.4M€**)

The bottom line

- How to absorb **74 M€ shortfall ?**
- **30 M€ cuts** in Technology/ Design
- **14 M€ cuts** in Physics
- **30 M€** overbudget

The approach was supported by the Bureau, to be further developed in consultation with the Task Force and Project Leadership, Project Boards, STAC and the Beneficiaries.

Towards a revised Budget envelope

- After the Bureau PM, HoDs and Admin in interaction with TFLS, PLs, E-TASC SC, developed a new budget plan aiming to re-organizing the Work Packages, defining the scope of the work plan 2026-27 and to addressing the budget shortfall with the application of budget cuts.

- In the meantime, the following corrections/modifications to the budget plan have been done:
  - Correction average budget WPRM (+2.9M€)
  - Addition budget for ICF (+2.5M€)
  - Removal AR from machine operation (-8.9M€)

- Application of budget cuts (to date):
  - -13.5M€ Physics
  - -32.3M€ Technology/Design

Budget envelope: 2nd projection

2nd projection (including EPFL) amounts to **207.1M€ EC** against an available budget of **~183.8M€** (140M€ from EC + 43.8M€ unspent). **Overbudgeting 23.3M€ EC**

	Sum of Total Resources (k€)	Sum of Cons. Contr. (CC)	Sum of EC (Commission Contr.)
FP8 Commitment	8,001	2,574	4,401
New Task	299,047	183,320	164,476
FP9 Commitment	69,613	51,933	38,287
Grand Total	**376,662**	**237,827**	**207,164**

Internal percentage 63.1%

- High Risk of shortfall resulting from overbudgeting, which in terms of Consortium Contribution is ~54M€.
- Revision of internal funding rates (?)
- GA in April to approve criteria for the re-distribution of a potential shortfall.

Budget Cuts in PSD (~9.2 M€): Rationale

- Retain present unique **Stellarator activity** (participation level and access to operational time as in 2024/2025):
  - ~2.87Mio Euro/yr instead of projected average of 2.5Mio Euro/yr ➔ **0.74Mio Euro increase** (1M€-2x28PM from PRD)
- Assume **JT-60SA is not transferred to F4E**, estimate for 2026/2027 exploitation of JT-60SA ongoing (not yet included in budget estimate by admin from 2021-2025 average):
  - **Save 1Mio Euro in WP SA → 1.2 Mio Euro budget for 2yr**
- Assume for **TE enhancements** only high priority and priority deviced between compass-U and prio 2:
  - estimated **saving 1.3 Mio Euro → 1.0 Mio Euro budget for 26/27**
- Assume **WP TE** analysis of JET data (presently 25-30% of total WP TE participation budget) reduced by 50% and general TE participation because of lack of human resources is reduced by 15%; End of AI projects; Reduce Missions by 10%, reduction of 27% of WP TE participation:
  - estimated **saving 2.74 Mio Euro** (3M€-2x28PM from W7X which received budget from PRD)
- Assume **PWIE** activities reduced by **0.7 Mio Euro**
- **4.2 Mio Euro saved in operation of tokamaks and stellarator compared to the 30Mio Euro budget assumed for operating devices presented at the Bureau**

See PSD presentation Marco Wischmeier

Budget Cuts in PSD (~4.3 M€): : Rationale

- Consolidate the TSVV ecosystem: Several TSVVs reaching maturity could transition to a new implementation phase, prioritizing code application over continued code development.
- Reduce ACH support currently allocated to software from mature TSVVs.
- Restrict ACH tasks to TSVV-developed software, discontinuing support for non-TSVV requests.
- Apply comparable cuts across all other DSD activities (apart from hardware investments).

See DSD presentation Frank Jenko

Budget summary (old WPs)

New version 28.03.2025 with cuts applied

	Sum of Total Resources (k€)	Sum of Cons. Contr. (CC)	Sum of EC (Commission Contr.)
WP01-TE	**56,028**	**36,703**	**30,815**
FP8 Commitment	5,671	1,642	3,119
New Task	17,111	9,165	9,411
New Task Machine Operation	31,107	24,885	17,109
FP9 Commitment	2,139	1,010	1,176
WP02-SA	**2,178**	**1,289**	**1,198**
New Task	2,178	1,289	1,198
WP03-W7X	**26,388**	**18,144**	**14,513**
New Task	10,431	5,378	5,737
New Task Machine Operation	15,957	12,766	8,776
WP04-AC	**41,934**	**25,954**	**23,064**
New Task	18,660	10,140	10,263
FP9 Commitment	23,275	15,815	12,801
WP05-PWIE	**15,268**	**7,797**	**8,397**
FP8 Commitment	2,330	932	1,282
New Task	12,938	6,865	7,116
WP07-ENR	**16,964**	**8,452**	**9,330**
New Task	16,964	8,452	9,330
Grand Total	**158,760**	**98,340**	**87,318**

REDUCTIONS

	Sum of Total Resources (k€)	Sum of Cons. Contr. (CC)	Sum of EC (Commission Contr.)
WP01-TE	**-10,107**	**21,385**	**-5,559**
FP8 Commitment	0	0	0
New Task	-5,249	-2,566	-2,887
New Task Machine Operation	-2,758	24,885	-1,517
FP9 Commitment	-2,100	-934	-1,155
WP02-SA	**-1,818**	**-792**	**-1,000**
New Task	-1,818	-792	-1,000
WP03-W7X	**-3,539**	**13,726**	**-1,946**
New Task	1,312	960	722
New Task Machine Operation	-4,851	12,766	-2,668
WP04-AC	**-7,839**	**-3,804**	**-4,311**
New Task	-7,839	-3,804	-4,311
FP9 Commitment	0	0	0
WP05-PWIE	**-1,273**	**-338**	**-700**
FP8 Commitment	0	0	0
New Task	-1,273	-338	-700
WP07-ENR	**0**	**0**	**0**
New Task	0	0	0
Grand Total	**-24,575**	**30,177**	**-13,517**

Reduction of machine operation in comparison with the assumed 30M€ budget discussed at the Bureau (now 25.8M€)

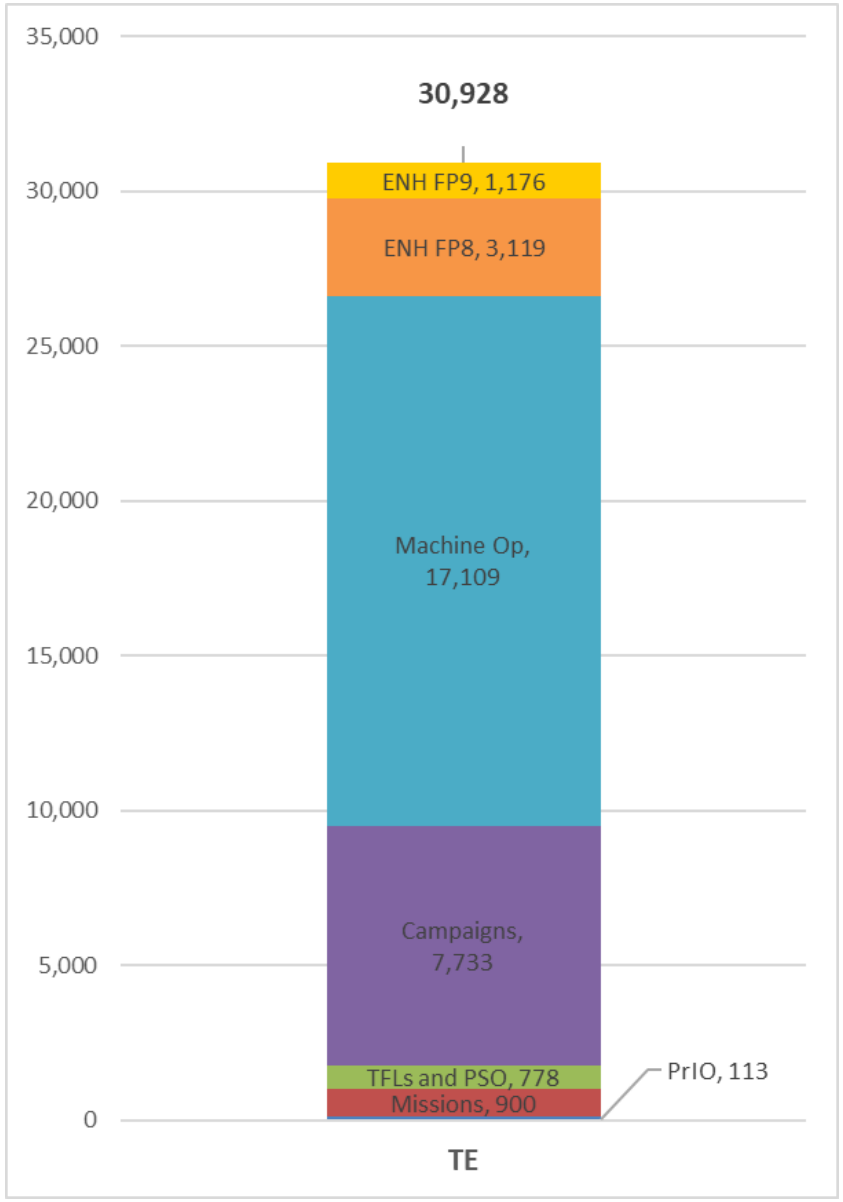
TE Enhancement projects

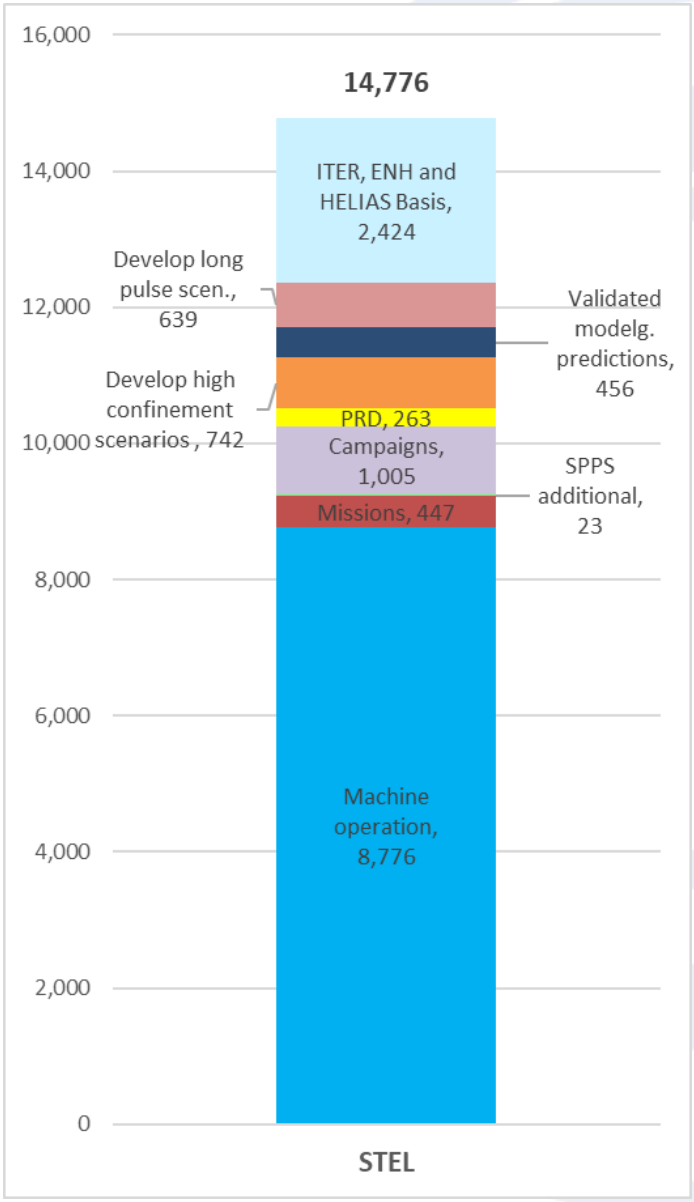
Budget summary (new WPs)

	Sum of Total Resources (k€)	Sum of Cons. Contr. (CC)	Sum of EC (Commission Contr.)
AC	**31,583**	**20,732**	**17,371**
WP04-AC	30,985	20,433	17,042
WP06-PrIO	598	299	329
ENR	**16,964**	**8,452**	**9,330**
WP07-ENR	16,964	8,452	9,330
PWIE	**15,268**	**7,797**	**8,397**
WP05-PWIE	15,268	7,797	8,397
SA	**2,178**	**1,289**	**1,198**
WP02-SA	2,178	1,289	1,198
STEL	**26,866**	**18,383**	**14,776**
WP03-W7X	26,388	18,144	14,513
WP21-PRD	478	239	263
TE	**56,233**	**36,806**	**30,928**
WP01-TE	56,028	36,703	30,815
WP06-PrIO	205	103	113
TM	**10,949**	**5,522**	**6,022**
WP04-AC	10,949	5,522	6,022
Grand Total	**160,041**	**98,981**	**88,023**

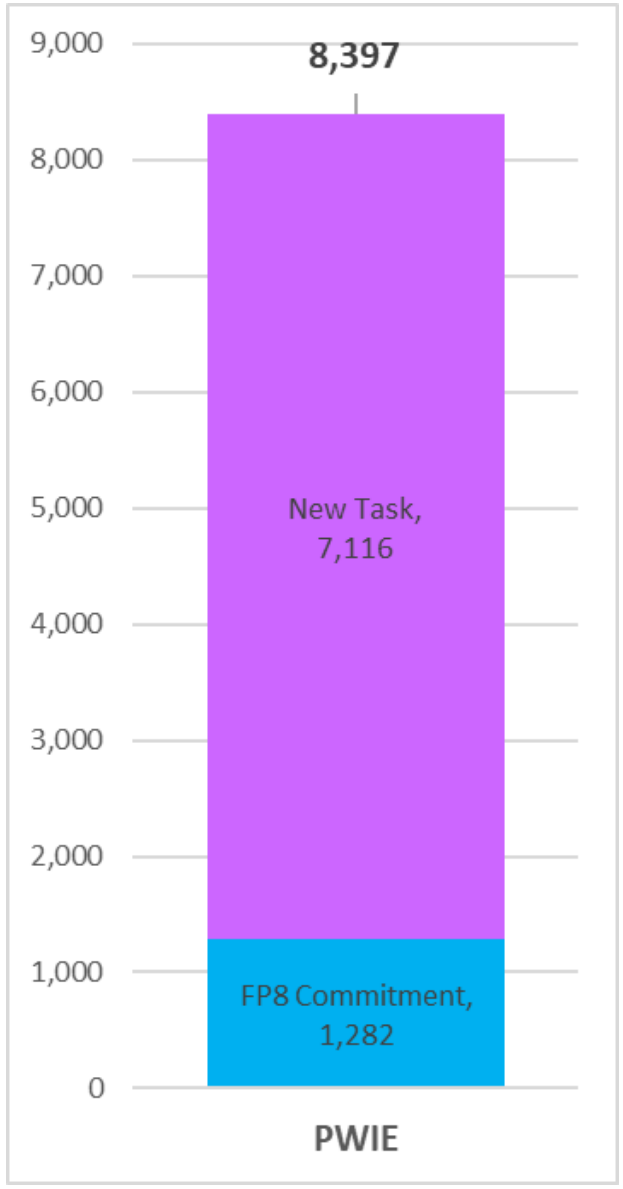
Total slightly higher than previous slide as resources from PrIO moved to AC and TE, and from PRD to STEL.

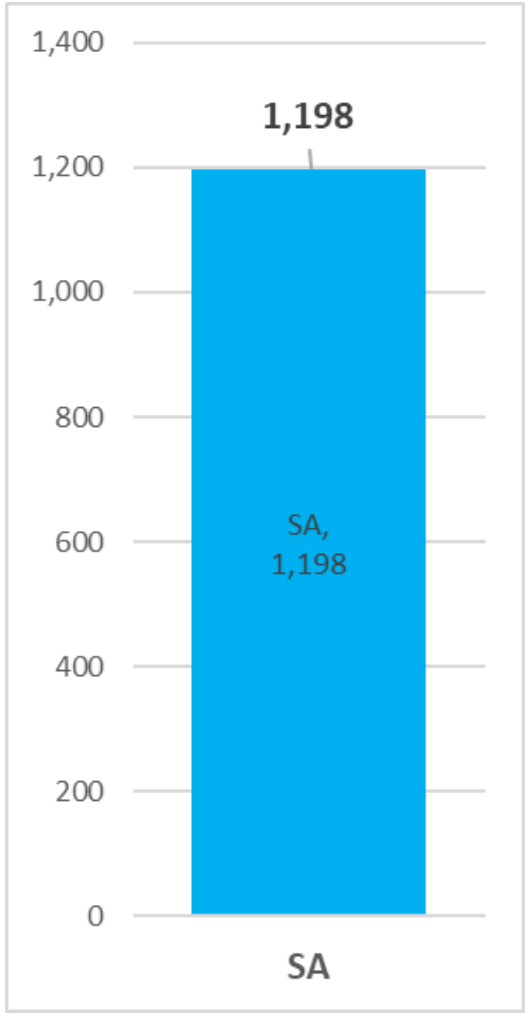
New WPs budget outlook 1/3

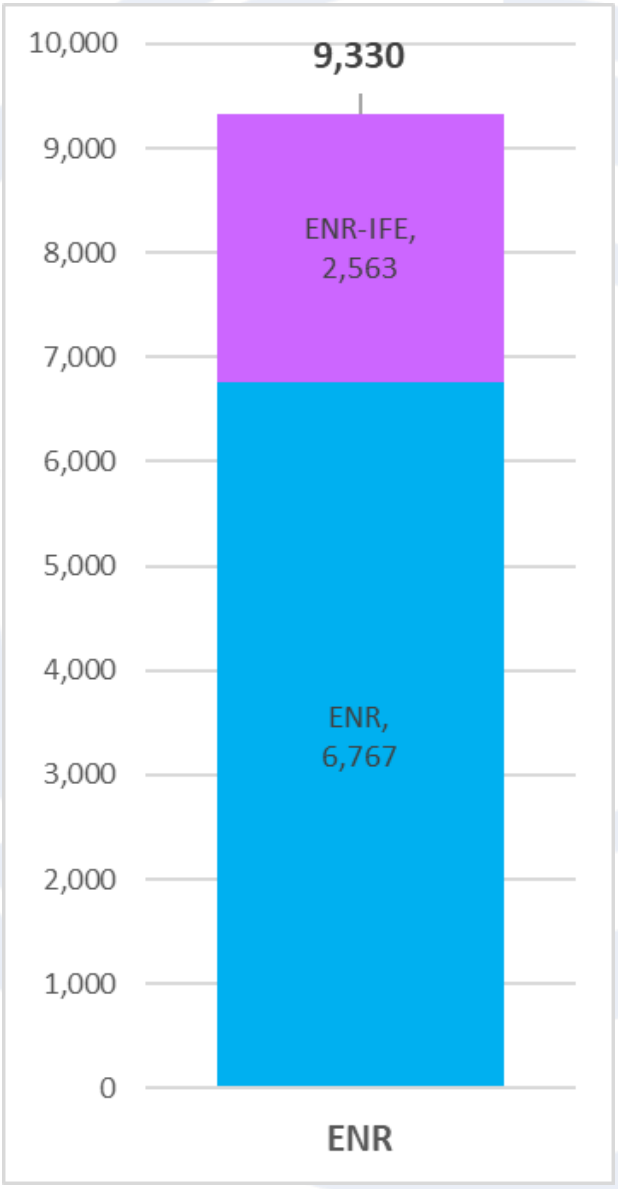




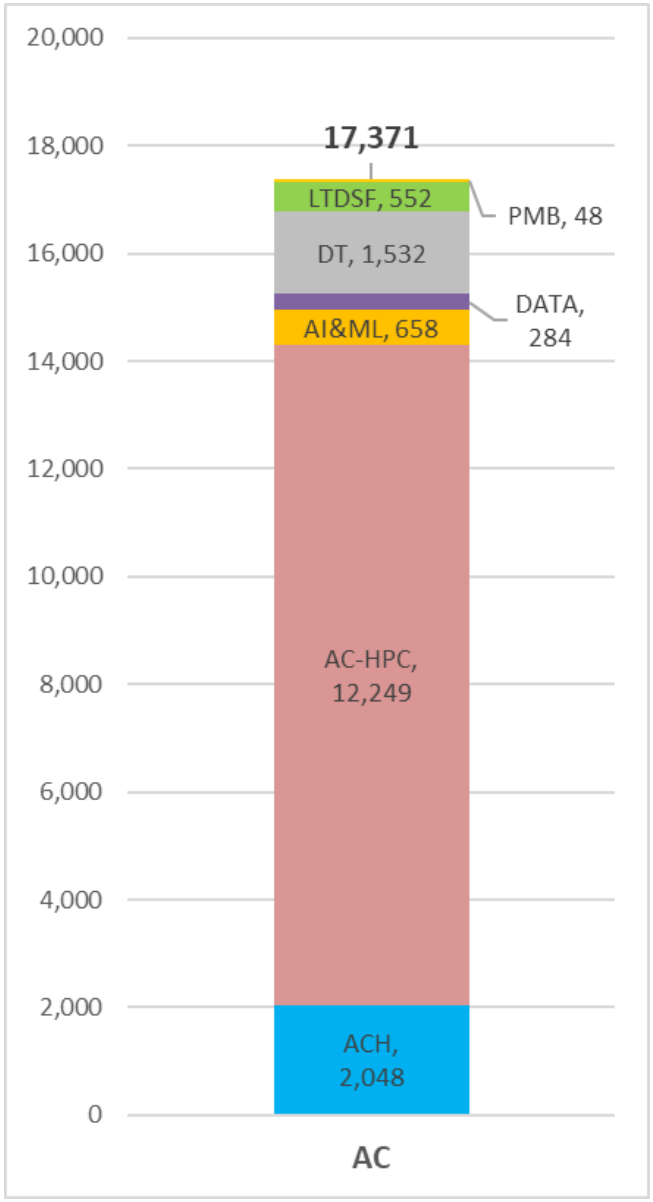
New WPs budget outlook 2/3

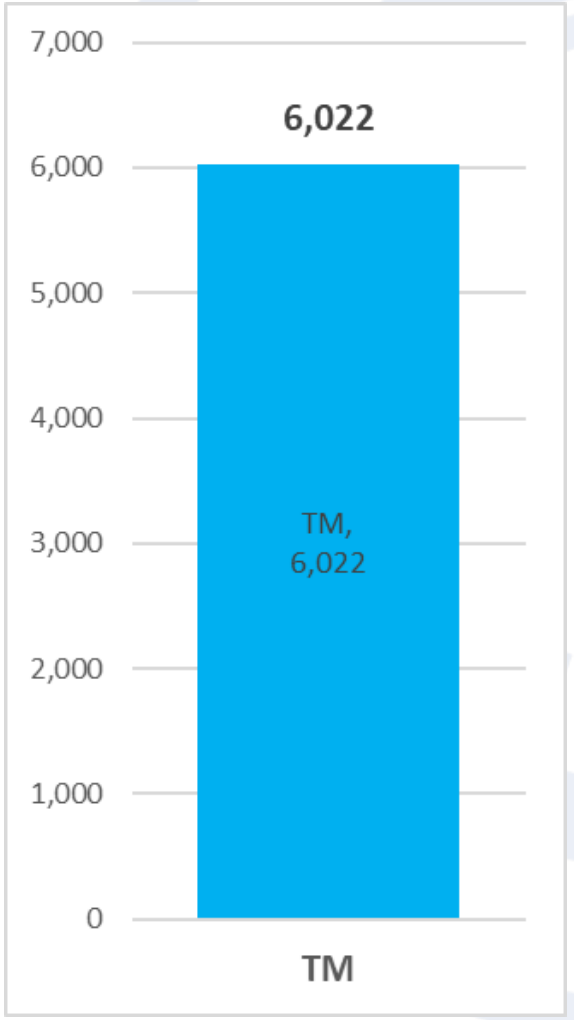






New WPs budget outlook 3/3





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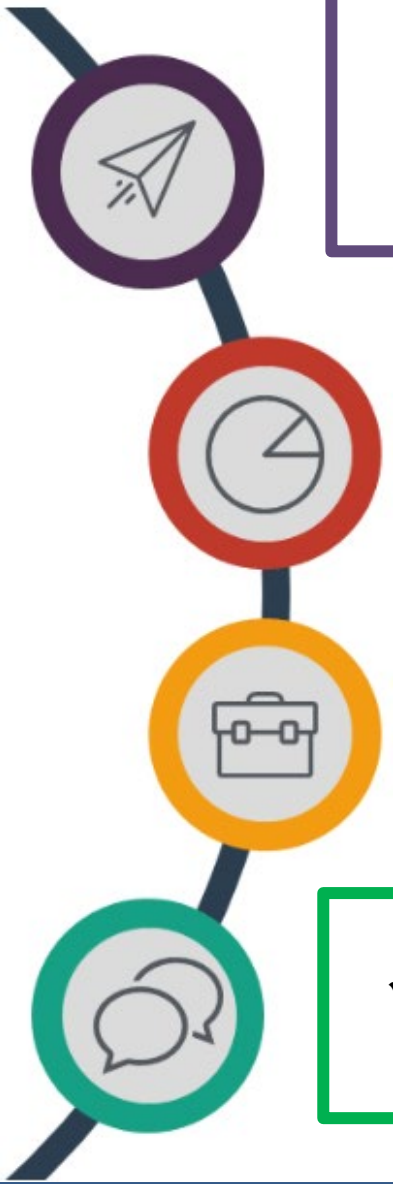

- ✓ Programmatic elements and priorities PSD and DSD (M. Wischmeier, F. Jenko)