EUROPEAN
PLASMA RESEARCH
ACCELERATOR WITH
EXCELLENCE IN
APPLICATIONS

EuPRAXIA@SPARC_LAB - 1st Cost&Schedule Review Meeting

Part II

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Monitoring & Control

How we intend to build EuPRAXIA@SPARC_LAB.

How we intend to monitor & control the implementation.

EVM

How we intend to monitor & control the deliverables

Asset & Configuration management

Monitoring & Control

The implementation phase is a O(100M€) project over a long period. It consists of the procurement, integration, assembly and installation of a very large number of equipments –> System complexity is very high.

It requires a solid framework for monitoring and control a risk assessment.

Earned Value Management methodology seems to be most natural choice. Based on the experience we are developing with the EuAPS project we are now in the process to build up a (hopefully) robust EVM framework.

Note that there's no tool available in the institute to implement such methodology. Therefore not only we have to implement an EVM methodology but also design all the tools and processes.

Monitoring & Control

EuAPS project is a good example on how external boundary conditions impose the implementation of technical choices in the Project Management.

22,5 M€ / 30 months / financial and physical accounting every 2 months / all the tender to be adjudicated in the first year.

Given the aggressive requirements we had to start from scratch to build up a solid framework of monitoring and control (EVM).

Monitoring & Control

Earned Value Management

Some constraints and boundary conditions have to be considered once approaching the implementation of the EVM methodology in our context.

1. NOT TECHNICALLY POSSIBLE to evaluate the actual effort of a single person on the project

2. Hardware based EVM + Follow up of the FTE allocated on personal basis.

3. Actual costs for each WP at the moment are very risky to calculate. It requires a manual procedure from the Business Intelligence application. An automatic procedure to extract the actual cost for each WP is under discussion and hopefully can be implemented in the next years.

Monitoring & Control Tools

We have to rely on the e-tools available at INFN. This heavily relies on Microsoft Tools: Office, MProject for the web, power BI, Sharepoint, Power Automate

Some of them are quite new: training is in progress and will be further strengthen in 2024.

We are exploring the possibility to set up a consultancy contract with MProject expert to set up a robust EVM framework using MProject and PowerBI.

GOAL: Automatic (i.e. reproducible and repeatable) process to extract all the relevant data about project advancement. KPI and Dashboard production.

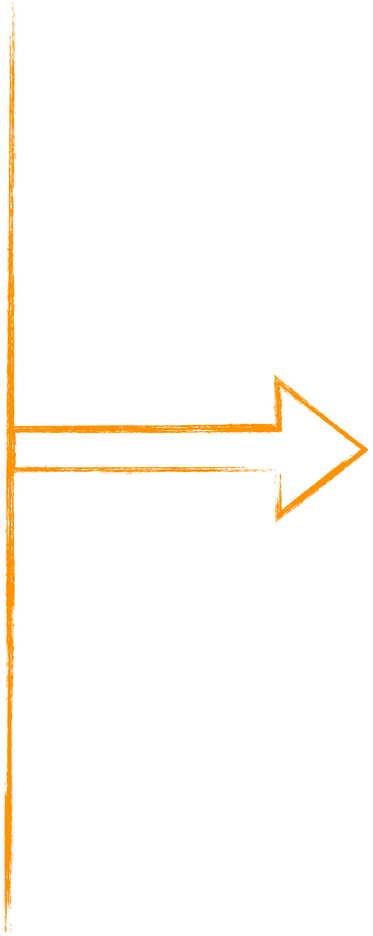
Monitoring & Control

PBS & Configuration - Deliverable baseline

WBS Loaded - Work needed to produce the deliverable and FTE allocated

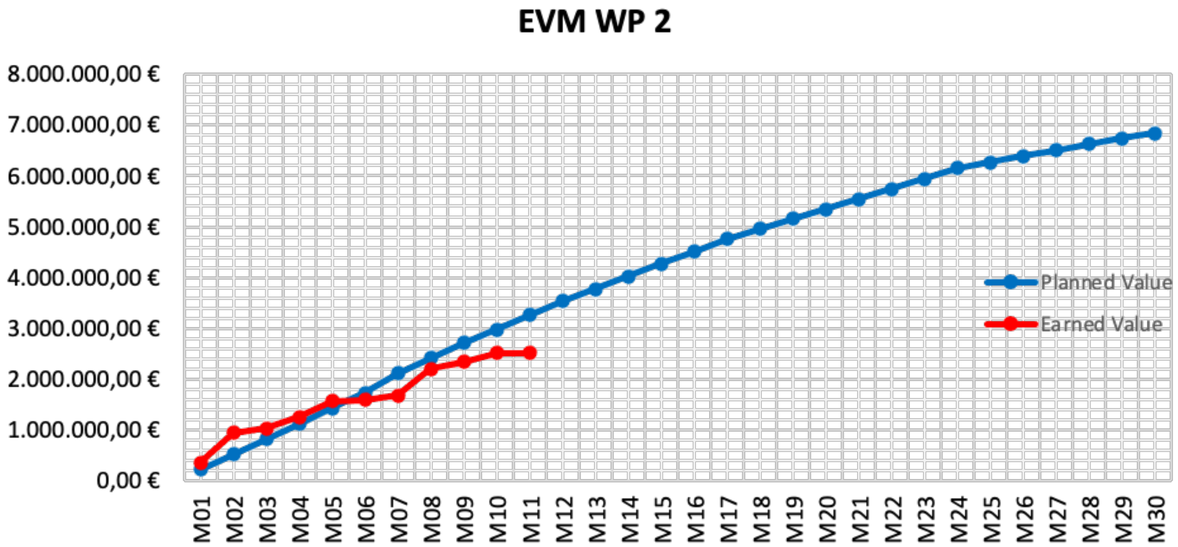
Time Schedule

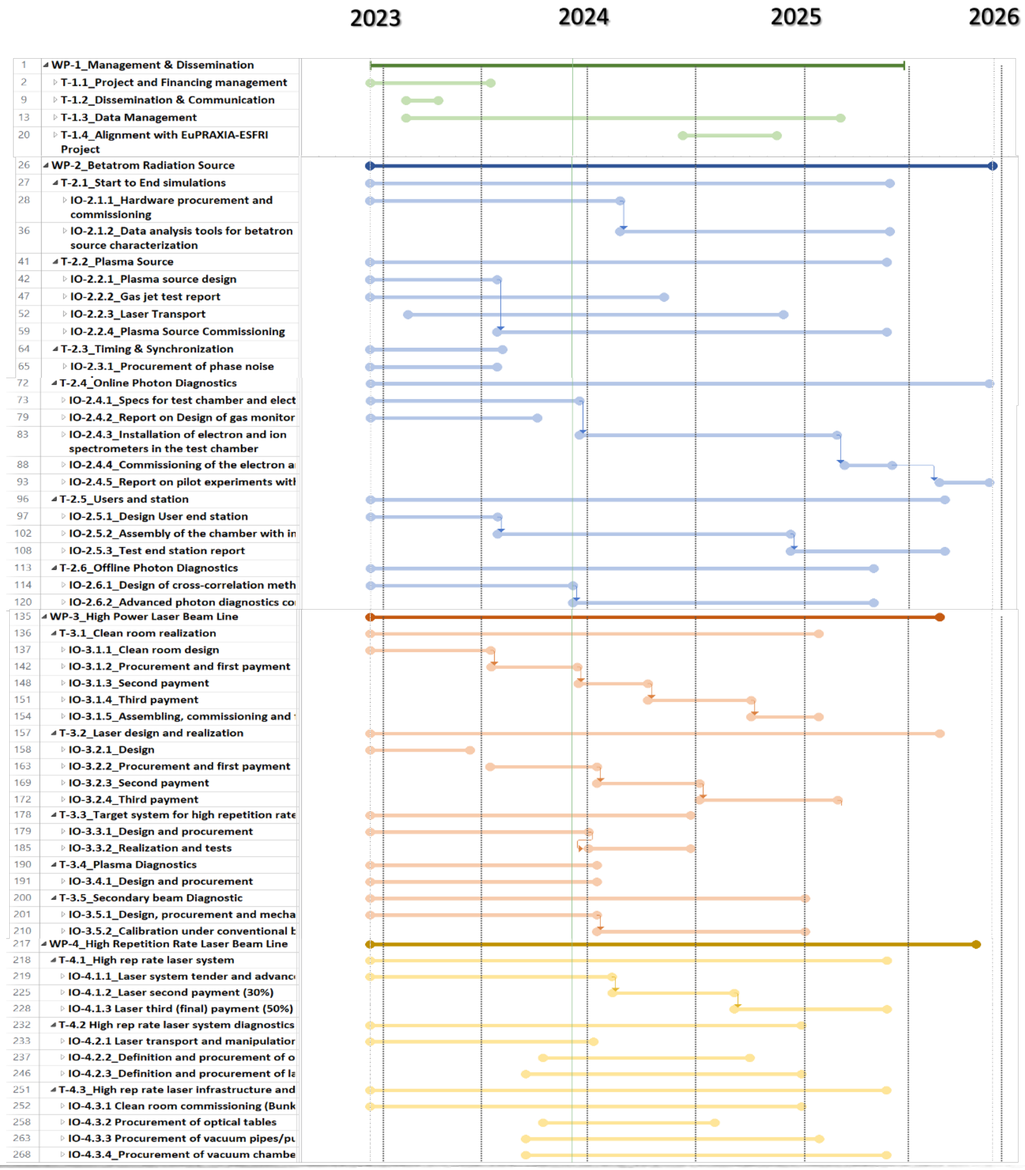
PLANNED VALUE (Which include PBS and WBS Cost)



PROJECT INTEGRATED BASELINE

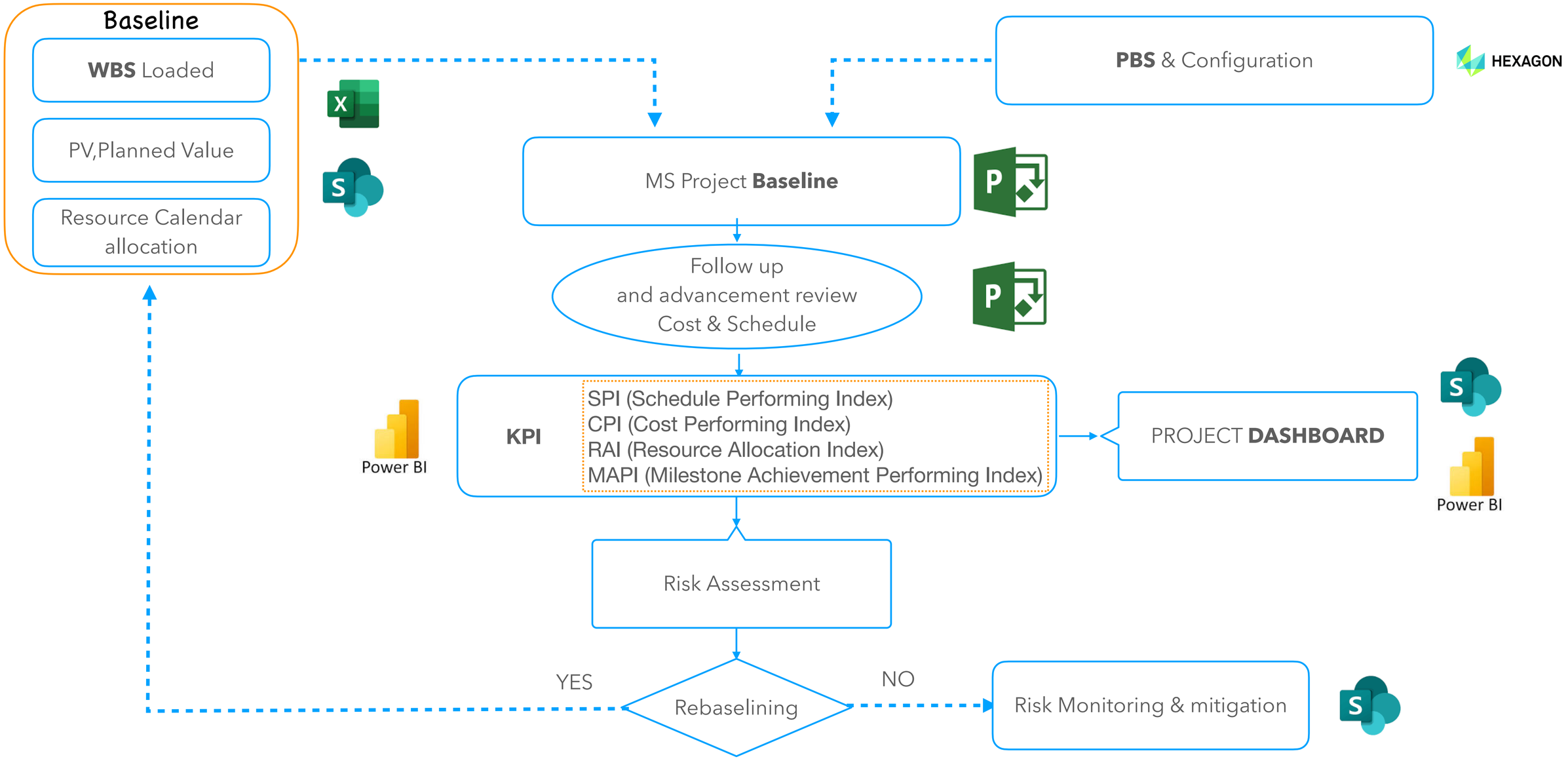
Monitoring & Control





- Resource units reasonably allocated on subtasks (PV)
- Regular Bi-weekly updates (% Complete)
- Standard rate: Purchasing costs/100 and applied according to activity duration on sub-tasks
- Actual costs manually added after payments of invoices.

Earned Value Management Framework



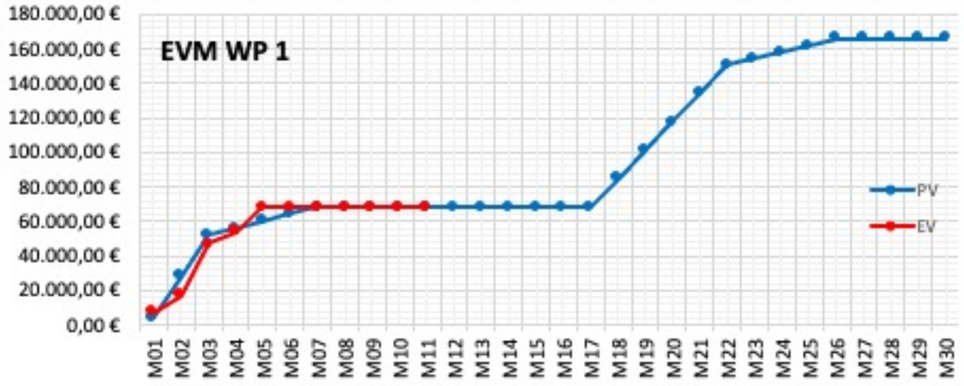
Earned Value Management Framework

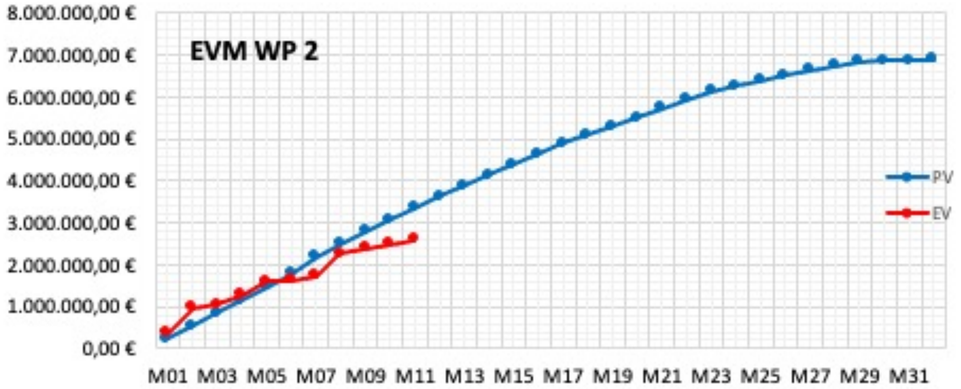
The advancement is assessed through regular follow up.
The degree of advancement of each intermediate objectives is calculated in the following way in order to avoid personal bias and poor accuracy (–> Systematic error instead of random error).

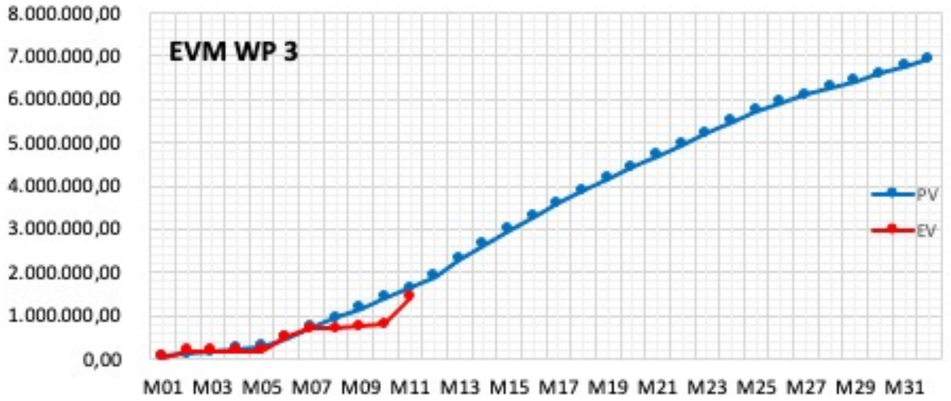
Activity Status	% of Advacement
Activity not started yet	0%
Activity started and preliminary results	25%
Activity started and consolidated results	50%
Activity started, final results but not completed yet	75%
Activity completed	100%

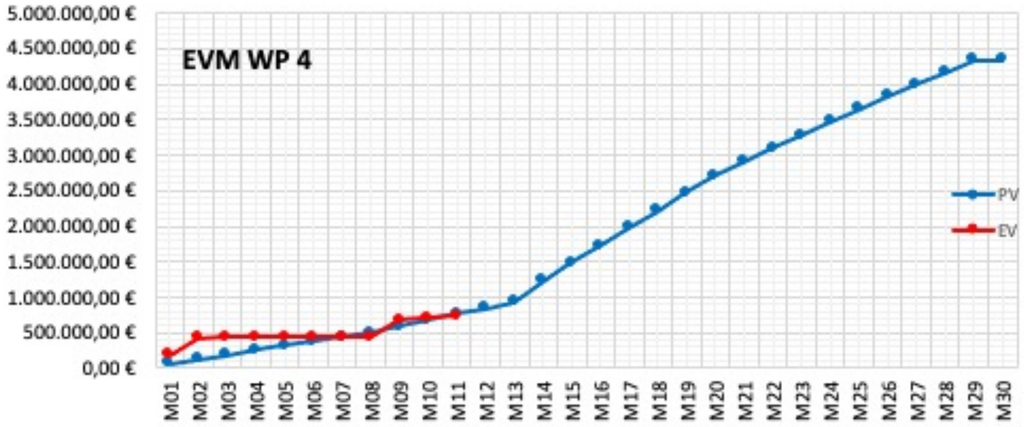
Although the unavoidable approximation, so far it provided quite good results in terms of ability to assess the overall advancement of the project and production of reliable KPI.

Typical Project Dashboard

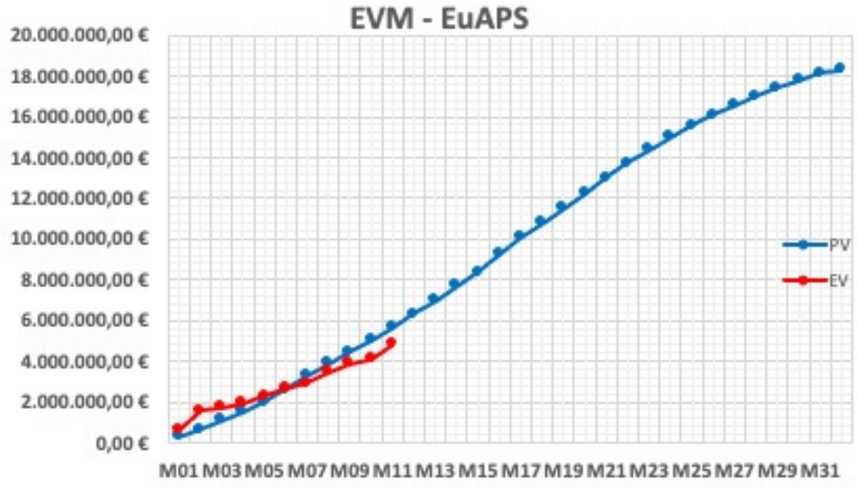


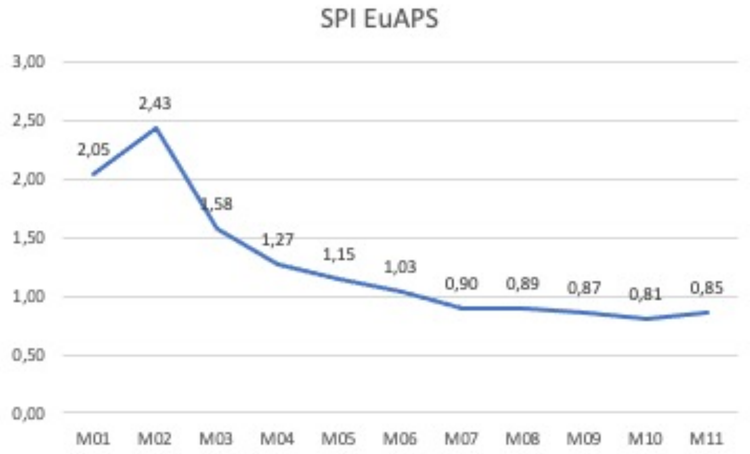


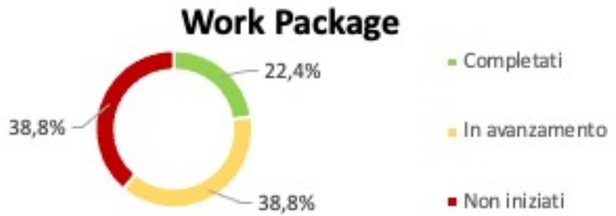


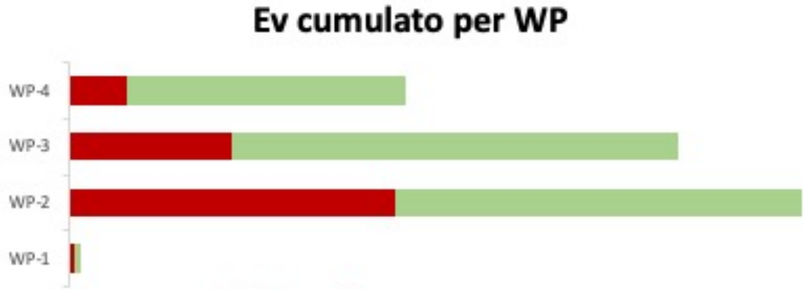


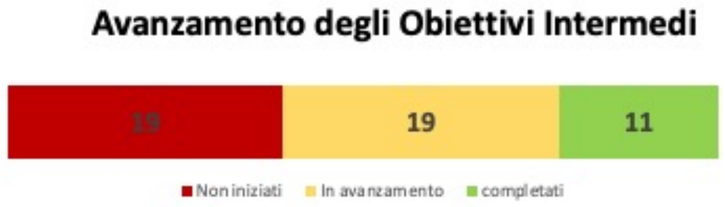
Typical Project Dashboard







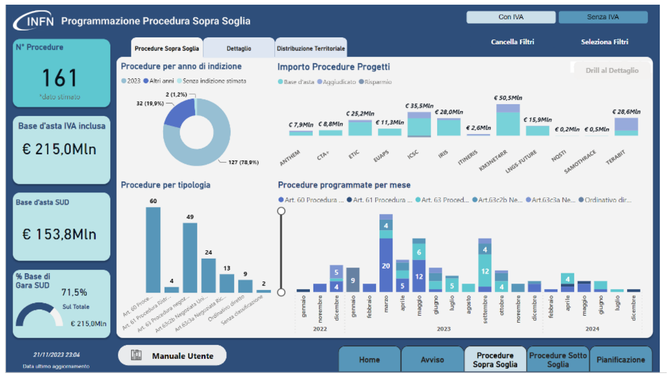




Relevant KPI automatic produced at each advancement step.

Actual Cost and Committed cost manually introduced.

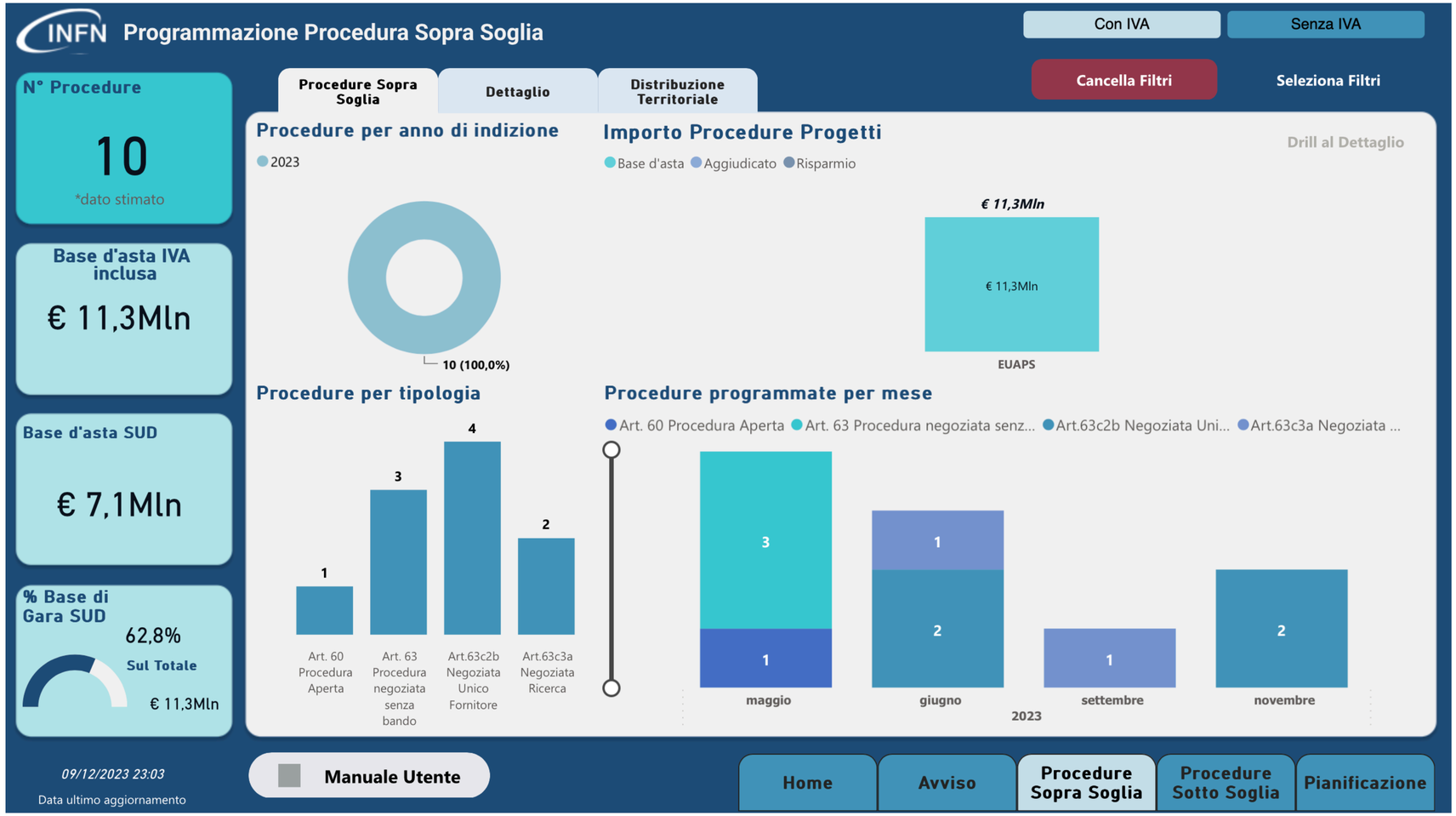
All the information are shared in Sharepoint within the team and with the PNRR working group (cabina di regia) to collect the information coming from ALL the PNRR Projects.



Typical Project Dashboard

Financial information at the moment are not correlated with the global EVM but are registered and monitored manually. KPI and Dashboard are also produced.

So far actual cost are very marginal.



Asset & Configuration Management

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Asset & Configuration management

Asset & Configuration Management

The functional layout was developed using Viso Professional of Microsoft Office 365 as the project software. The purpose of the functional layout is to give an immediate overview of machine elements in order to help to plan and to implement machine components that will be after listed in a specifics database.

In addition the functional layout helps for the identification of each object and its functionality in the machine.

Overall its main use can be summarized as follow:

- Machine configuration management and naming convention;
- Components database management Machine
- Components management related to ancillary elements (power supplies, cabling, controller, DAQ, etc…
- Budget management

System engineering

Beam Optics simulations

Components layout

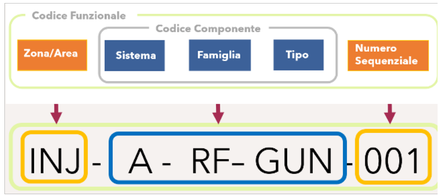
Name Assignment

3D Mechanical Layout

Functional Layout

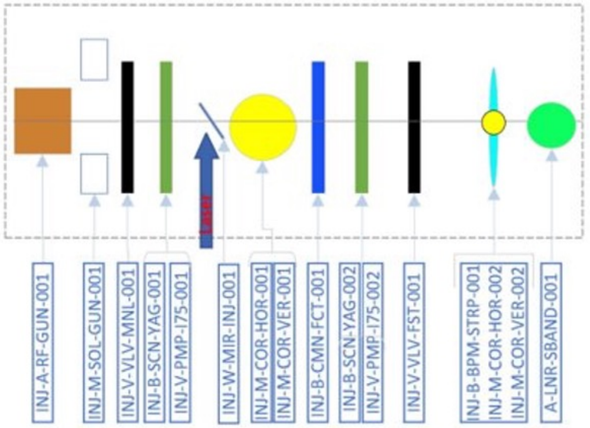
Component Code:

Functional Code:



It identifies the system as such. Identical components may have the same code.

Additional fields that determine the uniqueness of the component by identifying the zone or area of the machine where it is installed and where the component acquires its functionality.

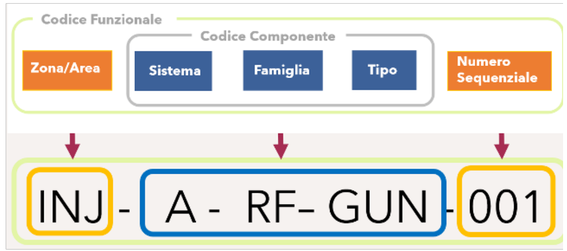


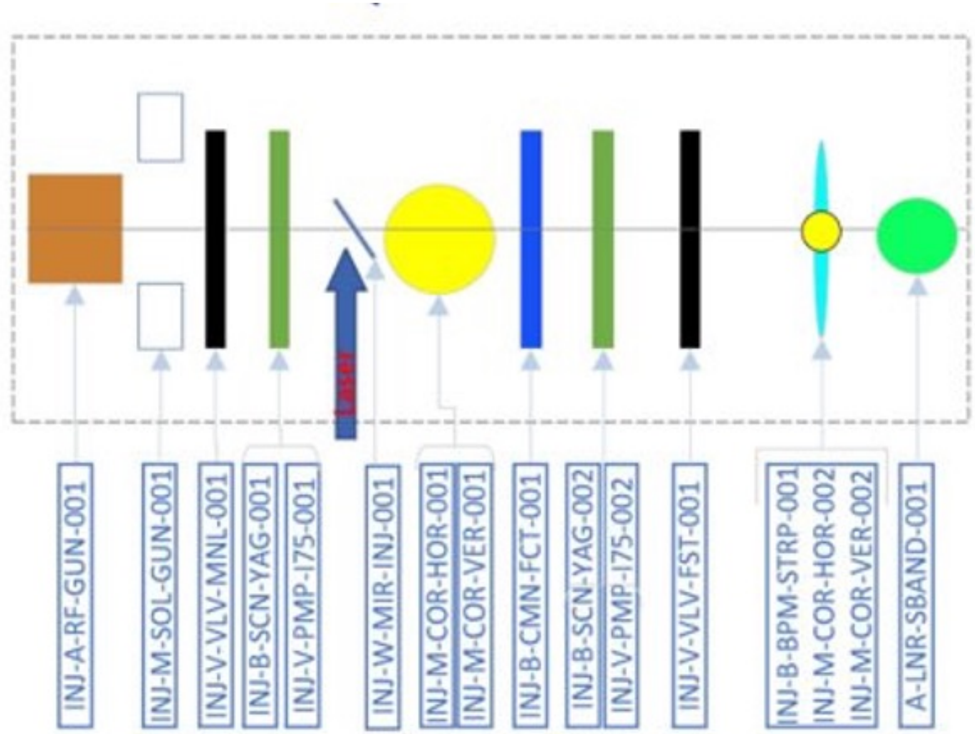
System engineering

The hierarchical structure of the components database makes the PBS which is then reflected in the WBS.

Each item of the PBS is then associated with the corresponding attributes:

- Data
- Requirements
- Specifications
- Interfaces
- Vendors
- QTY
- Etc…

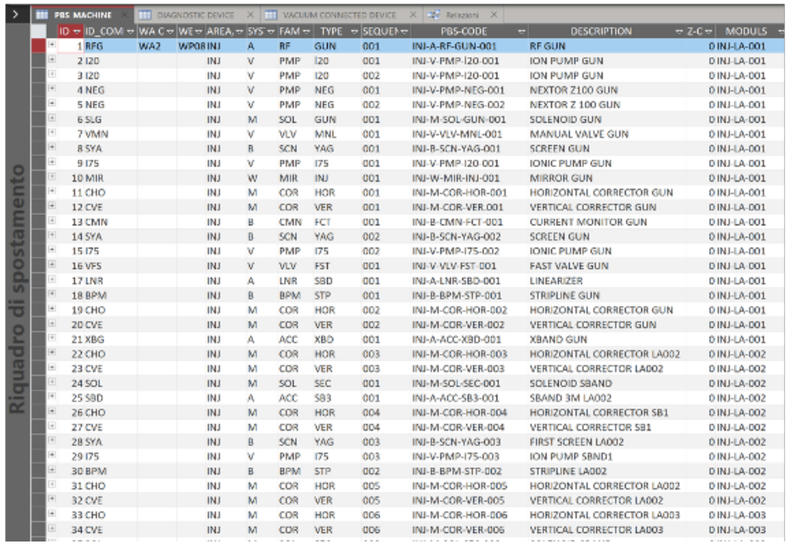




System engineering

Using specific software as a database (e.g. Hexagon INFOR-EAM), it is possible to create relationships between the various tables that collect requirements and components related to machine elements, so as to identify for each individual element the auxiliary components necessary at the proper operation and control as well as visualize all the components in the machine through the CAD interface. For each component therefore is possible to identified a specifics codes and attributes such as:

- UUID Code
- PBS Code
- WBS Code
- Moduls
- Longitudinal coordinate
- Type of connectors
- Facility requirements (water flow, electrical power)
- Costs
- Status
- Suppliers

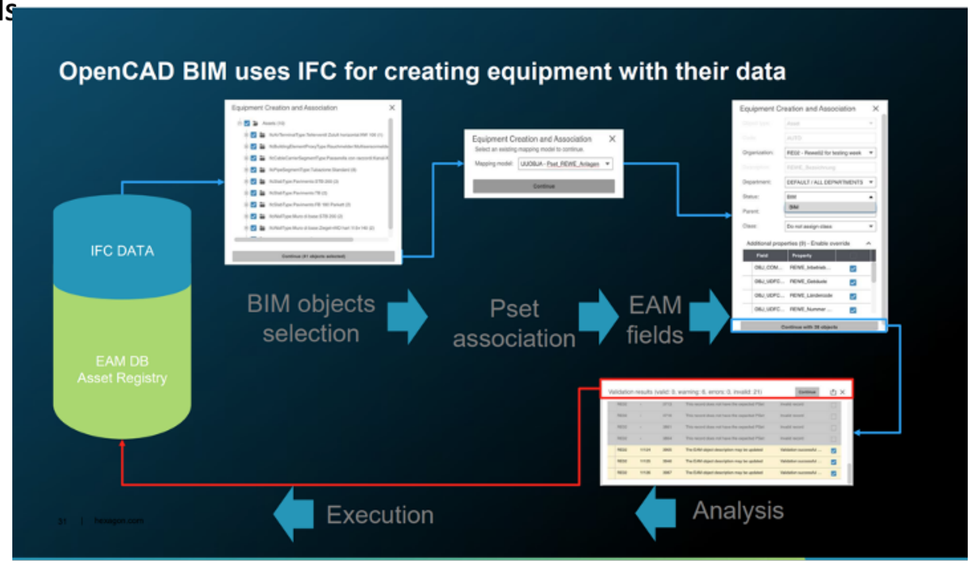


PBS MACHINE | DIAGNOSTIC DEVICE | VACUUM CONNECTED DEVICE | Relazioni

Riquadro di spostamento

ID	ID_COM	WA C	WE	AREA	SYS	FAM	TYPE	SEQUEN	PBS-CODE	DESCRIPTION	Z-C	MODULS
1	RFG	WA2	WP08	INJ	A	RF	GUN	001	INJ-A-RF-GUN-001	RF GUN	0	INJ-LA-001
2	I20			INJ	V	PMP	I20	001	INJ-V-PMP-I20-001	ION PUMP GUN	0	INJ-LA-001
3	I20			INJ	V	PMP	I20	002	INJ-V-PMP-I20-001	ION PUMP GUN	0	INJ-LA-001
4	NEG			INJ	V	PMP	NEG	001	INJ-V-PMP-NEG-001	NEXTOR Z100 GUN	0	INJ-LA-001
5	NEG			INJ	V	PMP	NEG	002	INJ-V-PMP-NEG-002	NEXTOR Z 100 GUN	0	INJ-LA-001
6	SLG			INJ	M	SOL	GUN	001	INJ-M-SOL-GUN-001	SOLENOID GUN	0	INJ-LA-001
7	VMN			INJ	V	VLV	MNL	001	INJ-V-VLV-MNL-001	MANUAL VALVE GUN	0	INJ-LA-001
8	SYA			INJ	B	SCN	YAG	001	INJ-B-SCN-YAG-001	SCREEN GUN	0	INJ-LA-001
9	I75			INJ	V	PMP	I75	001	INJ-V-PMP-I20-001	IONIC PUMP GUN	0	INJ-LA-001
10	MIR			INJ	W	MIR	INJ	001	INJ-W-MIR-INJ-001	MIRROR GUN	0	INJ-LA-001
11	CHO			INJ	M	COR	HOR	001	INJ-M-COR-HOR-001	HORIZONTAL CORRECTOR GUN	0	INJ-LA-001
12	CVE			INJ	M	COR	VER	001	INJ-M-COR-VER-001	VERTICAL CORRECTOR GUN	0	INJ-LA-001
13	CMN			INJ	B	CMN	FCT	001	INJ-B-CMN-FCT-001	CURRENT MONITOR GUN	0	INJ-LA-001
14	SYA			INJ	B	SCN	YAG	002	INJ-B-SCN-YAG-002	SCREEN GUN	0	INJ-LA-001
15	I75			INJ	V	PMP	I75	002	INJ-V-PMP-I75-002	IONIC PUMP GUN	0	INJ-LA-001
16	VFS			INJ	V	VLV	FST	001	INJ-V-VLV-FST-001	FAST VALVE GUN	0	INJ-LA-001
17	LNR			INJ	A	LNR	SBD	001	INJ-A-LNR-SBD-001	LINEARIZER	0	INJ-LA-001
18	BPM			INJ	B	BPM	STP	001	INJ-B-BPM-STP-001	STRIPLINE GUN	0	INJ-LA-001
19	CHO			INJ	M	COR	HOR	002	INJ-M-COR-HOR-002	HORIZONTAL CORRECTOR GUN	0	INJ-LA-001
20	CVE			INJ	M	COR	VER	002	INJ-M-COR-VER-002	VERTICAL CORRECTOR GUN	0	INJ-LA-001
21	XBG			INJ	A	ACC	XBD	001	INJ-A-ACC-XBD-001	XBAND GUN	0	INJ-LA-001
22	CHO			INJ	M	COR	HOR	003	INJ-M-COR-HOR-003	HORIZONTAL CORRECTOR LA002	0	INJ-LA-002
23	CVE			INJ	M	COR	VER	003	INJ-M-COR-VER-003	VERTICAL CORRECTOR LA002	0	INJ-LA-002
24	SOL			INJ	M	SOL	SEC	001	INJ-M-SOL-SEC-001	SOLENOID SBAND	0	INJ-LA-002
25	SBD			INJ	A	ACC	SB3	001	INJ-A-ACC-SB3-001	SBAND 3M LA002	0	INJ-LA-002
26	CHO			INJ	M	COR	HOR	004	INJ-M-COR-HOR-004	HORIZONTAL CORRECTOR SB1	0	INJ-LA-002
27	CVE			INJ	M	COR	VER	004	INJ-M-COR-VER-004	VERTICAL CORRECTOR SB1	0	INJ-LA-002
28	SYA			INJ	B	SCN	YAG	003	INJ-B-SCN-YAG-003	FIRST SCREEN LA002	0	INJ-LA-002
29	I75			INJ	V	PMP	I75	003	INJ-V-PMP-I75-003	ION PUMP SBND1	0	INJ-LA-002
30	BPM			INJ	B	BPM	STP	002	INJ-B-BPM-STP-002	STRIPLINE LA002	0	INJ-LA-002
31	CHO			INJ	M	COR	HOR	005	INJ-M-COR-HOR-005	HORIZONTAL CORRECTOR LA002	0	INJ-LA-002
32	CVE			INJ	M	COR	VER	005	INJ-M-COR-VER-005	VERTICAL CORRECTOR LA002	0	INJ-LA-002
33	CHO			INJ	M	COR	HOR	006	INJ-M-COR-HOR-006	HORIZONTAL CORRECTOR LA003	0	INJ-LA-003
34	CVE			INJ	M	COR	VER	006	INJ-M-COR-VER-006	VERTICAL CORRECTOR LA003	0	INJ-LA-003

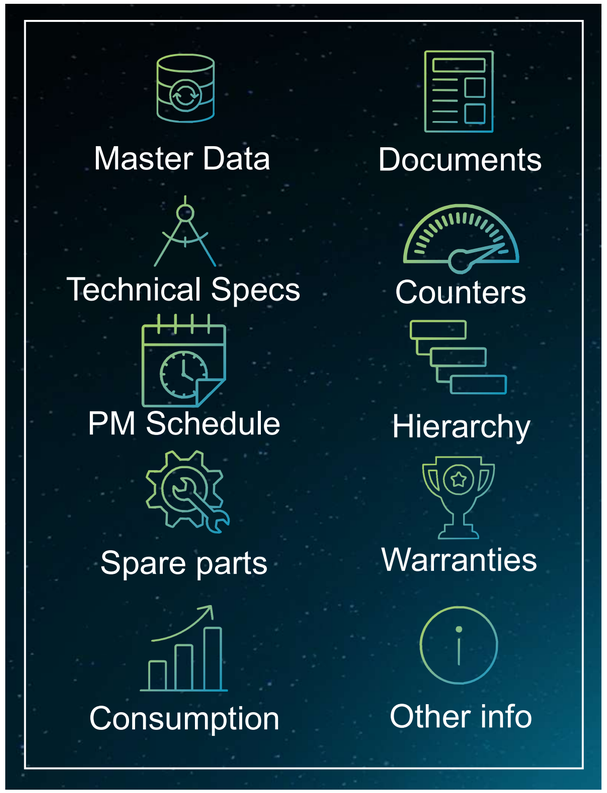
- Moreover is possible to link other document such as:
  1. Specifications
  2. Approved construction drawings
  3. Commercial documents (orders, specifications, etc.)
  4. Quality documents (calibration certificates, certificates of conformity, etc.)
  5. Warranty
  6. Manuals



System engineering

At the moment we have created the PBS tree and populated in some information (the ones available now).

We are in the process to migrate to a new solution: HxGN From Hexagon. This will allow a more custom-made configuration management approach. We can customize the data for each entry including technical details, administrative status, documentation and spare parts.

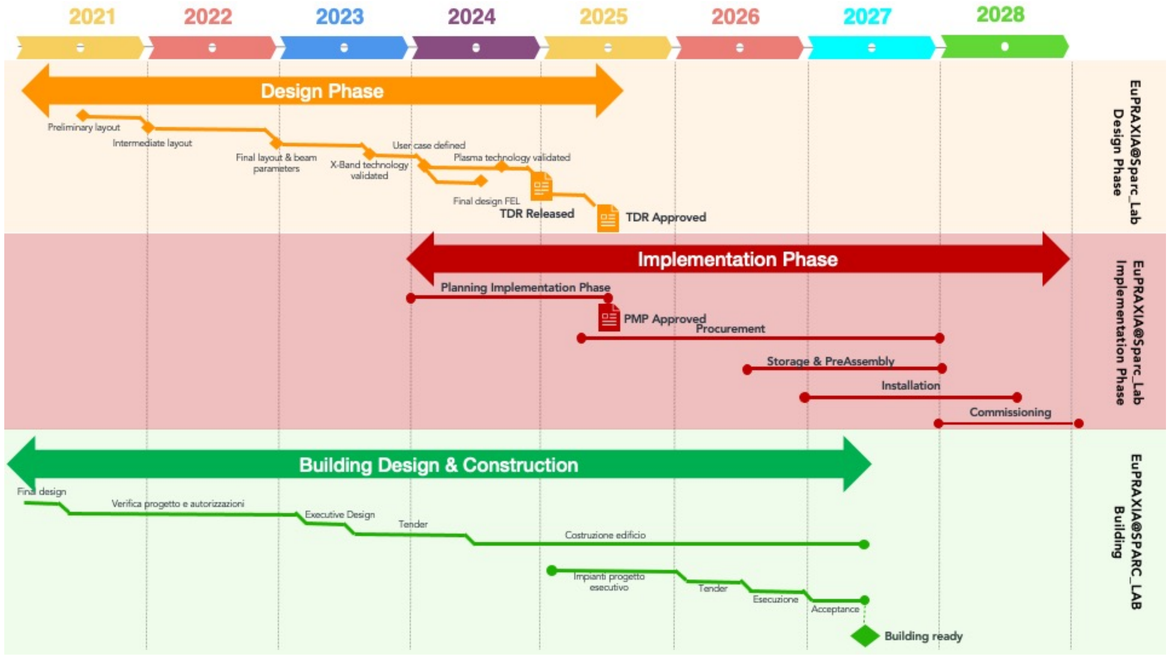


CAD & BIM interface are also foreseen.

Roadmap to Project Management Plan

Project Management Plan is meant to be delivered with the TDR (during 2025).

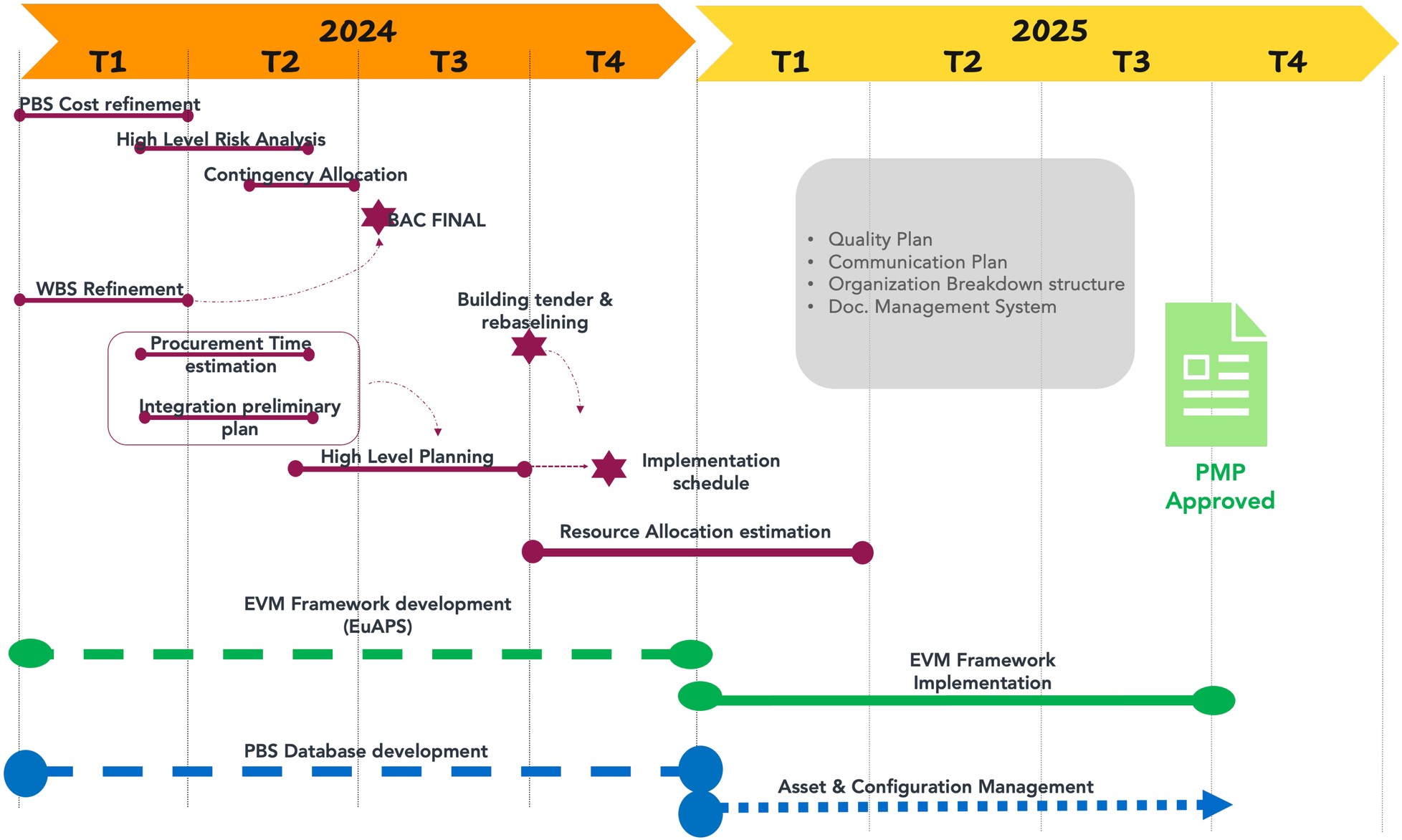
Many things to be done, many of them are dependent on the machine development and building execution.



Other things to be done are well known and a roadmap to cover all the topics has been done.

Some of these topics are out of the Project Office responsibility. In total 3FTE are allocated and it seems sufficient at the moment.

Roadmap to Project Management Plan



Conclusions

- Framework for EVM is almost complete
- Full baseline and automated process require some e-tools that are under development.
- A full EVM is in principle possible but it requires some upgrade on the Business Intelligence APP.
- Configuration and Assets management tool with HxGN will be fully exploited in 2024.