1st Accelerators Technology Sector Workshop

Engineering Design Tools and Processes
Project Management Methodologies and Tools

Chair: Mike Lamont

Interconnecting knowledge, experience, methods, people & data to foster learning & collaboration

ATS
Accelerators and Technology Sector

Showcasing North Area consolidation project management and its evolution

Deepti Kandhol & Etienne Scaioni

ATS
Accelerators and
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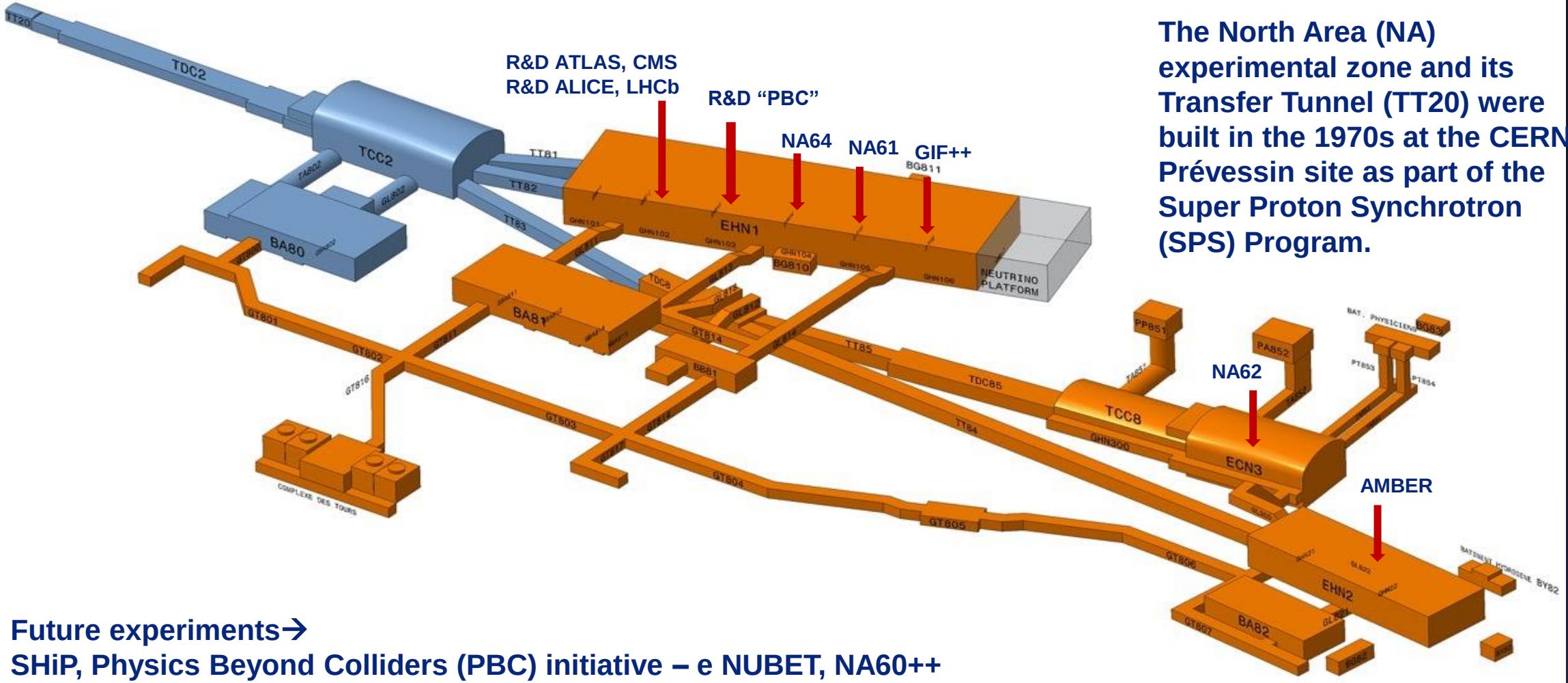
Introduction: North Area

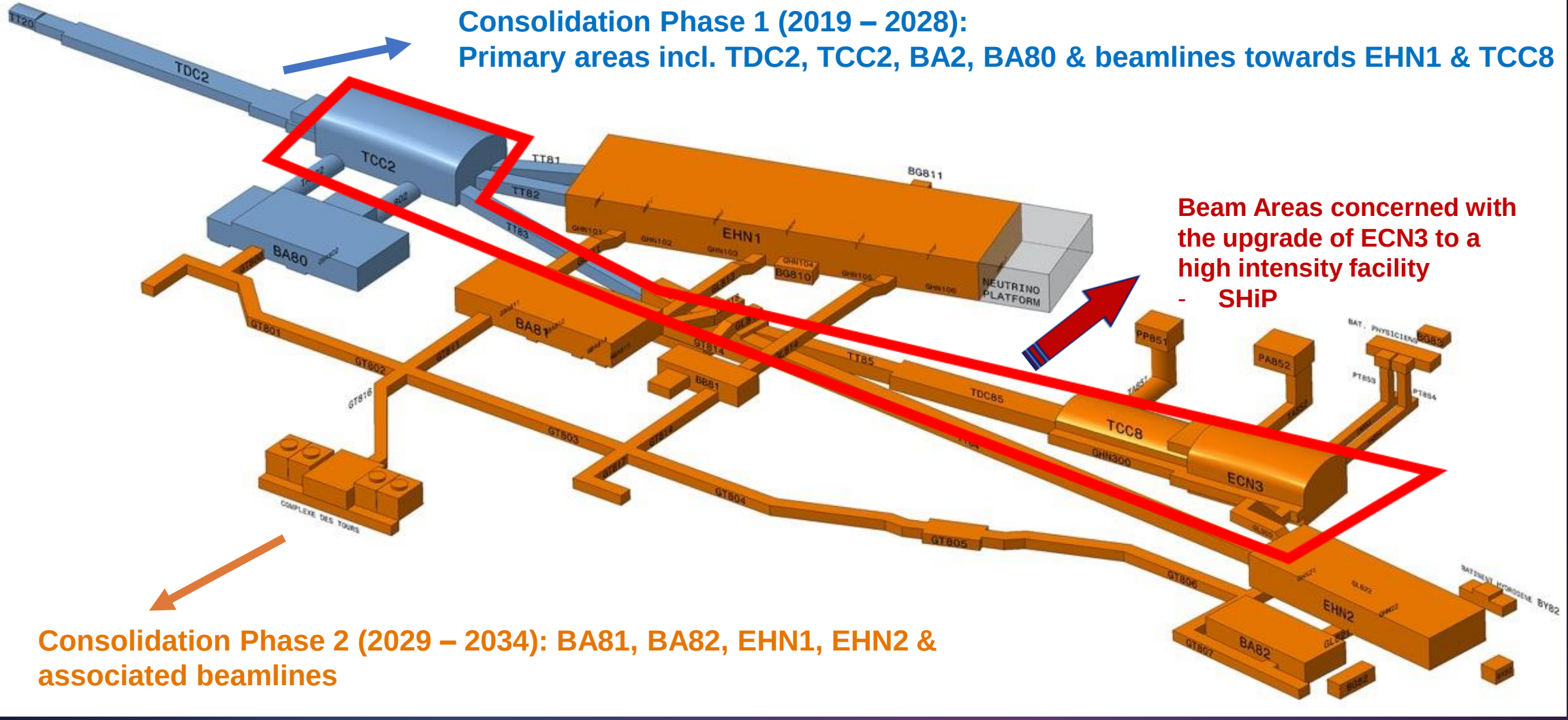


The North Area (NA) experimental zone and its Transfer Tunnel (TT20) were built in the 1970s at the CERN Prévessin site as part of the Super Proton Synchrotron (SPS) Program.

Future experiments→
SHiP, Physics Beyond Colliders (PBC) initiative – e NUBET, NA60++

Introduction: North Area Consolidation Project

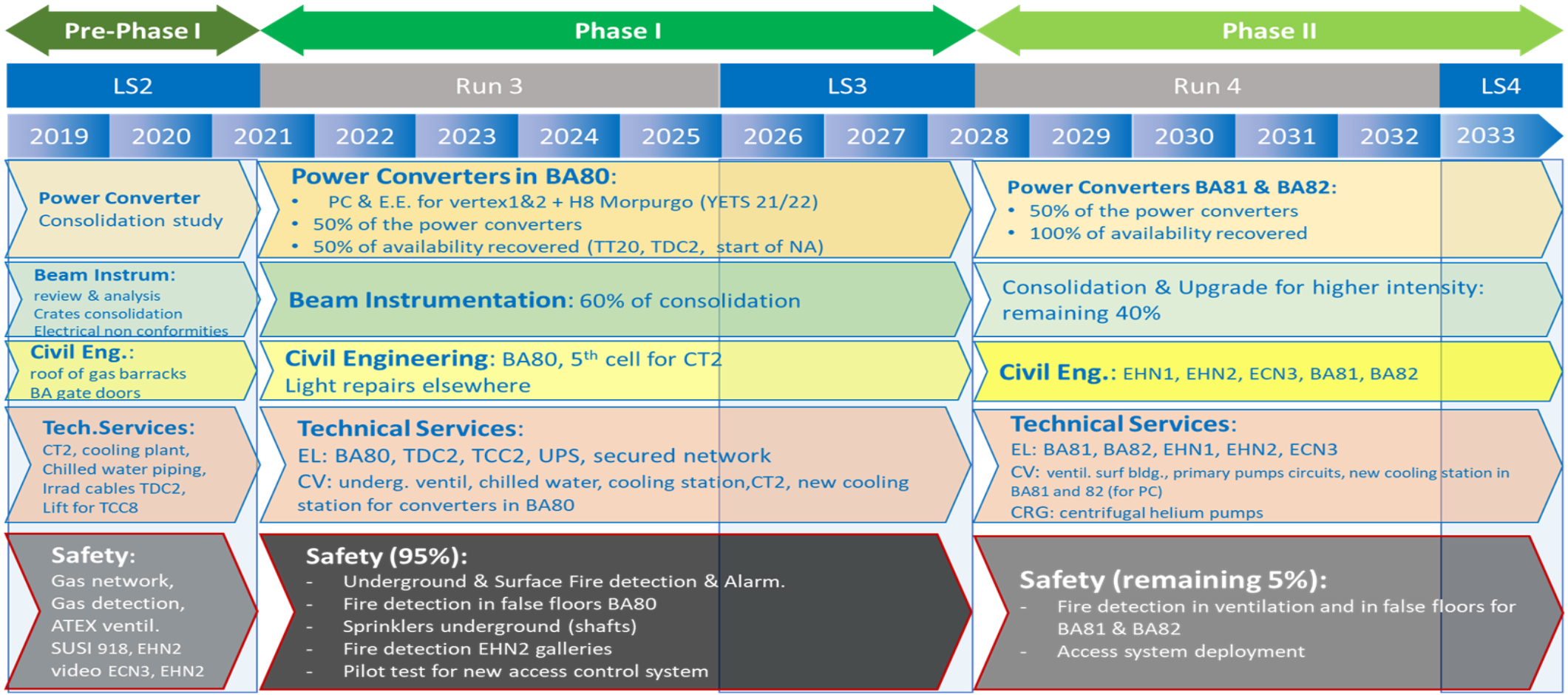
Consolidation Phase 1 (2019 – 2028):
Primary areas incl. TDC2, TCC2, BA2, BA80 & beamlines towards EHN1 & TCC8



Beam Areas concerned with the upgrade of ECN3 to a high intensity facility
- **SHiP**

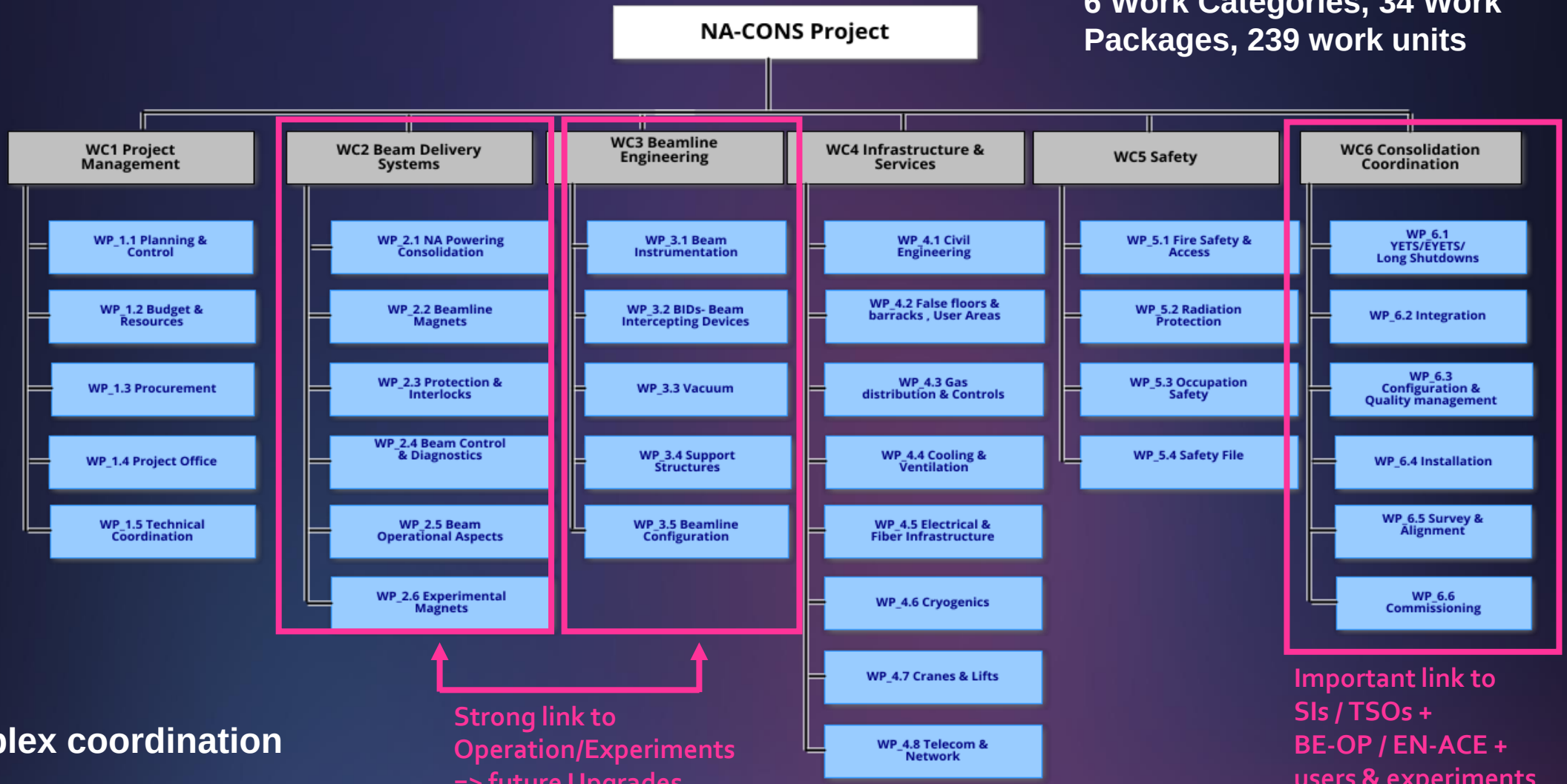
Consolidation Phase 2 (2029 – 2034): BA81, BA82, EHN1, EHN2 & associated beamlines

NA-CONS Roadmap



NA-CONS Project Organization

6 Work Categories, 34 Work Packages, 239 work units

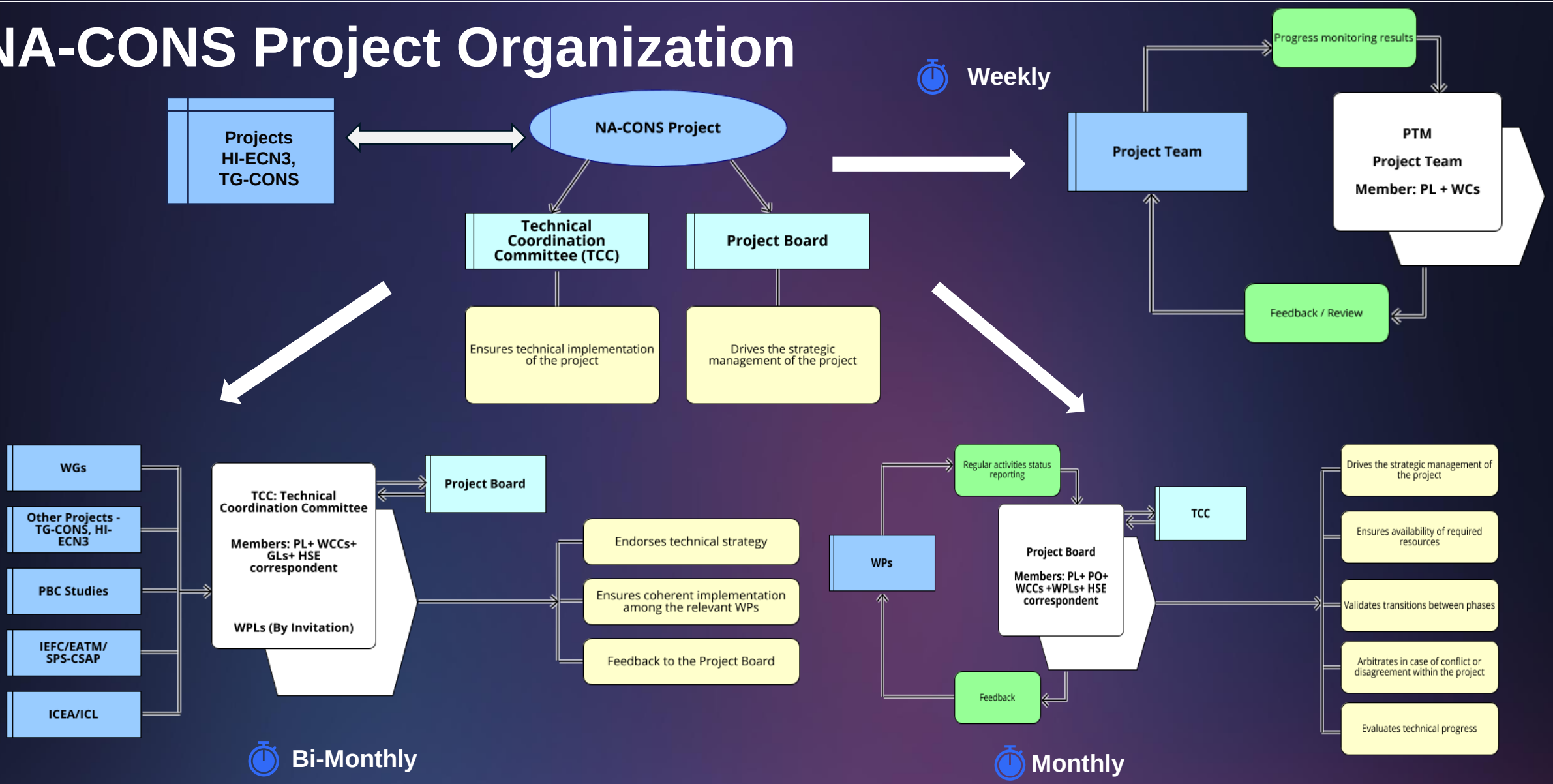


Complex coordination

Strong link to Operation/Experiments => future Upgrades

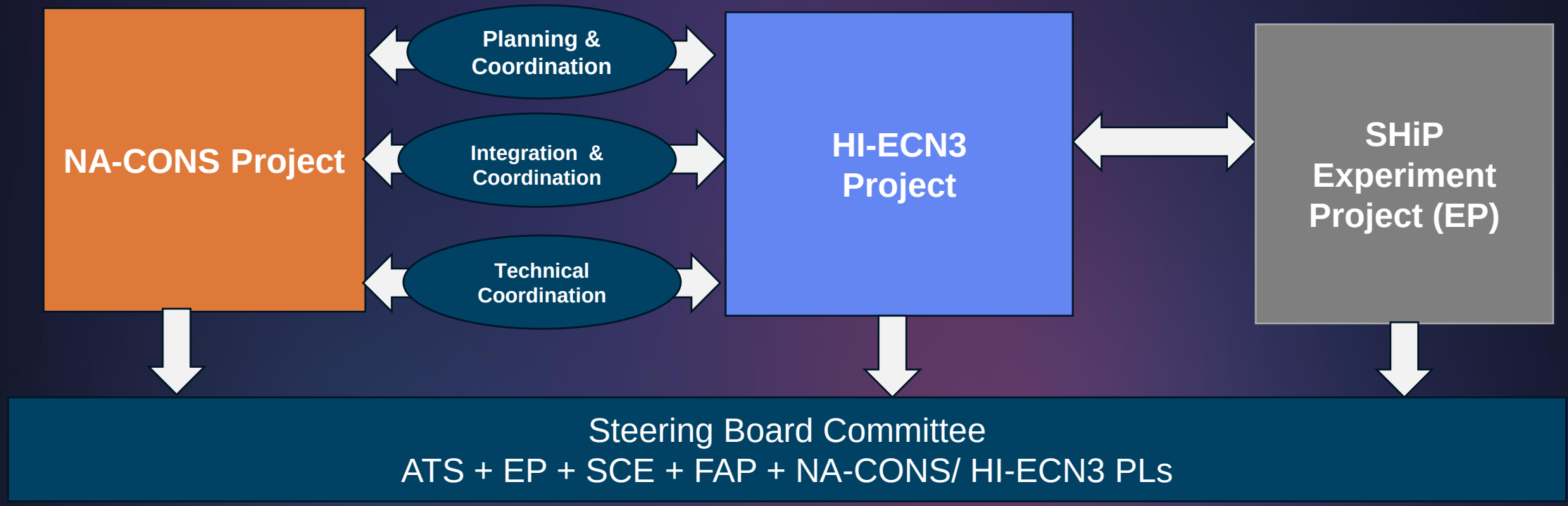
Important link to SIs / TSOs + BE-OP / EN-ACE + users & experiments

NA-CONS Project Organization



Management - Content - North Area Consolidation Project · Indico (cern.ch

Synergies with HI-ECN3 project



NA-CONS PM Methodology

Based on different stages of project lifecycle (PMI) and development phases of project lifecycle (OpenSE)

Project Management Institute.

Start

Initiation

Understand the goals, priorities, deadlines, and risks of the project

Planning

Outline the tasks and time required to complete the project

Execution

Turn plan into action and monitor project performance

Closure

Analyze results and plan the next steps

Stages of the project lifecycle

openSE

Systems engineering framework, i.e. a project management framework for projects that consist of developing complex technical systems

Developmental phases of the lifecycle

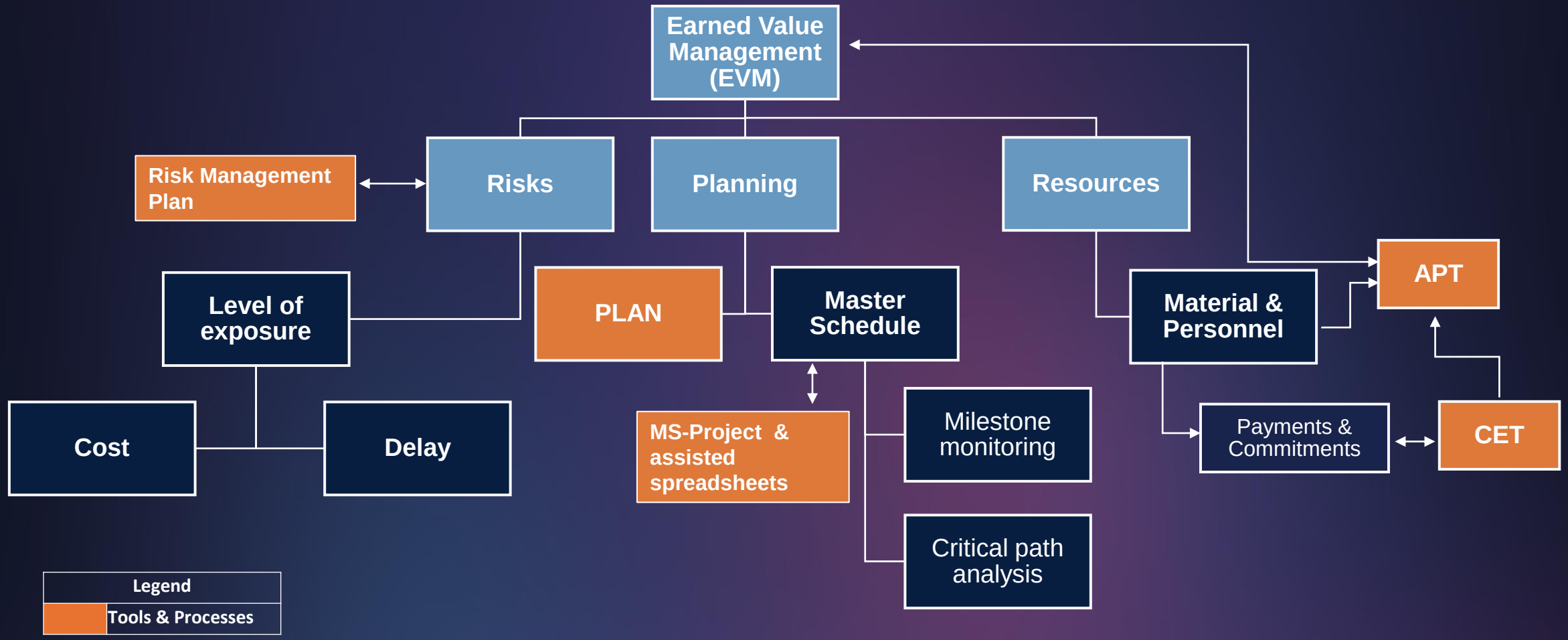
Planning for each NA-CONS WP package is based on these phases.

Track project performance & react faster!

Project Management Institute | PMI

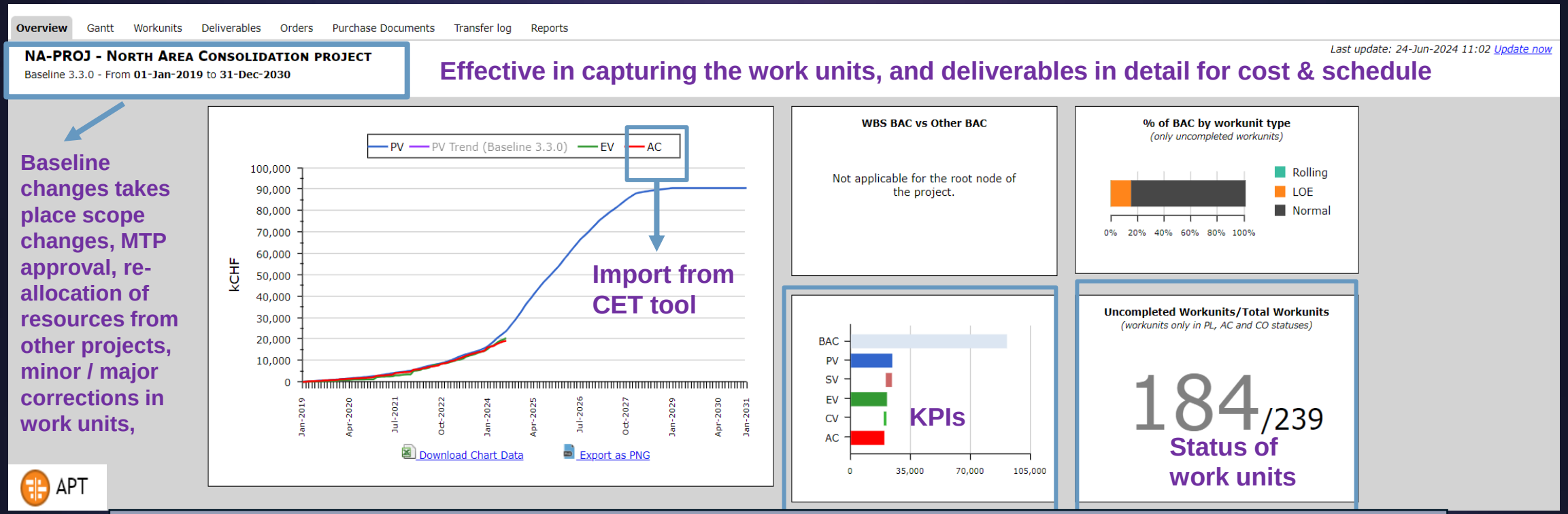
About | openSE (cern.ch)

How do we monitor project performance?



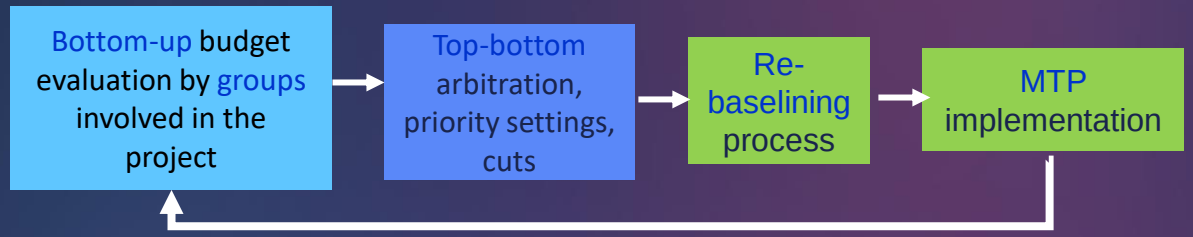
Together they are effective means to monitor project performance comprehensively.
But it has limitations too…

EVM in APT: Review the progress of the project in terms of cost (Material + personnel) and schedule.



KPIs: Cost Variance (in kCHF) 1'176 | Schedule Variance (in kCHF) -3'108 | Schedule Variance (in months) -2'74

Budgeting and Baseline Management Cycle



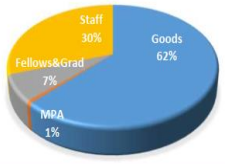
Manual & Iterative | Rigidity | Lack of integration | Lack Interdependencies

Project progress APT + CET data (June'24)

NA-CONS Project Budget - 1st June 2024

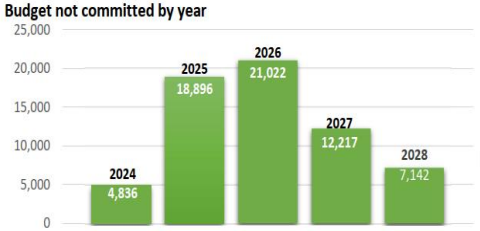
Cost to Completion (P+M) in kCHF 129,828

Goods	80,604
MPA	844
Fellows&Grad	9,041
Staff	39,339
	129,828



Material Budget in kCHF 90,489

Budget not committed by year

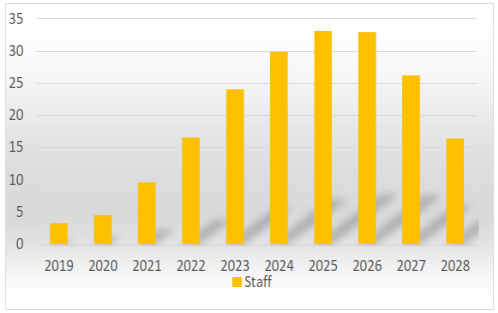


Budget usage

Personnel Budget in FTE 196.7 in kCHF 39,339

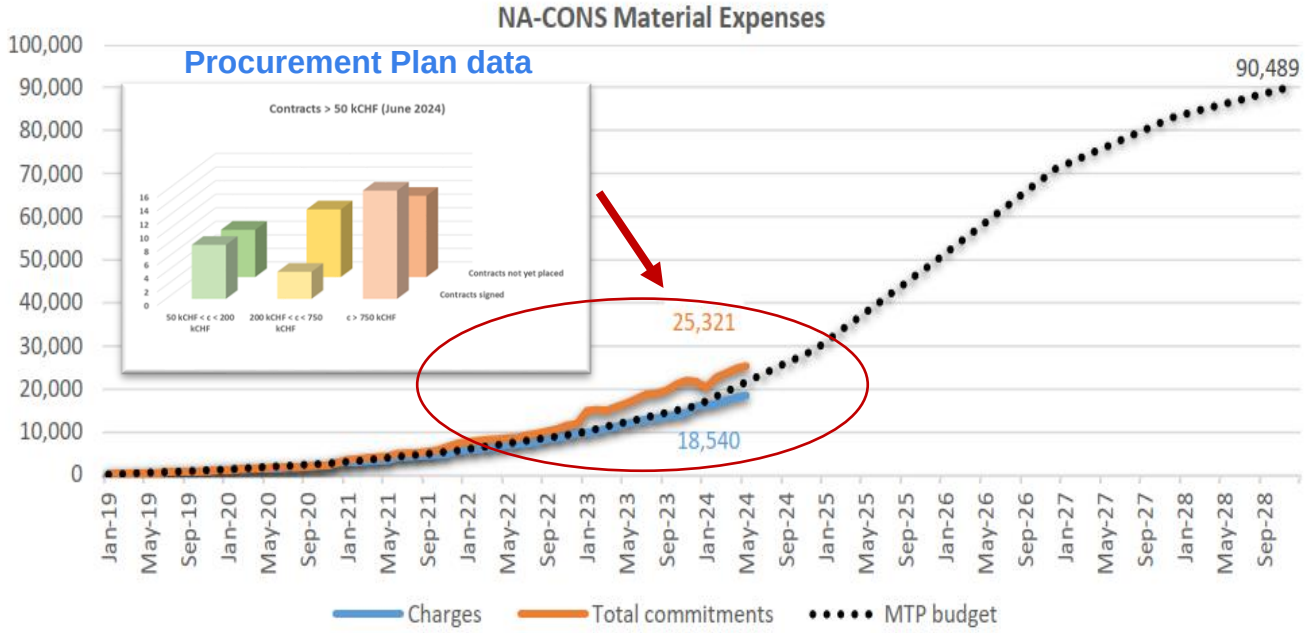
CET data up to 2023

APT target figures from 2024



NA-CONS Material Expenses

Procurement Plan data



Procurement well underway:

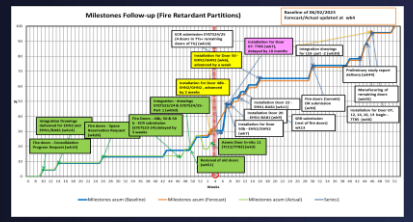
- ✓ 28 contracts placed in the past 12 months
- ✓ 29 contracts still to be placed
- ✓ Presently we are on good track: minor delays, but not critical.

APT (cern.ch)

Planning activities: PLAN tool & MS-project

MS-Project : Enables to create a resource-loaded master schedule with inter-logic between activities

Task Name	Duration	Baseline Start	Baseline Finish	Start	Finish
WP2.1_NA Powering Consolidation	1500 days?	Mon 03/01/22	Wed 30/06/27	Mon 03/01/22	Wed 22/12/27
WP2.2_Beamline Magnets	2251 days?	Mon 06/01/20	Wed 22/12/27	Mon 06/01/20	Thu 21/12/28
WP2.3_Protection & Interlocks	1818 days	Mon 08/01/24	Fri 31/03/28	Mon 04/01/21	Fri 31/03/28
WP2.4_Beam Diagnostics & Controls	1731 days?	Thu 03/01/19	Fri 20/12/24	Thu 03/01/19	Mon 22/12/25
WP3.1_Beam Instrumentation	2326 days?	Thu 03/01/19	Fri 28/04/28	Thu 03/01/19	Fri 28/04/28
WP3.2_Beam Intercepting Devices	2039 days?	Mon 06/01/20	Tue 29/02/28	Mon 06/01/20	Tue 29/02/28
WP3.3_Vacuum	2325 days?	Thu 03/01/19	Wed 22/12/27	Thu 03/01/19	Thu 27/04/28
WP3.4_Support Structures	1500 days?	Wed 05/01/22	Thu 23/12/27	Wed 05/01/22	Thu 23/12/27
WP4.1_Civil Engineering	1110 days?	Mon 03/01/22	Wed 10/06/26	Mon 03/01/22	Wed 10/06/26
WP4.3_Gas Distribution & Controls	1542 days?	Fri 04/01/19	Mon 23/12/24	Fri 04/01/19	Mon 31/03/25



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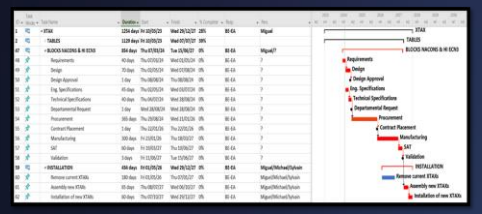


Master schedule & milestone monitoring extract

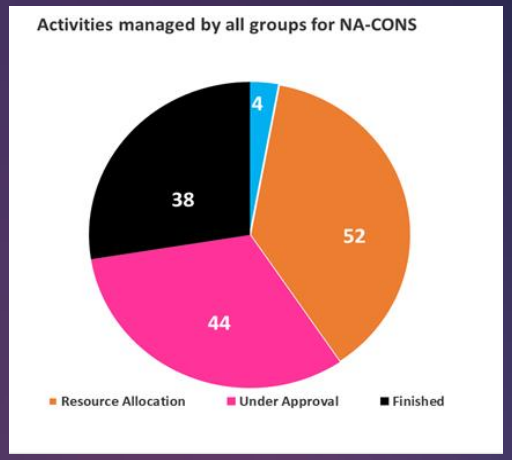
Spreadsheets to analyze specific data

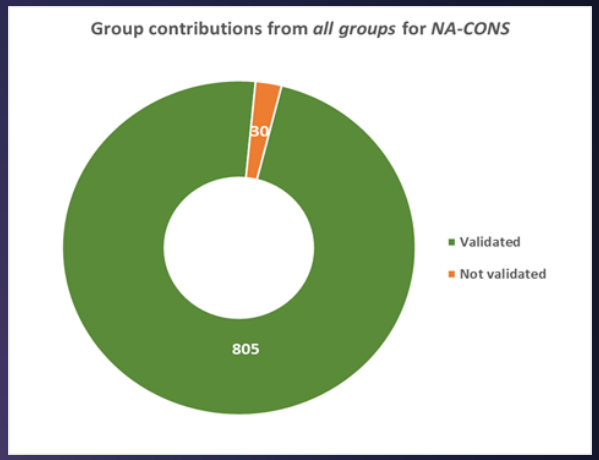
Gantt view zone-wise for coordination and arbitration

Linear view to track potential conflicts

Milestone monitoring and critical path analysis

To collect, review, and prioritize the activities from resource allocation perspective





Dashboard highlights planned activities resource contributions requested & validated

Even though NA-CONS is an approved project we are dependent on availability of resources

Plan : Dashboard (cern.ch)

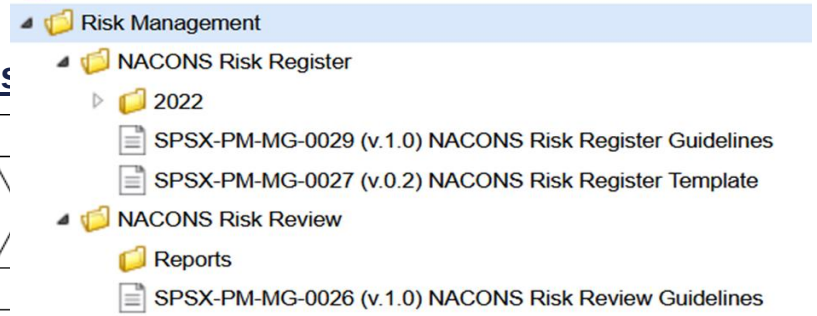
https://plananalytics.web.cern.ch/

Manual & Iterative | Rigidity | Lack of integration | Data Quality Issues

NA-CONS: Risks Identification & Mitigation

Risk Management Plan

The risk management plan consists of an iterative objectives of **identifying and mitigating risks.** This into 2 phases:



A risk review is planned to occur before every C should be re-evaluated, and new risks identified (if a

Risk Assessment Strategy

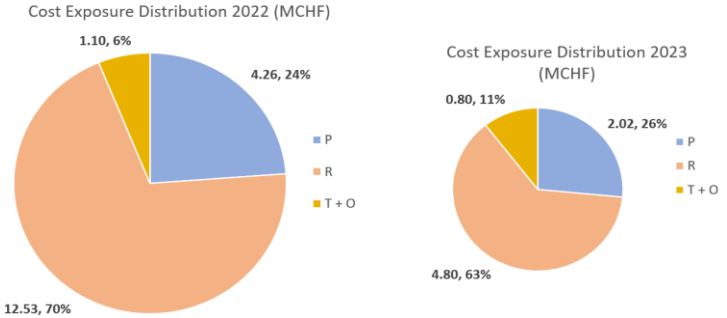
NA-CONS - Data Sheet Risk Register 2023

High Priority Risks

ID	Description	Counts	Likelihood	Risk Score
1	Uncertainty of components prices on the market	4	2.75	10.50
2	Uncertainty of component lead-time	4	3	11.25
5	shifts in the schedule of the organisation/project	2	2.50	7.50
14	Availability of human resources	3	2.67	9.67
20	Delays in the procurement phase	3	2.33	6.67
25	Cost overrun	3	2.33	8.00
31	accelerated ageing of the magnets resulting in systematic replacement	2	2.50	7.50
42	Unknown status of the underground control cables (radiation effect) and underground cabinets (ageing of connectors and terminals)	3	2.33	6.33
45	Technological obsolescence of CESAR software components	1	3.00	9.00
49	XCEDs and XCETs show evidence of deterioration and it is not in the scope of Phase I of the project to consolidate them	3	2.33	7.33
150	XCEDs newoptics manufacturing process not validated / new optics spares unusable / no available W spares	1	3	12
60	Installation-readiness of new XTDV tables as a result of non-conformities	1	3.00	9.00
65	Delays in the procurement phase	1	3.00	9.00
77	User requirements not adequate to cover current and/or future operational scenario	1	3.00	9.00
153	VXSS T4 has been removed due to possible damage and does not have a spare available	1	4	12
159	PU Jacks (pads + body) availability not enough to cover the urgent needs of consolidation during PHASE I	1	3	12
82	Underestimation of amount of asbestos	2	2.50	7.50
83	Water leaks during roof renovation	2	2.50	7.50
90	Cost overrun during procurement phase	3	2.33	8.67
91	Delays in the procurement phase	2	3.00	10.50

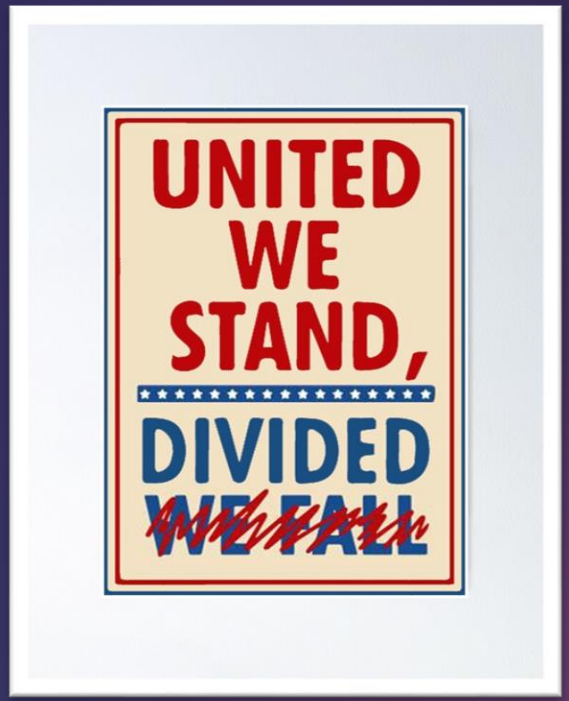
Risk Distribution by Type

Cost Exposure Distribution by Type of Risk



Level of risk exposure is calculated in terms of cost and schedule delays and reported in Project Cost & Schedule Review every year

Credits: NA-CONS Project Safety Officer F.Carvalho



In spite of the fact that each tool is highly useful on its own for PM activities,
However, there are a few challenges that we must overcome.
A successful outcome can be achieved if they are combined into an integrated solution

Way Forward ⏭

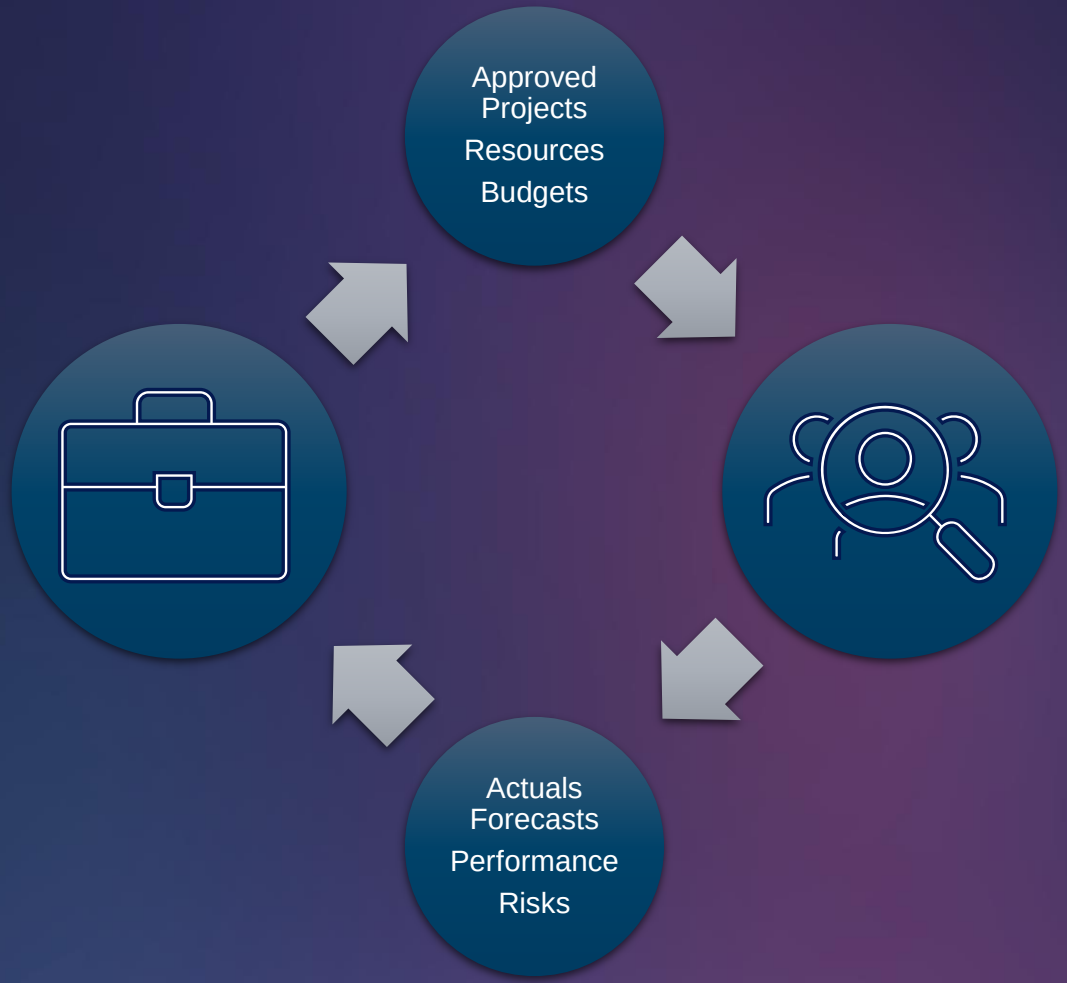
Enhanced Project Management with EVM Replacement initiative

Interoperability

Enterprise Project Performance

Strategy

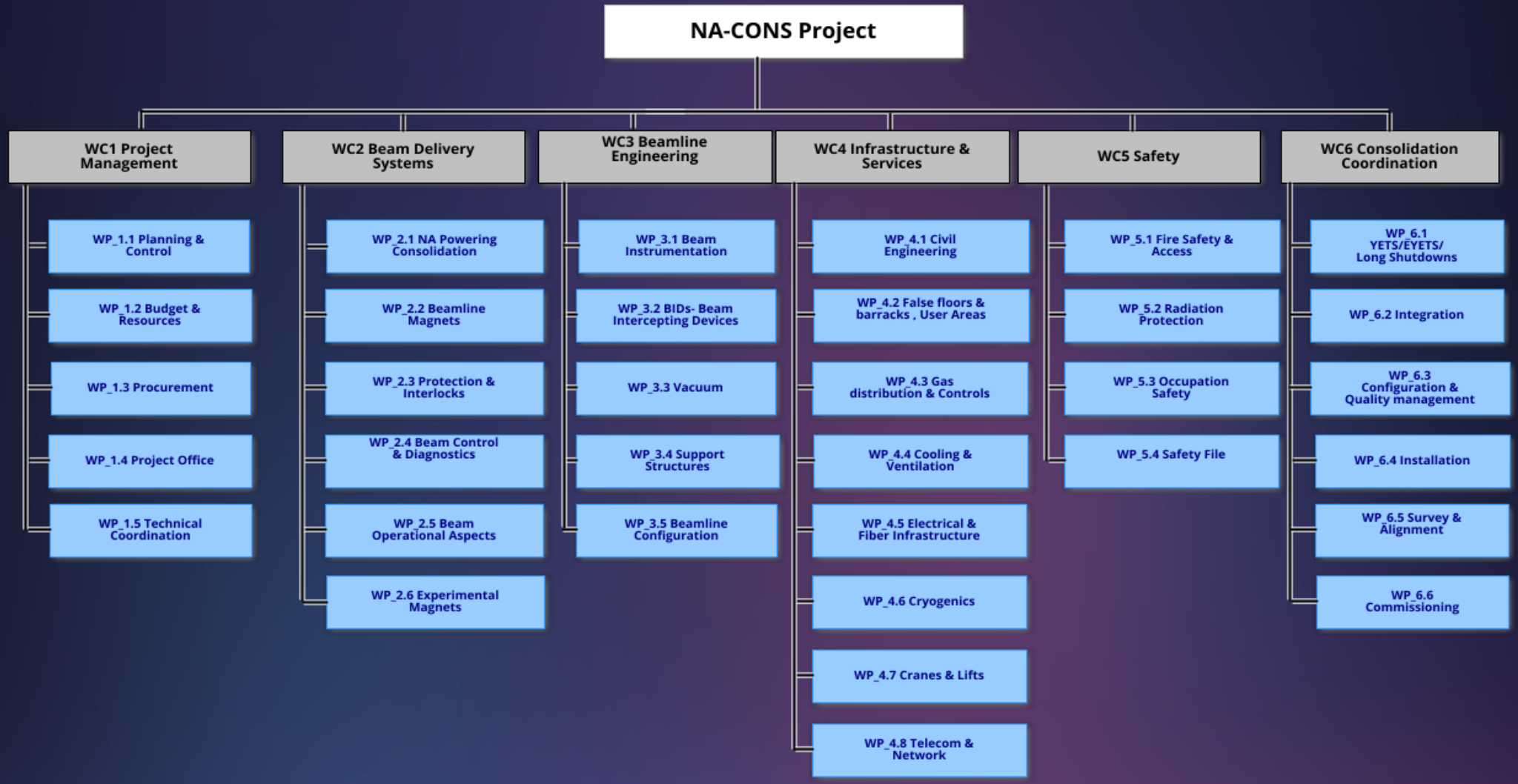
Portfolio
Management



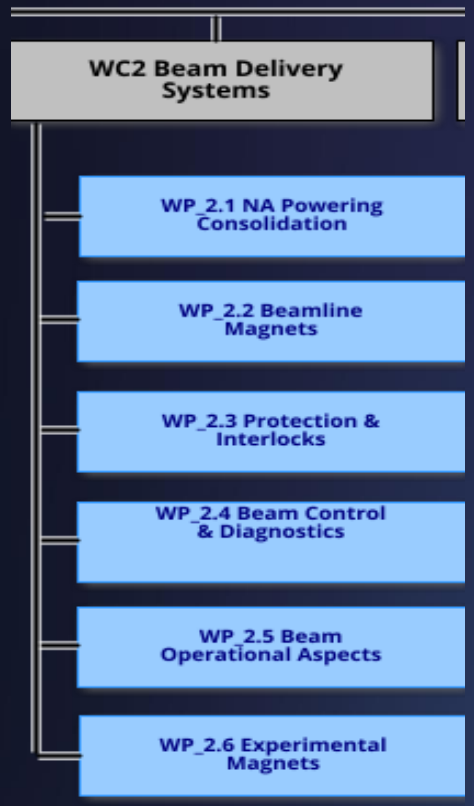
Project
Management and
Controls

Execution

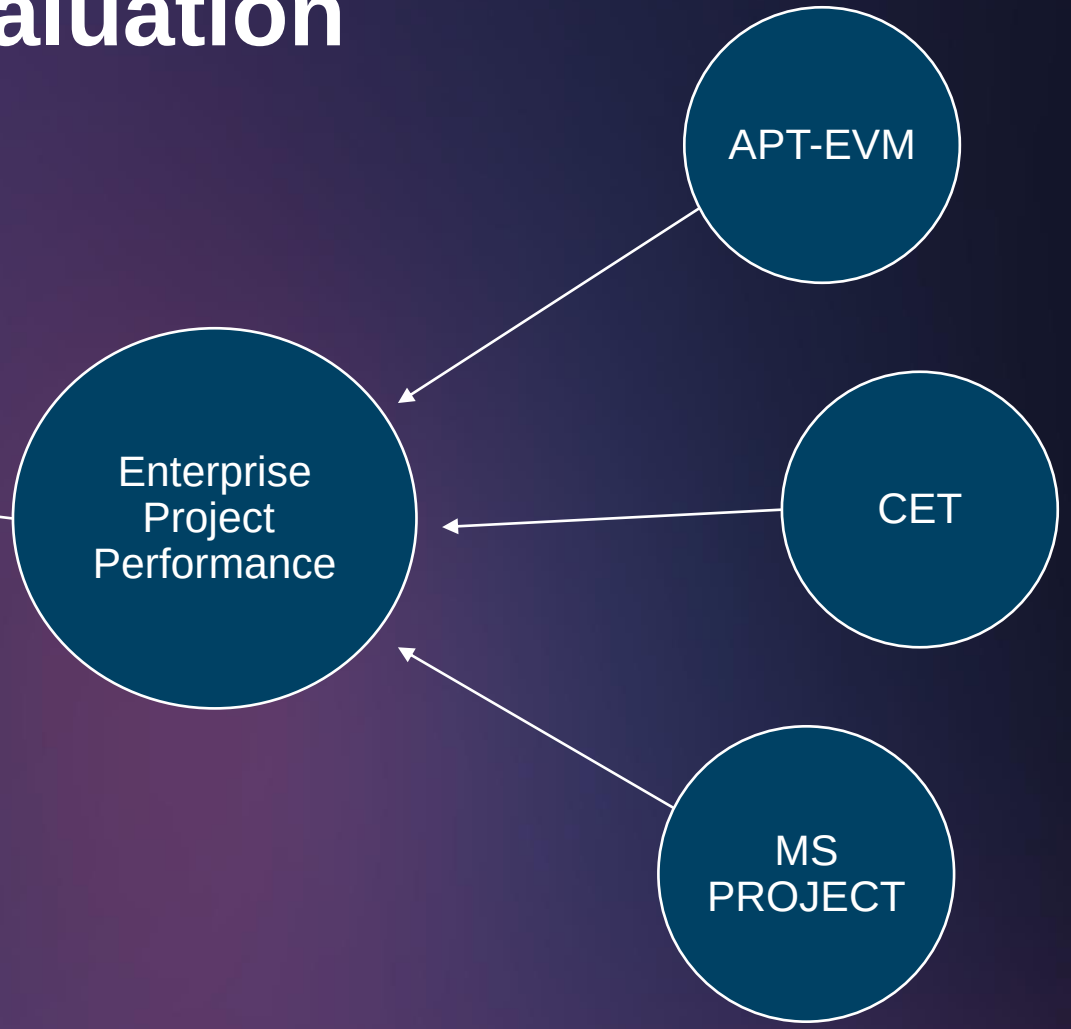
Solution Evaluation



Solution Evaluation



WORKUNITS



NA-CONS is effectively using the tools provided in house combined with PM methodology.

Open to alternative solutions/software's to tackle current limitations and improve monitoring practices.

Many Thanks to all NA-CONS Project Board Members, BE-EA, Equipment & Service Groups and the NA-CONS Team