NA-CONS underground coordination
EN-ACE Seminar

Xavier Palle

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My background

Studies: Master of sciences: Mechanical engineering and computational sciences, fluid mechanics specialization

EPFL, Lausanne Switzerland

2022: Research internship: Use of AI to support models for acoustic meta-material design (~100% sound absorbers, confidential development)

Sony, Stuttgart Germany

2023: Master thesis: Machine learning based simulator with perceptual enhancement (Input psychological and psychophysical factors in a ML based simulator)

Sony, Tokyo Japan

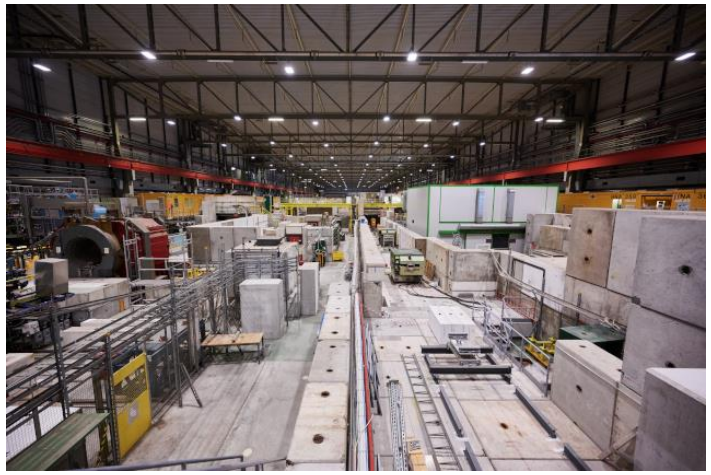
2024: Graduate at CERN: NA-CONS & HI-ECN3 coordination of underground activities and synergies between the projects

NA-CONS – Presentation of the North Area

CERN's largest experimental area

Constructed in 1970, with first beam received in 1978

Experiments conducted:



SHINE

NA62, NA64, and NA65

COMPASS

MADMAX

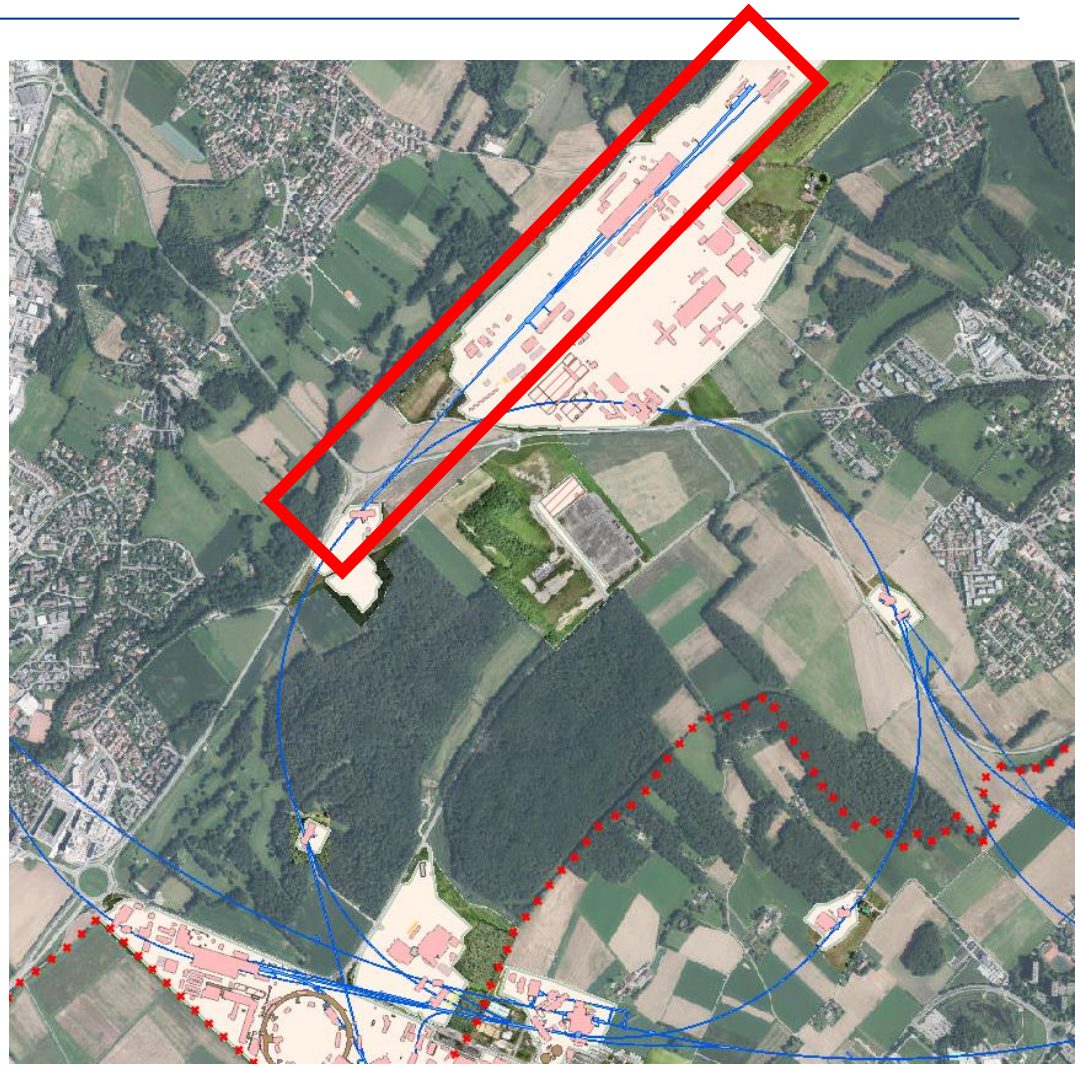
Neutrino platform

Various research and development (R&D) programs

Key characteristics & challenges:

High radiation risk

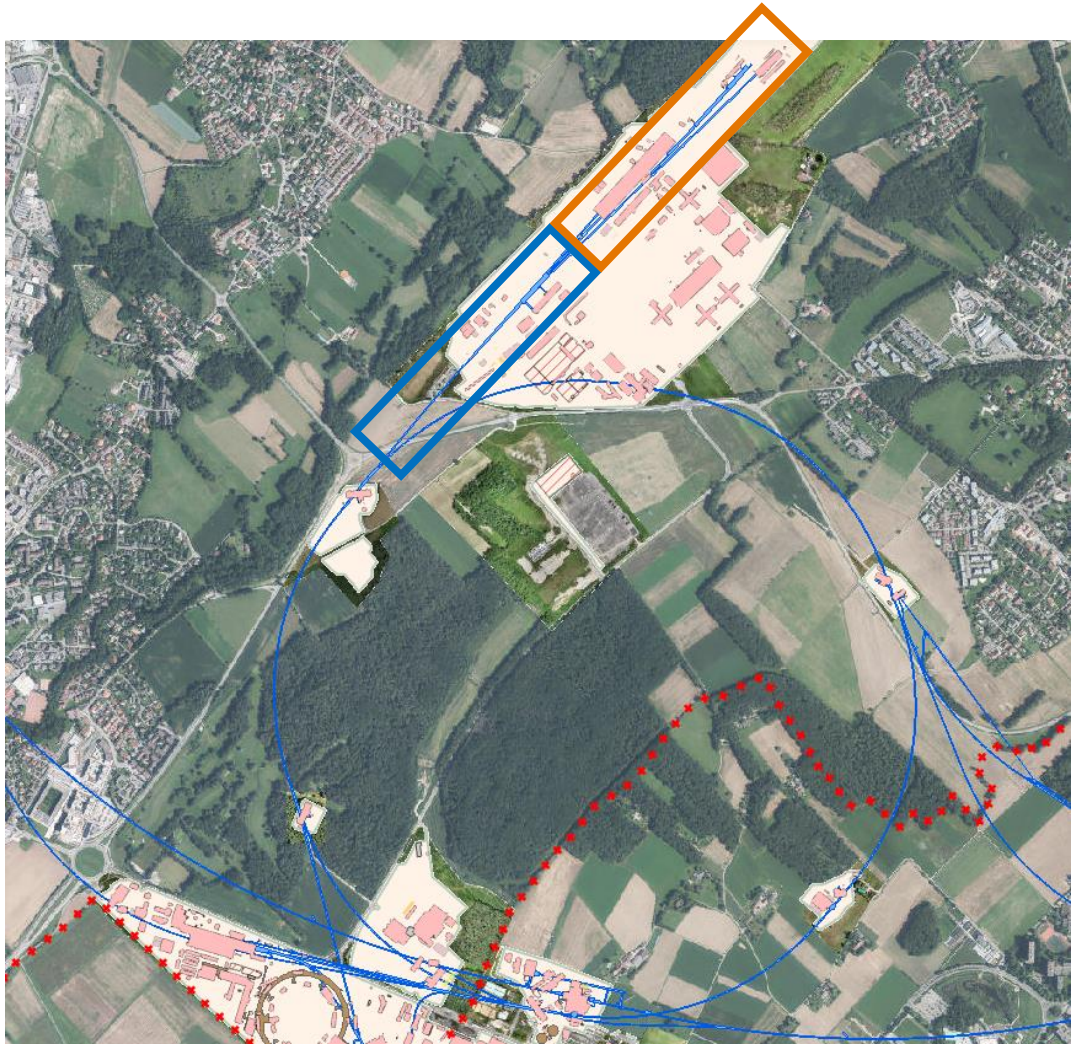
Use of fixed targets



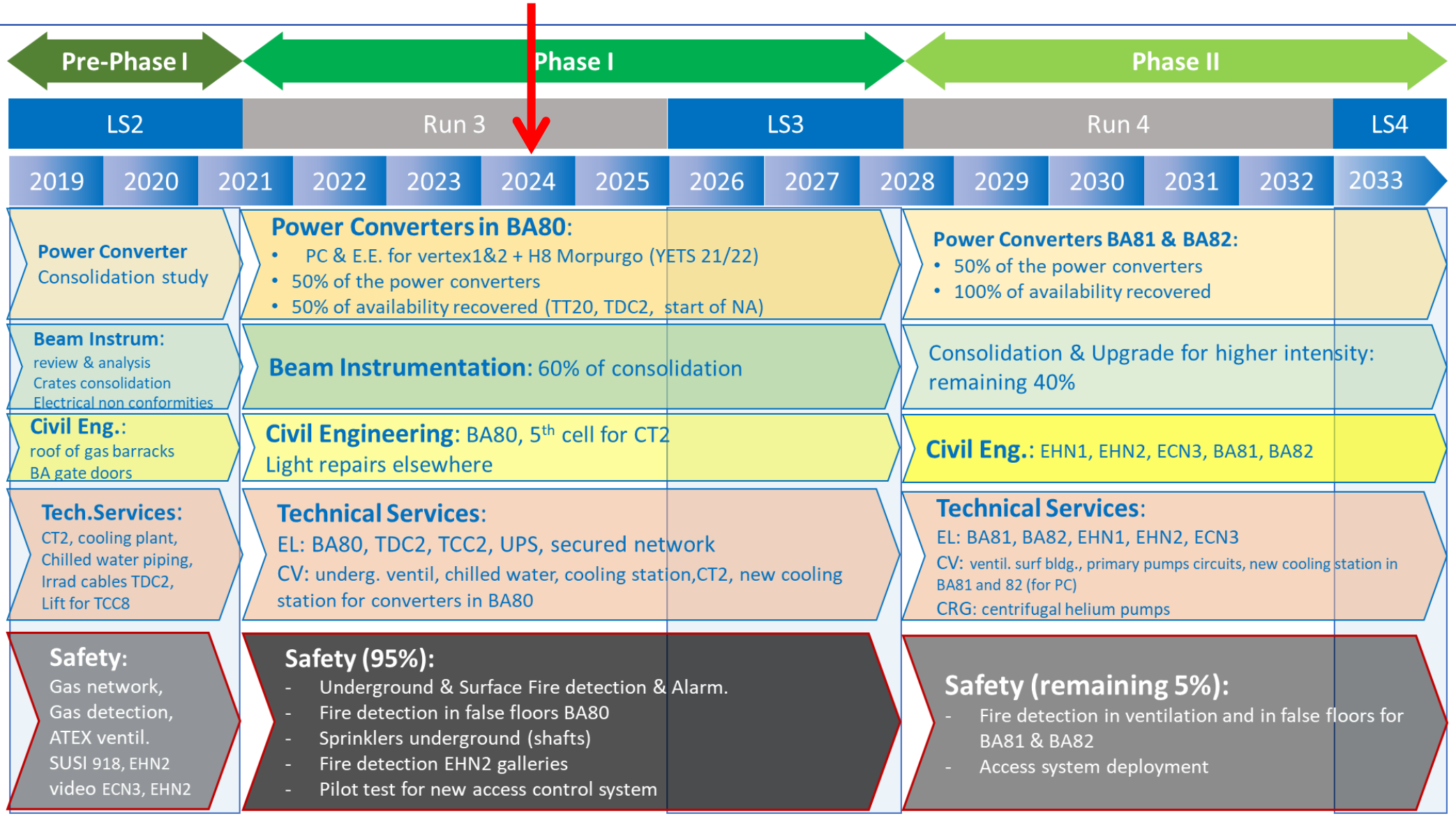
NA-CONS Roadmap

Consolidation Phase 1 (2019 – 2028): Primary areas incl. TDC2, TCC2, BA2, BA80 & beamlines towards EHN1 & TDC8

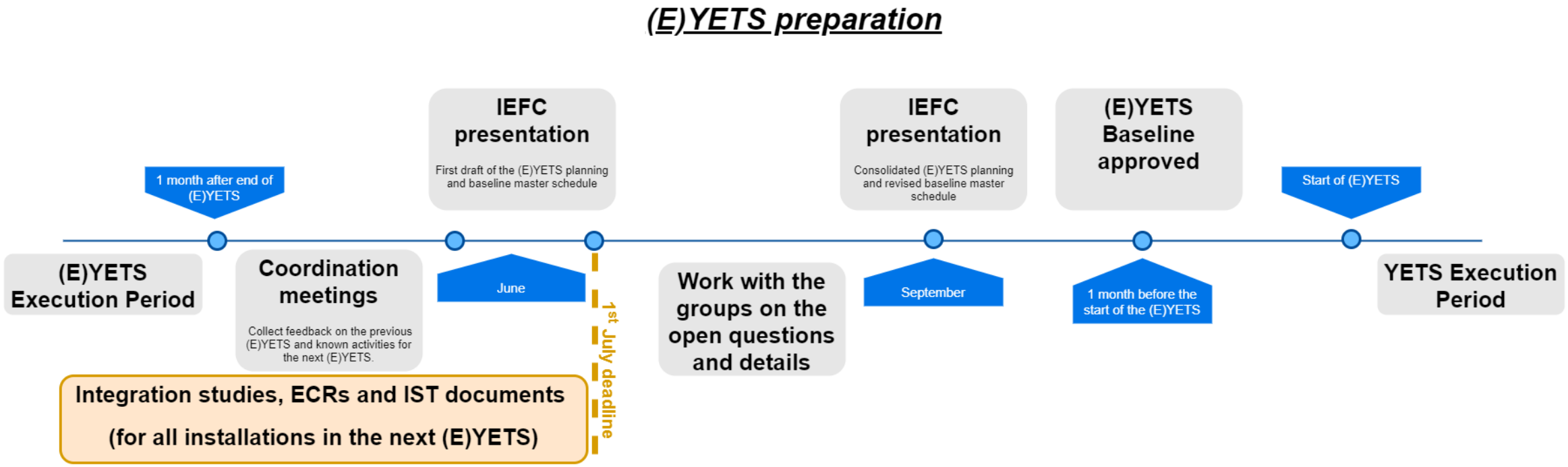
Consolidation Phase 2 (2029 – 2034): BA81, BA82, EHN1, EHN2 & associated beamlines



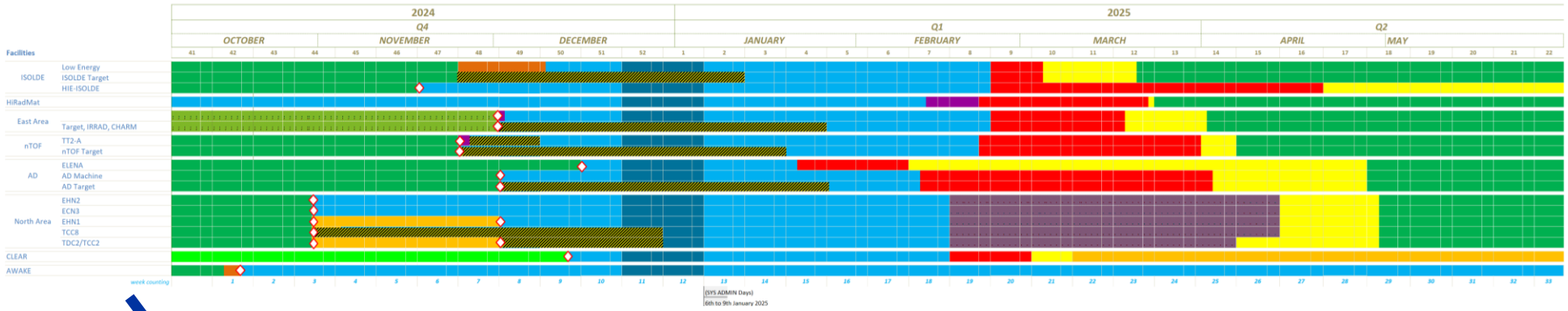
NA-CONS Roadmap

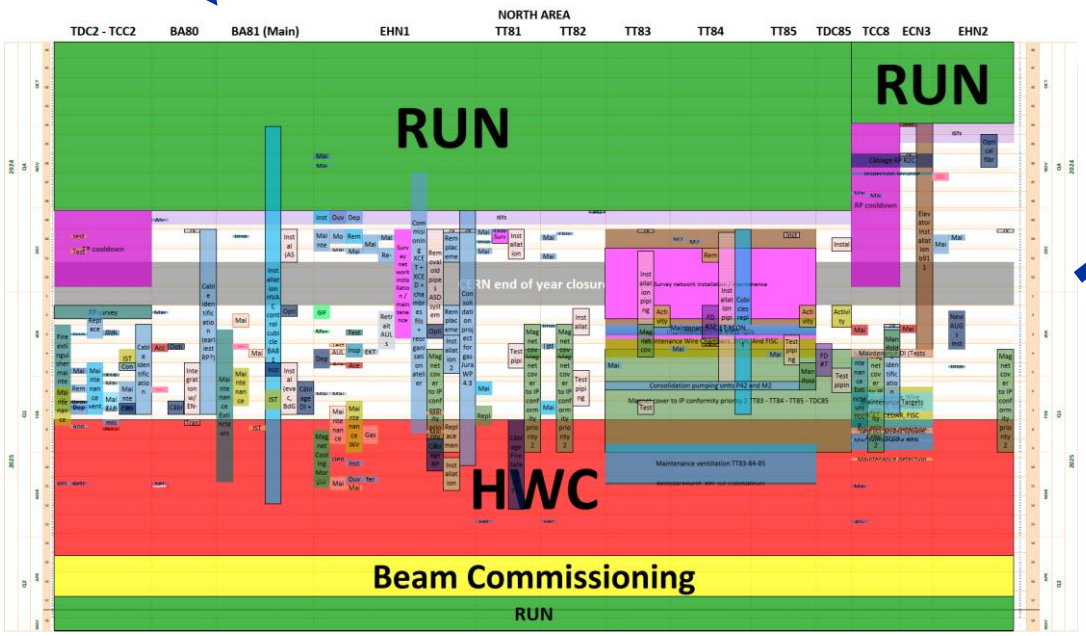


ACE methodology

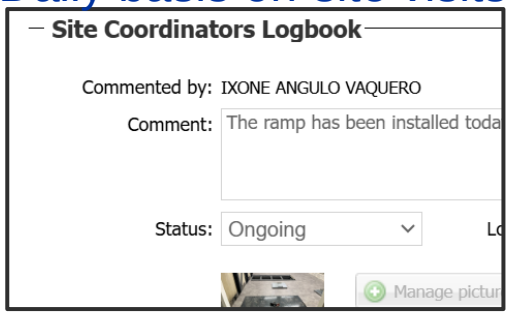


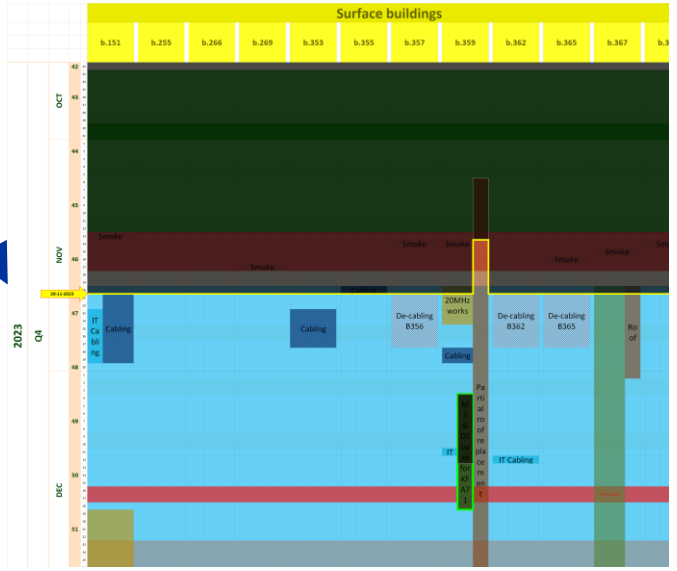
Preparation & Execution Follow-up





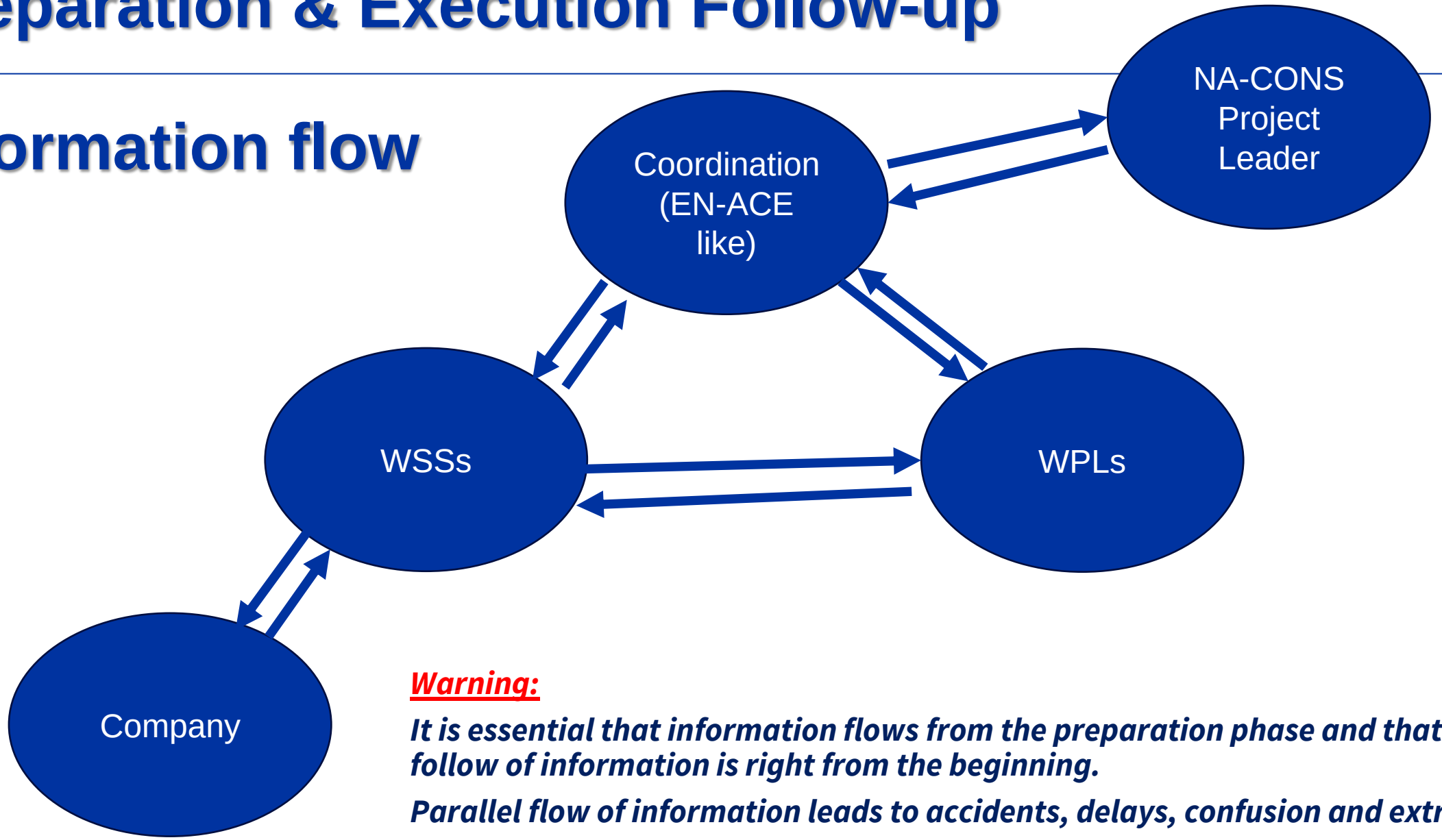
Daily basis on-site visits





Preparation & Execution Follow-up

Information flow

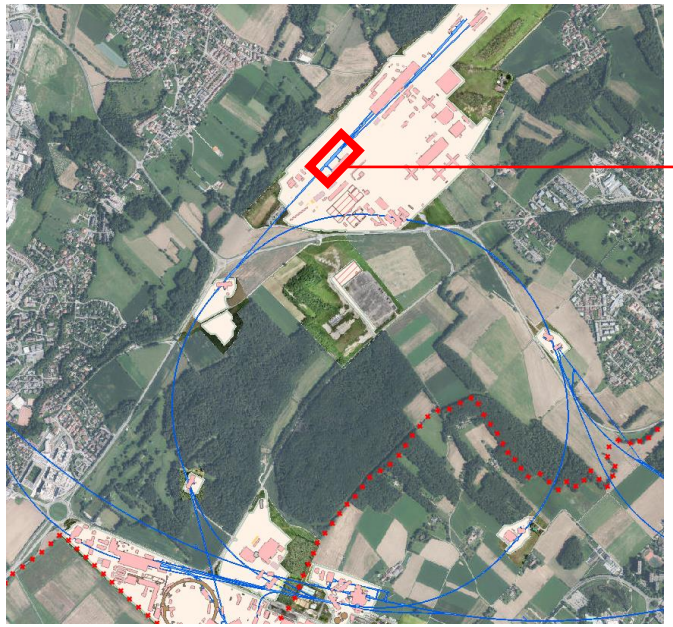


Warning:

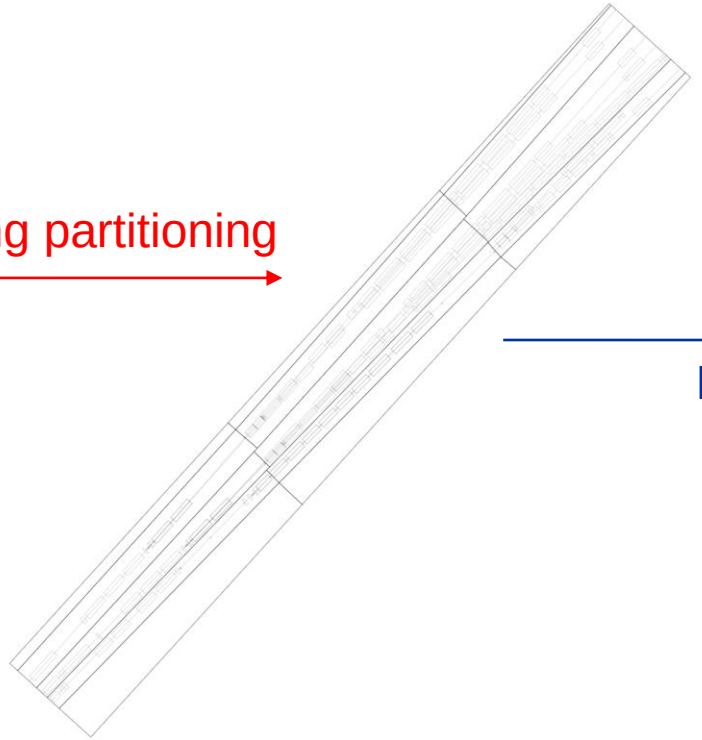
It is essential that information flows from the preparation phase and that the follow of information is right from the beginning.

Parallel flow of information leads to accidents, delays, confusion and extra cost.

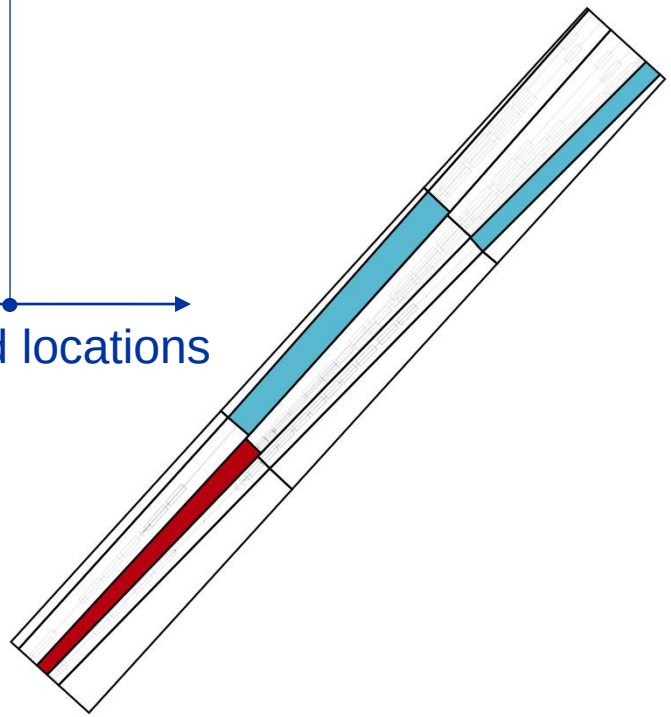
Support tool for the methodology – Time&Space



Building partitioning



Dates and locations



Phase 1 underground – TDC2 & TCC2 renovation

Facility characteristics

- Junction cavern - Splits primary beamline into 6 beams (nowadays)
- Adjusts beam properties for specific downstream experiments

Facility challenges

- Underground location - Limited space, access only through shafts
- High radiation levels - Requires optimized strategy and procedures for works

Defining a renovation strategy in a radioactive area

1. **Define possible scenarios**
2. **Calculate total collective radioactive dose** for each scenario and planning
3. **Comparison** of the scenarios
4. **Management decision** on the selected scenario

Defining a renovation strategy in a radioactive area

1. Define possible scenarios

What is radioactive ?

The equipment in the cavern depending on its location

Scenario 1

We perform the renovation works without touching any equipment

High dose rate environment

Scenario 2

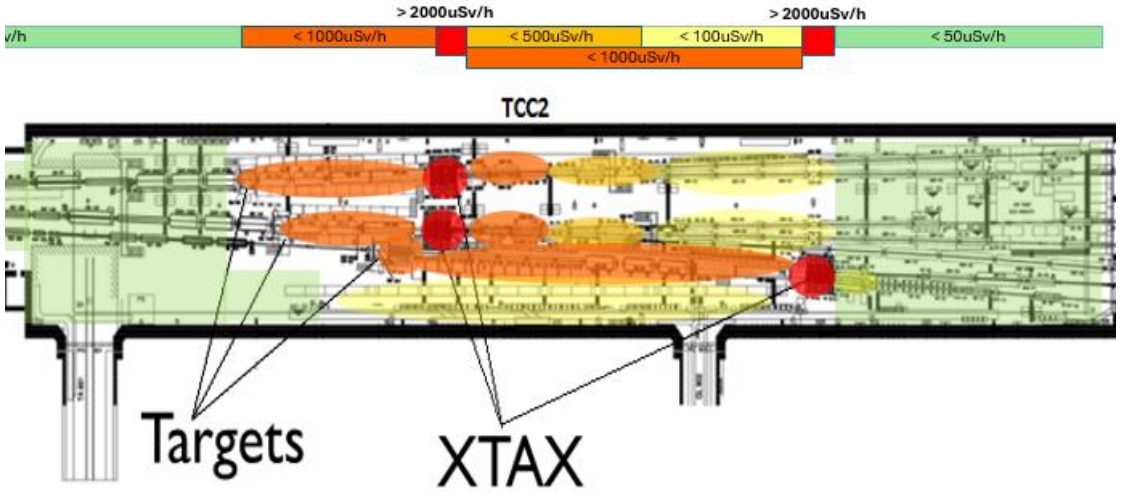
We perform the renovation works after removing all equipment from the cavern

Lower dose rate environment, but removal phase costs doses and need storage space

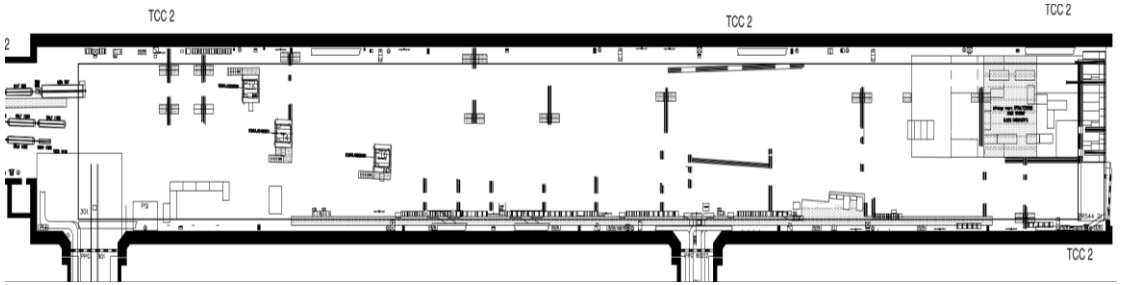
Defining a renovation strategy in a radioactive area

1. **Define possible scenarios**
2. **Calculate total collective radioactive dose** for each scenario

Scenario 1



Scenario 2



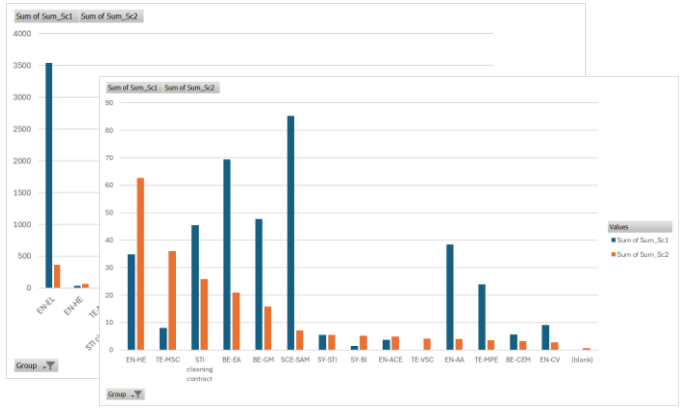
High dose rates Renovation VS High dose rates Removal + Low dose rates Renovation

Equation to solve

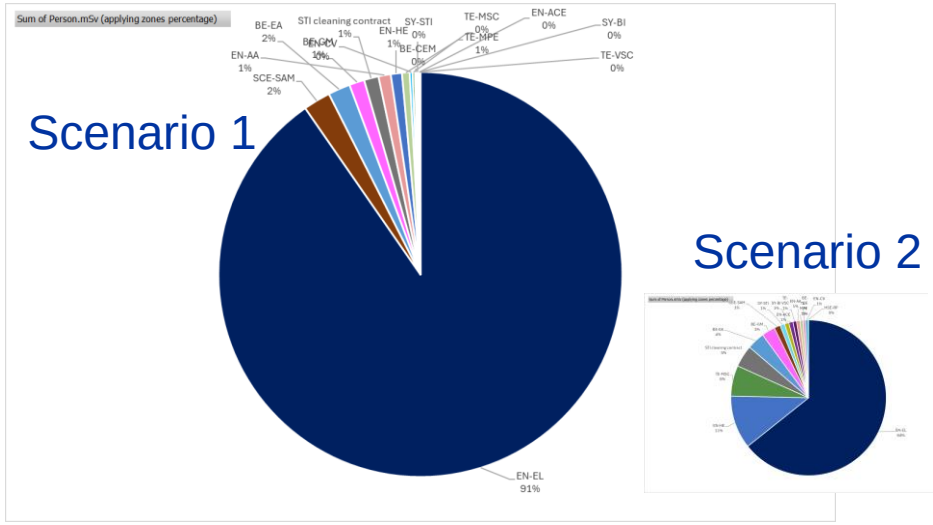
Defining a renovation strategy in a radioactive area

1. **Define possible scenarios**
2. **Calculate total collective radioactive dose** for each scenario
3. **Comparison** of the scenarios: Scenario 1 = **3917** Person.mSv, Scenario 2 = **566** Person.mSv

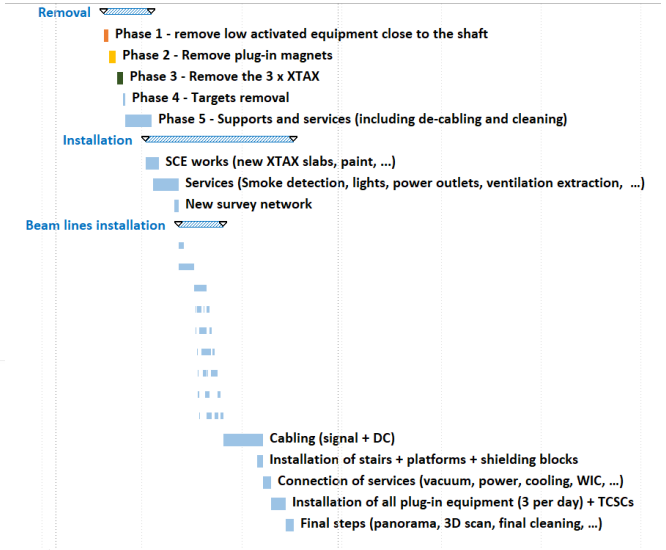
Collective dose direct comparison per group



Distribution of the dose across groups for both scenarios



Master planning



Why such a difference between scenarios ?

Scenario 1: Approved baseline

- XTAXs replacement;
- TCSCs replacement;
- WIC installation;
- Additional Beam instrumentation;
- De-cabling of all obsolete cables;
- Cabling (DC and signal cables);
- Fire doors;
- + few extra activities without moving magnets

Scenario 2: Full refurbishment of TCC2

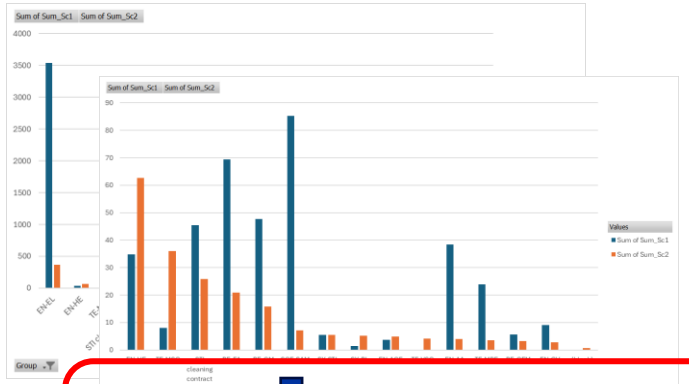
- Empty the TCC2;
- Everything that is in the approved baseline;
- Magnet refurbishment + some new magnets;
- Reorganization of the area:
  - Cable trays to avoid cables pulled on the floor;
  - Move the cooling manifolds closer to the lines to avoid flexible pipes in the passage;
  - New survey network system.

Dose rates for ☐ is ~ x10 with respect to ☐

Defining a renovation strategy in a radioactive area

1. **Define possible scenarios**
2. **Calculate total collective radioactive dose** for each scenario
3. **Comparison** of the scenarios
4. **Management decision** on the selected scenario

Collective dose direct comparison per group



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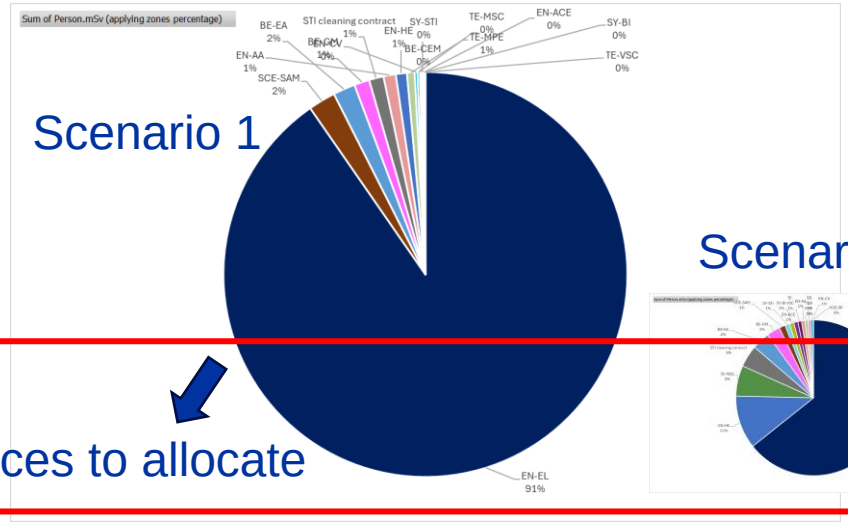

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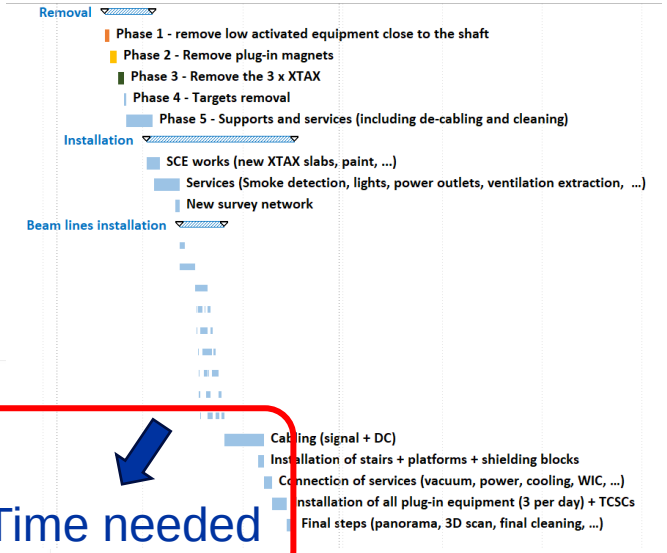


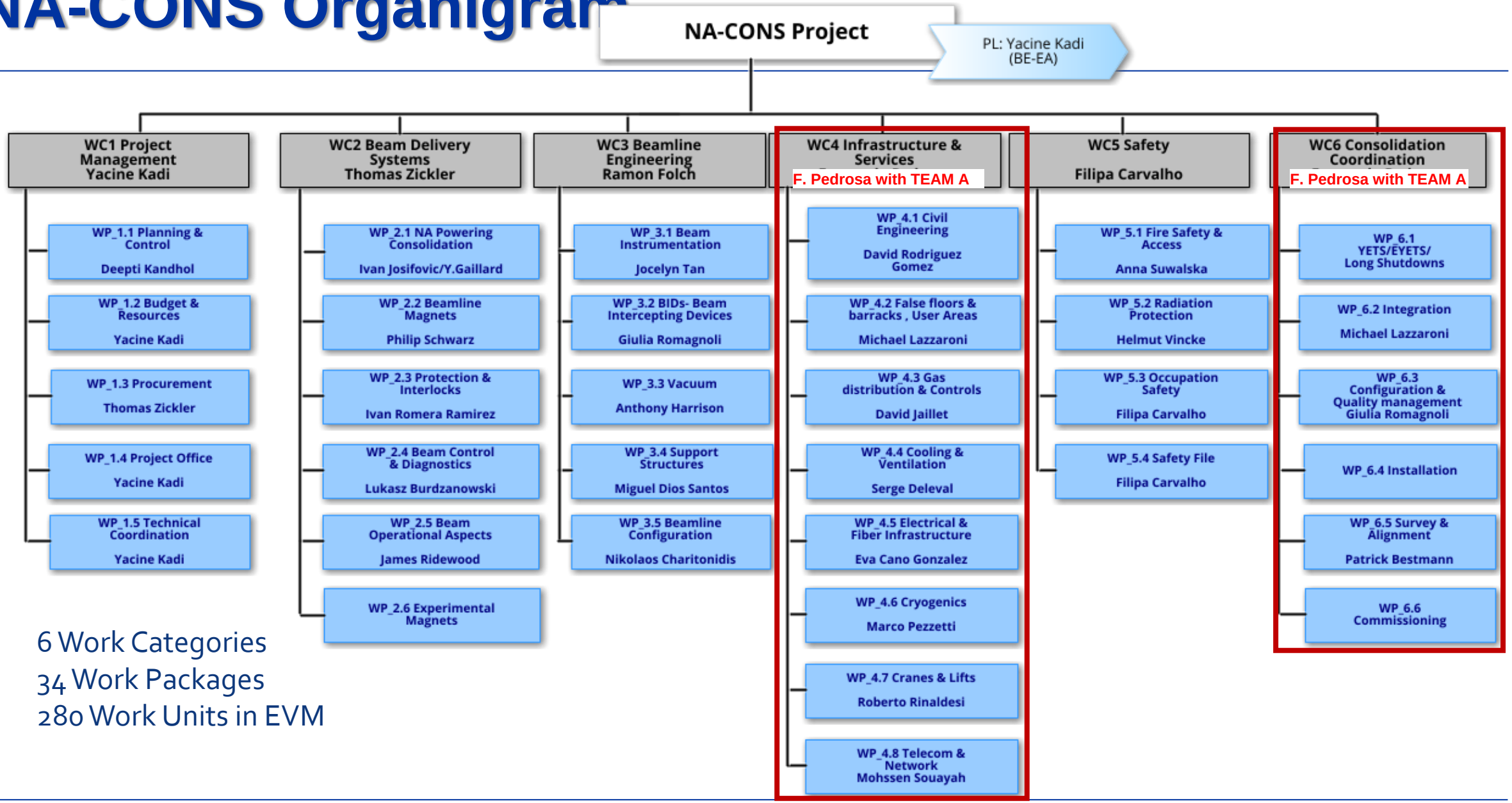
Which scenario

Resources to allocate

Time needed

Thank You!

NA-CONS Organigram



6 Work Categories
34 Work Packages
280 Work Units in EVM

ACE methodology

Collect each group's list of planned activities.

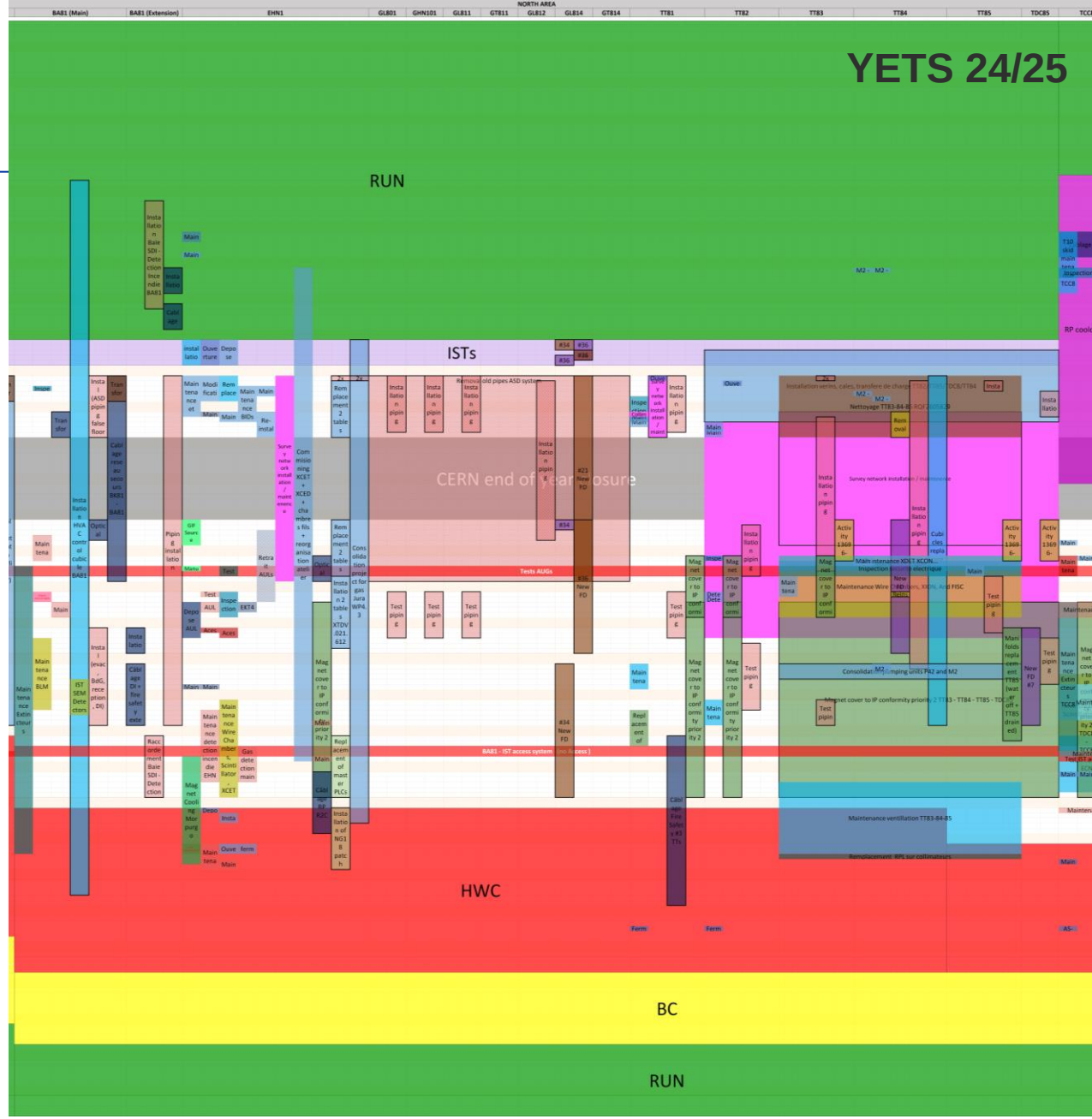
Draft an initial planning.

Hold meetings with each group to refine and adjust the planning.

Set a baseline of activities in EDMS.

Create the linear schedule.

Monitor and track progress on each activity.



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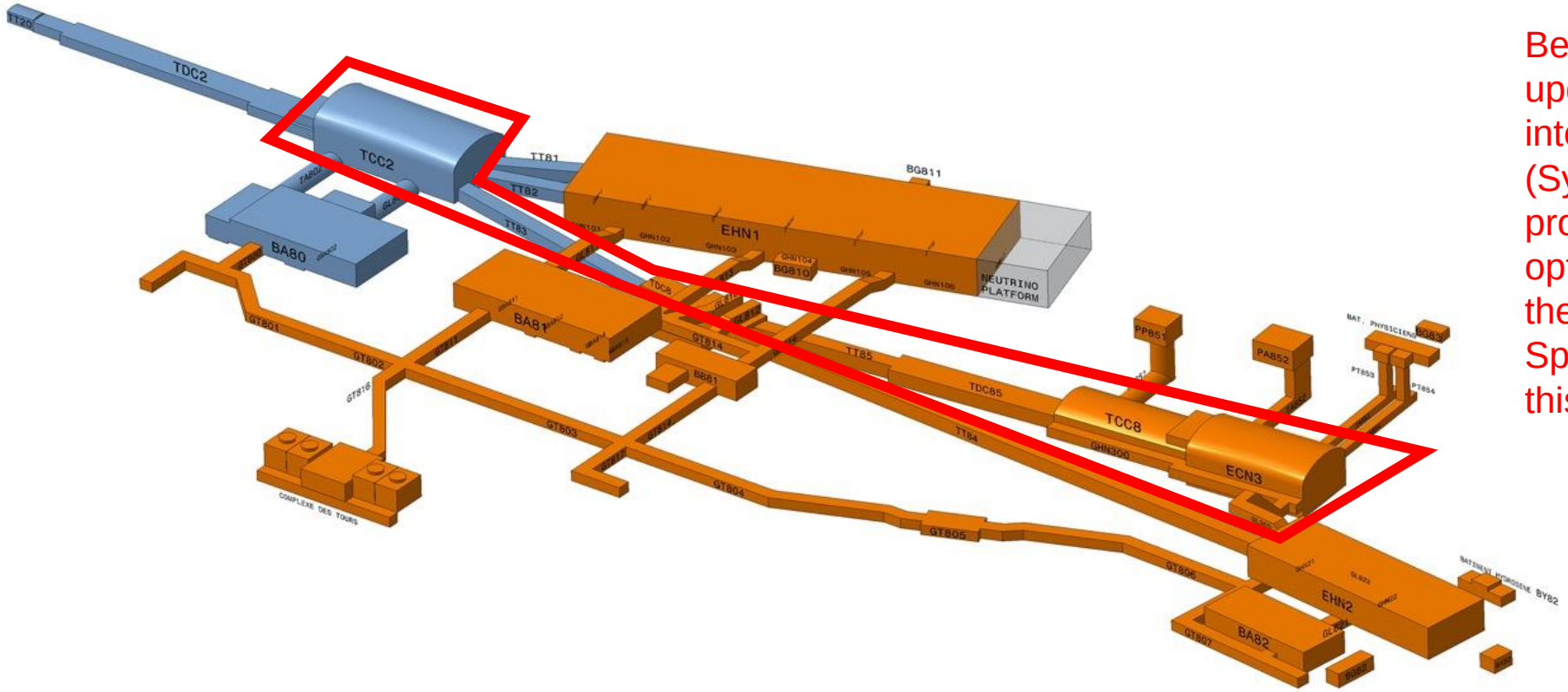

Beam Areas concerned with the upgrade of ECN3 to a high-intensity facility for SHiP (Synergies between the two projects are followed closely to optimize as much as possible the resources and the work) – Specific TCCs are organized on this subject

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