

Civil Engineering Aspects of the Forward Physics Facility

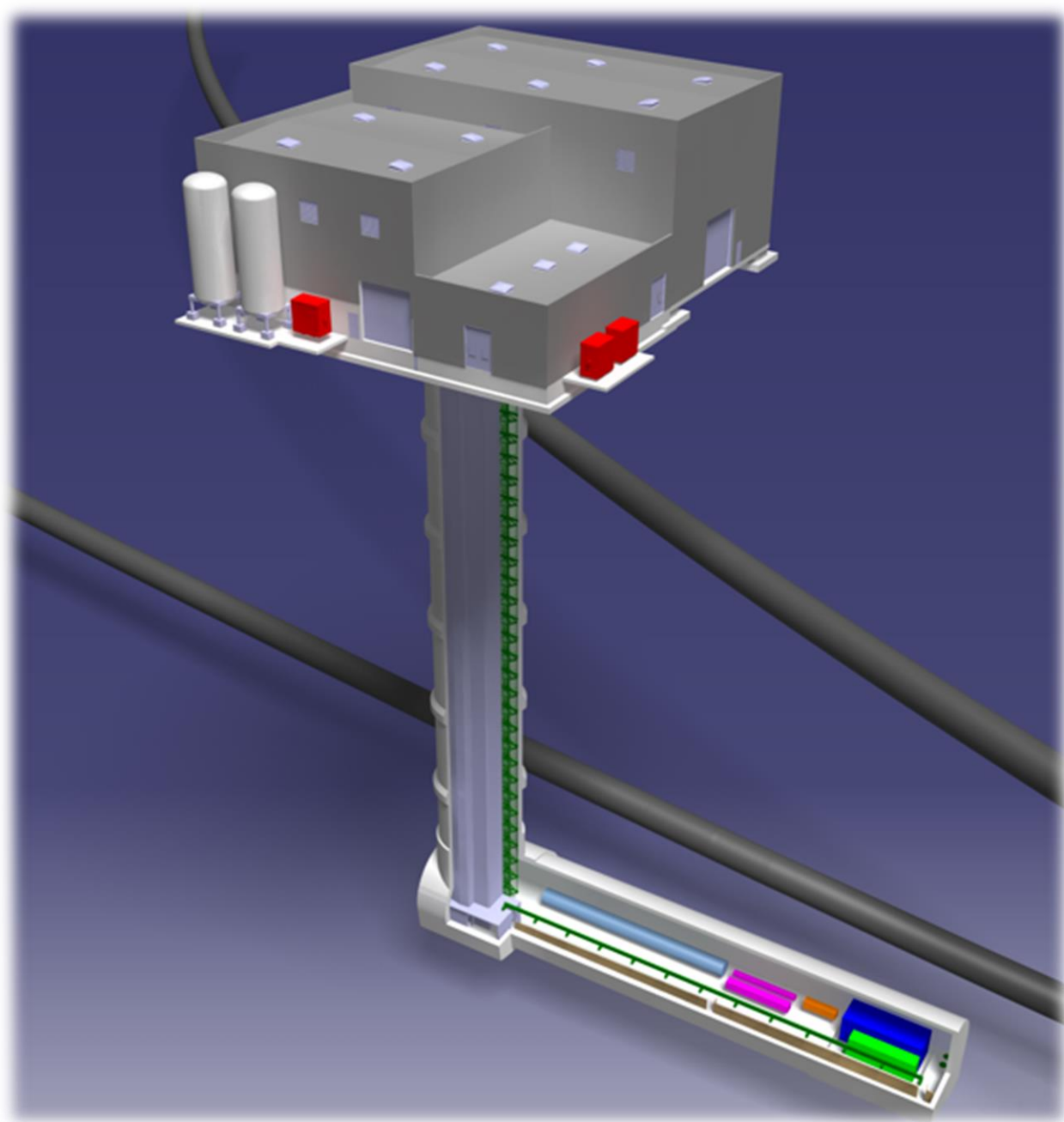
7th Forward Physics Facility Meeting, 29th February – 1st March 2024

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Drawings: A. Navascues Cornago- SCE-SAM-TG

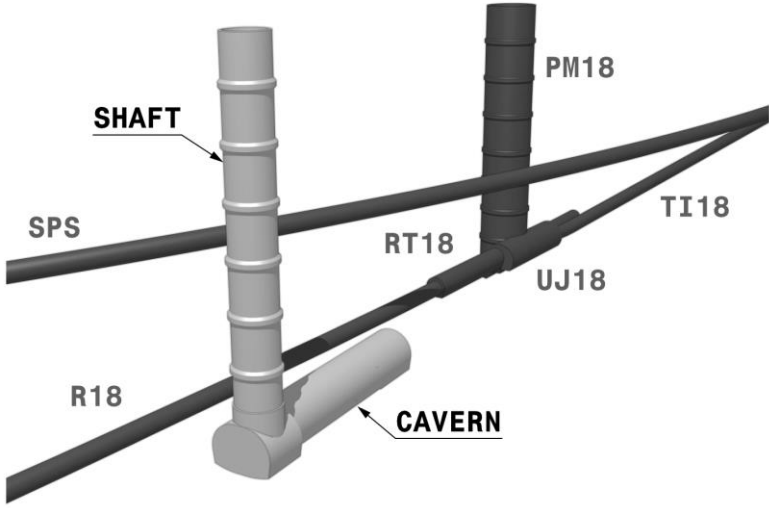
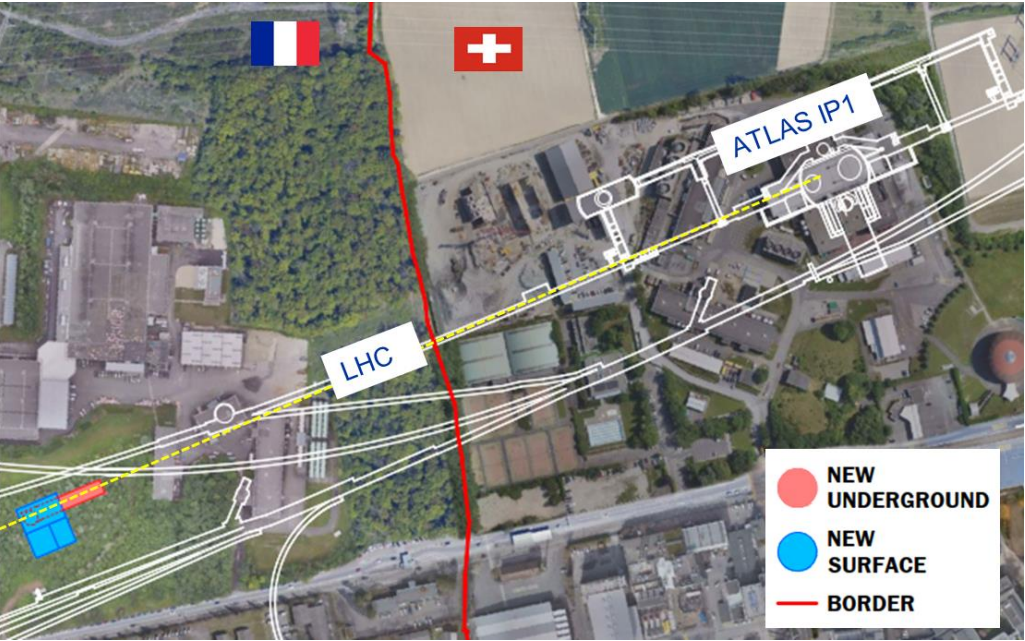
Outline

- **Proposed Design**
- **Site Investigation Works**
- **Cost and schedule updates**
- **Next steps**



Project Site

➤ **Proposed location:** 617m from ATLAS IP1 on the French side of CERN land, 10m away from the LHC tunnel

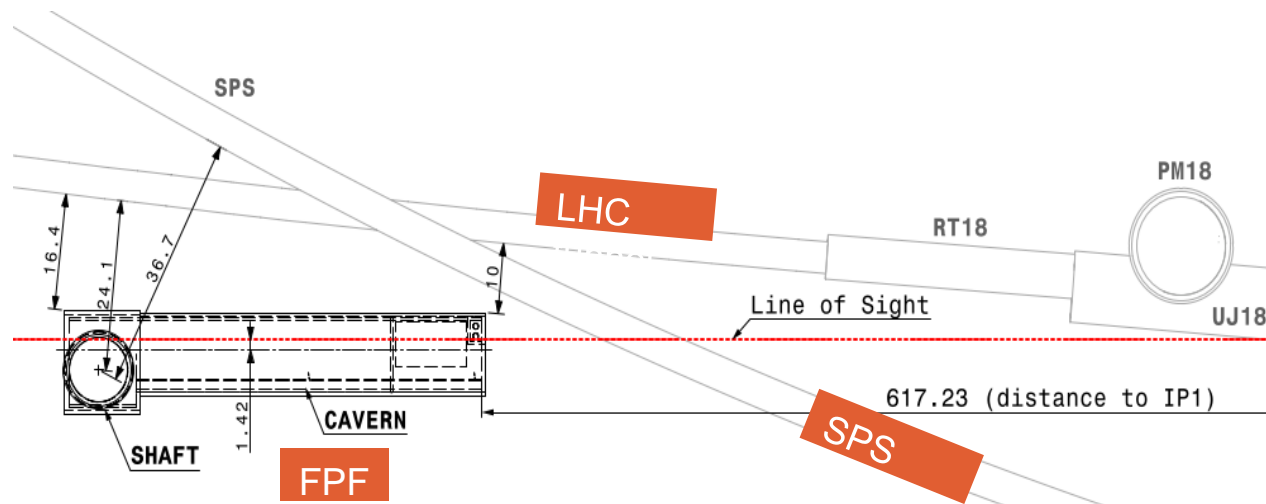


Initial Proposed Design

Purpose built facility

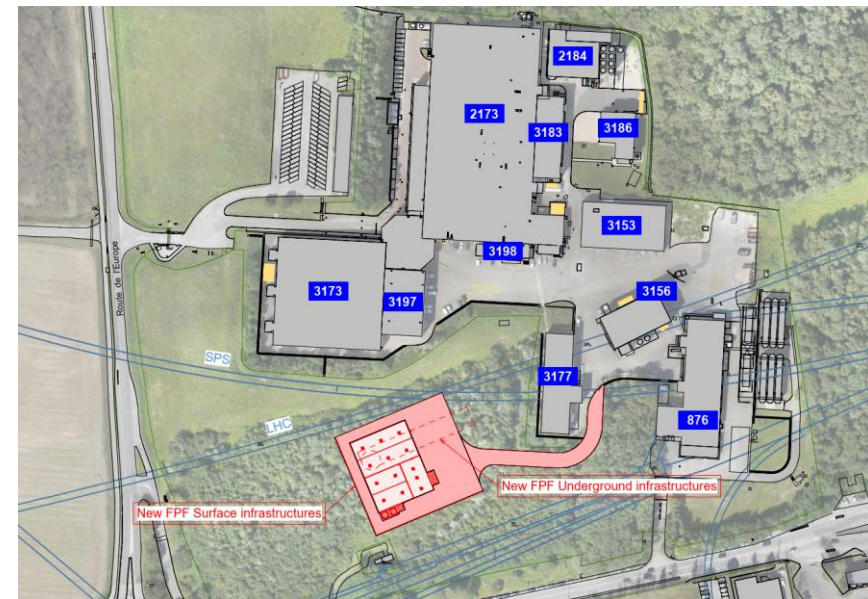
Underground:

- A 65m x 9.7m experimental cavern
- An 88m deep access shaft
- Safety corridor inside the cavern



Above ground:

- Access building
- Electrical building
- Cooling & Ventilation building



Updated Design Proposals

■ CURRENT VERSION

Option 1

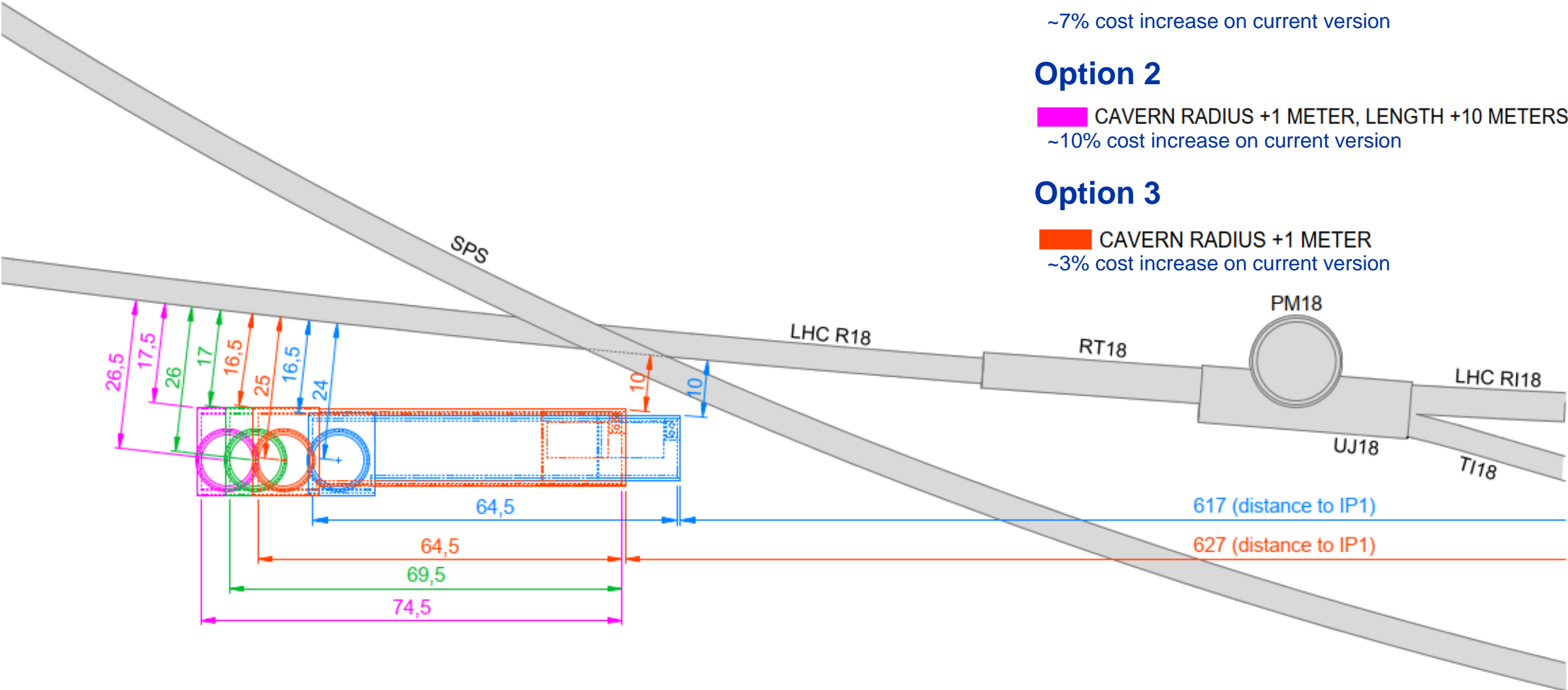
■ CAVERN RADIUS +1 METER, LENGTH +5 METERS
~7% cost increase on current version

Option 2

■ CAVERN RADIUS +1 METER, LENGTH +10 METERS
~10% cost increase on current version

Option 3

■ CAVERN RADIUS +1 METER
~3% cost increase on current version



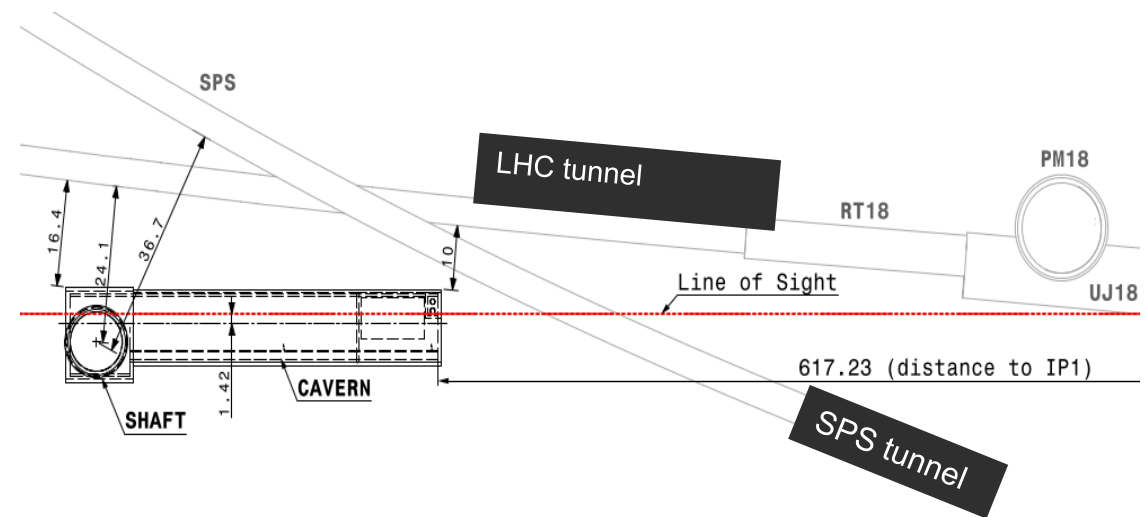
Forward Physics Facility

Site Investigation Works

- A single new core was drilled the full depth of the proposed shaft, 100 m deep.
- Shaft located 24m from LHC and 36.7m from SPS



Position marked by CERN survey team



Forward Physics Facility

Site Investigation Works



➤ Drilling machine in place



➤ Works started



➤ Core samples

Site Investigation Works

Results and Recommendations

Results

- Ground found mostly competent for tunnelling purposes
- Signs of hydrocarbons were found in the soft sandstone at depths between 84m and 90m
- Foundations of the surface buildings will sit within competent moraine
- No water table has been identified. Overall the ground is not very permeable.
- Vertical swelling test carried out showed a high swelling potential.
- Slight exceedance shown of fluoride levels in the existing backfill material.

Recommendations

- Excavation material contaminated with liquid hydrocarbons will require specific spoil management
- Underground tunnels and works in contact with soils contaminated with hydrocarbons will require specialised waterproofing membrane
- Swelling pressures to be considered during the design of the final lining
- Existing backfill material will need to be disposed of at appropriate facilities

Summary: Ground conditions are favourable, with some attention needed to hydrocarbons, fluoride and swelling

Proposed Civil Engineering Schedule

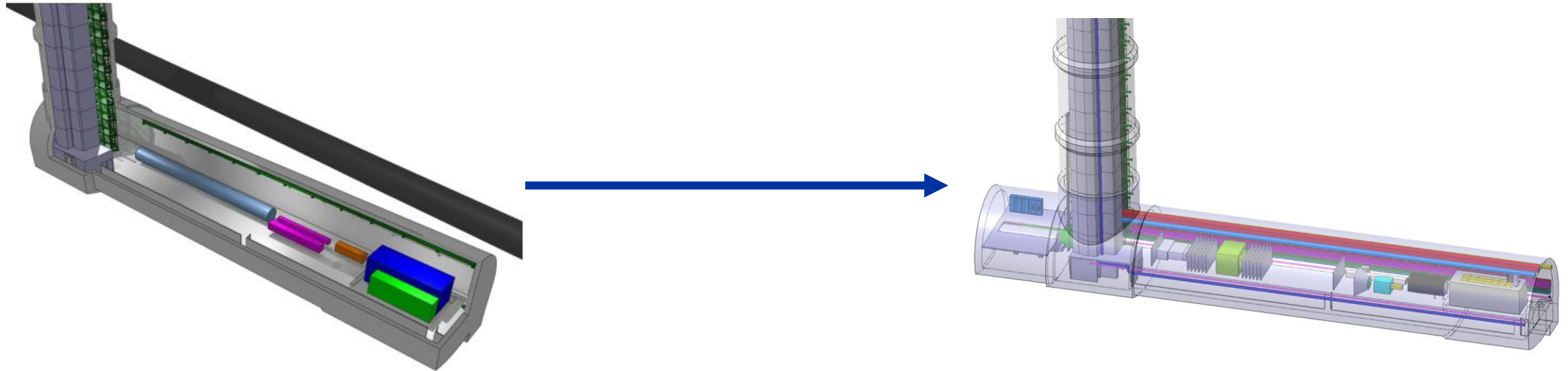
Civil engineering FPF Indicative Schedule	2019			2020			2021			2022			2023			2024			2025			2026			2027			2028			2029			2030			2031			2032											
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4							
LHC Operation Period	LS2			LS2			LHC run 3			LHC run 3			LHC run 3			LHC run 3			LS3			LS3			LS3			LS3			LHC run 4			LHC run 4			LHC run 4			LHC run 4											
HL-LHC Operation																																																			
Further Infrastructure/ Integration studies				Feasibility work and Concept Design																																															
Site Investigation							SI																																												
Technical design stage													Technical design																																						
Detailed design																Detailed design																																			
Procurement of design consultants																			Detailed design																																
Detailed design																						Tender specifications and drawings																													
Tender specifications and drawings																									Environmental permits and consents																										
Environmental permits and consents																												Construction Contracts																							
Construction Contracts																															Construction Contracts																				
Market survey																																		Market survey																	
Tender and award																																		Tender and award																	
Mobilisation																																		Mobilisation																	
Construction Works																																					Construction works														
Site installation and enabling works																																					Site installation and enabling works														
Shaft																																					Shaft														
Tunneling and caverns																																					Tunneling and caverns														
Surface works																																					Surface works														

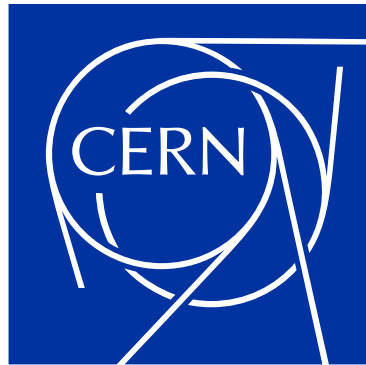
NB Very early stage estimate for schedule

★ Design must be frozen before technical design can begin

Next Steps

- Update cost estimate ahead of PBC baseline document (June)
- Refine the design and cost estimate (ongoing)
- Integration studies with the aim of frozen design





Thank you!

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