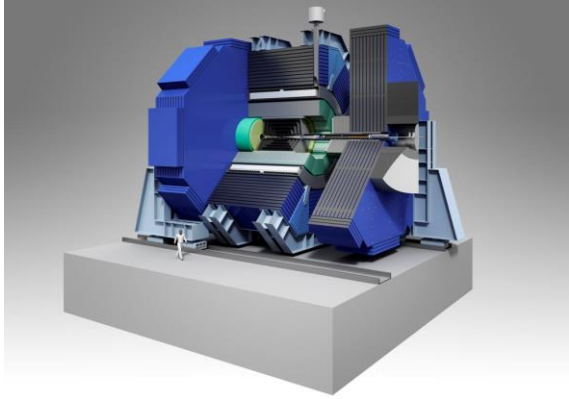


VS, HT and VS&HT

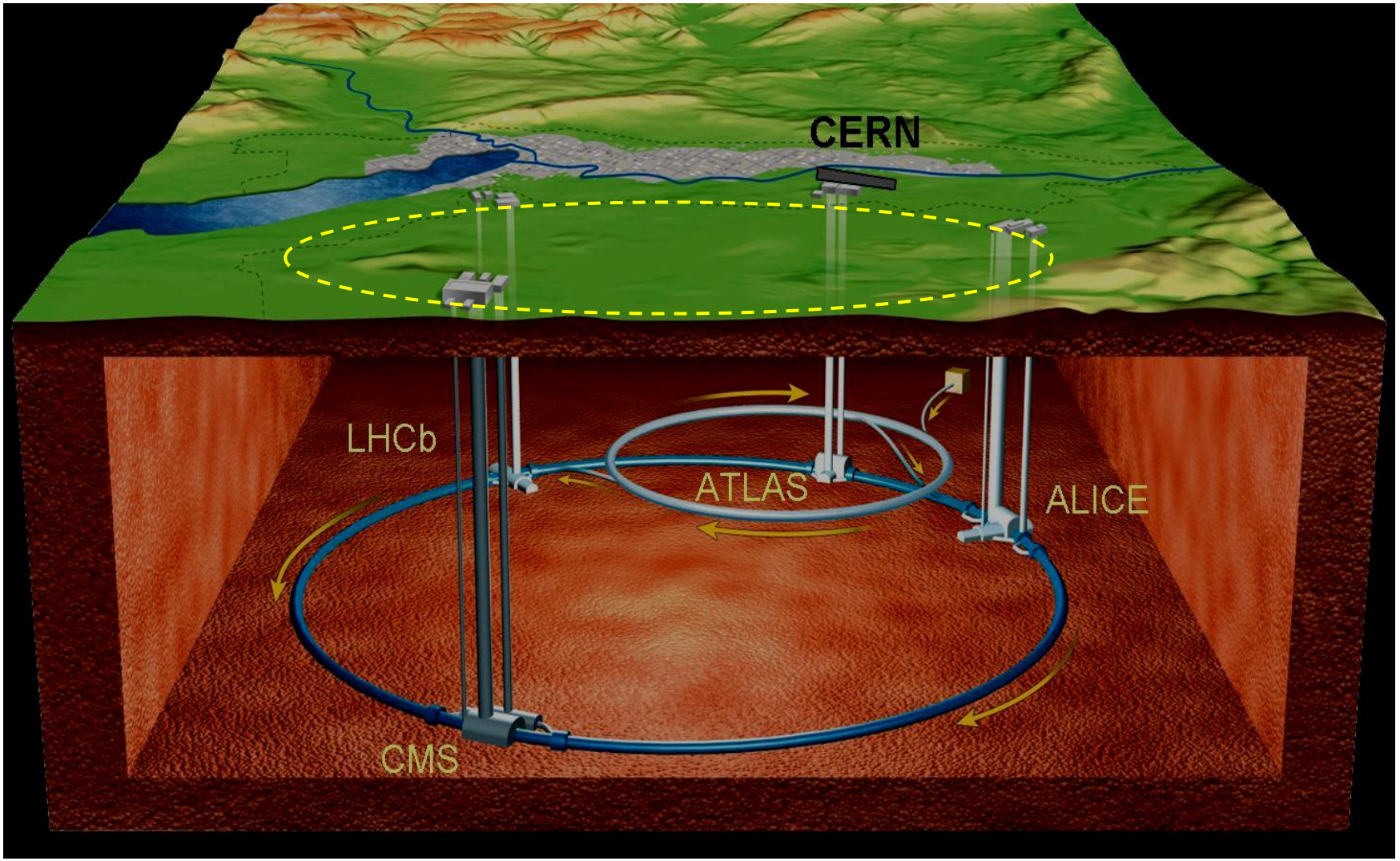
Marco Oriunno (SLAC), March 12, 2014

MDI WG

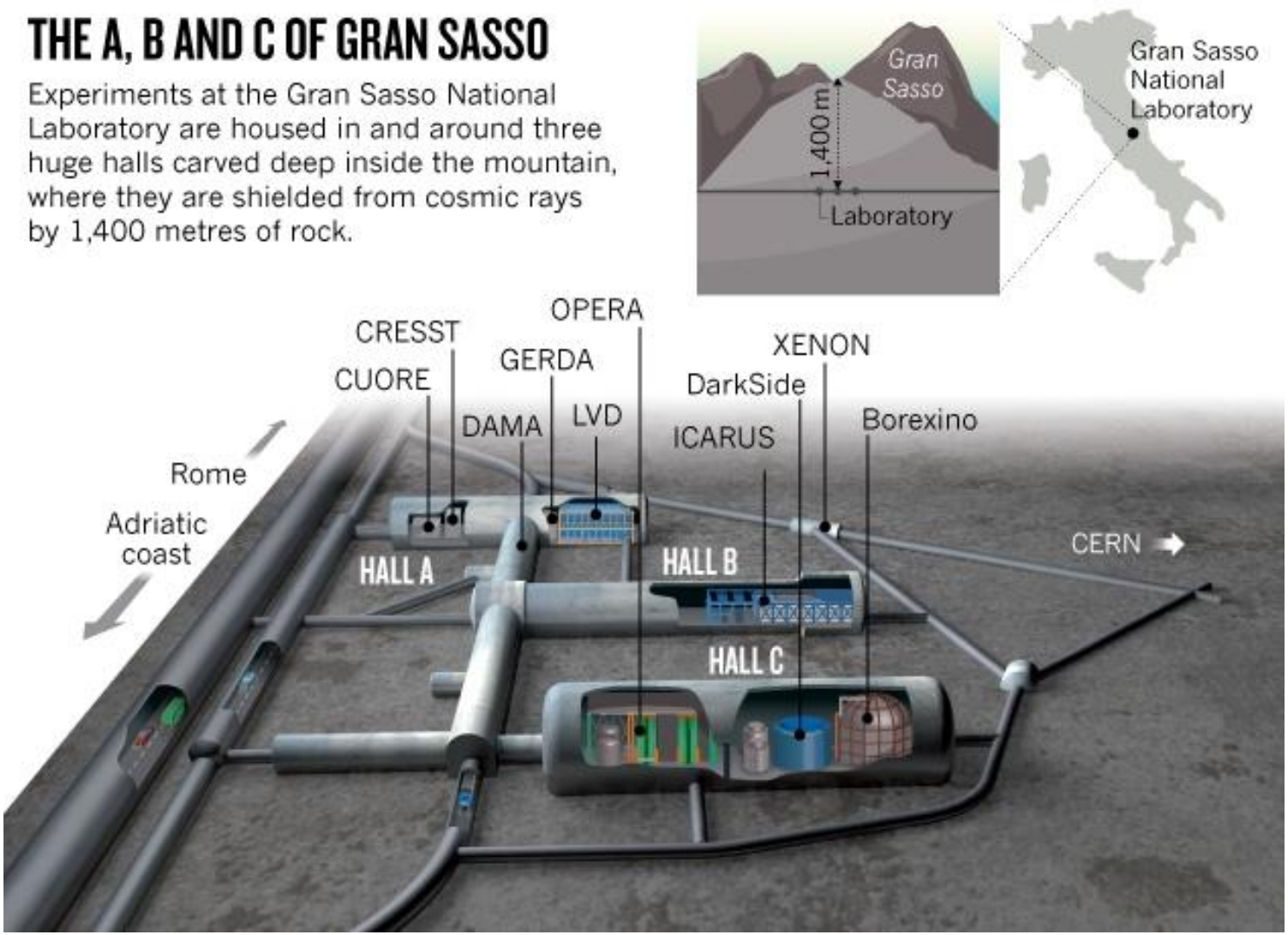
U.S. DEPARTMENT OF ENERGY
Office of Science

SLAC NATIONAL ACCELERATOR LABORATORY

LHC = Vertical Shafts



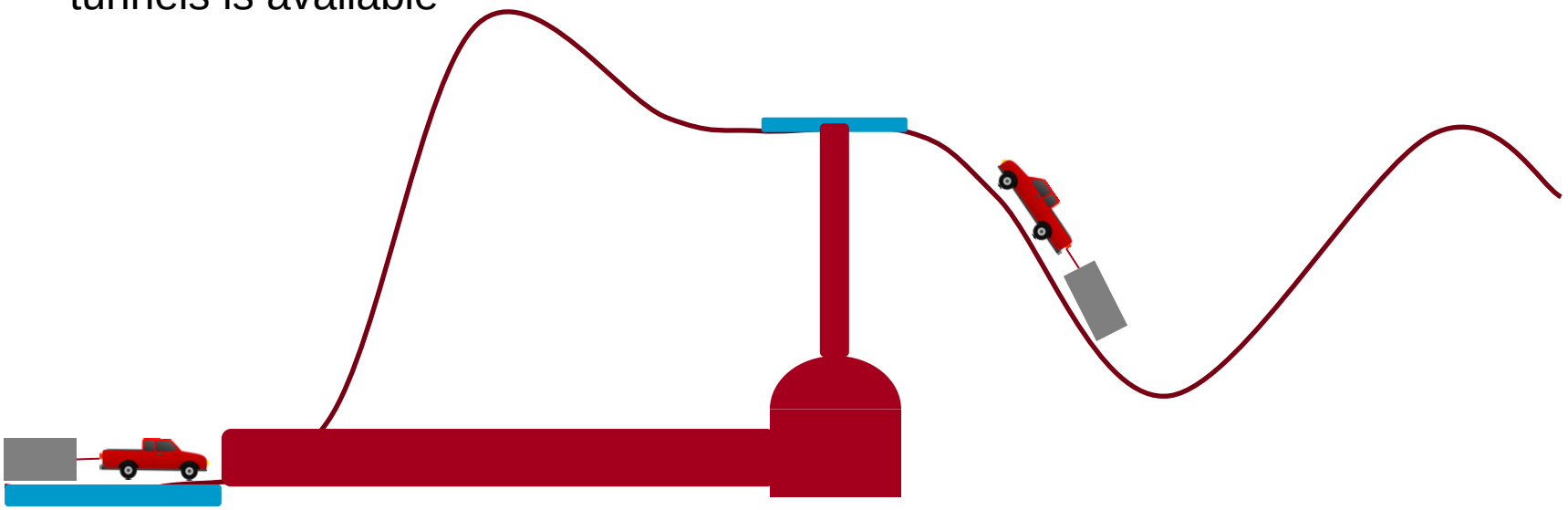
Gran Sasso Lab = Horizontal Tunnel



Shafts versus Tunnel

1. Vertical shafts are an obvious solution for underground accelerator complex in flatlands (CERN)

2. Are less obvious in mountainous sites if the choice of short and flat tunnels is available



LHC Schedule drivers

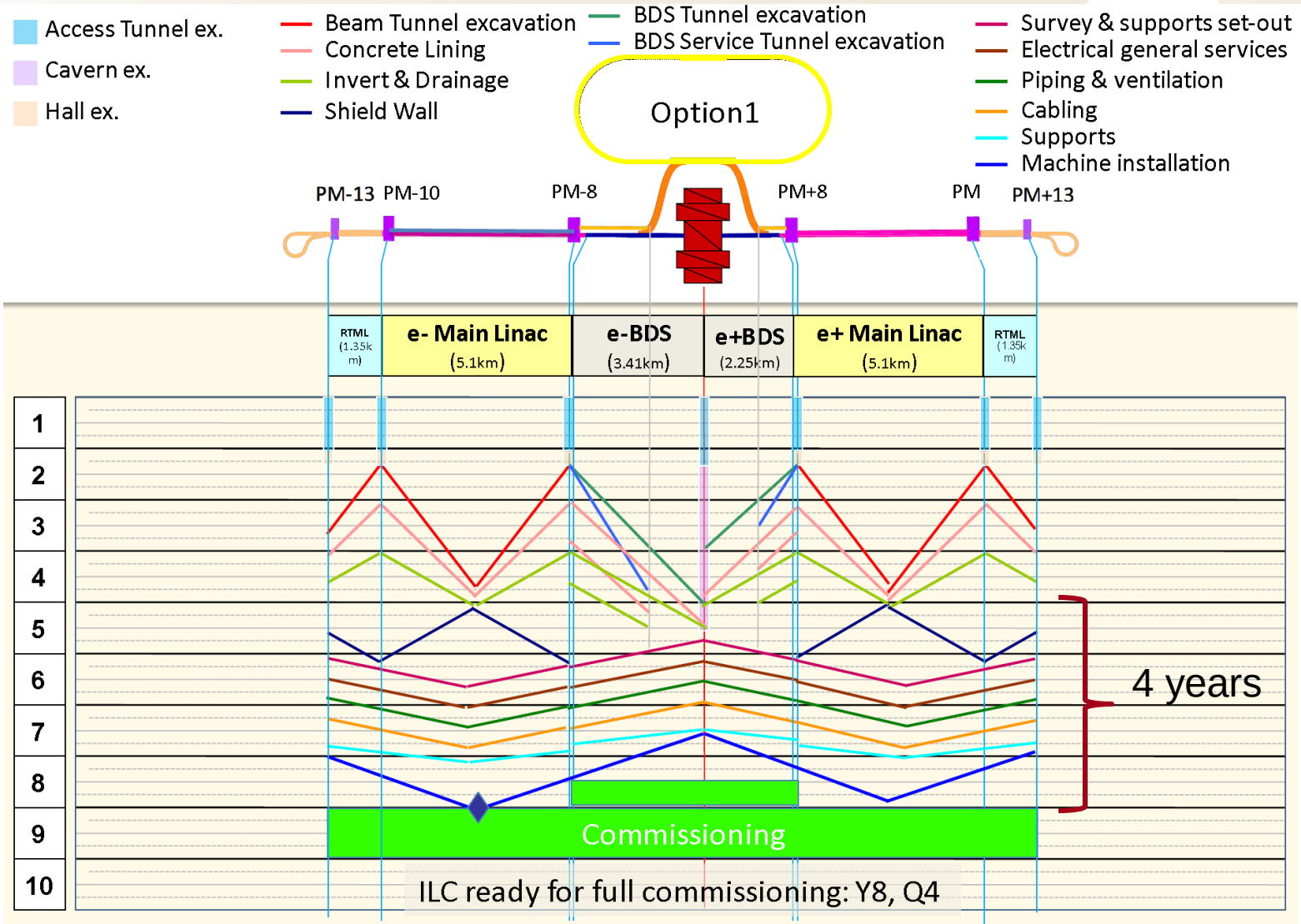
1. LHC was built inside the preexisting LEP tunnel.

2. The main schedule drivers were the removal of the LEP parts and the installation of the new magnets.

3. The CMS schedule challenges were because the cavern was built almost by scratch, certainly true for the large shafts, versus an almost ready-to-go detector hall for ATLAS.

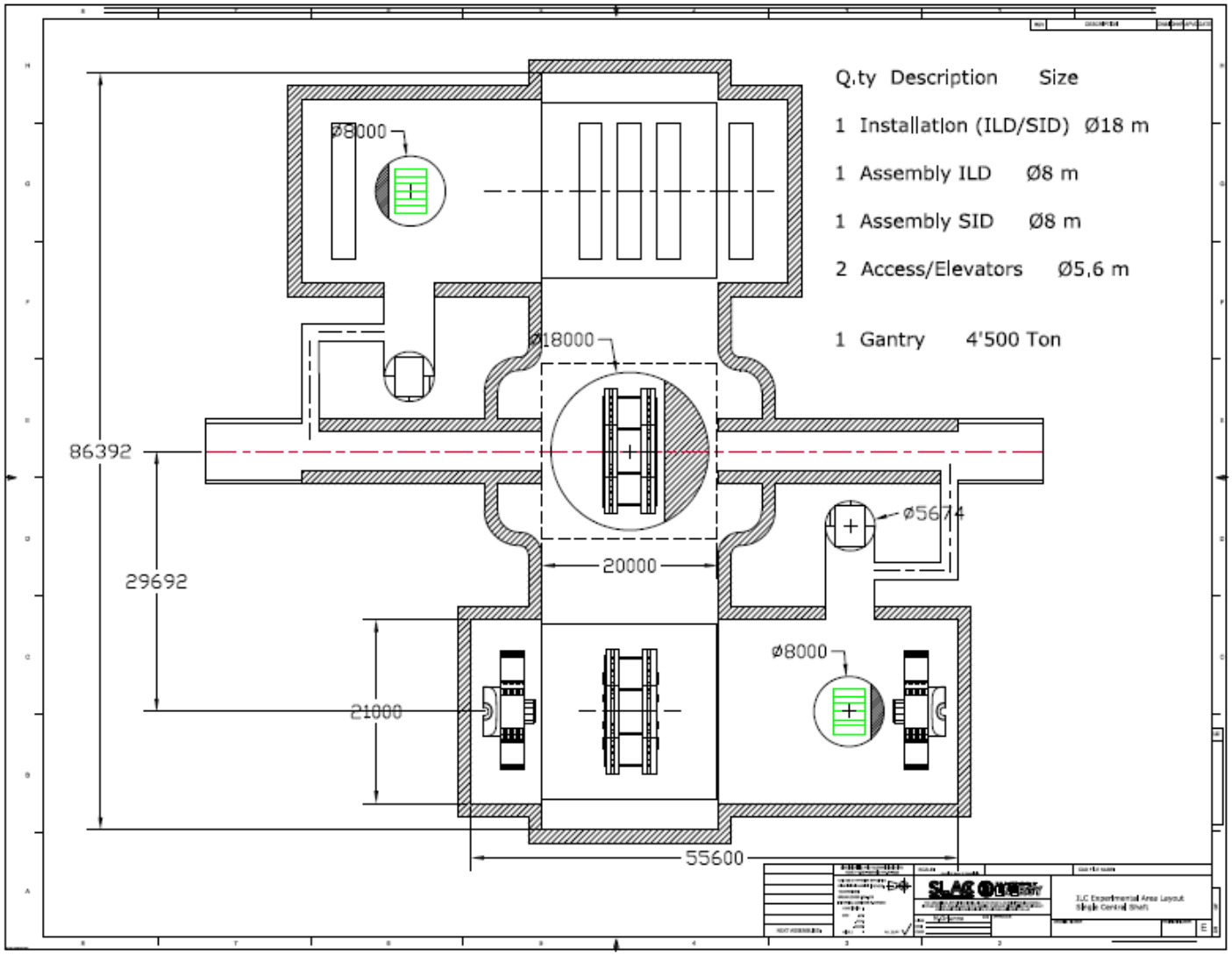
4. The ILC complex will be entirely built by scratch.

ILC Schedule



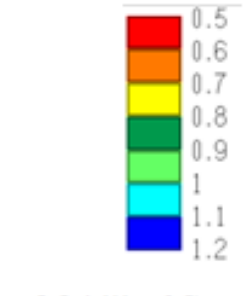
ILC IR layout (LCWS11,Granada)

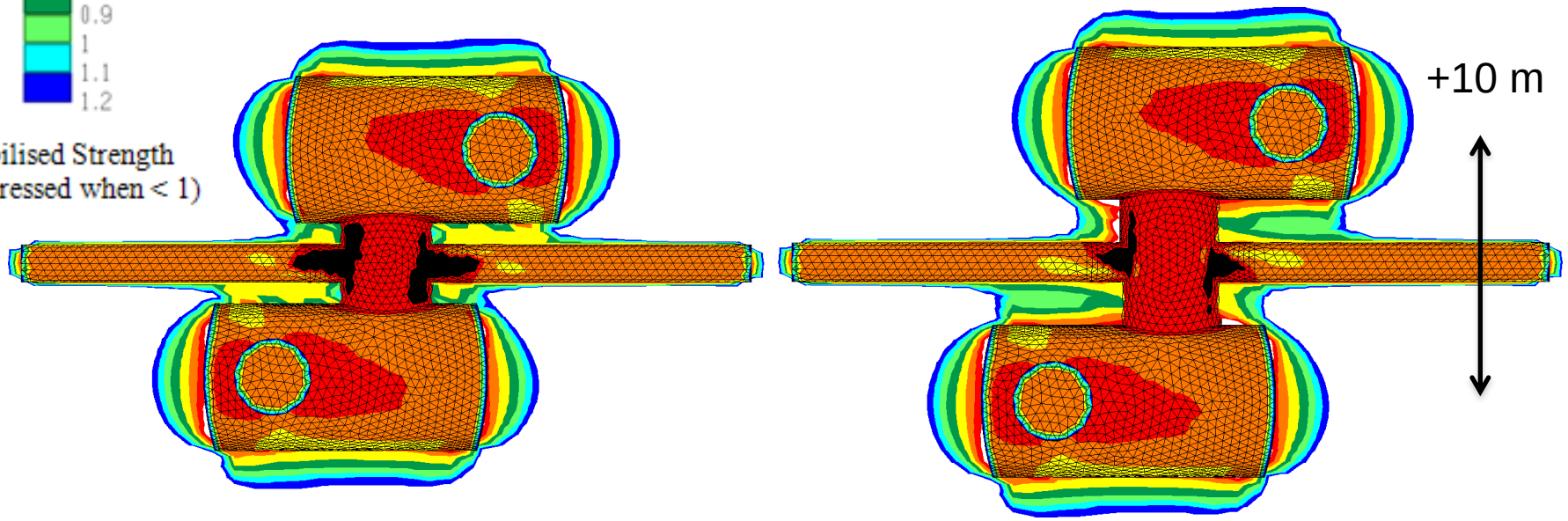
SLAC



Geology Study (CLIC geometry)

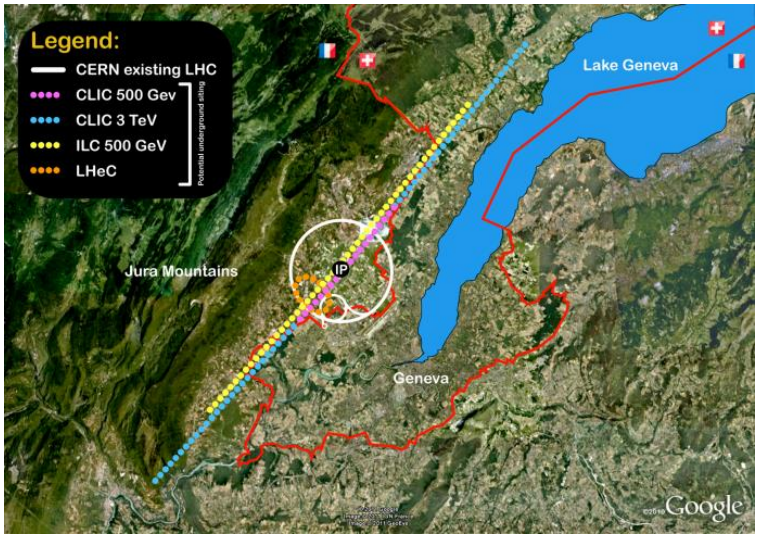
ARUP

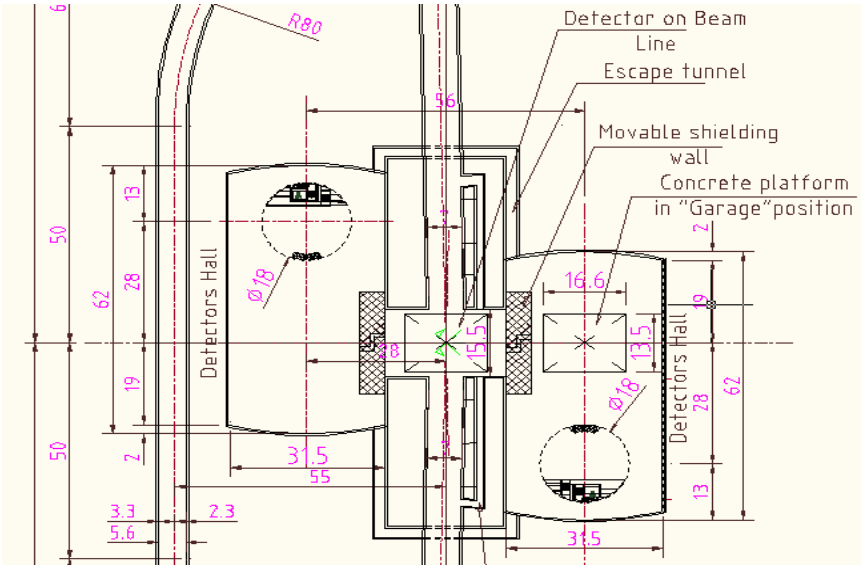




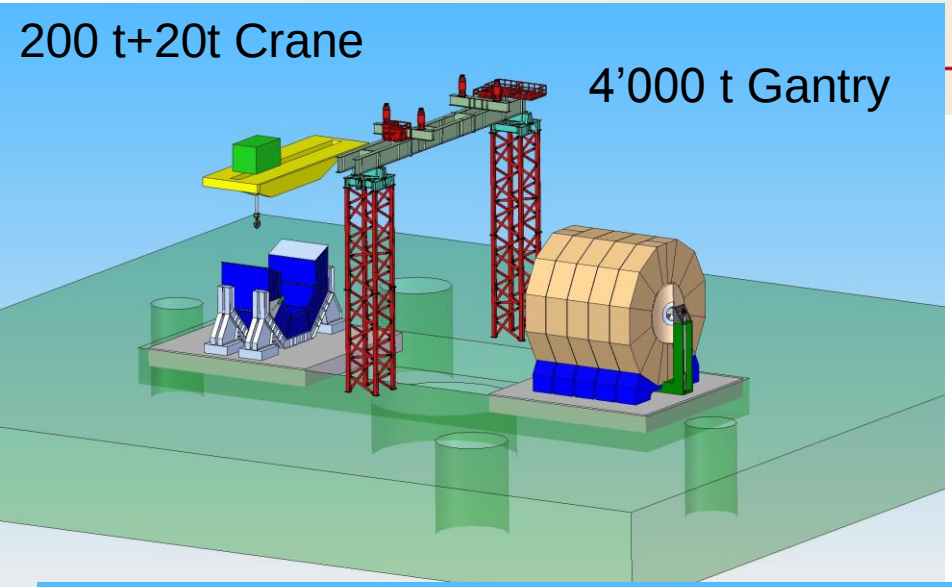
Baseline

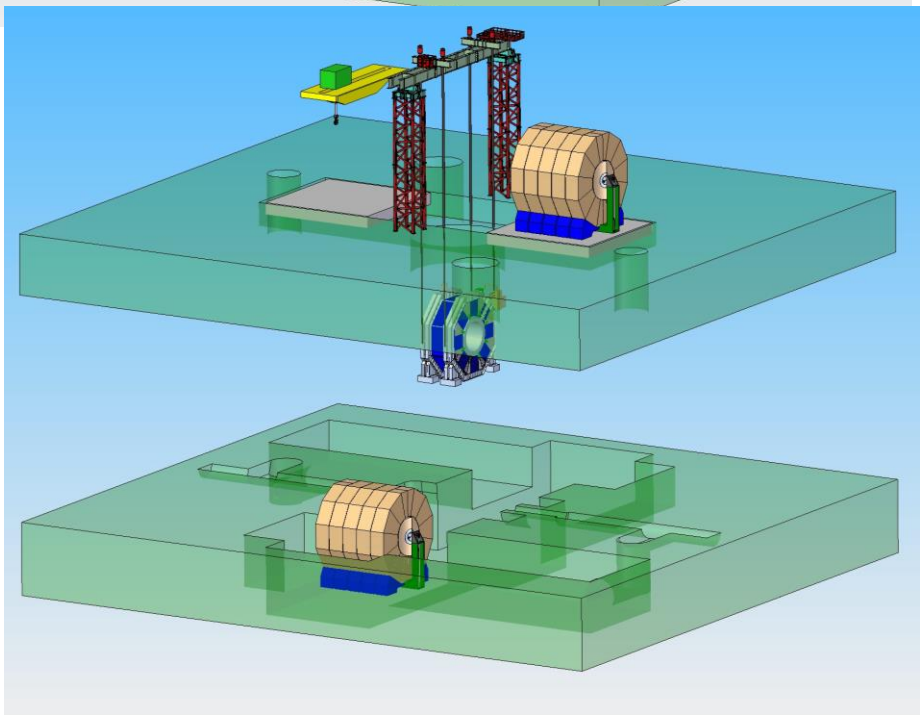
Baseline + 10m



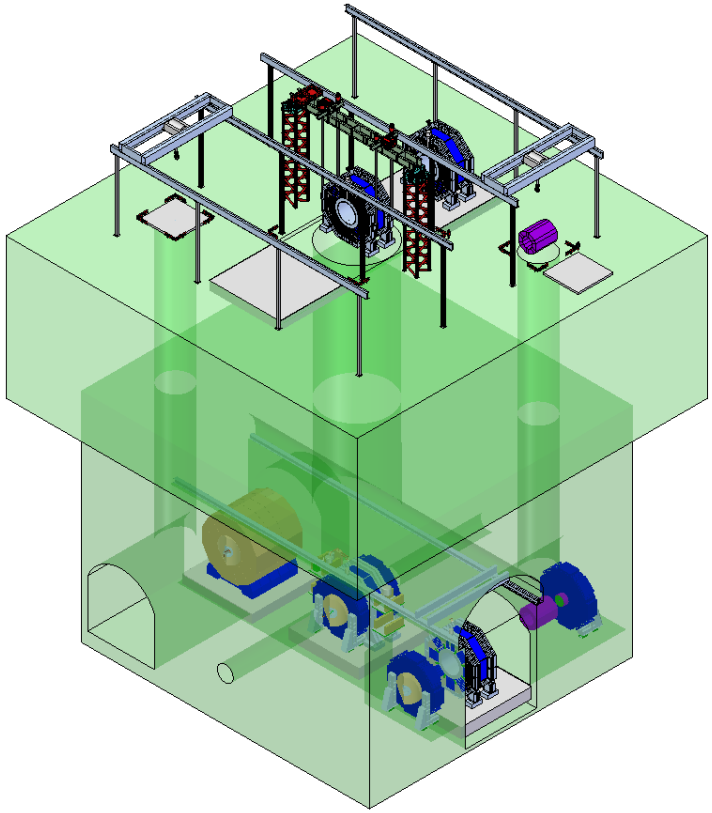


Surface assembly

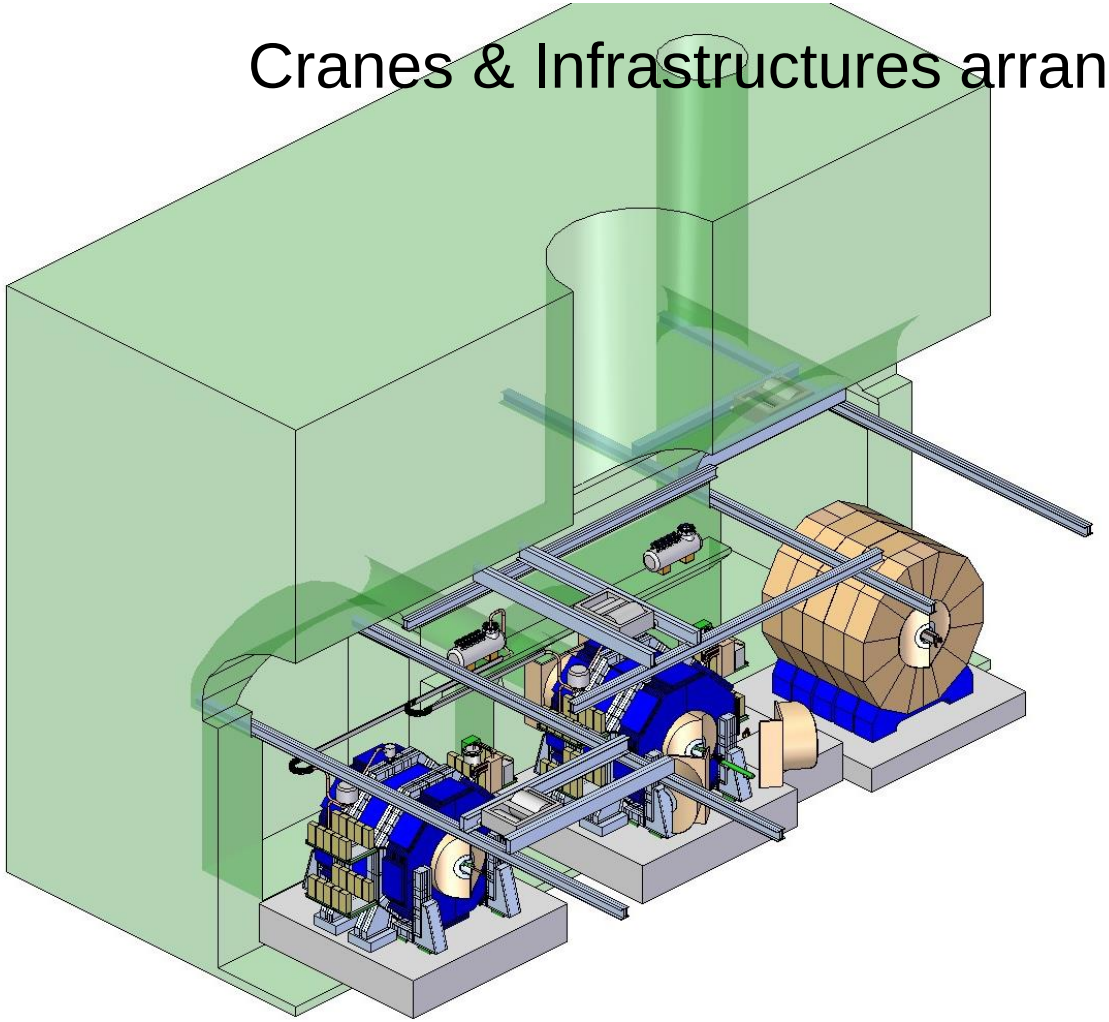


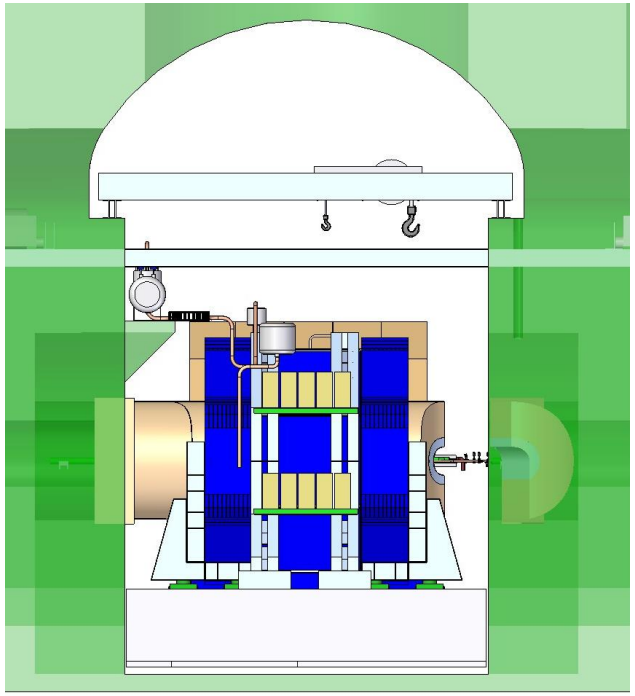


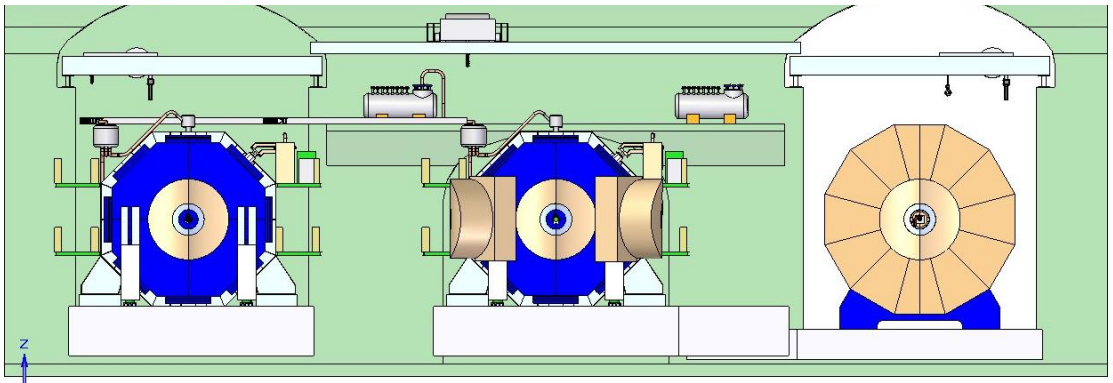
1. Assembly of Iron Doors+Barrel on surface
2. Commissioning of the magnet on surface
3. Large capacity gantry

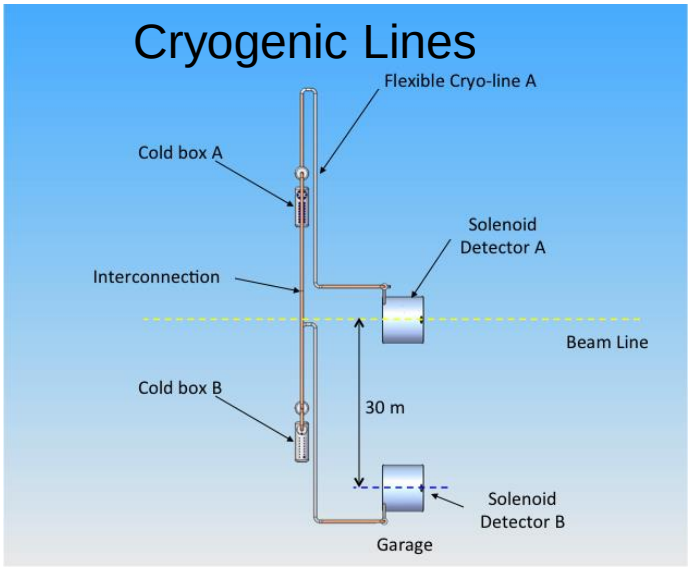


Cranes & Infrastructures arrangements, Undergound

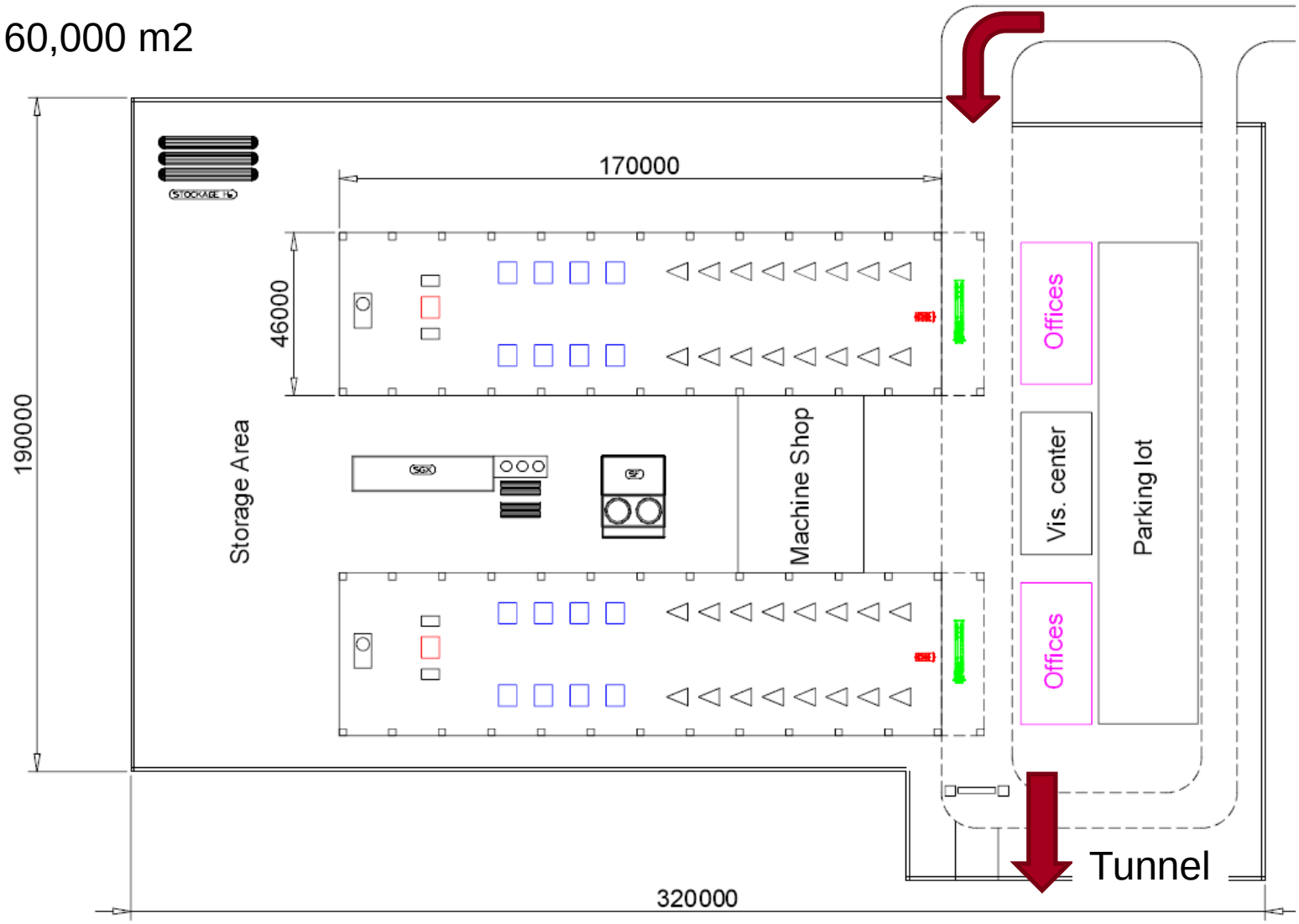




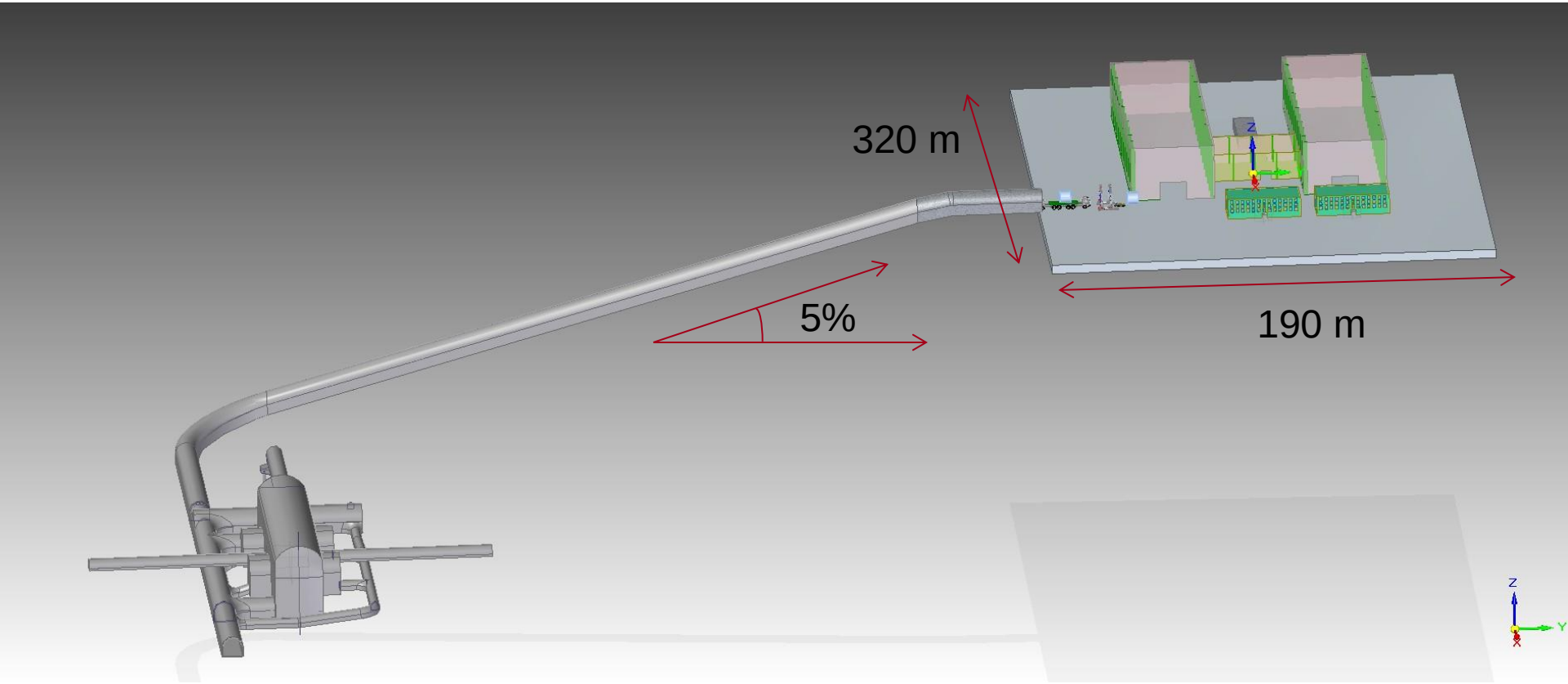




Kitakami Access Yard = one 50T crane + one 200T gantry

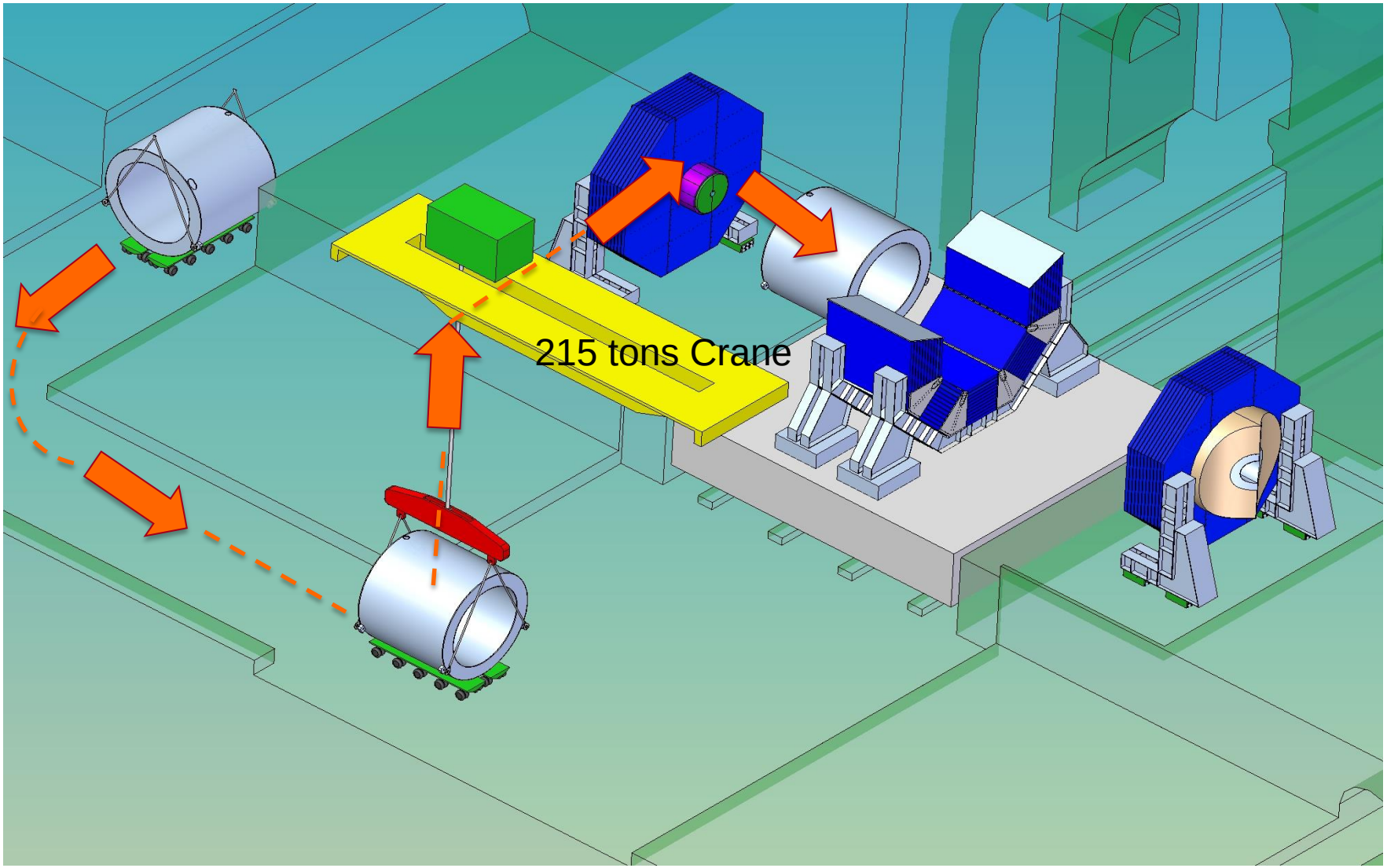


Kitakami Access Yard

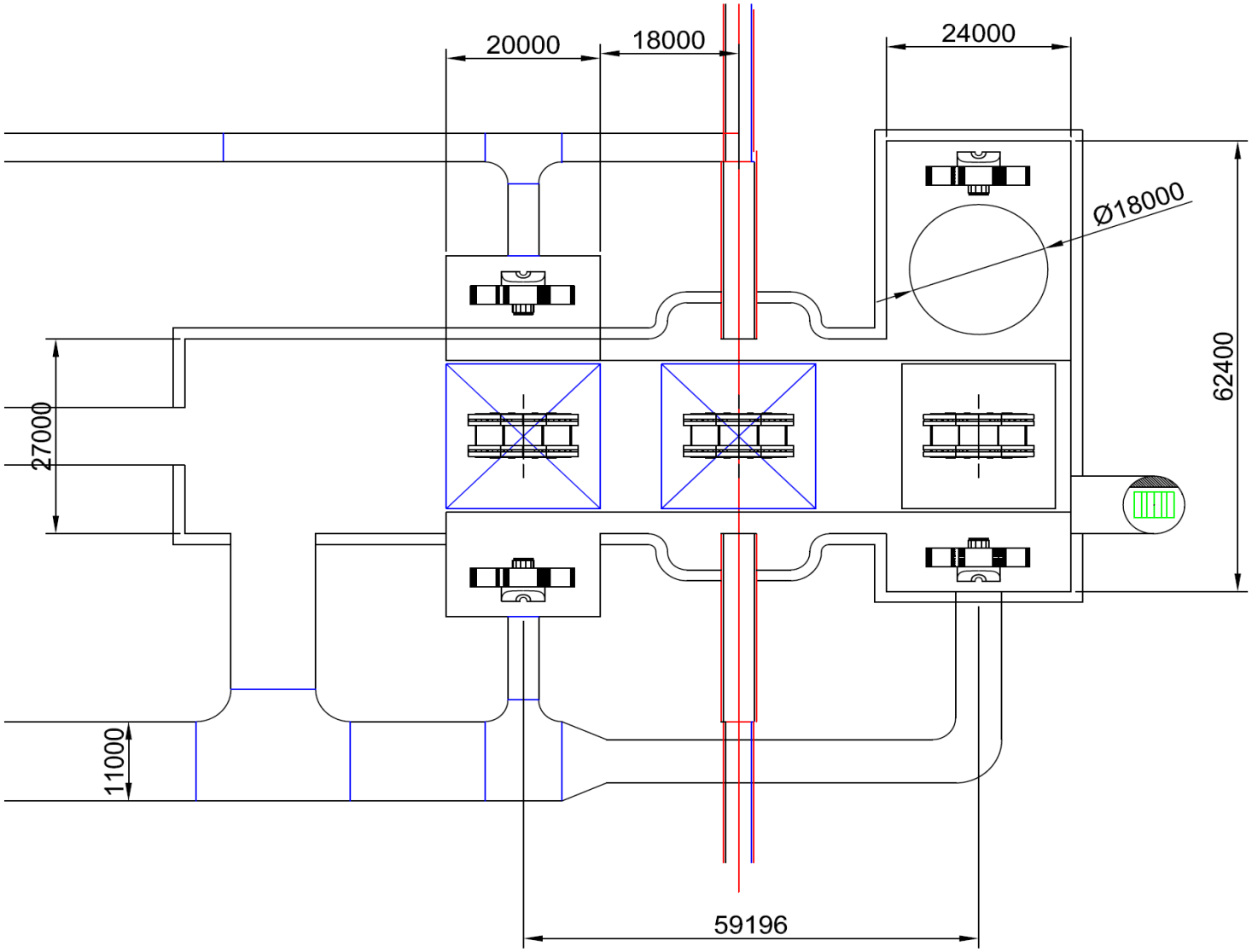


Detector Units on cart + Pushback track

Magnet Installation – Japanese Site



Hybrid layout



Final remarks

1) SiD supports and prefers the HT access

2) The analysis of costs given does not include 2 major items:

a) Consequences (cost, engineering, etc.) of translating the IP to translating the entire ILC complex

b) The surface infrastructure needs are different and larger for the VS or HT/VS schemes. Schemes using VS require:

-Large assembly building

- Large (400T) assembly crane

- 4000T gantry

- Two moving platforms similar to those needed underground

-Moving systems for the surface platforms

By contrast a HT surface building would require a 200T crane to lift segmented iron or coil from delivery trucks

3) Concerns:

- Not enough information to believe that the location of the assembly hall for the HT scheme is optimized

- grade of tunnel should be minimized

- Radius of curvature of hairpin turn in HT schemes: what are implication to size/length of largest item that can be transported around the hairpin in a tunnel of the diameter stated

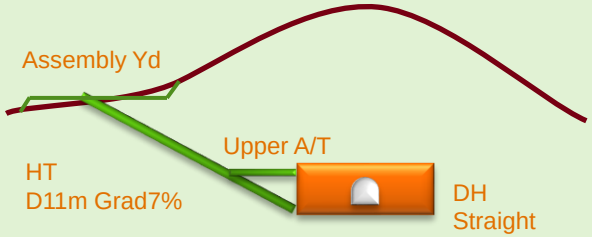
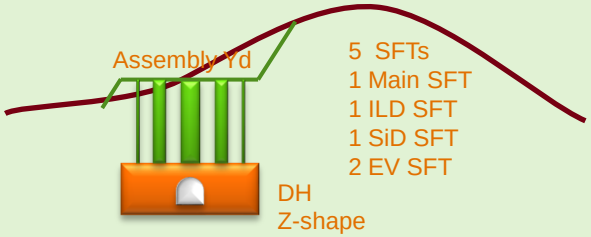
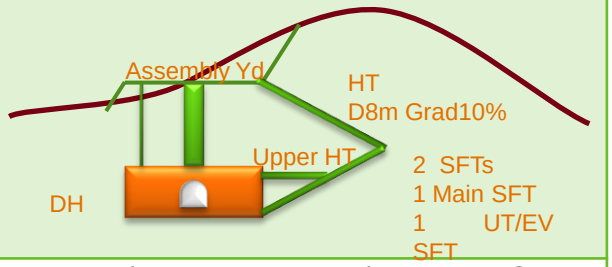
4) Comment:

- We don't believe that the error bars on your time or cost estimates would permit a selection based on those quantities

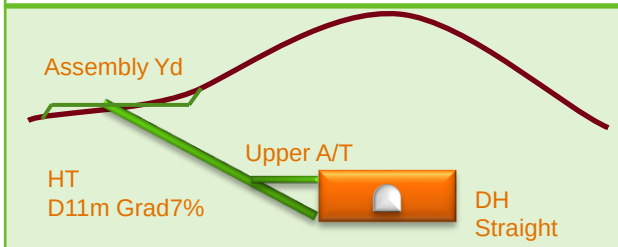
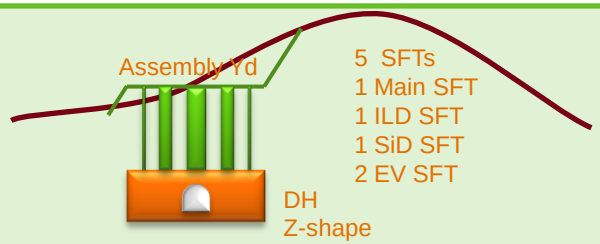
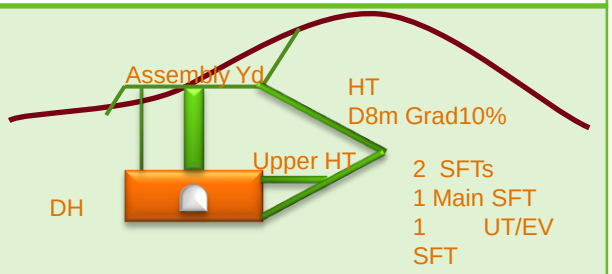
-Even in the case of the HT, we suggest looking into the possibility of a personnel only elevator & surface parking lot for secondary access.

Case Outlines

SLAC

HT access (baseline)	VS access	HT & VS access
		
• 1 HT (Large size 7% grad tunnel) • Detector assembling is inside of DH	• 5 VS • Detector assembling is on-ground.	• 1 HT (mid size tunnel) and 2 VSs • Detector assembling is on-ground.
• DH size is larger Vol:175,000m3 • L144m H42m W25m with Alcoves	• DH size is smaller Vol:143,000m3 • Z-shape	• DH size is smaller Vol:128,000m3 • L108m H40m W25m with Alcoves
• Heavy lowering system is unnecessary	• Heavy lowering system is necessary	• same as on the left
• Location of DH and assembly yd. can be selected individually.	• Location of assembly yd. must be satisfied on ground social condition and underground geological condition.	• same as on the left
• Vehicles are used for personnel and machines entering and leaving.	• All of personnel and machines use lifting equipment.	• Both of vehicles and lifting equipment are available.
• Detector assembled after completion of DH civil work.	• Detector assembled in parallel with DH civil work.	• same as on the left
• Environmental impact will be smaller during construction.	• Noise reduction of explosion excavation.	• same as on the left .
• Evacuation ways are DH HT, and DR HT.	• Isolated shelters and shafts with elevators	• Tunnels and shafts are available for evacuation

Schedule and Cost Summary

HT access (baseline)	VS access	HT & VS access
		
Construction periods		
45.7 months after land development	46.4 months	42.3 months
Construction Costs		
100	122	99