

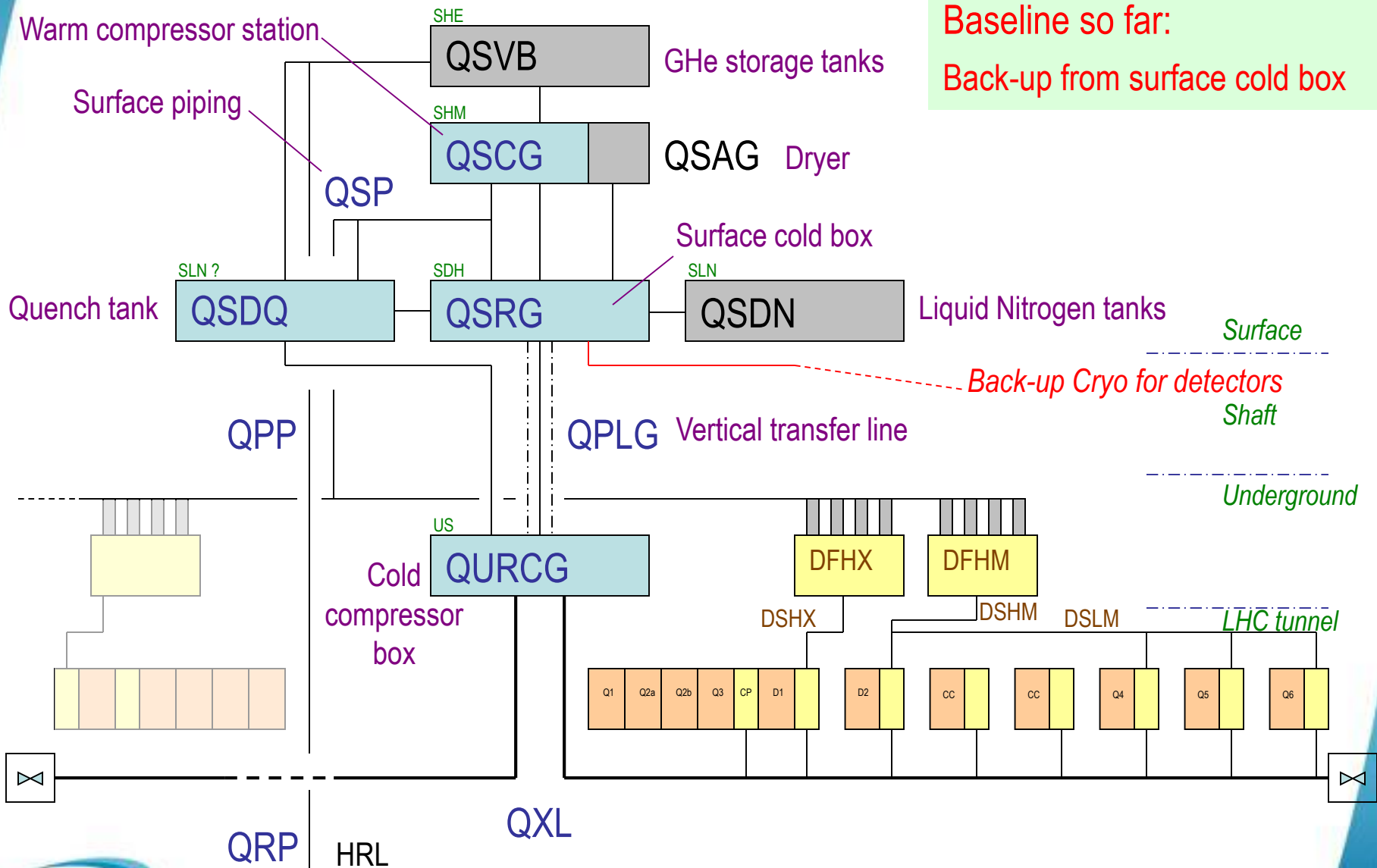


Back-up of LHC detectors from new P1/P5 Cryogenic infrastructure

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Integration meeting 13May'16

P1/P5 Cryogenic architecture

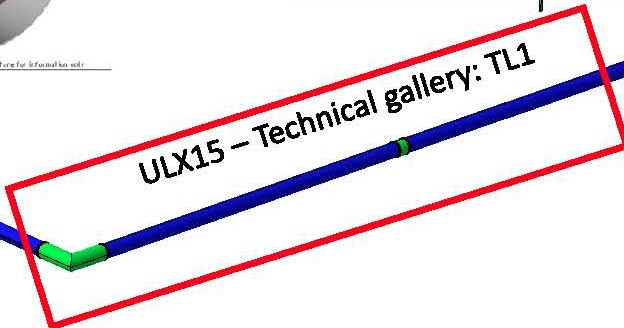
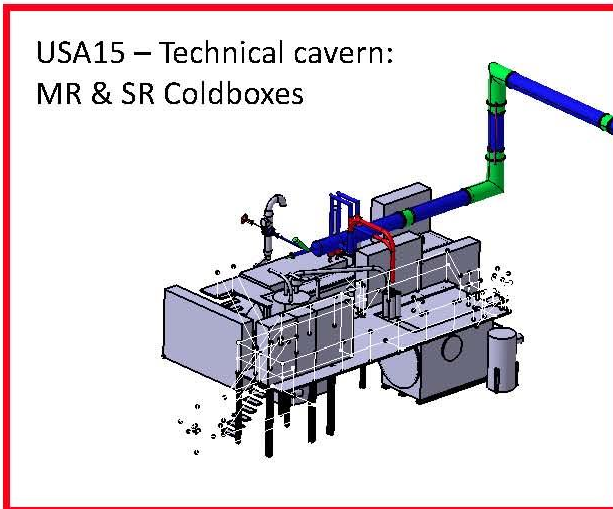
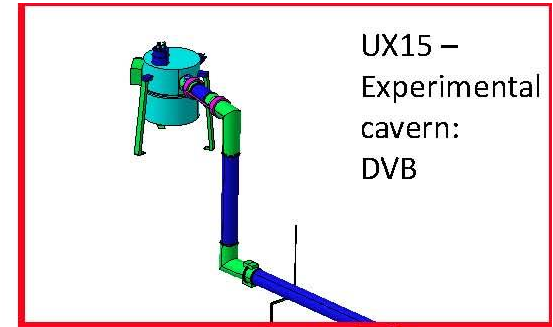
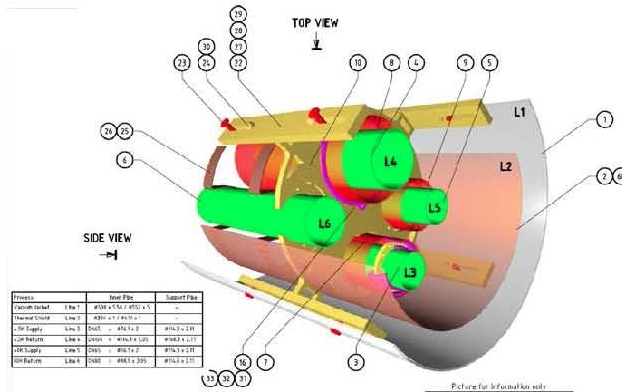


Baseline so far:
Back-up from surface cold box

Our basic approach

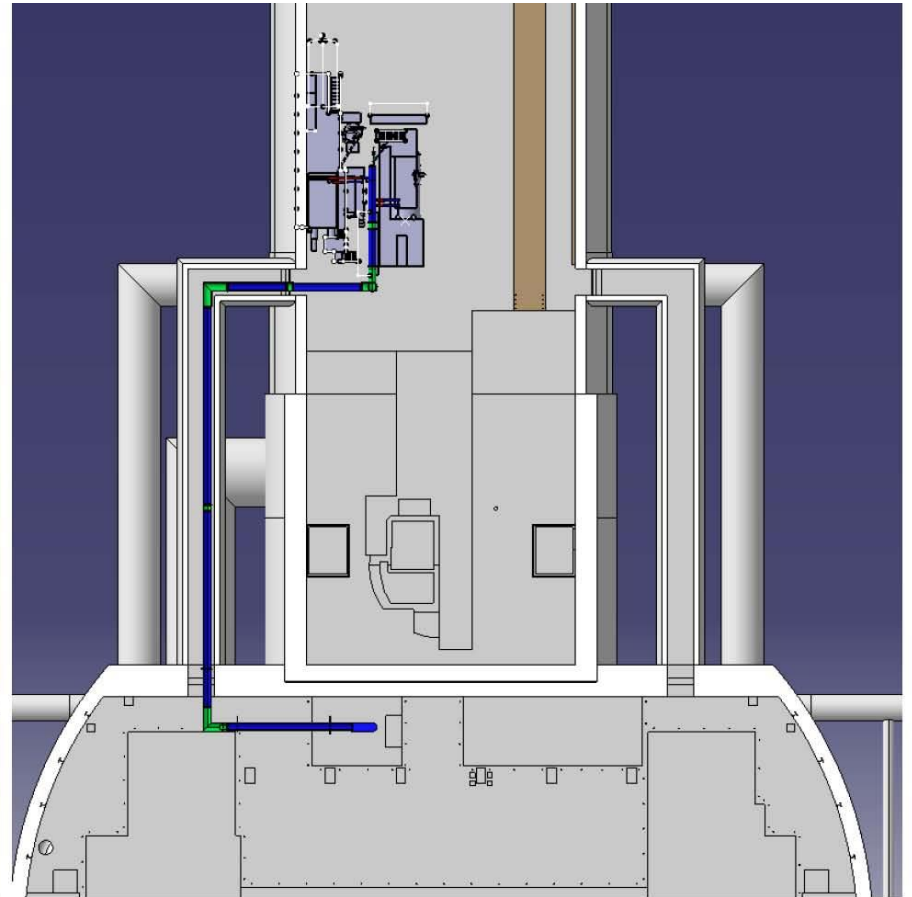
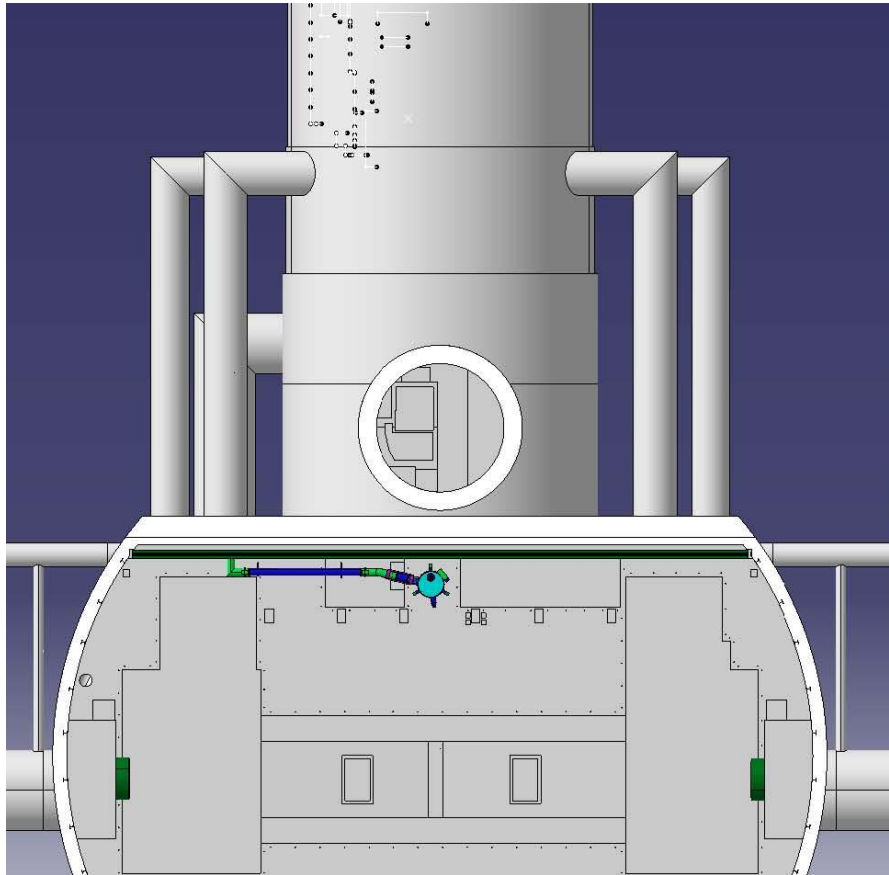
- Cooling capacity:
 - So far no additional cooling capacity foreseen, if back-up required, HL-LHC would be operated at reduced luminosity for some time
 - *Marginal additional capacity could be evaluated of desired*
- Feeding line:
 - 1st evaluation surface to shaft in experimental environment
 - 2nd from QURCG and HL underground infra to detectors
- Feasibility and cost estimate:
 - Feasibility for Cryo, Civil Eng. & general integration to be confirmed
 - Costs (orders of magnitude) to be presented at HL/detectors Mngt June 1st or 2nd
- Possible cost effective alternatives ?
 - Always check if the 1st idea was the right one and cost effective !
- Decision:
 - Obviously at management level (HL + detectors)

P1 Cryo underground



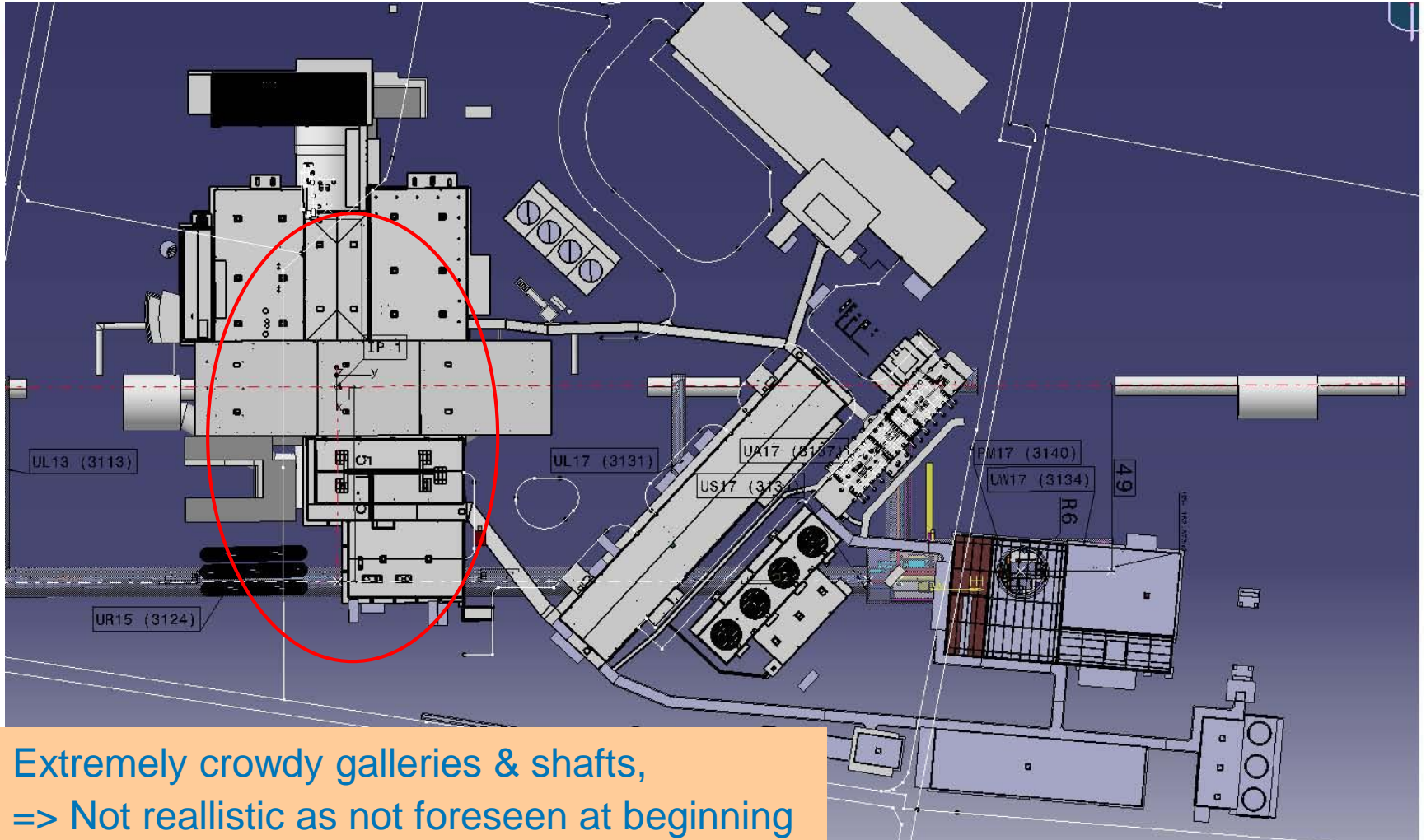
Process		Inner Pipe	Support Pipe
Vacuum Jacket	Line 1	∅508 x 5.56 / ∅552 x 5	-
Thermal Shield	Line 2	∅394 x 1 / ∅417 x 1	-
4.5K Supply	Line 3	DN65 = ∅76.1 x 2	∅114.3 x 2.11
4.5K Return	Line 4	DN100 = ∅114.3 x 3.05	∅168.3 x 2.77
40K Supply	Line 5	DN65 = ∅76.1 x 2	∅114.3 x 2.11
80K Return	Line 6	DN80 = ∅88.9 x 3.05	∅114.3 x 2.11

P1 Cryo underground as installed



Routing at the surface

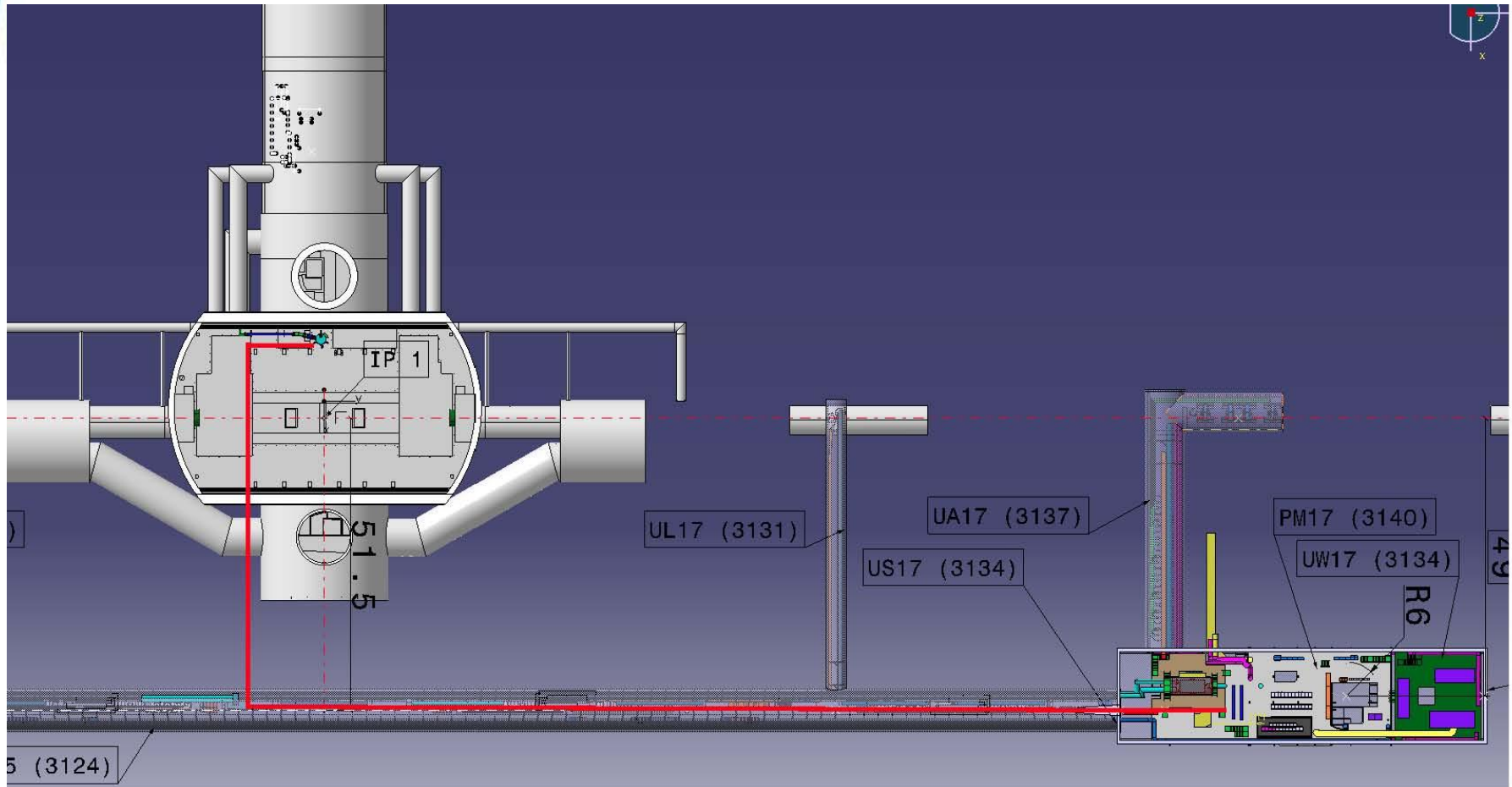
New cryogenic line DN400 considered at this stage



Extremely crowded galleries & shafts,
=> Not realistic as not foreseen at beginning

Routing underground

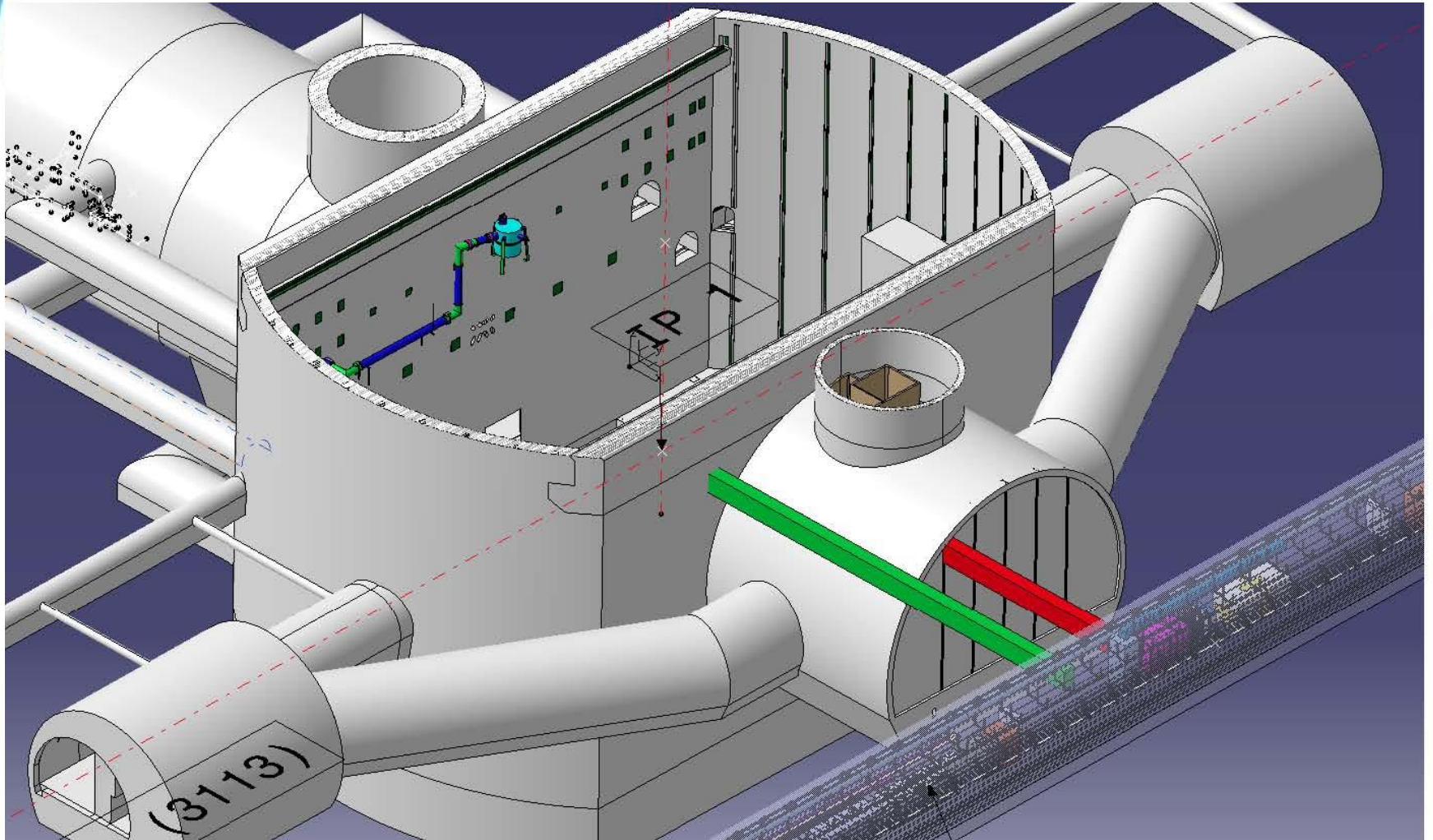
New cryogenic line DN400 considered at this stage



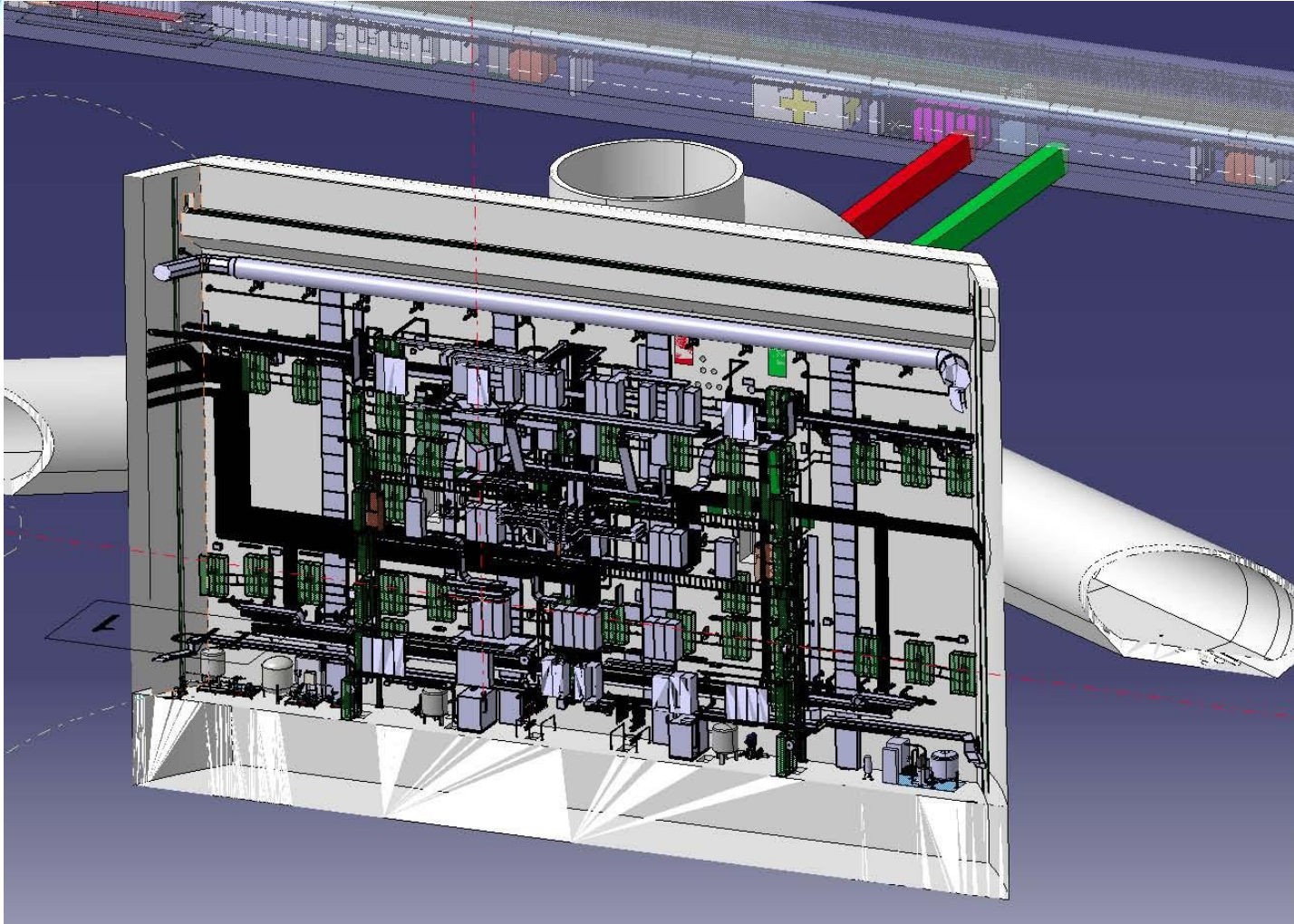
Transferline line length from underground coldbox to proximity cryogenics in UX15: 220m

Why not a shorter duct ?

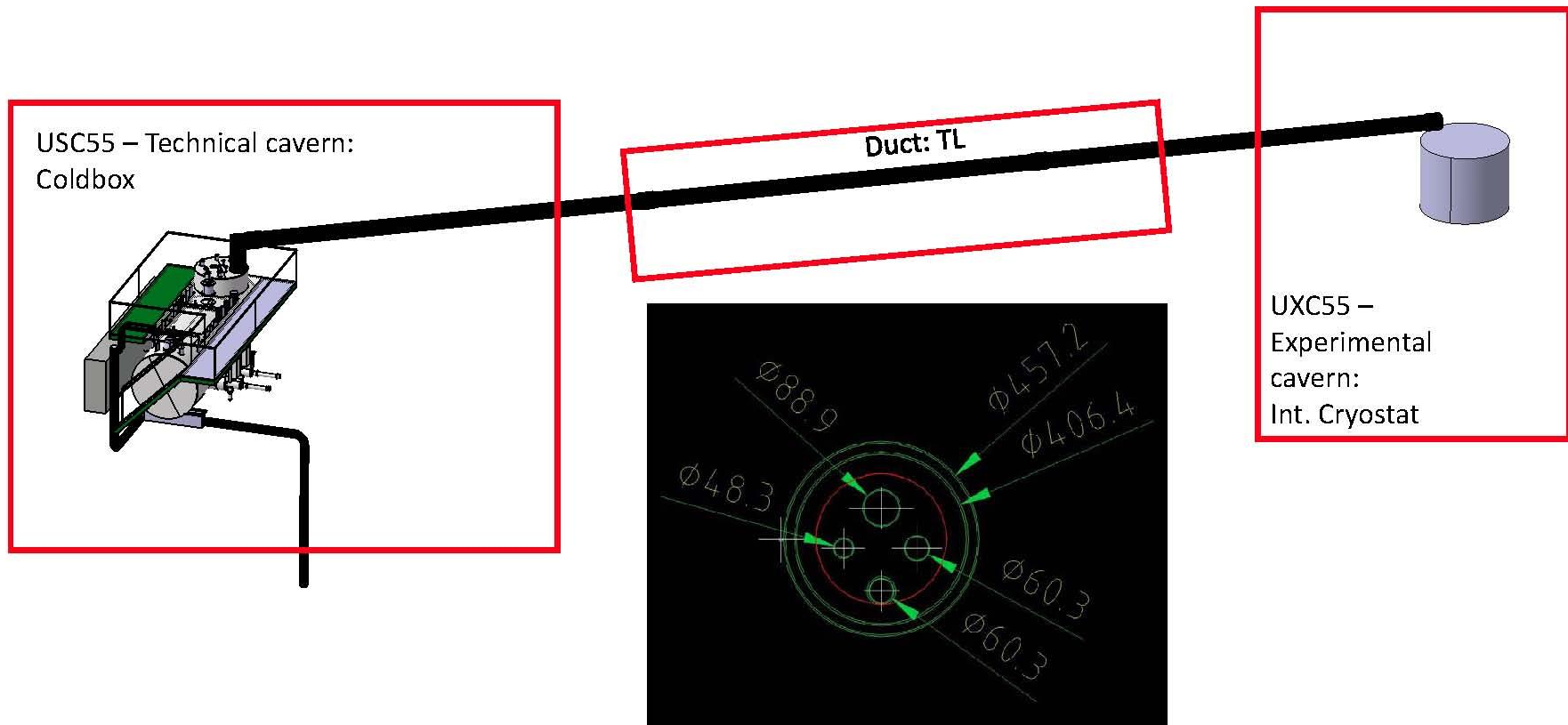
=> *To arrive a zone where there is room to continue ...*



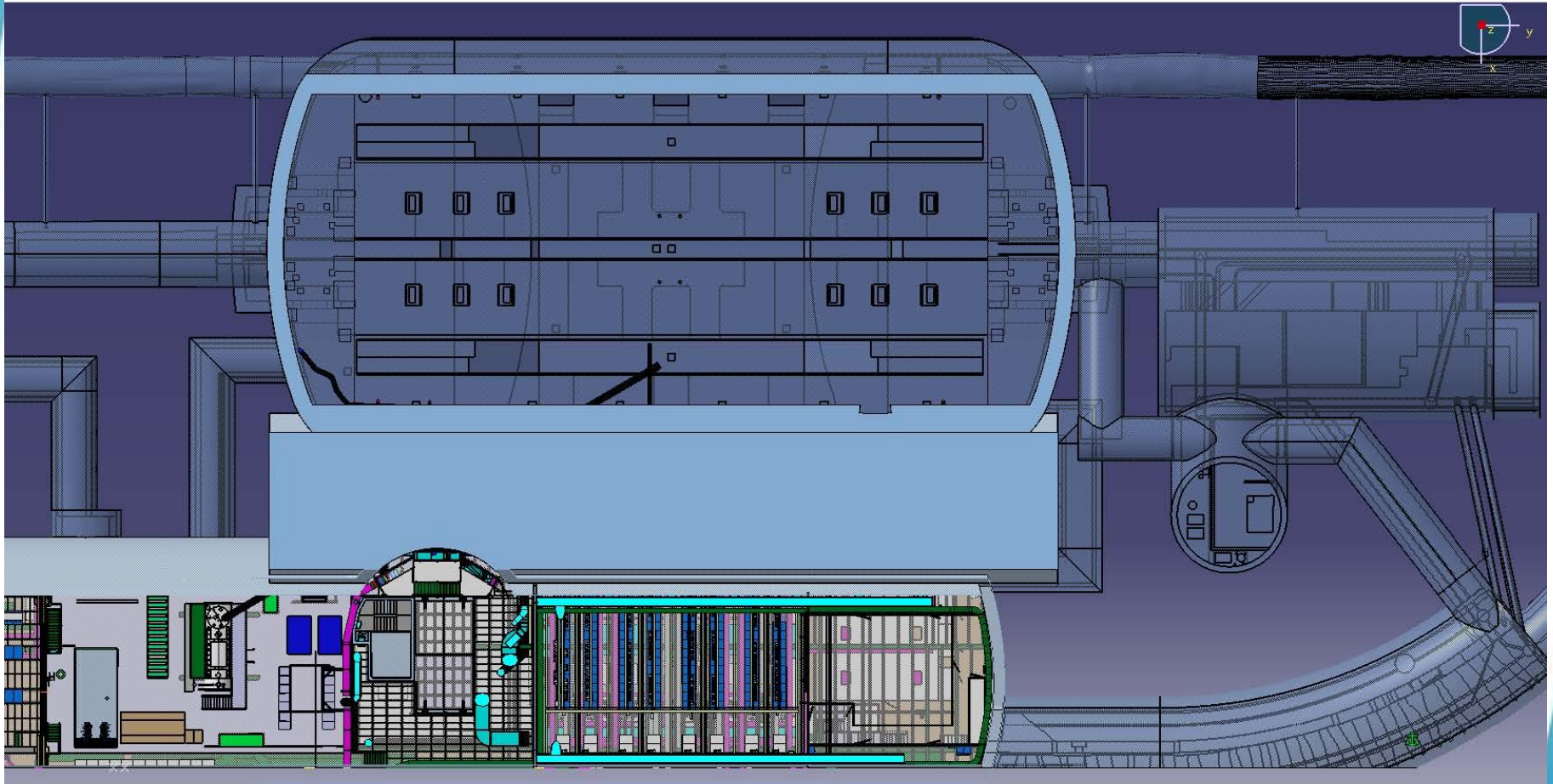
Not easy but could be envisaged



P5 Cryo underground

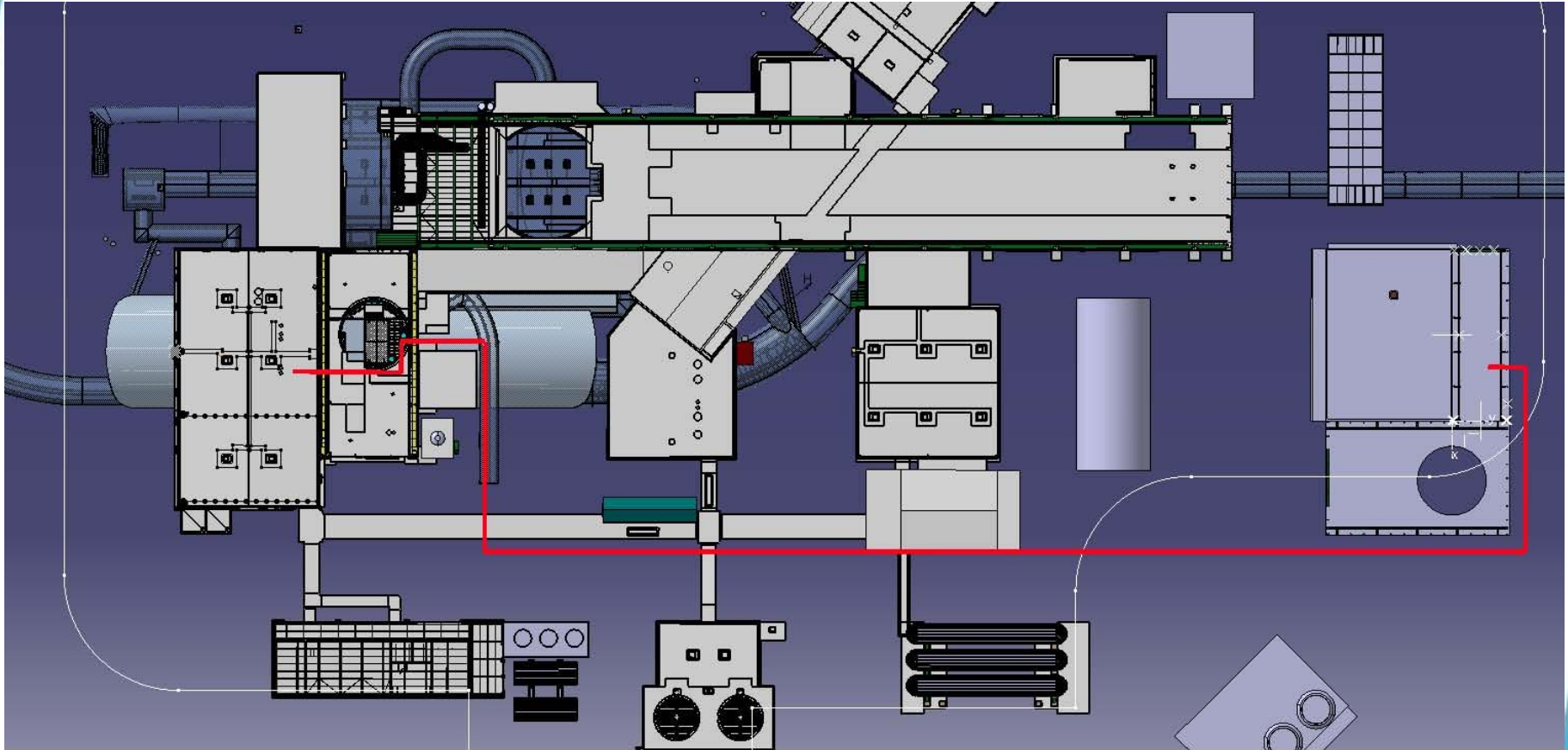


P5 Cryo underground as installed



Routing at the surface

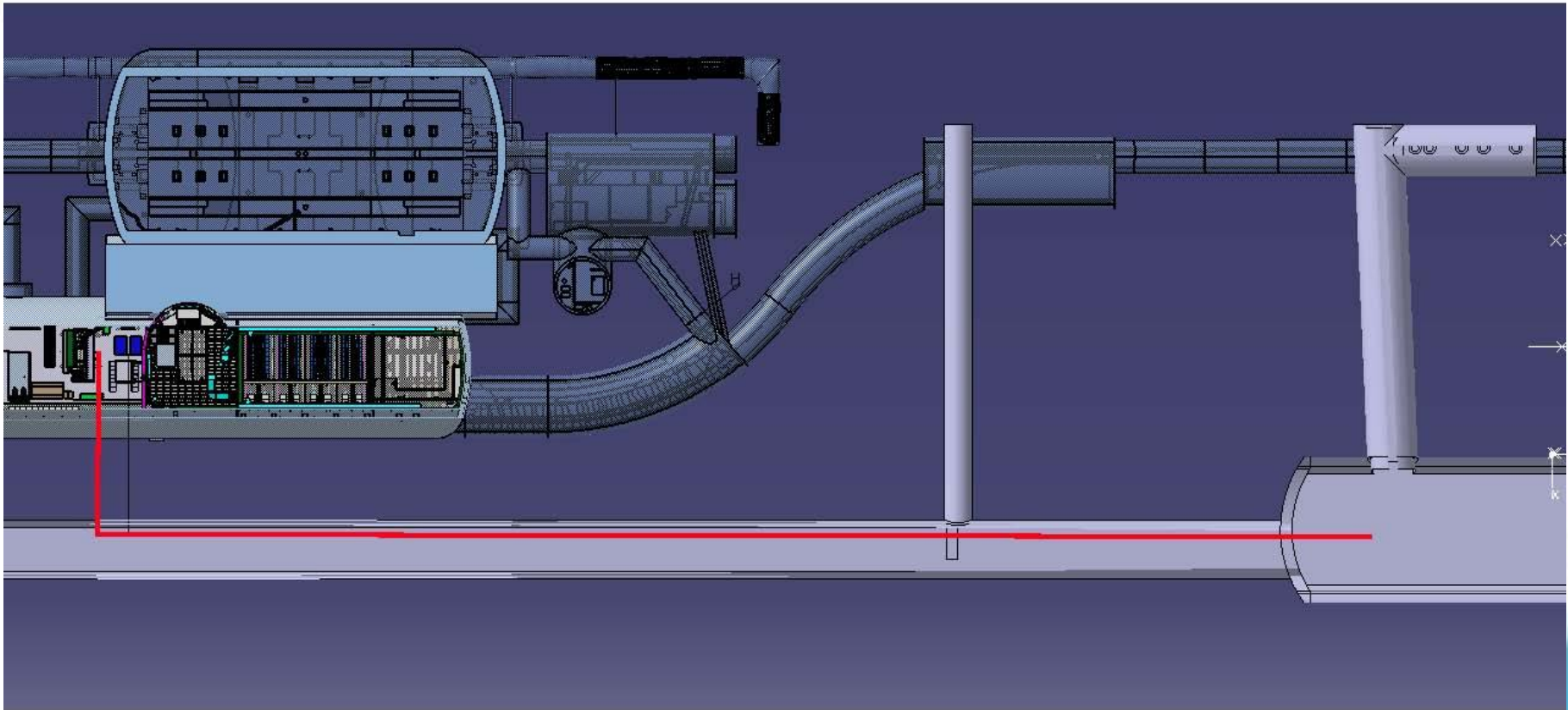
New cryogenic line DN400 considered at this stage



Option 1: Direct connection form surface coldbox to the underground surface cavern USC55 through PM54
Transferline line length from surface coldbox to external cryogenics in USC55: 350m (inclu 80m in the shaft)

Routing underground

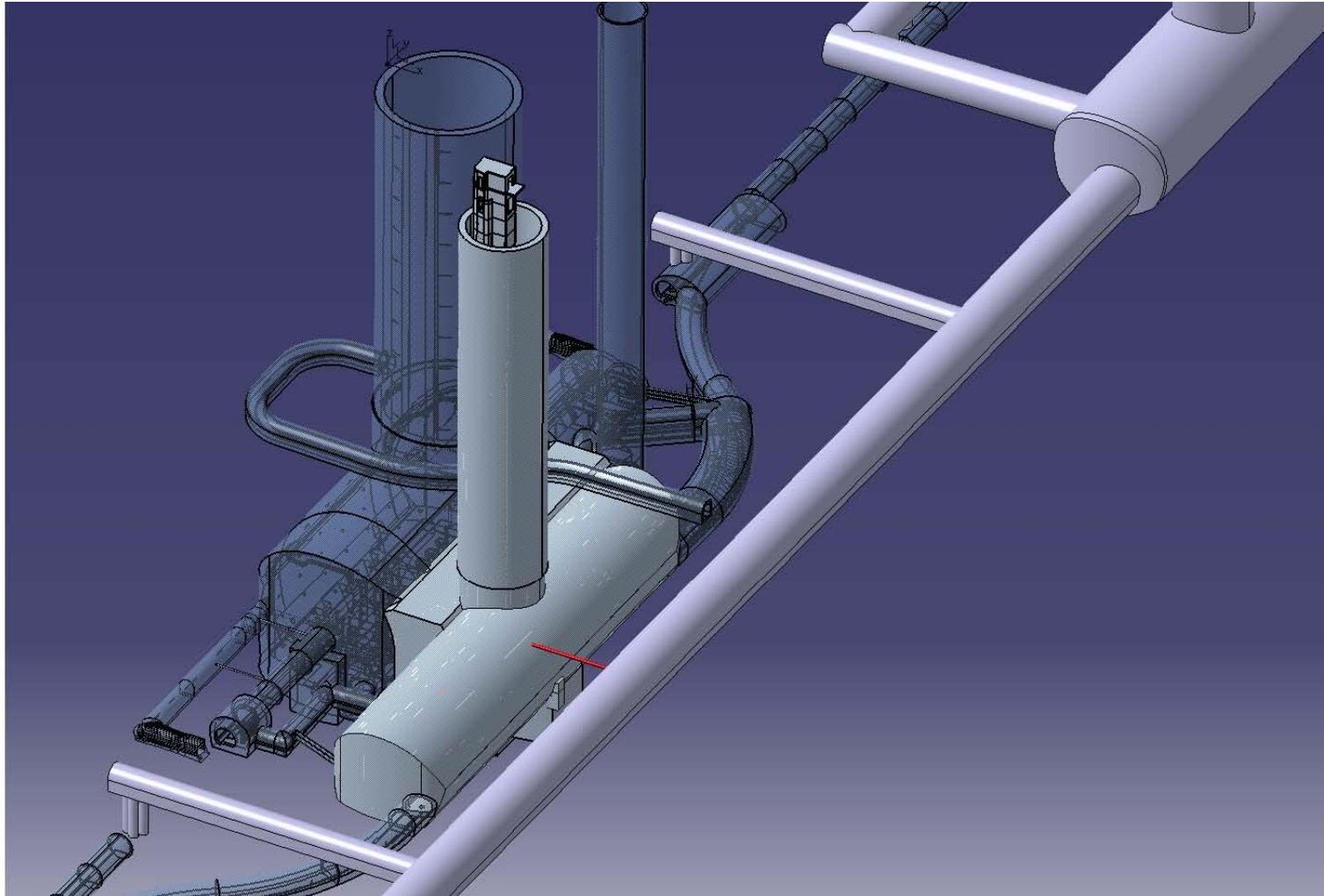
New cryogenic line DN400 considered at this stage



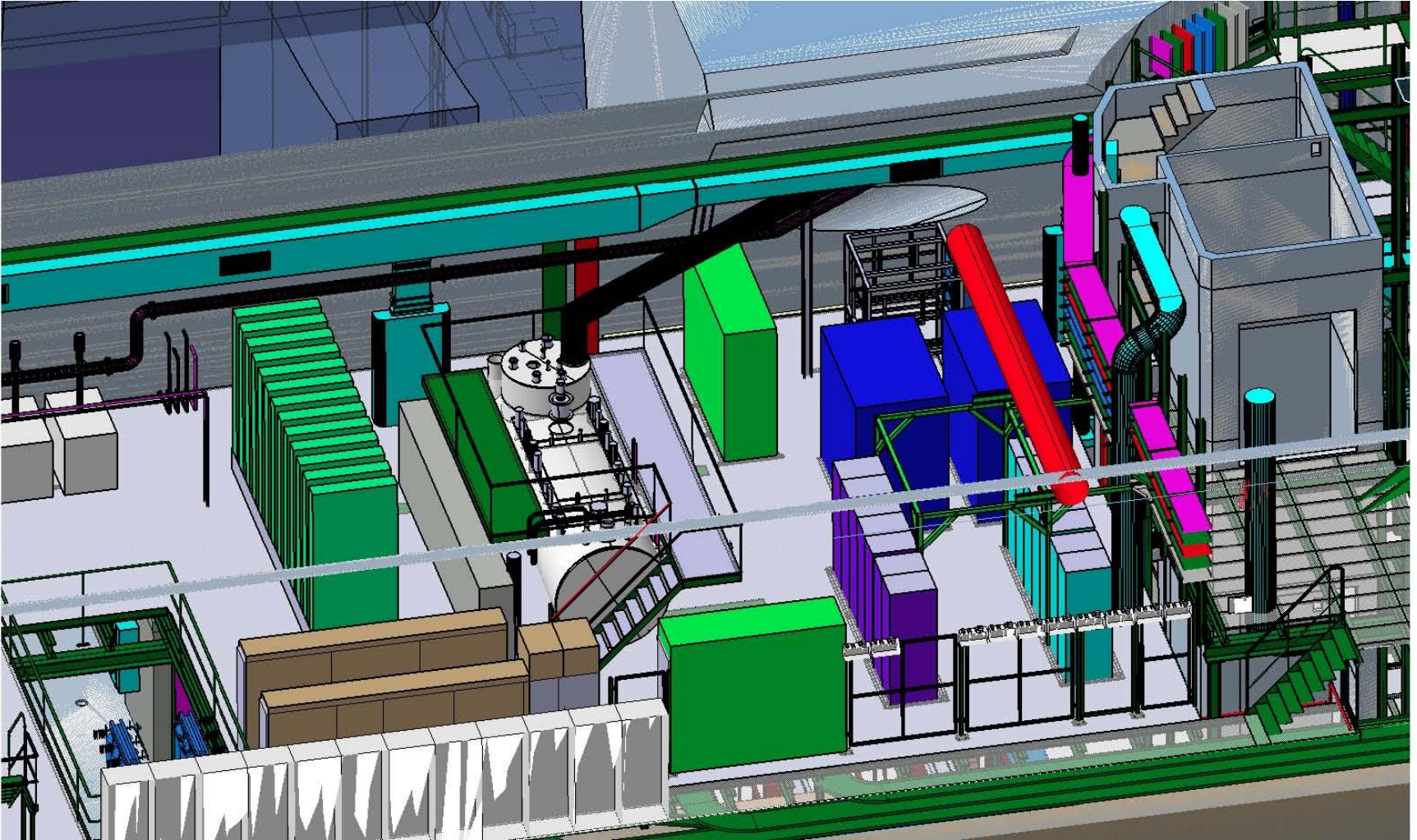
Option 2: Connection form underground coldbox

Transferline line length from underground coldbox to external cryogenics in USC55: 200m

Connection between HL & CMS

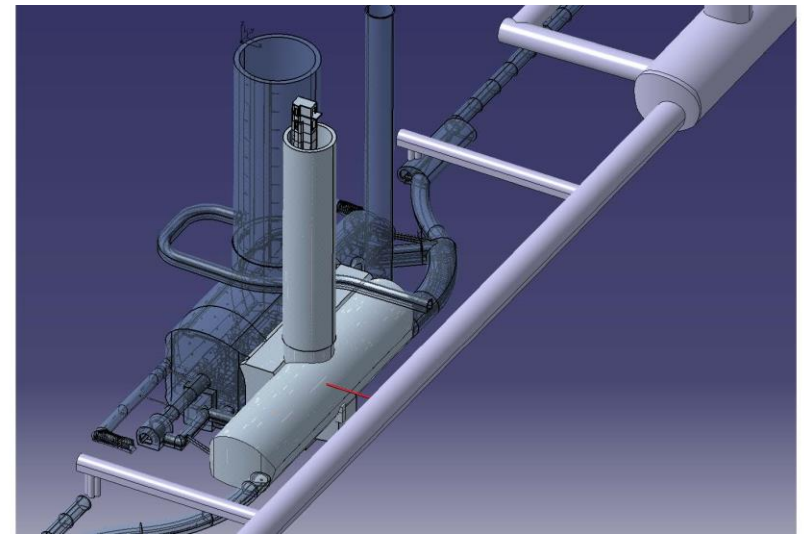
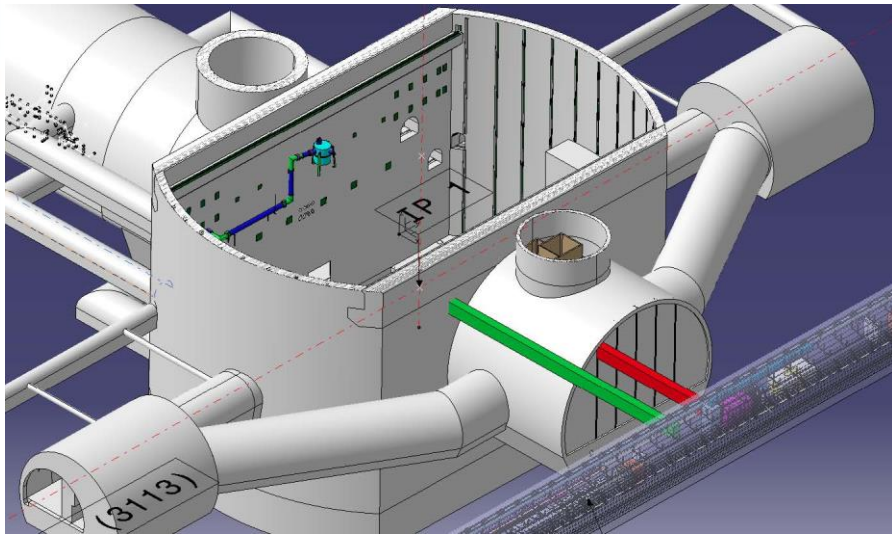


Not easy but could be envisaged



Integration and civil works

Cost effective connection to be evaluated:
Maximum length for a duct or real $\approx 2\text{m}$ gallery ?



Cryoline design to be adapted to the selected solution
(without intermediate junctions or classic)

Summary

- Surface option:
 - Not realistic for a DN400 like cryoline at this stage
if it would have been possible, most likely 250m of DN500 (2 x 125m)
- Underground:
 - Not easy but it appears feasible for Cryo
 - Cost effective integration/Civil to be evaluated
should not induce safety/ventilation issues, provided tightness realistic
- Feasibility and cost estimate:
 - To be completed with reasonable orders of magnitude (CHF/m)
- Possible cost effective alternatives ?
 - Considering at least 3-5 MCHF, what else could be envisaged ?
- Decision:
 - Most likely before next C7S Review...