

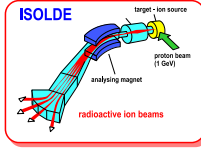
# Isolde in 2011 and Beyond

IEFC 2011 Workshop

22 March, 2011

R. Catherall, Y. Kadi and E. Siesling

- **Isolde today – Safety Improvements**
- **Hie-Isolde – The Energy upgrade**
  - Planning
  - Civil Engineering, Cryogenics and Ventilation
  - Superconducting Linac and Beam Transfer Line
- **Impact on Isolde & REX operation**
- **Resources**



# Safety Improvements at ISOLDE

A-P Bernardes & R. Catherall  
EN-STI-RBS

*Present system:*

- Annual maintenance and repairs done by Staubli
- Testing and protocols for operation and recovery on-going

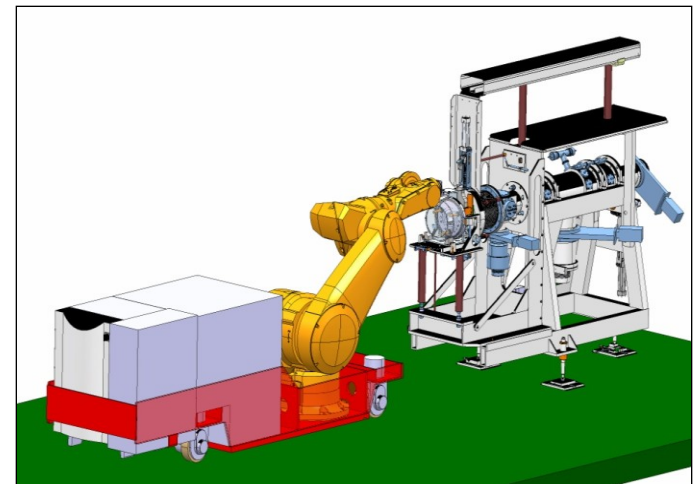
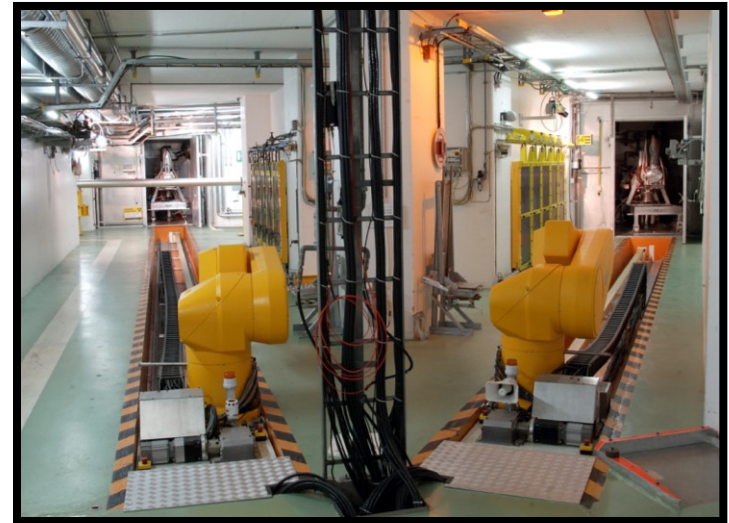
## New System

### Market Survey

- 4 firms/consortia will be qualified after clarifications – some additional replies still pending.

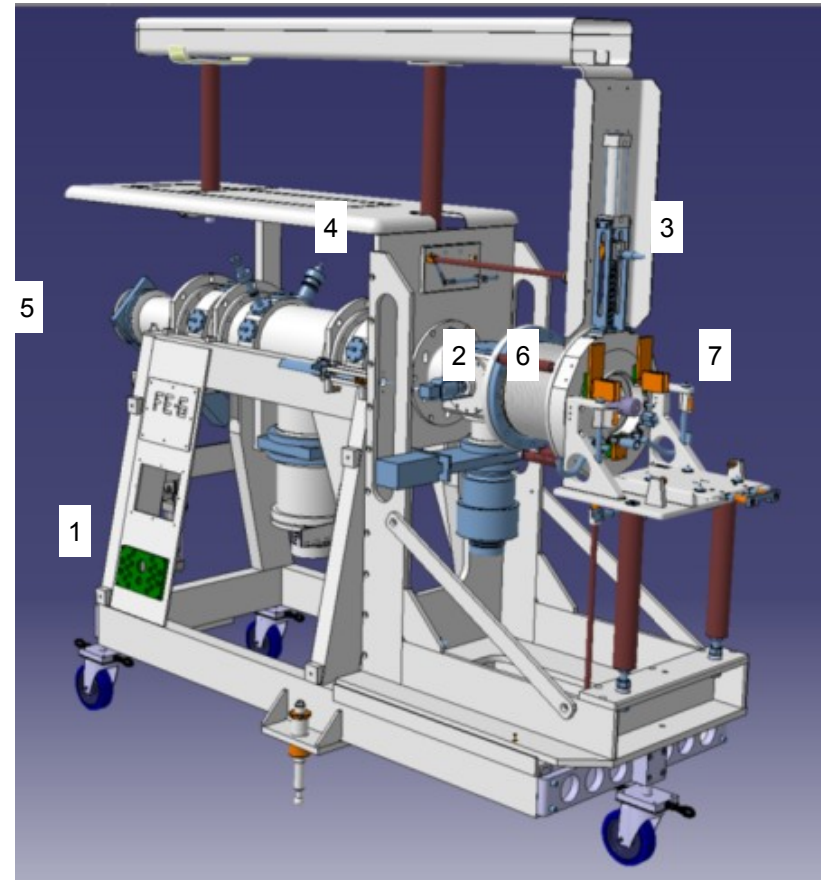
### Specification and conceptual design on-going

- Planned safety and technical reviews prior to submission



Improve Target handling, Minimize maintenance, Improve reliability,  
Reduce radioactive waste inventory  
=> nuclearization

1. External alignment targets
  - Remove need for internal alignment
  - Can be checked at a distance
2. Deflector plates
  - Removal of mechanical parts and motors
3. Combined shutter and target valve piston
  - Less moving parts to exchange
  - Metallic joints
  - Quick release of piston for maintenance purposes
4. Smaller volume
  - Less exhaust gases
  - Smaller pumps
5. Cabling patch panels
  - Quick exchange of cables locally if required
6. Ceramic insulator
  - More radiation resistant
7. New extraction electrode design
  - Easier to remove
  - Removable with dedicated tooling
8. New control system
  - Replaces obsolete equipment

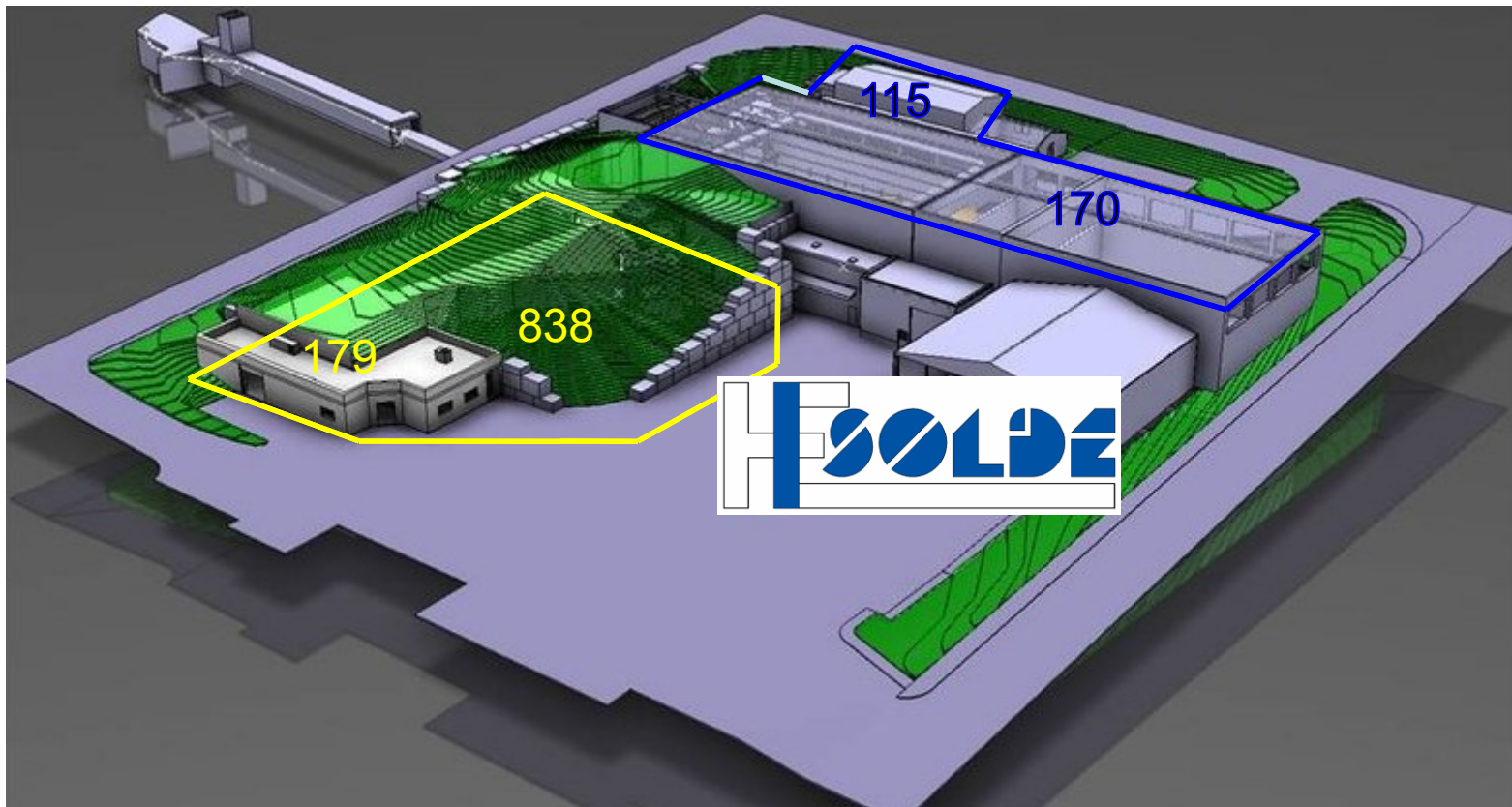


- Implementation of Technical Advisory Committee (TAC) prior to INTC.
  - Assess and report on all proposals in terms of:
    - Beams available
    - Infrastructure & Operation
    - Safety & Radioprotection
- Safety documentation
  - improve quality assurance and safety
  - Process description for normal operation and in case of incident
- Feed-back on failure, false alarms, incidents or accidents used:
  - To improve safety
  - Improve equipment or installation design
  - Reduce time delay on physic's schedule

Primary area (building 179 and 838 tunnel) (EN) : Safety File on Sharepoint

Experiments in building 170 and 115 (PH) : Safety File for ISOLTRAP, WITCH, CRIS, MINIBALL, COLLAPS and FOR SOLID STATE PHYSICS LABORATORIES

HIE-ISOLDE project (EN) : Safety File started

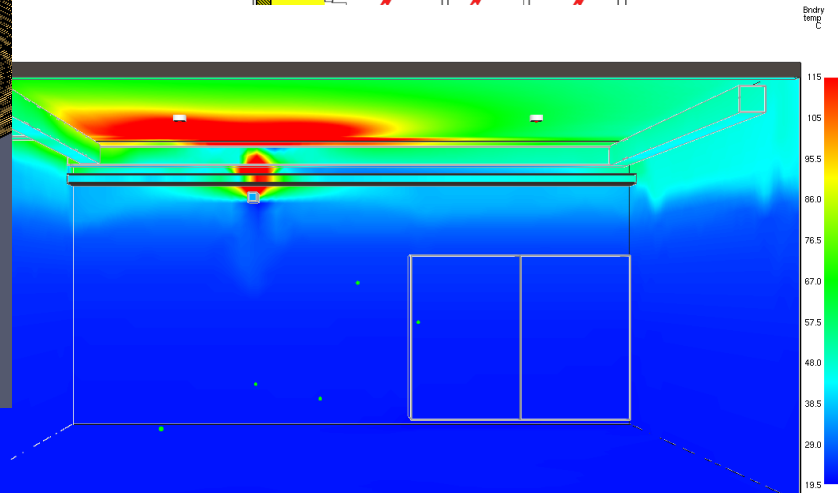
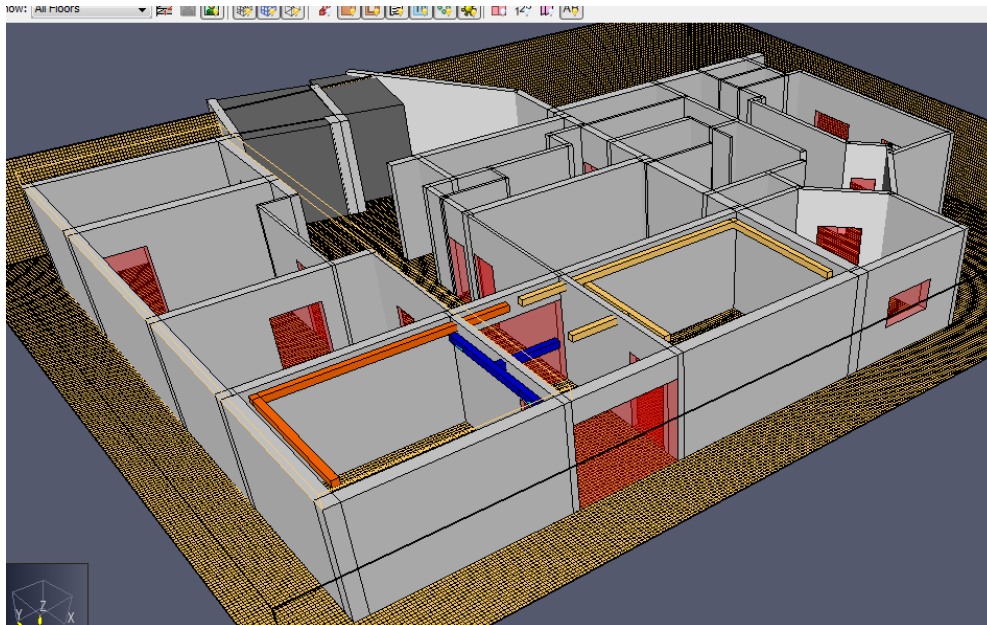


Thanks to a collaboration between EN, PH and HSE unit

Assess Fire risk and Fire prevention of the Class A laboratories (EN and RP collaboration)

- Fire propagation simulations used by CEA
  - Risk Analysis Methods for INB
  - Used for the first time at CERN

ISOLDE - Building 179



Aknowledgement : F.Kiersch

Simulation of burning cables



## Radiological Work Permit

New ▾   Actions ▾								
Title	Work coordinator	Dep/Grp	RWP class	Equipment family	Localisation	Expected intervention date	WDP document	
Installation Pick up ISOLDE	Delphine Gerard	BE/BI	II	BEAMDIAG	838	18/03/2011	ISOLDE 2010-02-25 Installation_PickUp	
GLM changement pieces - GHM inspection visuelle	Richard Catherall	EN/STI	III	SEPARATOR GPS	170	09/03/2011	ISOLDE 2011-03-09 GLM changement pieces GHM inspection visuelle	
Maintenance du FE 6	Stefano Marzari	EN/STI	III	FRONTEND HRS	179	15/03/2011	ISOLDE 2011-01-11 Maintenance FE 6	
Transfert de cibles irradiées à ISOLDE vers ISRS	Bernard Crepieux	EN/STI	III	TARGET	179, 838	13/01/2011	ISOLDE 2011-01-13 Transfert cibles tunnels vers ISR	
Changement fenetres laser GPS et HRS	Erwin Siesling	BE/OP	III	SEPARATOR GPS	838	13/12/2010	ISOLDE 2010-12-13 WDP changement fenetre laser	
Changement du Front End 4 par le Front End 7	Stefano Marzari	EN/STI	III	FRONTEND GPS	838	06/12/2010	ISOLDE 2010-10-18 Changement FE 4 par FE 7 Shut down 2010-2011	
Accès 838 pour fermeture manuelle de la porte Faraday du HRS	Stefano Marzari	EN/STI	II	FRONTEND HRS	Tunnel ISOLDE - 838	05/11/2010	ISOLDE 2010-11-05 acces tunnel 838 - inspection visuelle vérin porte Faraday HRS	
Démantèlement de cibles ISOLDE	Richard Catherall	EN/STI	II	TARGET	179/R-002	22/09/2010		
Acces 838 - Fermeture manuelle vanne cible	Richard Catherall	EN/STI	II	TARGET	838	15/09/2010		
Récupération d'un "Hall prob" situé dans la zone séparateur HRS	Tim Giles	EN/STI	II	SEPARATOR HRS	170 zone separateur HRS	15/09/2010	ISOLDE 2010-09-15 Retrait du Hall prob du HRS.MAG90 ou 60	
Echange du "Hall prob" du GPS.MAG70	Tim Giles	EN/STI	I	SEPARATOR GPS	170 zone GPS	15/09/2010	ISOLDE 2010-09-15 Echange du Hall prob du GPS.MAG70	
GPS Extraction electrode exchange	Richard Catherall	EN/STI	III	FRONTEND GPS	179 - Tunnel Isolde 838	02/09/2010	ISOLDE 2010-09-02 GPS extraction electrode exchange	

<https://espace.cern.ch/rpps/wdp/Lists/rwp/ISOLDE%20%20All.aspx>

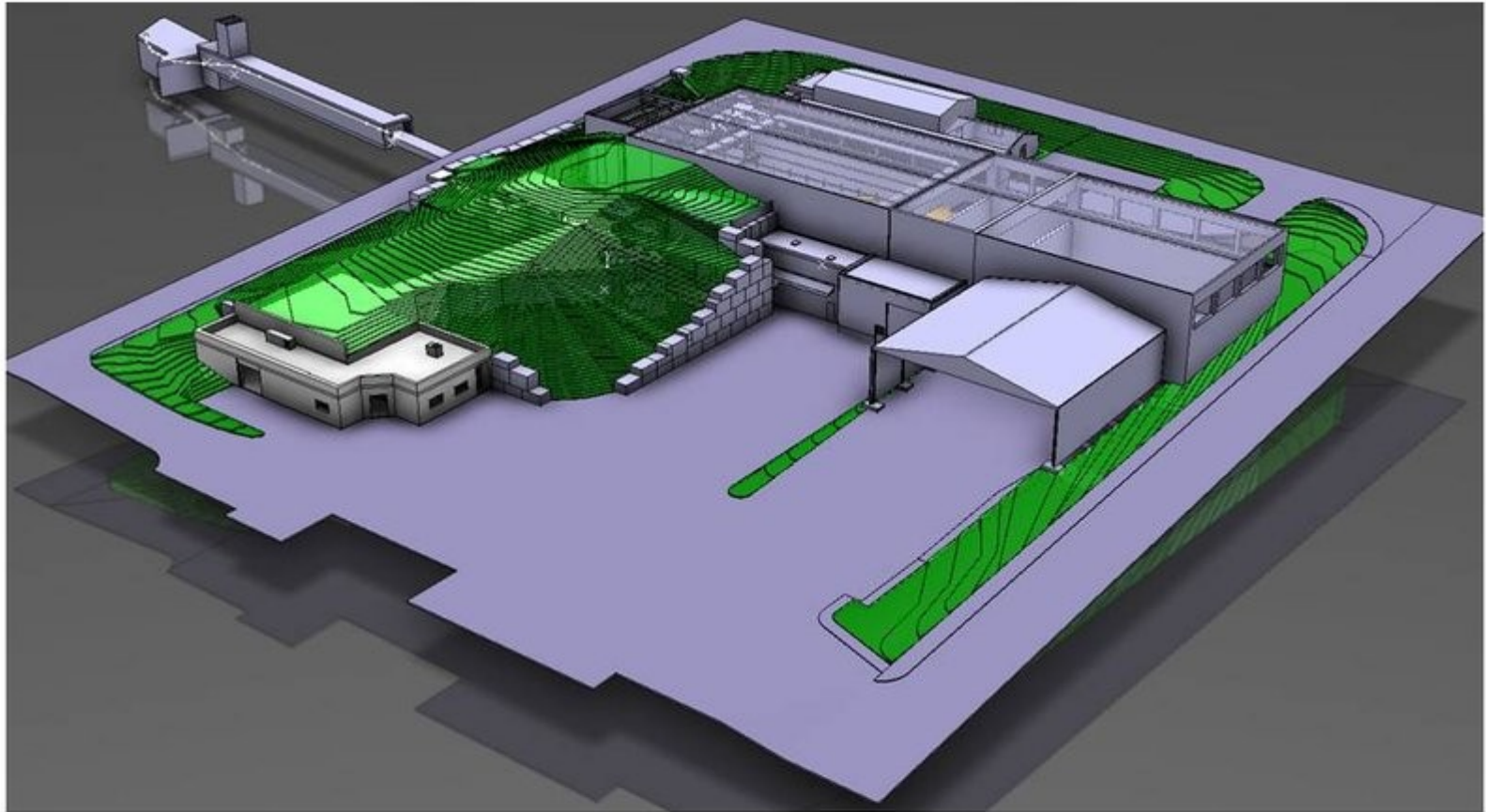
15 ALARA Level III requested in 2010

Follow-up of ALARA committee recommendations

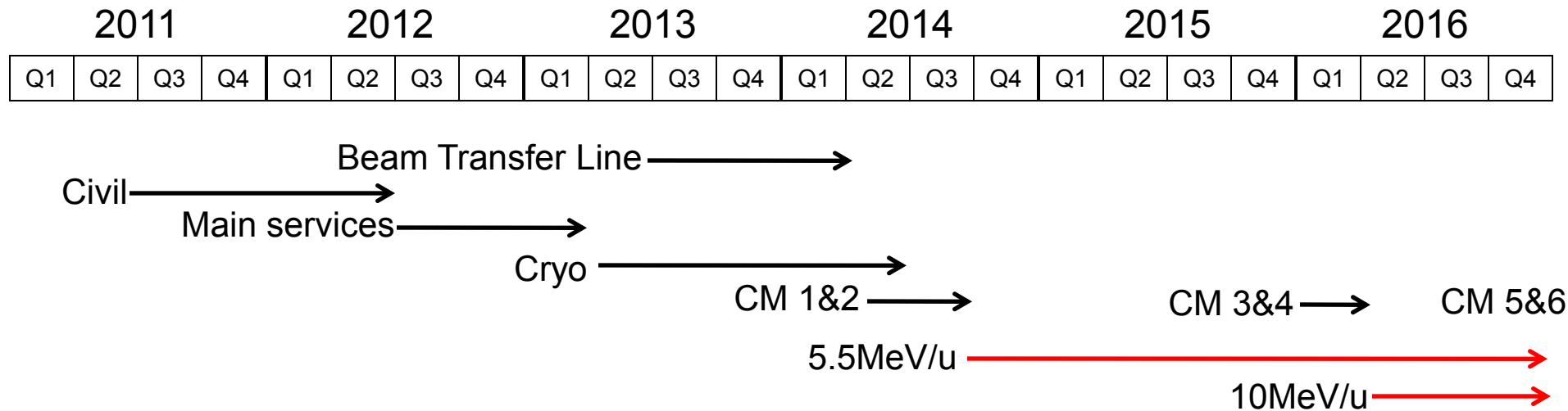
Feed-back on ALARA level III interventions

- ALARA level III type of interventions are frequent at ISOLDE
  - ~50% related to surface contamination criteria last year
  - **Could this be revised in order to minimize the need for ALARA L3 committees?**
- Delays can occur in the approval process
  - Makes it unsuitable for urgent interventions
  - Some confusion between derogations, ALARA L3 committees and responsibilities
    - Partly due to absences, meeting schedules and an overlap of responsibilities
    - The ISOLDE Facility includes PH, EN, BE and TE
  - Follow up and feedback is managed by the ISOLDE team.
  - **Is it possible to have one single channel of approval?**
- Overall the ALARA concept has proved to be worthwhile both in work preparation and dose rate planning
  - The combined DWP (Excel) and RWP (Sharepoint) approach is more efficient than the DIMR system and has generally been adopted at ISOLDE.
  - The hiring of a safety engineer attached to the facility has been most instrumental in addressing all safety issues and making progress with the safety files.
  - Excellent collaboration with RP

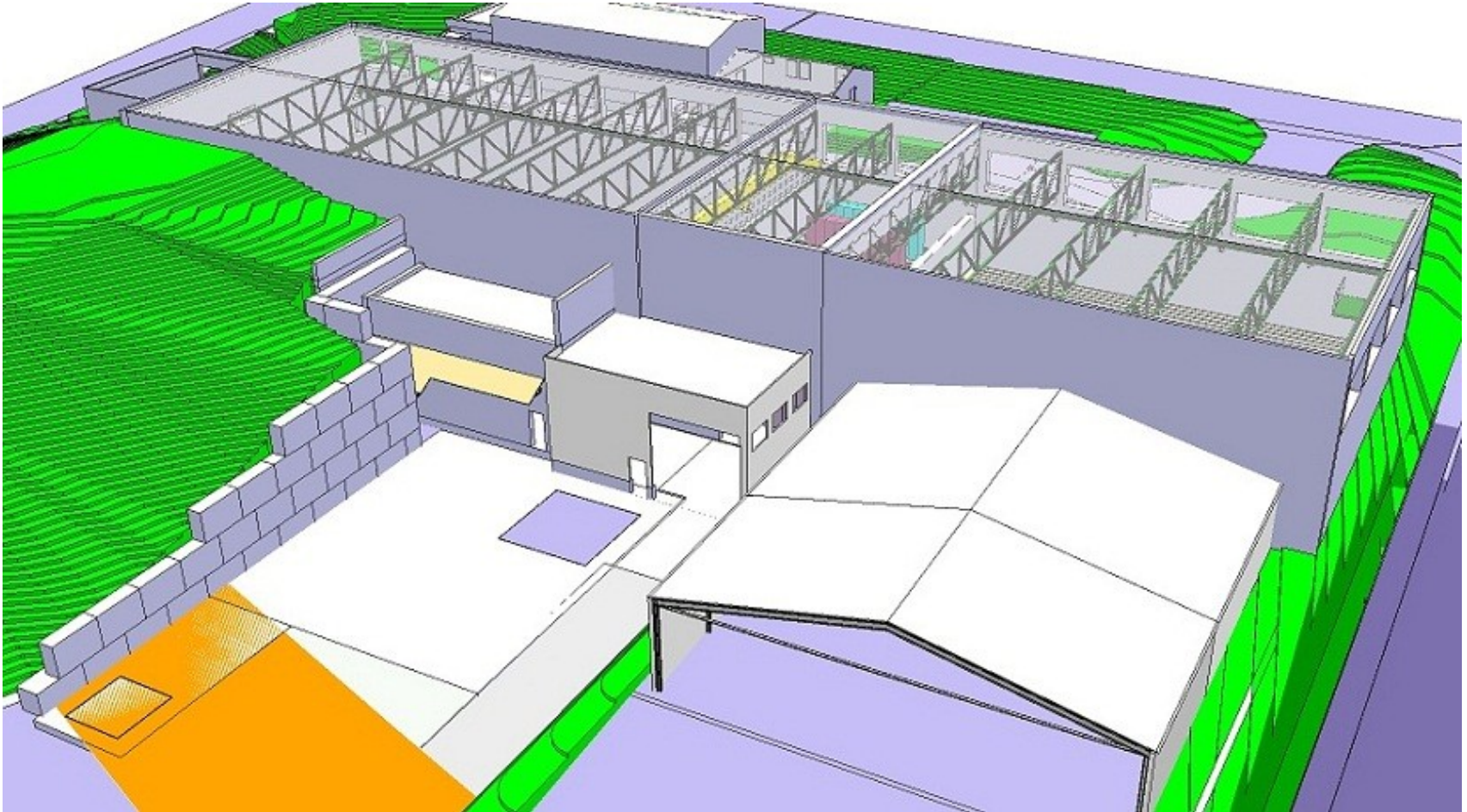
# From Isolde to Hie-Isolde Step by Step



## A simplified presentation of the different stages:

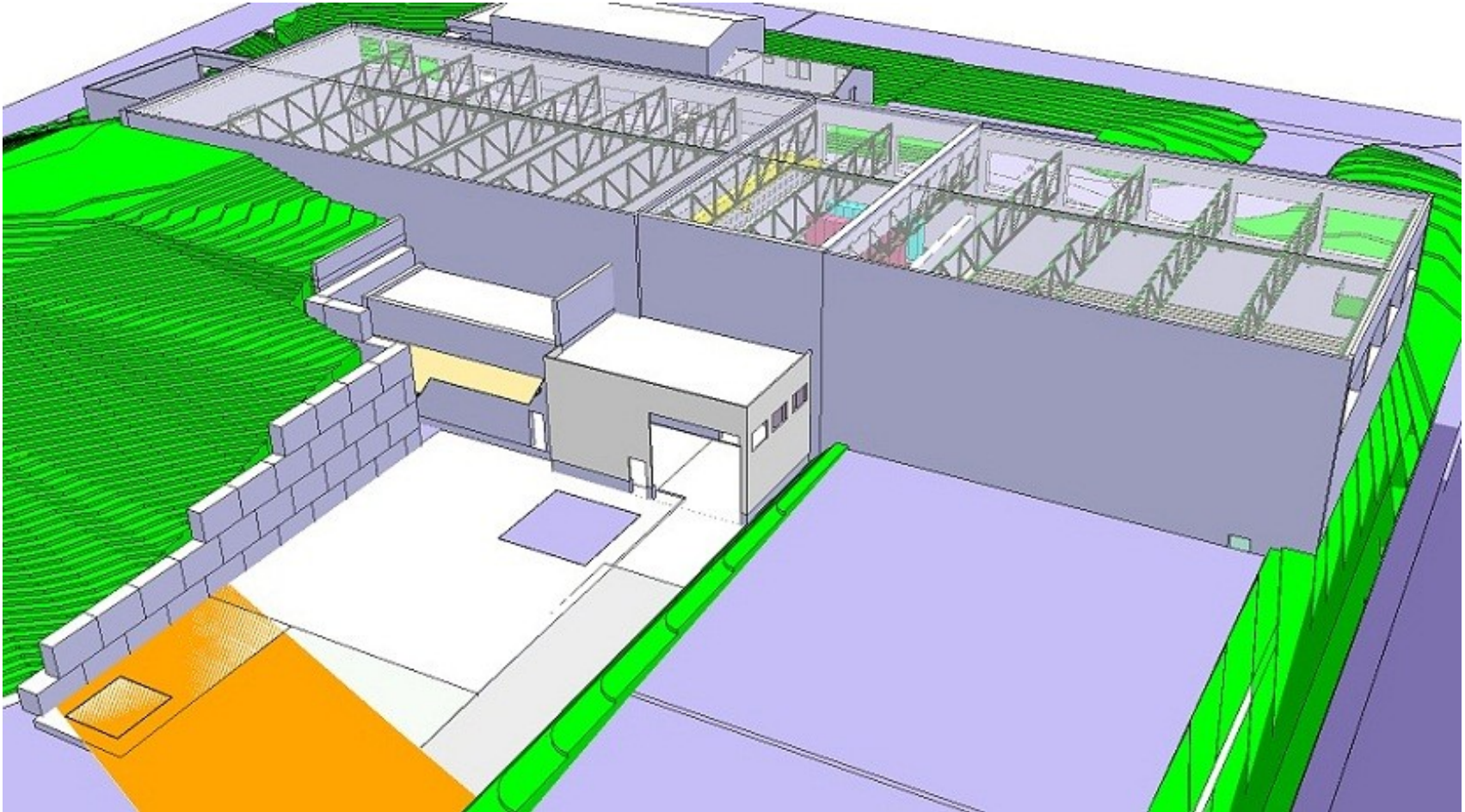


-What is the impact on operations? And LHC long shutdown?



**Construction starting date: June 2011**

## Removal of the transport hangar



## New SAS



**September 2011**

## Move of the controlled access



**September 2011**



## Compressor Building

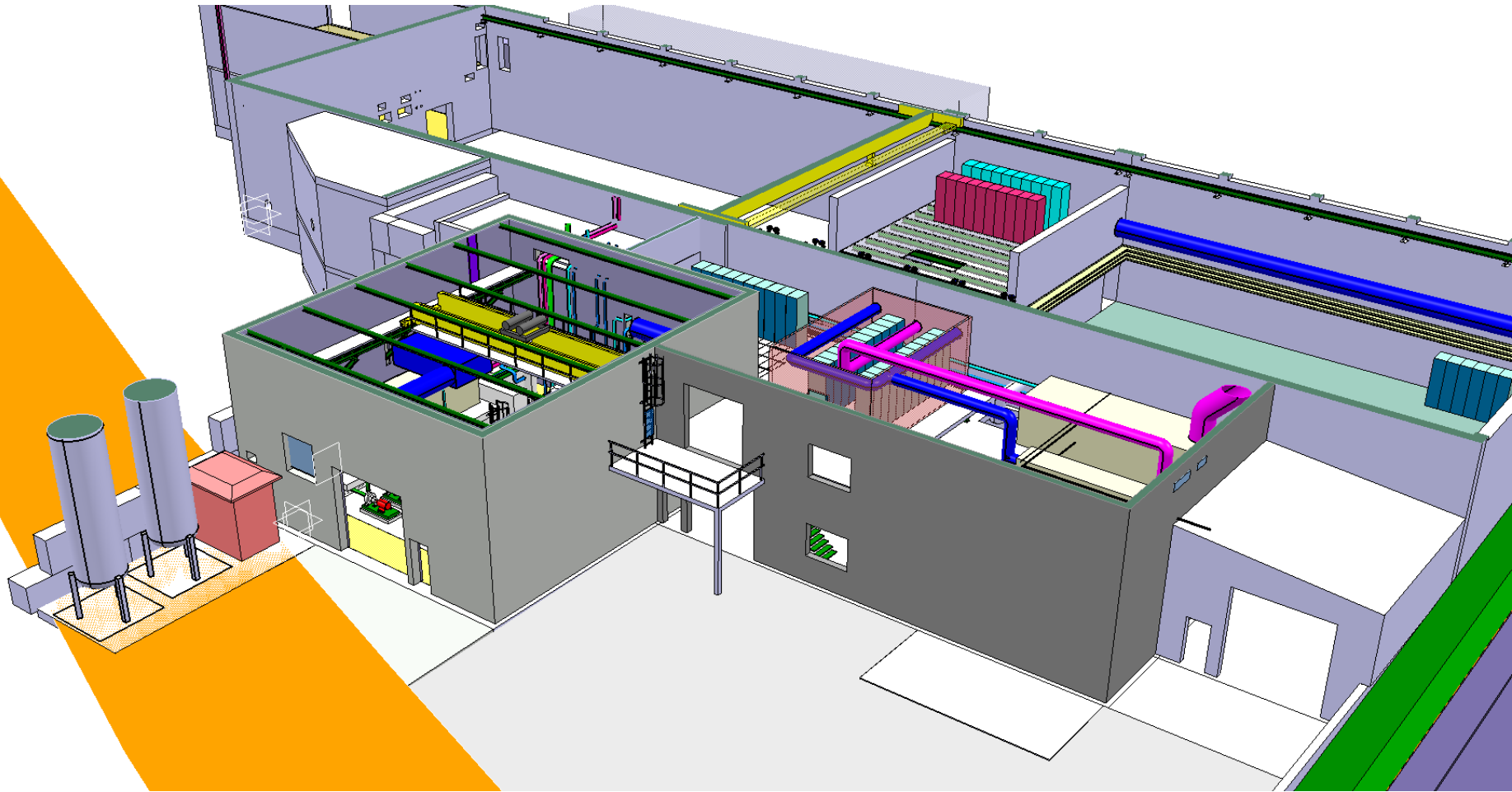


**Start end September 2011**

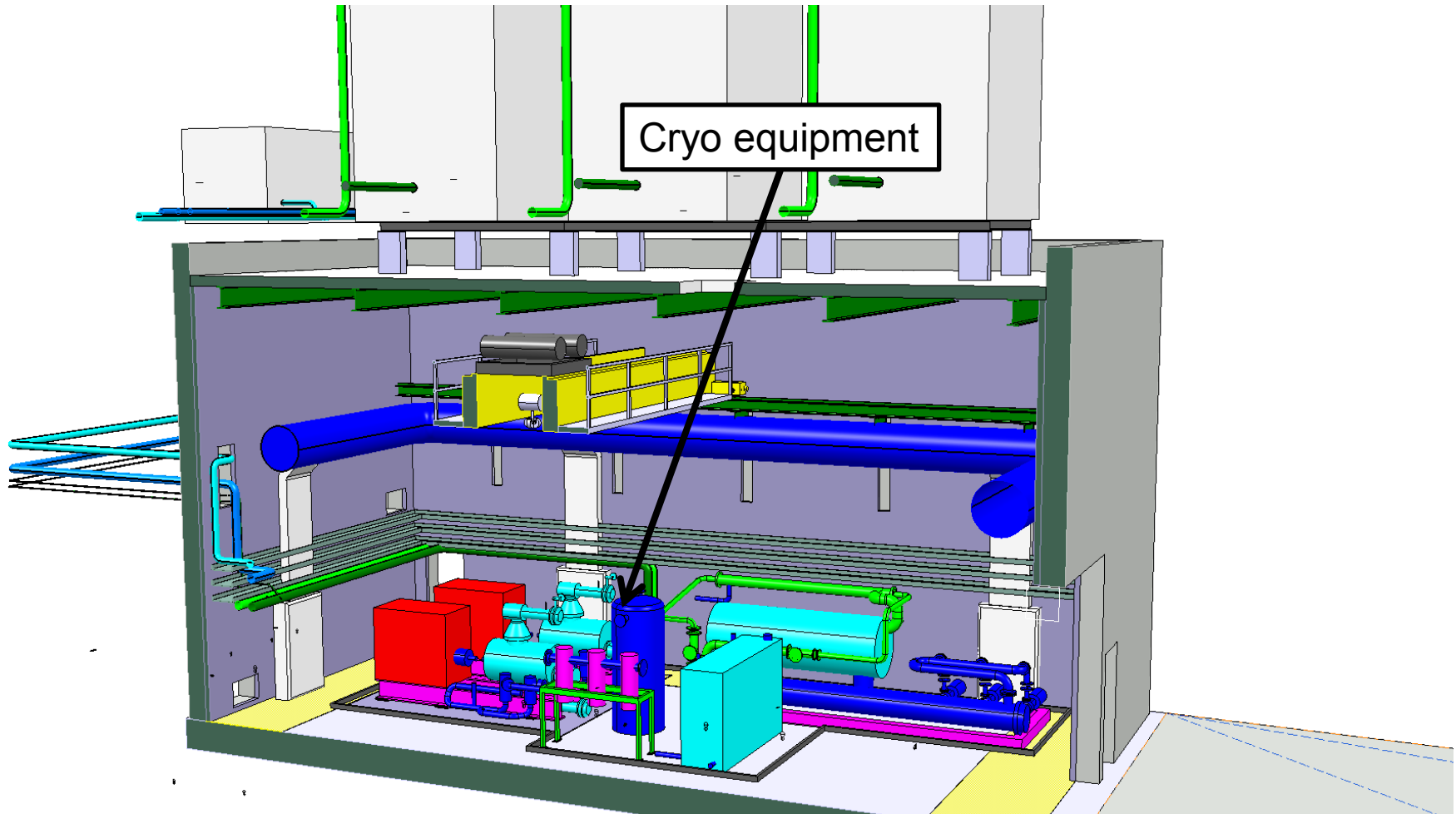
## Cold Box Building



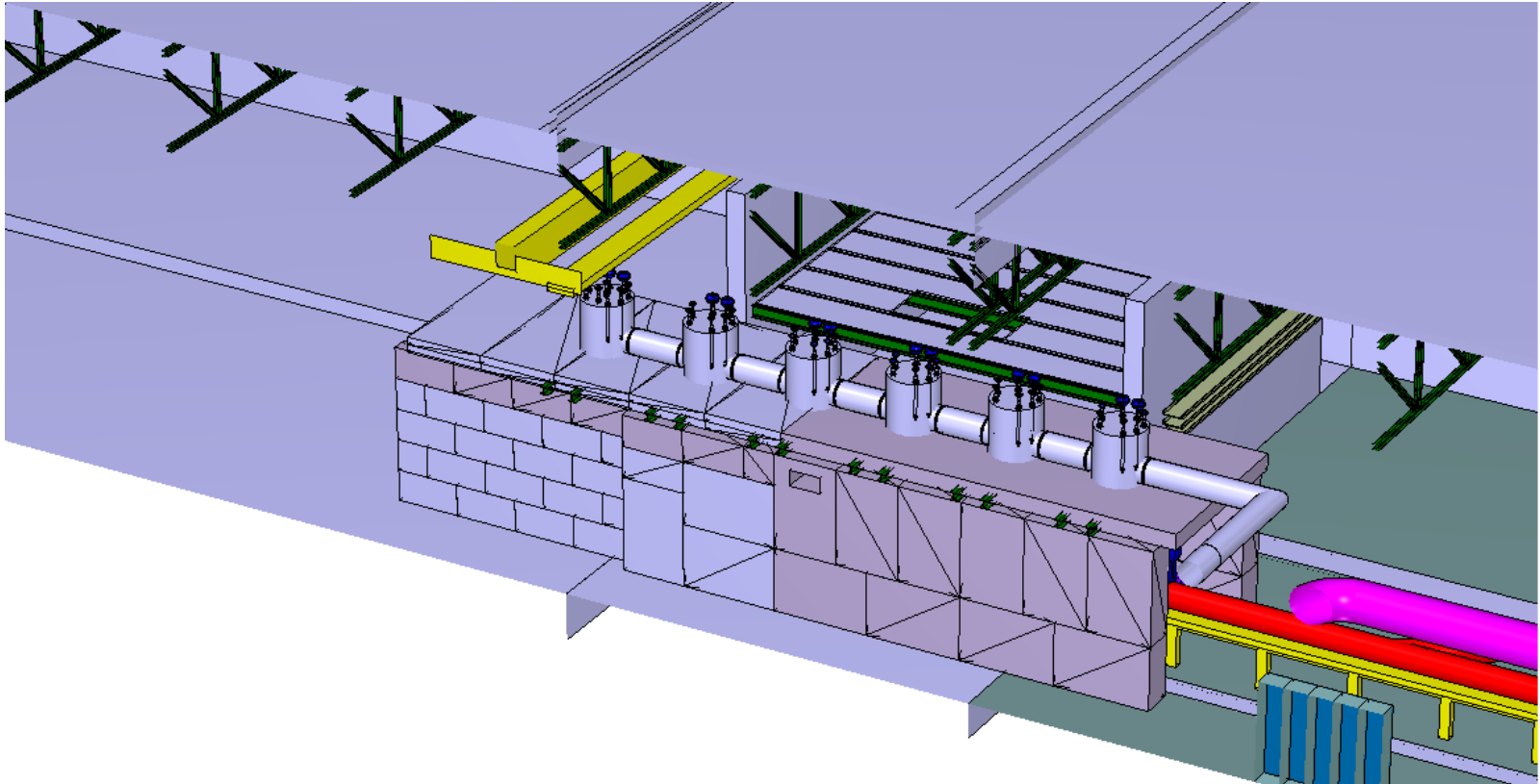
**Civil Engineering finished by July 2012**



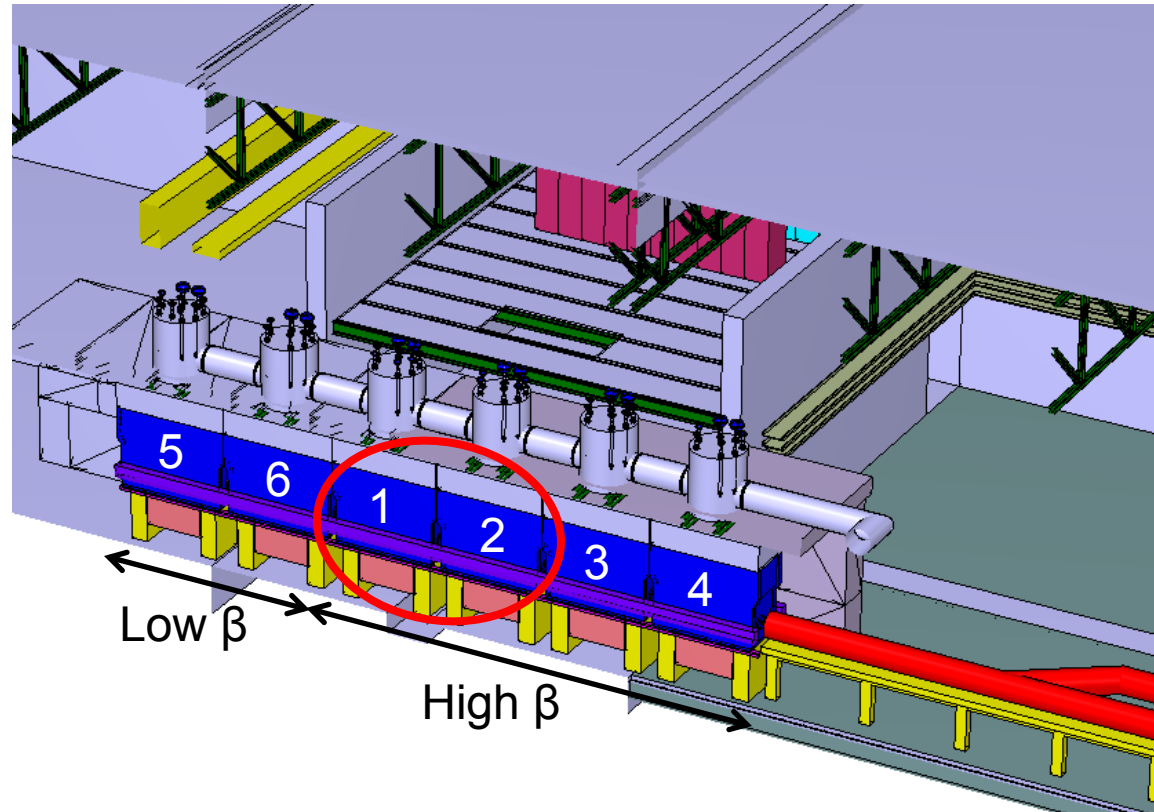
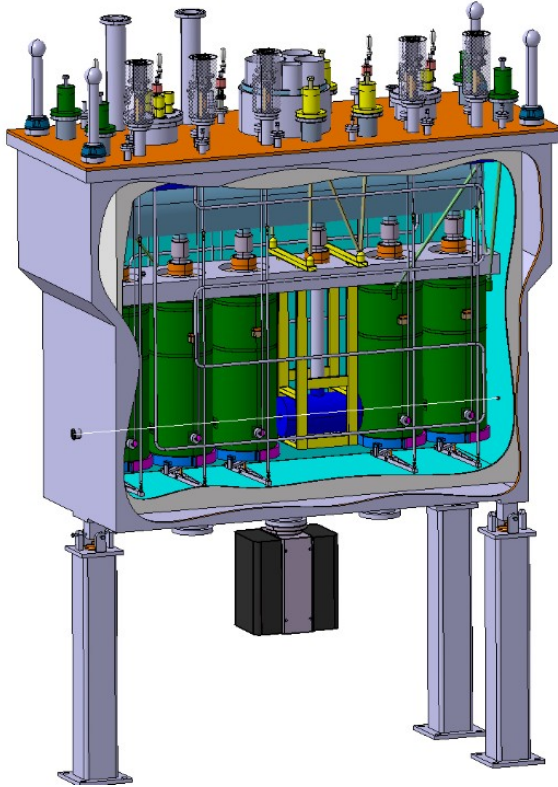
**Electrical systems: July 2012 – March 2013**  
**Cooling & Ventilation: Aug 2012 – March 2013**



**Compressors: April 2013 – October 2013**  
**Cold Box & Cryo-line: Jan 2014 – June 2014**



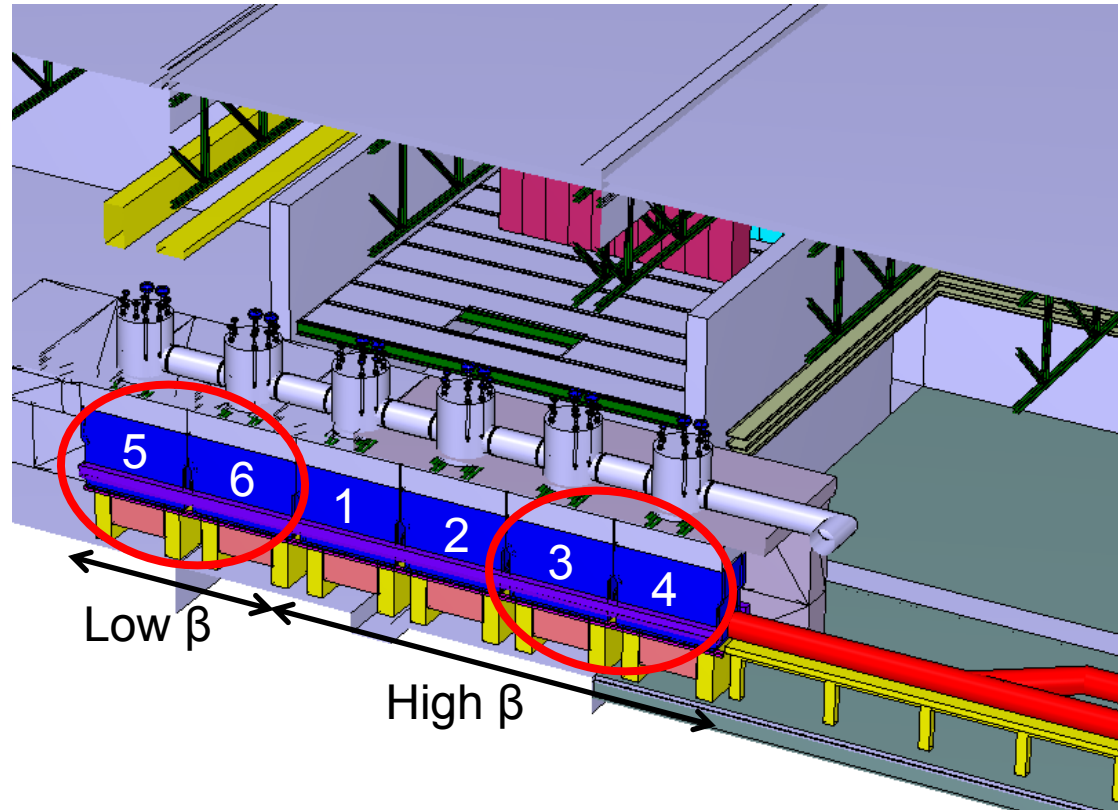
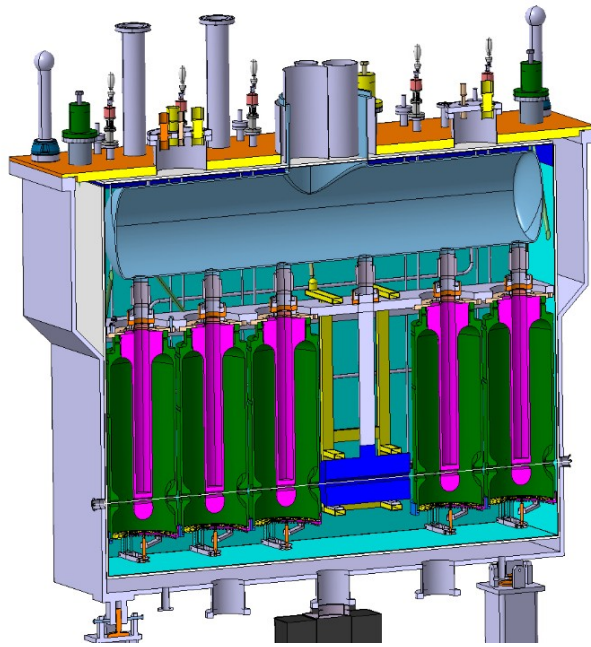
**Cutting walls & install tunnel: long 2013 shutdown**  
**Allowing a normal 2012 REX / Miniball run**  
**Cold Line: January 2014 – June 2014**



**Cryo Modules 1 & 2: July 2014 – Oct 2014**

**First beam at 5.5MeV/u autumn 2014**

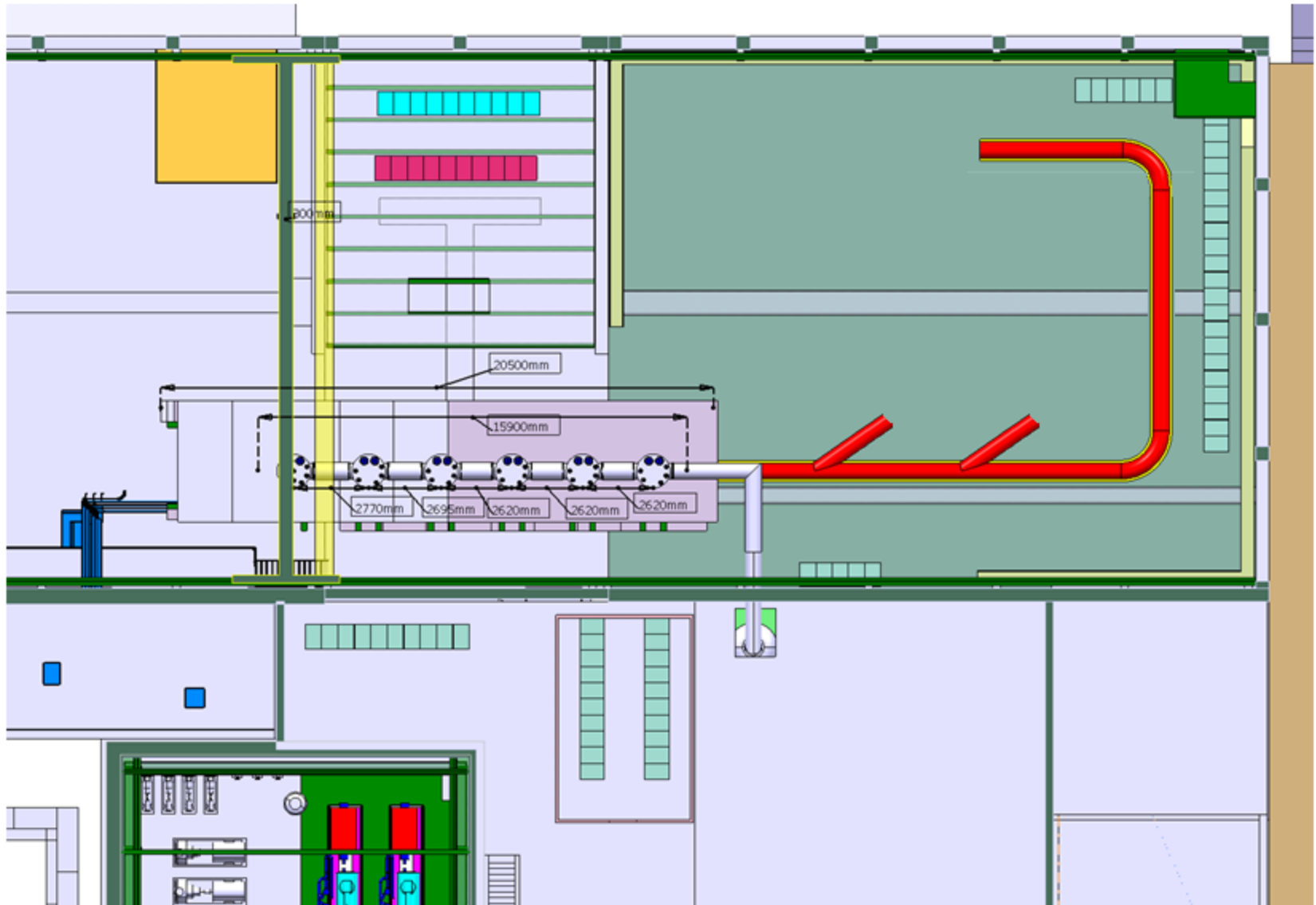
**REX physics at 5.5MeV/u for 2015**



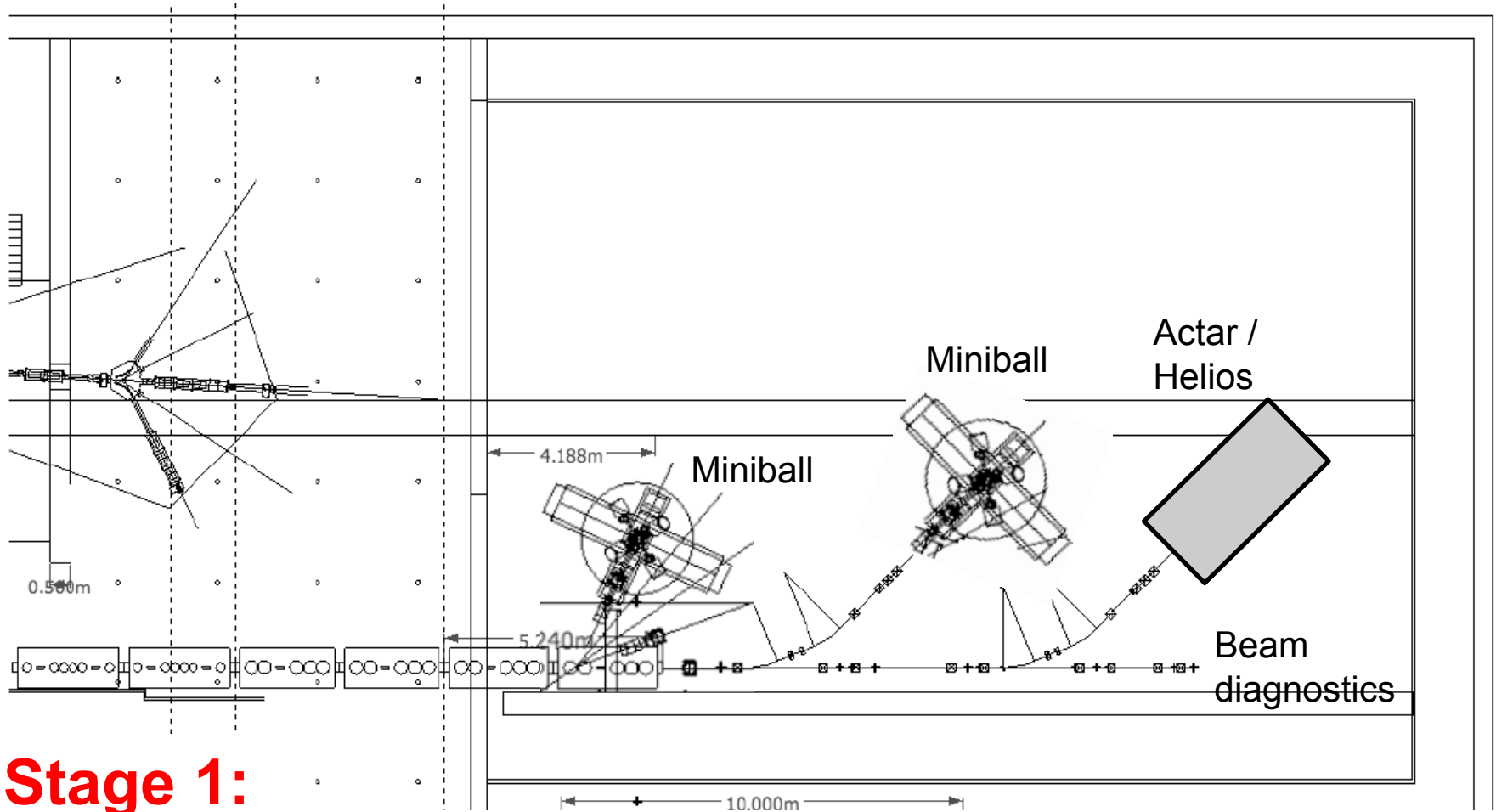
**Cryo Modules 3 & 4: January - April 2016**

**Cryo Modules 5 & 6: January - April 2017**

**Final Energy 10MeV/u**



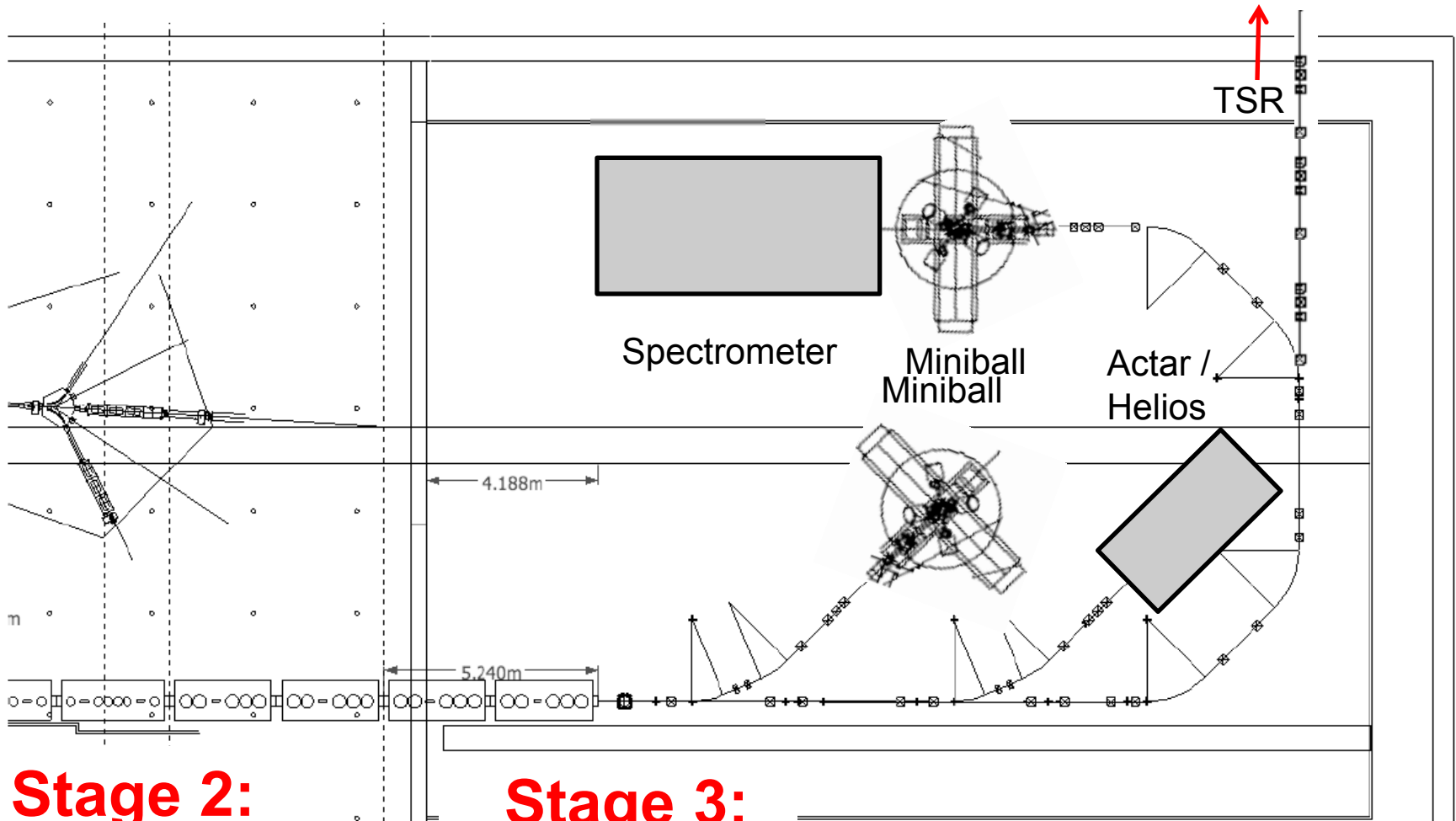




## Stage 1:

**Straight line with 2 branches – July 2013 - April 2014**

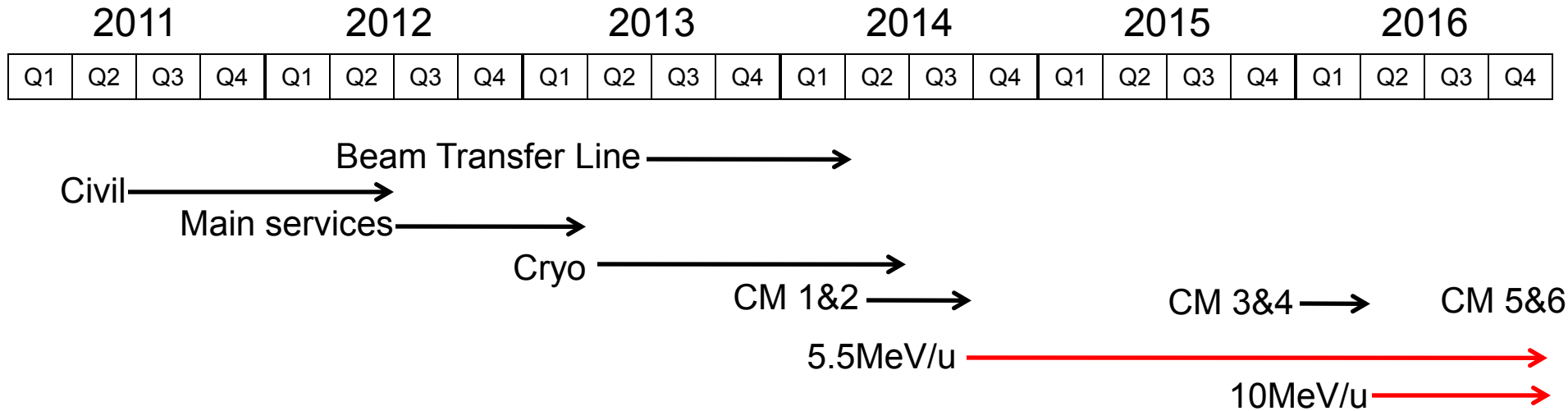
**Miniball move: Oct 2013 – April 2014**



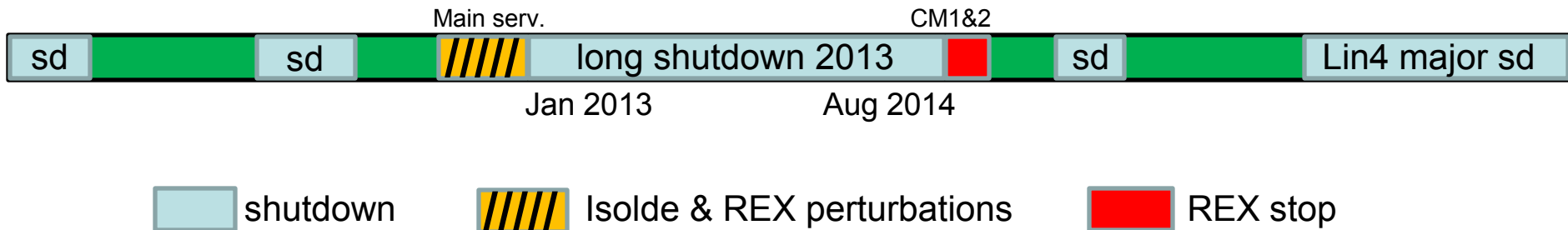
**Stage 2:**  
The bend

**Stage 3:**  
TSR and beyond..

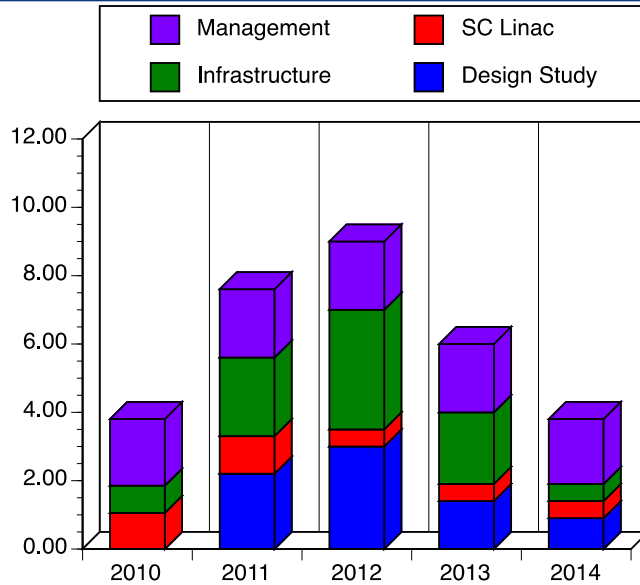
**Spectrometer installation and 2nd Miniball move**



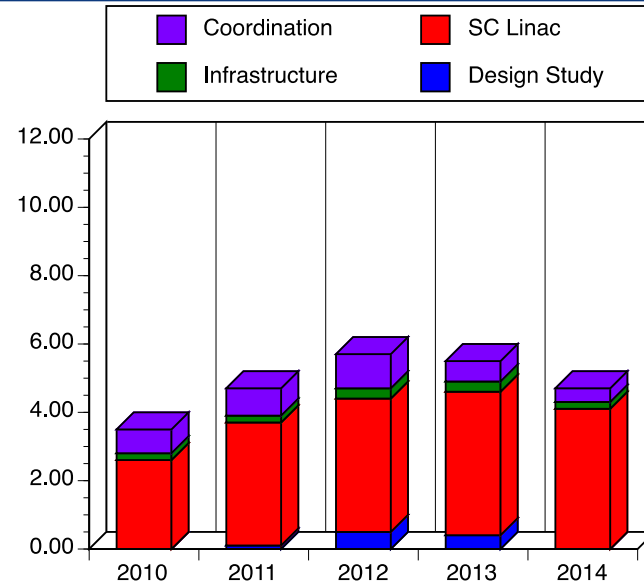
Isolde & REX Operations:



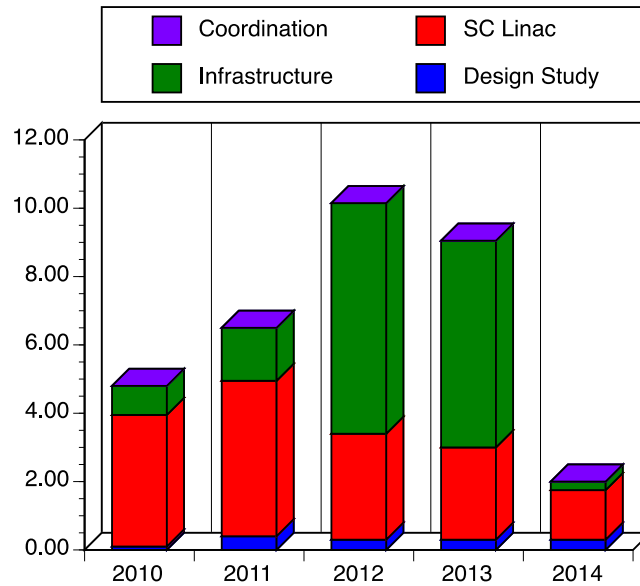
EN



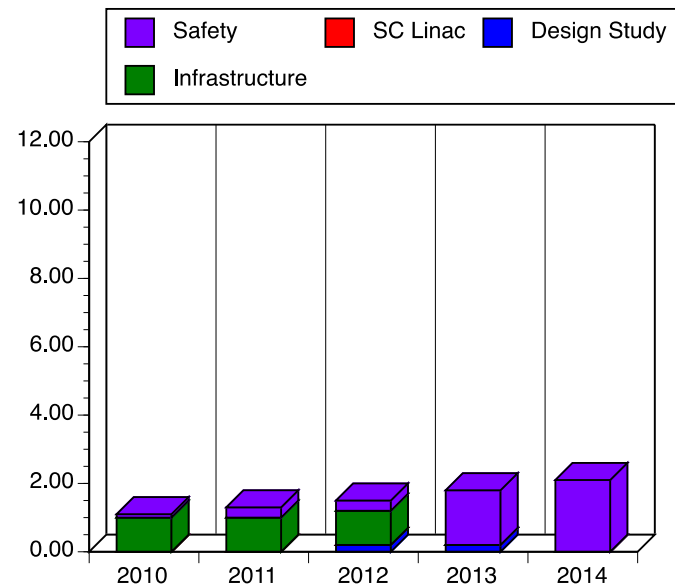
BE



TE



GS



- CERN Staff
  - ✓ Resources defined by group leaders (105 FTE over 5 years)
- Fellows (70 FTE)
  - ✓ 5 FTE paid on departmental budget
  - ✓ 9 FTE paid by Isolde Collaboration
  - ✓ 56 FTE paid by ITN3 Marie Curie Contract (20 fellows)

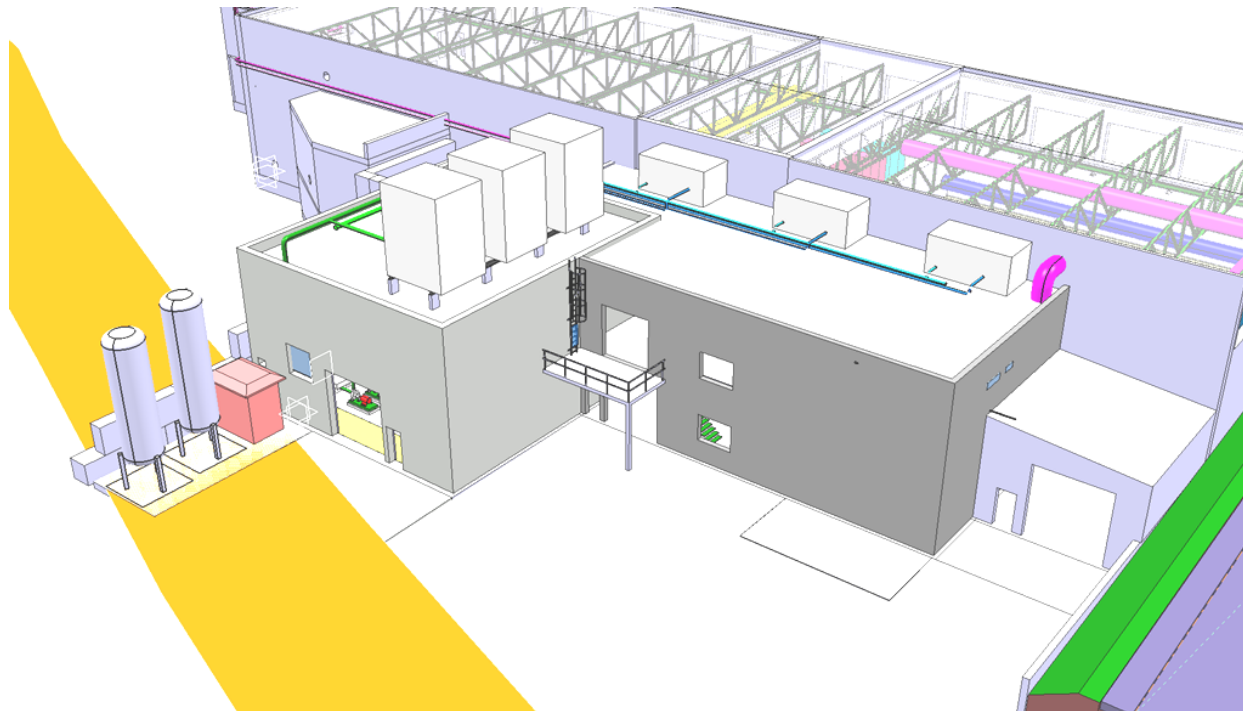
As defined in MTP 2010 –  
**Approved** by Council -> Sep. 2010

Total budget of 35.3 MCHF (2010 – 2016) with two funding sources:

- External funding (incl. Isolde Coll.)
  - LINAC (17.7 MCHF)
- CERN budget
  - Infrastructure (14.7 MCHF)
  - Design studies for intensity upgrade (2.1 MCHF)
  - Safety (0.8 MCHF)

- BE/OP : ERWIN SIESLING,
- EN/STI : ANA-PAULA BERNARDES, RICHARD CATHERALL
- BE/RF : MATTEO PASINI
- GS/SE : DANIEL PARCHET, ELISEO PEREZ-DUENAS
- EN/CV : PAUL PEPINSTER, BENOIT BELLIN-CROYAT
- EN/EL : RENE NECCA
- TE/CRG : NICOLAS DELRUELLE, JOS METSELAAR
- EN/MEF : STEPHANE MARIDOR
- GS/DI : CYRILLE BEDEL
- TE/MSC : YANN LECLERCQ

Thank you very much for  
your attention





1 - Hazards increase 



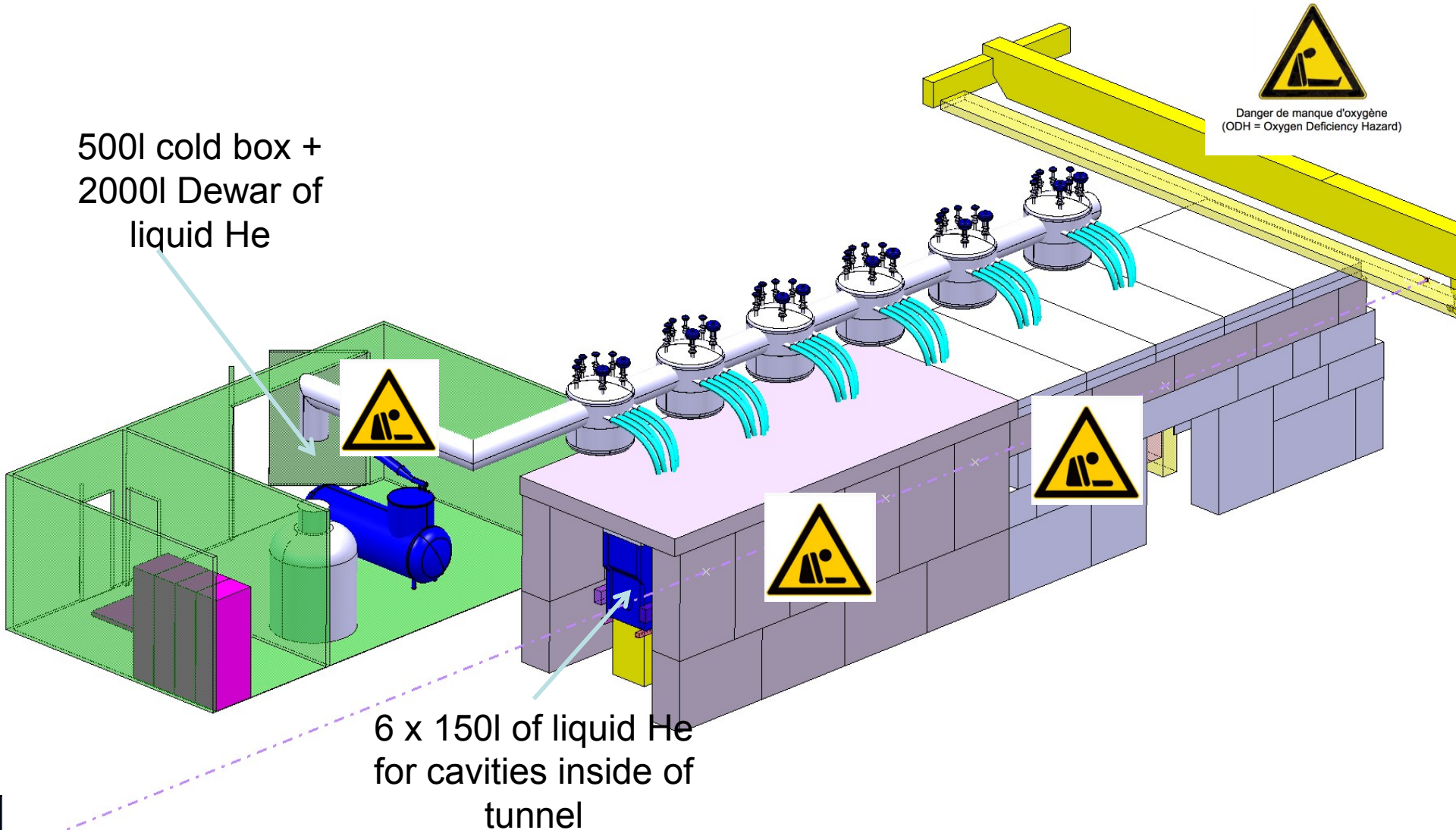
With the augmentation of Intensity and Energy



With an increase in number of equipments

## 2 – New Hazard: Oxygen Deficiency Hazard

500l cold box +  
2000l Dewar of  
liquid He



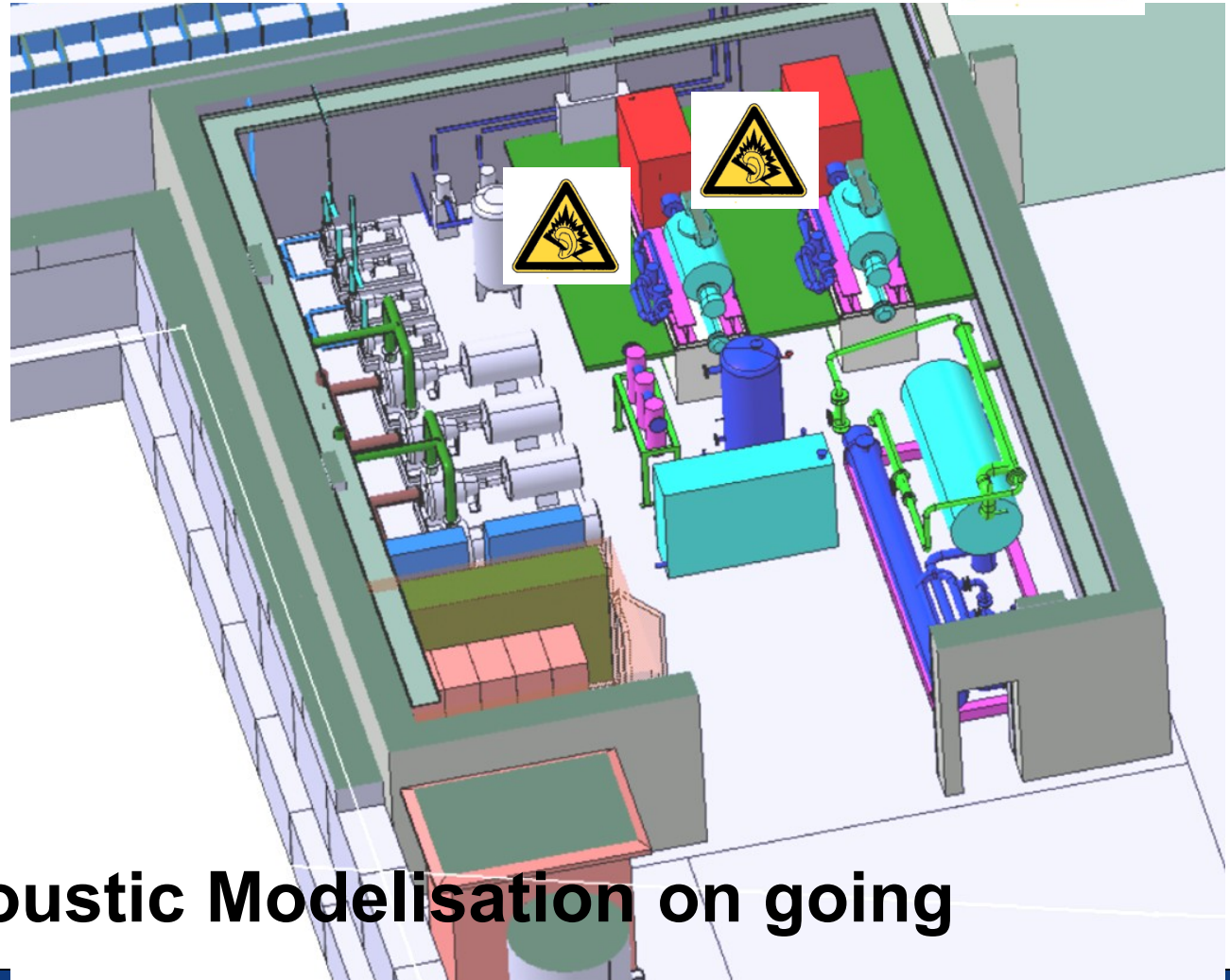
## 3 – New Hazard: Noise



-Level of noise inside building

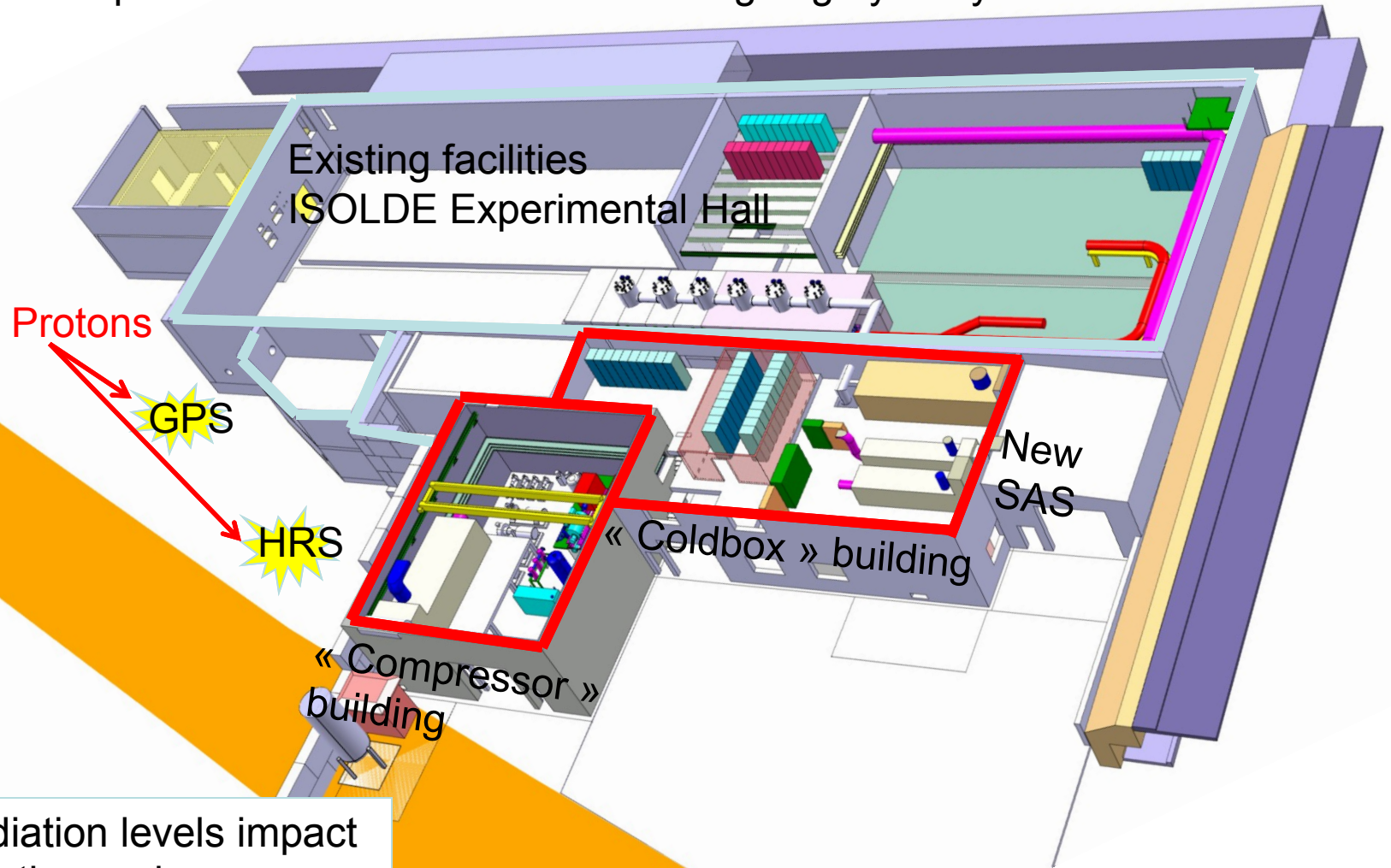
- Noise propagation to other buildings

- Noise propagation out of the building



**Acoustic Modelisation on going**

Radiation protection – Fluka calculations on going by Yuriy Romanets



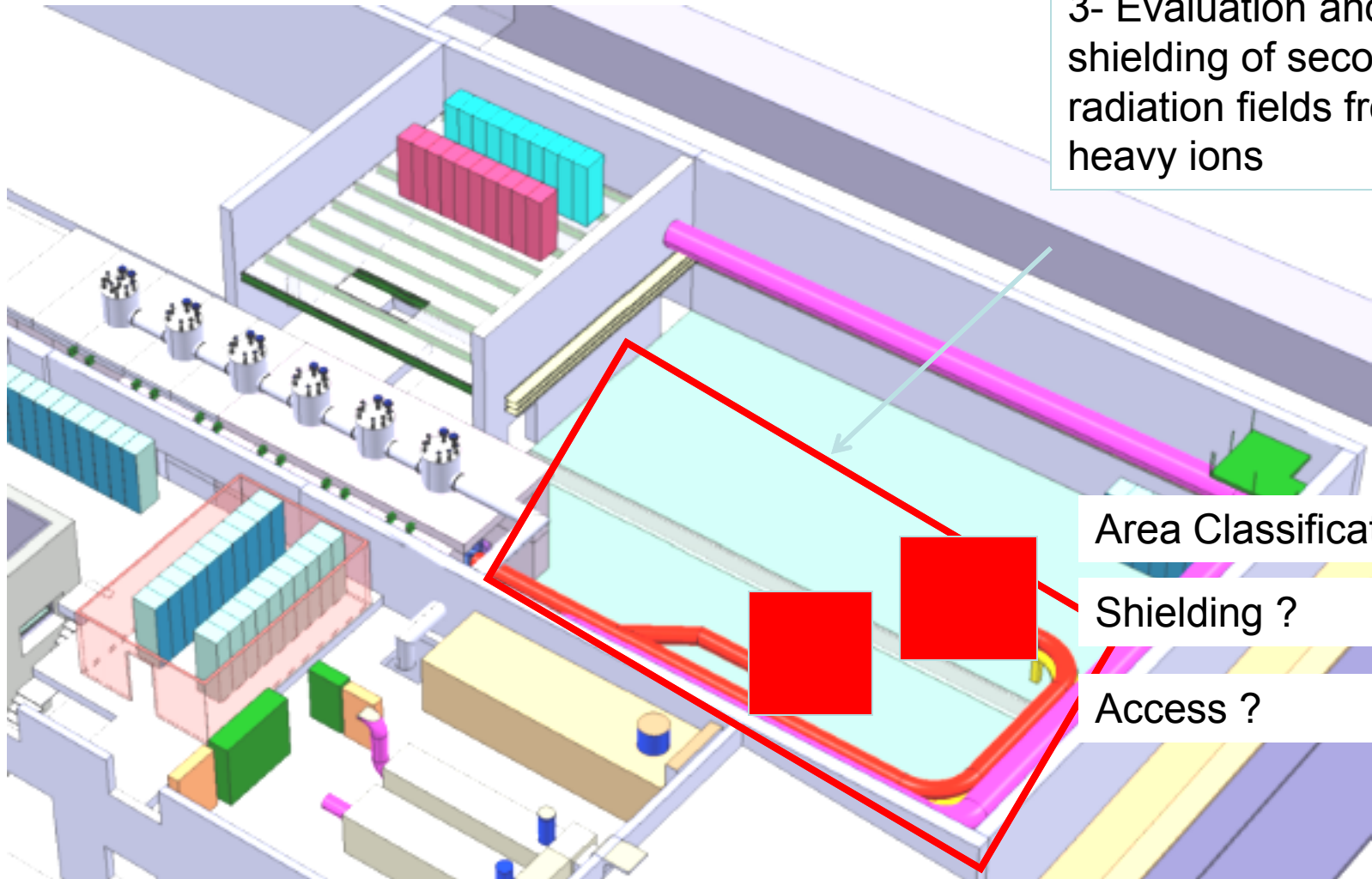
1- Radiation levels impact on existing and new facilities.

Fluka simulations done by

Y. Romanets

Radiation protection – Follow-up by J.Vollaire

3- Evaluation and shielding of secondary radiation fields from heavy ions



Area Classification 

Shielding ?

Access ?

Workunit Description	Dept-Grp	Code	PSI (CAT)					Sub Total	PFE (CAT)										Sub Total	Grand Total	
			No Recharging Code						Recharging code T131910					CERN Fellows							
			2010	2011	2012	2013	2014		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014			
HIE ISOLDE Design Study - HV & High Current Systems	TE-ABT	99223	0.10	0.20	0.10	0.10	0.10	0.60							0.20	1.00	1.50	1.00	0.30	4.00	4.60
HIE ISOLDE Design Study - Vacuum	TE-VSC	99799		0.20	0.20	0.20	0.20	0.80	0.60	1.00	1.00	0.40	3.00								3.80
HIE ISOLDE Infrastructure - Power Converters	TE-EPC	99641		0.70	2.70	2.50		5.90													5.90
HIE ISOLDE Infrastructure - Cryogenic system	TE-CRG	99537	0.80	0.70	3.70	3.50	0.20	8.90													8.90
HIE ISOLDE Infrastructure - Interlocks	TE-MPE	99688	0.05	0.15	0.35	0.05	0.05	0.65													0.65
HIE ISOLDE Linac - Beam Transfer Line	TE-MSD	99160	0.10	0.50	0.50	0.50	0.10	1.70	0.50	1.00	1.00	0.50	3.00								4.70
HIE ISOLDE Linac - Cryomodule Test	TE-MSD	99159									1.00	0.50	1.50								1.50
HIE ISOLDE Linac - Cryomodules	TE-MSD	99158	0.80	0.85	0.90	0.90	1.05	4.50	0.50	1.00	1.00		2.50								7.00
HIE ISOLDE Linac - SC Cavity Sputtering	TE-VSC	99796	1.00	0.50	0.50	0.50		2.50	0.30	0.50	1.00	1.00	0.70	3.50							6.00
HIE ISOLDE Linac - SC Solenoids	TE-MSD	99157	0.50	0.50	0.50	0.50		2.00													2.00
HIE ISOLDE Linac - Vacuum	TE-VSC	99798	1.20	1.80	0.30	0.20	0.20	3.70													3.70
HIE ISOLDE - Protection Study	TE-MPE	99689	0.25	0.40	0.40	0.10	0.10	1.25													1.25
		<b>Grand Total</b>	<b>4.80</b>	<b>6.50</b>	<b>10.15</b>	<b>9.05</b>	<b>2.00</b>	<b>32.50</b>	<b>0.80</b>	<b>2.60</b>	<b>4.00</b>	<b>4.00</b>	<b>2.10</b>	<b>13.50</b>	<b>0.20</b>	<b>1.00</b>	<b>1.50</b>	<b>1.00</b>	<b>0.30</b>	<b>4.00</b>	<b>50.00</b>

Workunit Description	Dept-Grp	Code	PSI (CAT)					Sub Total	PFE (CAT)										Sub Total	Grand Total			
			No Recharging Code						ISOLDE & CATHI Fellows					CERN Fellows									
			2010	2011	2012	2013	2014		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014					
HIE ISOLDE Design Study - Beam Diagnostics	BE-BI	64520			0.10	0.10		<b>0.20</b>															<b>0.20</b>
HIE ISOLDE Design Study - Alignement	BE-ABP	61520			0.10	0.10		<b>0.20</b>															<b>0.20</b>
HIE ISOLDE Design Study - EBIS Upgrade	BE-ABP	61522		0.10	0.30	0.20		<b>0.60</b>		0.50	1.00	0.50		<b>2.00</b>									<b>2.60</b>
HIE ISOLDE Infrastructure - Beam Control Systems	BE-CO	66520	0.20	0.20	0.30	0.30	0.20	<b>1.20</b>															<b>1.20</b>
HIE ISOLDE Linac - SC Cavity RF	BE-RF	69520	0.80	1.10	1.40	1.30	1.20	<b>5.80</b>	0.75	1.30	2.00	0.70		<b>4.75</b>									<b>10.55</b>
HIE ISOLDE Linac - SC Cavity Test	BE-RF	69521	0.90	0.50	0.50			<b>1.90</b>		0.50	1.00			<b>1.50</b>									<b>3.40</b>
HIE ISOLDE Linac -Beam Dynamics	BE-RF	69522	0.20	0.10	0.10			<b>0.40</b>	1.00	0.50	0.50			<b>2.00</b>									<b>2.40</b>
HIE ISOLDE Linac - Beam Instrumentation	BE-BI	64520	0.50	1.50	1.50	1.50	1.70	<b>6.70</b>	0.60	1.60	2.40	1.70	0.70	<b>7.00</b>									<b>13.70</b>
HIE ISOLDE Linac - Linac Commissioning	BE-RF	69523				1.00	1.00	<b>2.00</b>		0.20	1.00	1.00	0.80	<b>3.00</b>									<b>5.00</b>
HIE ISOLDE Linac - Alignment	BE-ABP	61520	0.20	0.40	0.40	0.40	0.20	<b>1.60</b>		0.50	1.00	1.00	0.50	<b>3.00</b>									<b>4.60</b>
HIE ISOLDE - Project Coordination	BE	55600	0.70	0.80	1.00	0.60	0.40	<b>3.50</b>															<b>3.50</b>
		<b>Grand Total</b>	<b>3.50</b>	<b>4.70</b>	<b>5.70</b>	<b>5.50</b>	<b>4.70</b>	<b>24.10</b>	<b>2.35</b>	<b>5.10</b>	<b>8.90</b>	<b>4.90</b>	<b>2.00</b>	<b>23.25</b>									<b>47.35</b>

Workunit Description	Dept-Grp	Code	PSI (CAT)					Sub Total	PFE (CAT)										Sub Total	Grand Total				
			No Recharging Code						ISOLDE & CATHI Fellows					CERN Fellows										
			2010	2011	2012	2013	2014		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014						
HIE ISOLDE Design Study - Experimental Hall layout	EN-MEF	55612		0.50	0.50			<b>1.00</b>																<b>1.00</b>
HIE ISOLDE Design Study - Target Area Layout	EN-MEF	55616			0.50	0.50		<b>1.00</b>																<b>1.00</b>
HIE ISOLDE Design Study - Target Design	EN-STI	55606		0.20	0.40	0.40	0.20	<b>1.20</b>	1.50	3.00	3.00	1.50	<b>9.00</b>											<b>10.20</b>
HIE ISOLDE Design Study - Extraction Optics	EN-STI	55606		0.10	0.10	0.10	0.10	<b>0.40</b>	0.20	0.50	0.50	0.30	<b>1.50</b>											<b>1.90</b>
HIE ISOLDE Design Study - Frontend Design	EN-STI	55606		0.50	0.50	0.50	0.10	<b>1.60</b>	0.20	0.50	0.50	0.30	<b>1.50</b>											<b>3.10</b>
HIE ISOLDE Design Study - Cooling & Ventilation	EN-CV	55607		0.10	0.10	0.10	0.10	<b>0.40</b>	0.40	1.00	1.00	0.60	<b>3.00</b>											<b>3.40</b>
HIE ISOLDE Design Study - Electrical Systems	EN-EL	55608		0.20	0.20	0.20		<b>0.60</b>																<b>0.60</b>
HIE ISOLDE Design Study - Transport & Handling	EN-HE	55618		0.10	0.20	0.10		<b>0.40</b>																<b>0.40</b>
HIE ISOLDE Design Study - Control Engineering	EN-STI	55609		0.10	0.10	0.10	0.10	<b>0.40</b>	0.50	1.00	1.00	0.50	<b>3.00</b>											<b>3.40</b>
HIE ISOLDE Design Study - Offline Separator	EN-STI	55610		0.20	0.20	0.20	0.10	<b>0.70</b>	0.50	0.50	0.50	0.50	<b>2.00</b>											<b>2.70</b>
HIE ISOLDE Design Study - Separators Area	EN-STI	55611		0.20	0.20	0.20	0.20	<b>0.80</b>	0.50	1.50	1.50	0.50	<b>4.00</b>											<b>4.80</b>
HIE ISOLDE Infrastructure - Integration	EN-MEF	55613	0.10	0.30	0.30			<b>0.70</b>																<b>0.70</b>
HIE ISOLDE Infrastructure - Handling Systems	EN-HE	55614	0.10	0.10	0.20	0.10		<b>0.50</b>																<b>0.50</b>
HIE ISOLDE Infrastructure - Transport & Handling services	EN-HE	55617		0.10	0.30	0.20		<b>0.60</b>																<b>0.60</b>
HIE ISOLDE Infrastructure - Cooling & Ventilation	EN-CV	55604	0.40	1.00	1.00	0.30		<b>2.70</b>																<b>2.70</b>
HIE ISOLDE Infrastructure - Electrical Systems	EN-EL	55605	0.10	0.30	0.30	0.10		<b>0.80</b>																<b>0.80</b>
HIE ISOLDE Infrastructure - Control Systems	EN-ICE	55615	0.10	0.50	1.40	1.40	0.50	<b>3.90</b>																<b>3.90</b>
HIE ISOLDE Linac - SC Cavity Design & Prototyping	EN-MME	55601	0.60	0.60				<b>1.20</b>							0.20	0.20							<b>0.40</b>	<b>1.60</b>
HIE ISOLDE Linac - Cryomodule Design	EN-MME	55602	0.40					<b>0.40</b>							0.20								<b>0.20</b>	<b>0.60</b>
HIE ISOLDE Linac -Integration & Installation	EN-MEF	55603	0.05	0.50	0.50	0.50	0.50	<b>2.05</b>	0.60	1.00	1.00	0.40	<b>3.00</b>											<b>5.05</b>
HIE ISOLDE - Project Management	EN	55600	1.95	2.00	2.00	2.00	1.90	<b>9.85</b>																<b>9.85</b>
		<b>Grand Total</b>	<b>3.80</b>	<b>7.60</b>	<b>9.00</b>	<b>7.00</b>	<b>3.80</b>	<b>31.20</b>		<b>4.40</b>	<b>9.00</b>	<b>9.00</b>	<b>4.60</b>	<b>27.00</b>	<b>0.40</b>	<b>0.20</b>						<b>0.60</b>	<b>58.80</b>	



Workunit Description	Dept-Grp	Code	PSI (CAT)					Sub Total	PFE (CAT)										Sub Total	Grand Total			
			No Recharging Code						ISOLDE & CATHI Fellows					CERN Fellows									
			2010	2011	2012	2013	2014		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014					
HIE ISOLDE Design Study - Civil Engineering	GS-SEM	76155			0.20	0.20		<b>0.40</b>															<b>0.40</b>
HIE ISOLDE Infrastructure - Beam Control Systems	GS-SEM	76155	1.00	1.00	1.00			<b>3.00</b>															<b>3.00</b>
HIE ISOLDE Safety - Coordination	GS-DI	70155	0.10	0.10	0.10	0.10	0.10	<b>0.50</b>															<b>0.50</b>
HIE ISOLDE Safety - Access System	GS-DI	72155				0.20		<b>0.20</b>															<b>0.20</b>
HIE ISOLDE Safety - Fire Detection	GS-DI	72155				0.10		<b>0.10</b>															<b>0.10</b>
HIE ISOLDE Safety - Radiation Protection	DGS-RP			0.20	0.20	1.20	2.00	<b>3.60</b>		0.30	1.00	0.70		<b>2.00</b>									<b>5.60</b>
		<b>Grand Total</b>	<b>1.10</b>	<b>1.30</b>	<b>1.50</b>	<b>1.80</b>	<b>2.10</b>	<b>7.80</b>		<b>0.30</b>	<b>1.00</b>	<b>0.70</b>		<b>2.00</b>									<b>9.80</b>