

LIU/HL-LHC C&S Review Preparation Status

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Content

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- Purpose of the review
- Programme // Sessions Reviewers and CERN Lead
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- C&S review preparation with WP leaders
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- Conclusion



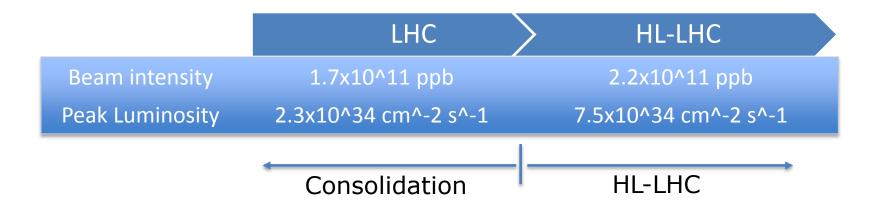
Background

- MTP 2015-2019 incorporates long-term outlook up to 2025, in line with the updated European Strategy for Particle Physics
- Integration in the MTP of the construction and commissioning of the full HL-LHC programme and the completion of the detector upgrades by the end of Long Shutdown 3 (LS3), scheduled for the years 2023 to 2025
- Driving factor for the budget cumulative deficit for the period up to 2025
- → Cost and Schedule Review 9 to 11th of March 2015



Cost & Schedule Review - Scope

- HL-LHC and LIU projects
- taking into consideration how these are linked to the consolidation project and the operation of the CERN accelerator complex





Cost & Schedule Review - Purpose

- Assess the status of the project development taking into account the technical developments that are still ongoing
- Assess the project baseline, i.e.
 - Scope
 - Resources (Material and personnel costs)
 - Schedule
 - And also
 - Project Management methods
 - Risks: Evaluation and risk management



Cost & Schedule Review - 3 Days Programme

9 March 2015

Plenary

Breakout sessions

10 March 2015

Breakout sessions

Breakout sessions

11 March 2015

Q&A session

Recommendations and Close-out



Cost & Schedule Review – // Sessions - CERN Lead

- Session 1: LIU (CERN Lead: G. Rumolo)
- Session 2: SC Magnets and Cryogenic Systems HL-LHC project (CERN Lead: L. Bottura)
- Session 3: SC cavities HL-LHC project (CERN Lead: Erk Jensen)
- Session 4: Other Accelerator systems, Support and Interface Systems -HL-LHC (CERN Lead: O. Bruning)
- Session 5: Cost, Schedule, Management, Risk, Infrastructure and Integration - LIU and HL-LHC projects (CERN Leads: M. Meddahi, L. Rossi)



Cost & Schedule Review – Reviewers

Breakout session	Chair	Members
LIU	T. Roser	W. Fischer
		Q. Qin
SC Magnets and Cryosystems	S. Gourlay	P. Vedrine (CEA)
		B. Petersen (DESY)
SC Cavities		oto (KEK)
Other accelerator syste CIV	1AC Meeting	g #10
Support and interface		PSI)
systems systems (QPS,		,1 31/
collimation, beam dumps,		
feedback, controls)		
Project Management,	N. Holtkamp	K. Oide
	iv. Holtkallip	K. Olde
Schedule, Cost, Risk, Infrastructure and civil		C. Neumeyer (PPPL)
engineering		



Cost & Schedule Review – Programme Details

- Shared on HL-LHC Collaboration Workspace
 - Cost&Schedule Review Programme

- Indico page in preparation
 - http://indico.cern.ch/event/357610/



Presentations – Scope of WP



The Review panel has received the PDR (January 2015)

The scope shall include

- Description of the WP (from the PDR)
- Clear PBS with what is Baseline and not Baseline
- Systems architecture
- Interface specifications
- Deliverables/Milestones



Presentations - Resources



Each presentation will include

- HR effort during the full project (up to 2025) (P and M4P)
 - Associate each P and M4P WU to the top level of the PBS and the corresponding WP leader
- Material resources (including major supply contracts)
 - Associate each M WU to the level 2 (or 3 in some case) of the PBS and the technical responsible person (see again EDMS1405056)
- Collaborations



Presentations - Schedule



Each presentation will include

- Consolidated data (prepared centrally)
- List of major constrains and elements in the critical path (prepared centrally)



Presentations - Risk



Your presentation will include

Main risks and mitigation actions (prepared centrally)

Presentations – Uncertainty

 Global uncertainty on the cost of each WP, together with list of equipment with major contribution to the level of uncertainty



List of actions to get ready for the C&S review



- Complete existing reference documents (Conceptual specifications, Interface specifications, space reservations)
- Best guess of material expenditures, split on the project phases
- Pre-strategy of supplies (amount, timing, by whom) (Industry, In-house, Collaboration)
- List of existing collaborations
- Update of HR resources presently working (next 3 years) and plan up to 2025
- M4P plan (MPA, FSUs and Industrial Services contracts)
- List of Deliverables
- Existing schedules (that will be integrated globally)
- Reflection on risks and uncertainties

Cost & Schedule Review – Preparation in practise



- 2 to 3 meetings to define and check the information
- Individual targeted meetings to obtain/complete information on scope, resources or schedule
- Rehearsal meeting (Status provided by CERN Lead) in Special TC end February 2015

Traceability via the SharePoint

https://espace2013.cern.ch/project-HL-LHC-

Technical-

coordination/CandS/ layouts/15/start.aspx#/



C&S Review Preparation - Global view



Week #	W6	W7	W8	W9	W10	W11
BC Structure						
APT WBS						
APT WUs						
Data P						
Data M4P						C&S
Data M						REVIEW
APT data integration						
Schedule						
Risk						
Uncertainty						
Today – TE retreat – Special 1	гс					
Milestor	ne for bo	ttom-up				
Data on resource	s and scl	nedule int	tegrated			

WP Interfaces final check
Strategic Decisions (CONS? R2E? What is on the critical path?...)



Ready for the review? Global view





WP	Description	Dep.	ВС	APT WBS	APT wus	Data P	Data M4P	Data M	Date	Schedule	Risk	Uncertainty
2	Accelerator Physics and Performance			,	IL	IL	IL.	IL		W7	, non	Under tunity
3	Magnets for Insertion Regions	TE		BD	BD	BD	BD	BD	02-Feb			
4	Crab Cavities & RF	BE		IL	IL	IL	IL	IL		W7		
5	Collimation	BE		IL	IL	IL	IL	IL		W7		
6A	Cold Powering	TE		BD	BD	BD	BD	BD	06-Feb	W8		
6B	Warm Powering	TE		IL	IL	BD	BD	BD		W8		
7	Machine Protection	TE		IL	IL	BD	BD	BD	13-Feb	W8		
8	Collider-Experiment Interface	BE		IL	IL	IB	IB	IB		W8		
9	Cryogenics	TE		IL	IL	IL	IL	IL	03-Feb	W7		
10	Energy Deposition & Absorber Coordination	EN		IL	IL	IB	IB	IB		W7		
11	11 T Dipole Two-in-One for DS	TE		BD	BD	BD	BD	BD	06-Feb	W8		
12	Vacuum	TE		IL	IL	BD	BD	BD		W8		
13	Beam Diagnostics	BE		IL	IL	IL	IL	IL		W8		
14	Beam Transfer & Kickers	TE		IL	IL	BD	BD	BD		W8		
15	Integration & (De-)Installation	EN		IL	IL	IB	IB	IB				
16	Hardware Commissioning	BE		IL	IL	IL	IL	IL		W7		
17	Infrastructure, logistics and civil engineering	EN		IB	IB	IB	IB	IB		W7		



Budget Structure

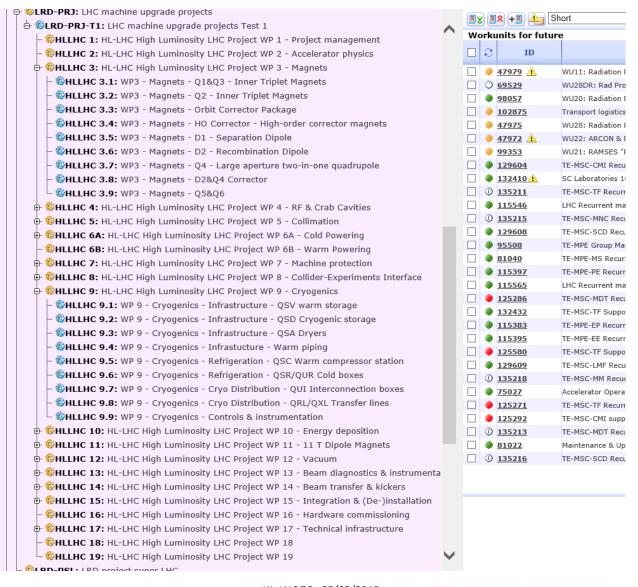


WP3- Budget Codes					BUDGET					
	Section		Description		Material BC		Pers	sonnel BC		
<u>Cable</u>	SCD H		cable HL-LHC WP HL-LHC WP HL-LHC WP	03-Cable-Q1/Q3 03-Q2 cable 03-D1 D2 Q4 cable 03-superferric cable 03-corrector cable	92530 92531 92532 92533 92534	Н	HL-LHC WP03 Cable (Personnel) Code 92500			
				03-Q1/Q3 model	92535 02526			1/0		
<u>Model</u>	MI				_K -check expenses Y'	Н	L-LHC WYU3 MOde	el (Personnel) Code 92501		
WP9-Budget Codes				Hata)	K-Check Chi	S				
Workunits				a he able to			Material BC	Personnel BC		
Infrastructure - QSV warm stor	rage	Λi	im is th	(pasil	V'					
Infrastructure - QSD Cryogenic		P	1111	Easi	•		92705			
Infrastructure - QSA Dryers							92705			
Infrastucture - Warm piping										
Refrigeration - QSC Warm com	·						92706			
Refrigeration - QSR/QUR Cold							32700			
Refrigeration - QSC Warm com	•		I E-CKG-	HL-LHC WP09-Refrige	eration@P1/P5		92707	HL-LHC WP09 (Personnel) code		
Refrigeration - QSR/QUR Cold			ML					92700		
ryo Distribution - QUI Interconnection boxes			TE-CRG- ML	HL-LHC WP09-Cryo D	oistribution@P4		92708			
	yo Distribution - QRL/QXL cryo lines yo Distribution - QUI Interconnection boxes			,						
Cryo Distribution - QUI interco			TE-CRG- ML	HL-LHC WP09-Cryo D	istribution@P1/P5		92709			
Controls & instrumentation	yo iiiles		TE-CRG- ML	HL-LHC WP09-Contro	ols & Instrumentation					



APT WBS & WUs







Resources P and M4P – Key Concepts



P Work Units

- One WU will be created yearly for each WP for personnel purposes.
- Staff and fellows (existing) are included in P WUs.
- for the first 3 years must be nominative (it is mandatory for APT for 2 years). From the 4th year onwards until 2025, general needs are expressed.
- All corrections or changes will be made in collaboration between HL-LHC team and the DPO, with the responsibility of the information kept by the DPO.



Resources P and M4P – Key Concepts



M4P Work Units

- One WU will be created yearly for each WP for M4P purposes.
- M4P includes MPA, FSU and service contracts.

MPAs

- covers all requests for TRNE, STUD, DOCT, ADMI, TECH, COAS, PJAS AND FELLOW-GET
- at a general cost od 67.2kCHF per person per year PJAS subsistence + 12kCHF/year for the institute. Trade-off between students, PJAs and fellows (some covered by the departments as DGP).
- All existing MPA for the first 3 years must be nominative. For the future MPA and from the 4th year onwards until 2025, general needs are expressed.

FSUs

cost expressed in CHF and based on present FSU contracts. The average cost to be used is 110 kCHF/year. This cost includes the margin for the replacement of the resources during holidays, maternity, etc.

Service contracts – Industrial services

- Values for service contracts will be expressed in CHF and based on previous service contracts used for the construction of the LHC (indexed) or on currently existing service contracts.
- A maximum amount of 2000 CHF will be assigned per person per year for integration of personnel, conferences, travel and/or training expenses.



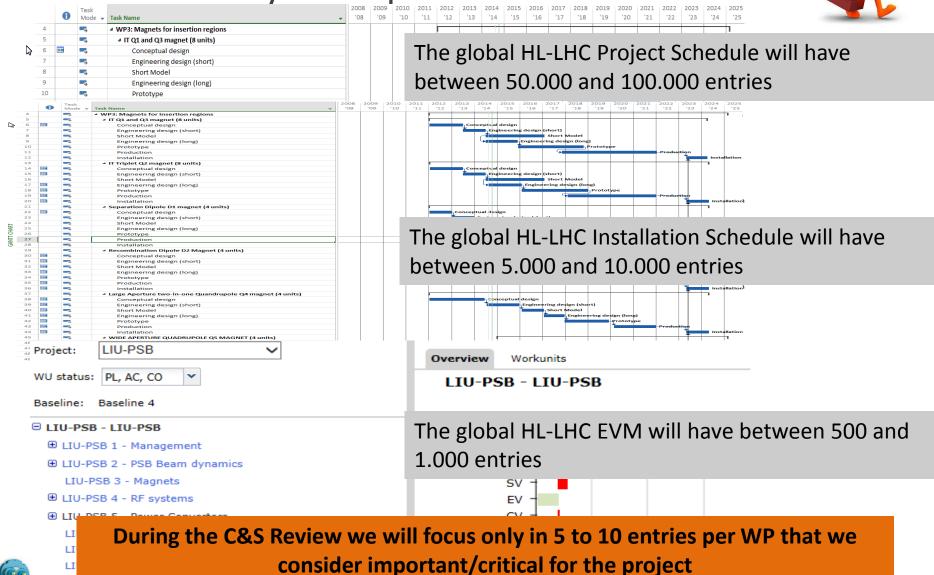
Resources P and M4P - APT numbers — WP14



			HL-LHC WP14 Budget Estimate								
Unit: KCHF				n MPA	30 D4	MPA for Kickers	40000		67200 CHF		
				n MPA	40 D4	MPA for WP office	40000	r	33600 CHF		
Summary per budget code				n OTHERS	50 D4	Integration of personnel, conferences, travels	70000		20000 CHF		
	Dept/Group	Responsible	Description	n wu	PL	HL-LHC-WP14-M4P-BeamTransfer&Kickers	HLLHC 14	jan.uythoven@cern.ch		1-Jan-2016	31-Dec-2016
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/acuum	TE-VSC-absorber	V.Baglin	Vacuum for absorbers	n MPA	40 D4	MPA for Diamond BLM for injection region	40000		33600 CHF		
	TE-VSC-kicker		Vacuum for kickers	n MPA	50 D4	MPA for WP office	40000	ſ	67200 CHF		
Cickers	TE-ABT	L.Ducimetiere	Kickers FPS	n OTHERS	60 D4	Integration of personnel, conferences, travels	70000		20000 CHF		
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Schedule – Key concepts





Uncertainty – Key concepts



- Allows to put a level of risk on the overall project.
- Documents where the estimate comes.
- Allows to judge whether the cost estimates provided are within 20%, 50% or a factor of 2
 ...
- Basic principle is: The more you know what needs to be done, the more precise can you
 give a price for it.

		Primary Characteristics	Secondar	y Characteristic
Cost Estimate				Expected
Classification	Level of Definition (%		Typical	accuracy range -
Classification	of Complete		purpose of	Variation in low
	Definition)	Typical Estimating Technique of the Cost	estimate	and high ranges
Class 5, Concept		Capacity factored, Stochastic, most Parametric	Concept	L: -20% to -50%
Screening	0% to 2%	models, judgement or analogy	screening	H: +30% to +100%
Class 4, Study or			Study or	L: -15% to -30%
Feasibility	1% to 15%	Equipment factored, more Parametric models	feasibility	H: +20% to +50%
		Semi-detailed unit costs with assembly level line items,		
		cost estimating technique includes the combinations of		
		, ,	Budget	
Class 3, Preliminary,) ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '		L: -10% to -20%
Budget Authorization	10% to 40%	trend analysis)	or control	H: +10% to +30%
		Detailed unit cost, cost estimating technique includes		
Class 2, Control or			Control or	L: -5% to -15%
Bid/Tender				H: +5% to +20%
			Check	
Class 1, Check Estimate				L: -3% to -10%
1 2 1		Deterministic, most definitive cost estimation		H: +3% to +15%



Interfaces Identification



									CUSLI	IO L III	luucuı	II WEX							
	10/24	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	WP11	WP12	WP13	WP14	WP15	WP16	WP17	Comments
			_													11112	101 20	11111/	All Wilston links disc Wild St. 1. 1/
	WP2	_														_	 	_	All WPs are linked to WP1 for travel/computing/training expe
	WP3																†	-	
	WP4									Х						 			
	WP5																		
	WP6									Х									
	WP7							1	1	1							1		
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	WP9																		
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	WP11								. 110	rk	in pi	051	SS						
	WP12								MA	ייון								-	All WPs are linked to WP15 for dismontling/transport/etc
	WP13		Х															_	All Wesare linked to We 15 for dishortoning transport
	WP14																	_	
	WP15													_	-	-	-	-	
	WP16	-														-	-	-	All Williams linked to WIDIE for only branco articles
	WID17	-	-	-	-														



Conclusion

- Schedule to get ready for the C&S review is tight, we need schedule and resources data (P, M4P, M) ready by end of next week (W8)
 - > leaving 2 weeks to prepare risks, uncertainty, interfaces identification ...
- P resources to be uploaded in APT (in the WUs proposed by the project team)
- Interfaces to be discussed in the TC of this afternoon
 - WP6A-WP6B-WP9
 - WP9-WP4 for SPS infrastructure
 - WP12 with almost all others
 - WP3-WP11-WP15 Interconnections
 - •
- Last 2 weeks to look for global consistency, chase up interfaces
 issues, reflect on risks and uncertainty

Thank you for your attention

