
CERN

BDF/SHiP at the High Intensity ECN3 facility

M. Fraser (SY-ABT-BTP)
on behalf of the HI-ECN3 Study Project Team

BDF Target & Target Complex Initial Review
CERN, Geneva, Switzerland
29th April 2024

Thoughts for today

- **Newcomers we will see a complete overview of the most critical system in the Beam Dump Facility:**
  - Please get involved, be active and share new ideas: profit from this opportunity to discuss
- **For the experienced BDF WG members, we have a chance to reflect:**
  - **Baseline:** what is our baseline today ? Can we converge on a baseline design before LS3 to guarantee reliable & safe operation in 2030 ?
  - **Baseline R&D:** what are the most important problems to solve & test with beam before LS3 ? Scope? Can we converge on a prioritized list of activities with decision points on a timeline?
    - **Physics performance:** what can we optimize further, is it worth it ?
    - **Reliability:** validation with beam before LS3 is necessary / alternative labs for beam time during LS3 ?
    - **Safety:** can we improve the choice of cladding material (LOCA) and reduce free radicals in cooling water ?
  - **Longer term R&D:**
    - **Strategy for upgradeability:** can we stage development to focus on safe/reliable operation at 4×10^{13} ppp but leave the door open to installing an upgraded target for ultimate SPS performance closer to 7×10^{13} ppp in ~ Run 5 ? … imagine a FIP signal is observed in Run 4 !

HI-ECN3 Study Project Team

Project Leader (PL):
Matthew FRASER

Deputy Project Leader (DPL):
Claudia AHDIDA

Project Safety Officer (PSO):
Melenia AVERNA

Project Radiation Safety Officer (PRSO):
TBC

Project Budget Officer:
Sylvie PRODON

Project Planning Officer (PPO):
Fernando PEDROSA

Configuration & Quality Assurance Manager:
Giulia ROMAGNOLI

Integration Support via ICEA:
Michael LAZZARONI

North Area Operation & Experiment Liason:
Dipanwita BANERJEE

SHiP Experiment (EP) Contact Person:
Richard JACOBSSON

SHiP Experiment (EP) Safety Correspondent:
Letizia DI GIULIO

Project & Experiment Safety Support (PESS) Correspondant :
James CURRIE

Admin Support:
Katarina SIGERUD & Diane KIVENDA MOKUBA

+ WPLs

WP1 – Project Management
Matthew FRASER
Deputy: **Claudia AHDIDA**

WP2 – Beam Extraction, Transfer and Delivery
Francesco VELOTTI
Deputy **Laurie NEVAY**

WP3 – Target & Beam Intercepting Devices
Rui XIMENES

WP4 – Target Complex
Jean-Louis GRENARD

WP5 – Exp. Area, Interface & Integration
Francois BUTIN

WP6 – Radiation Protection & Safety
Claudia AHDIDA

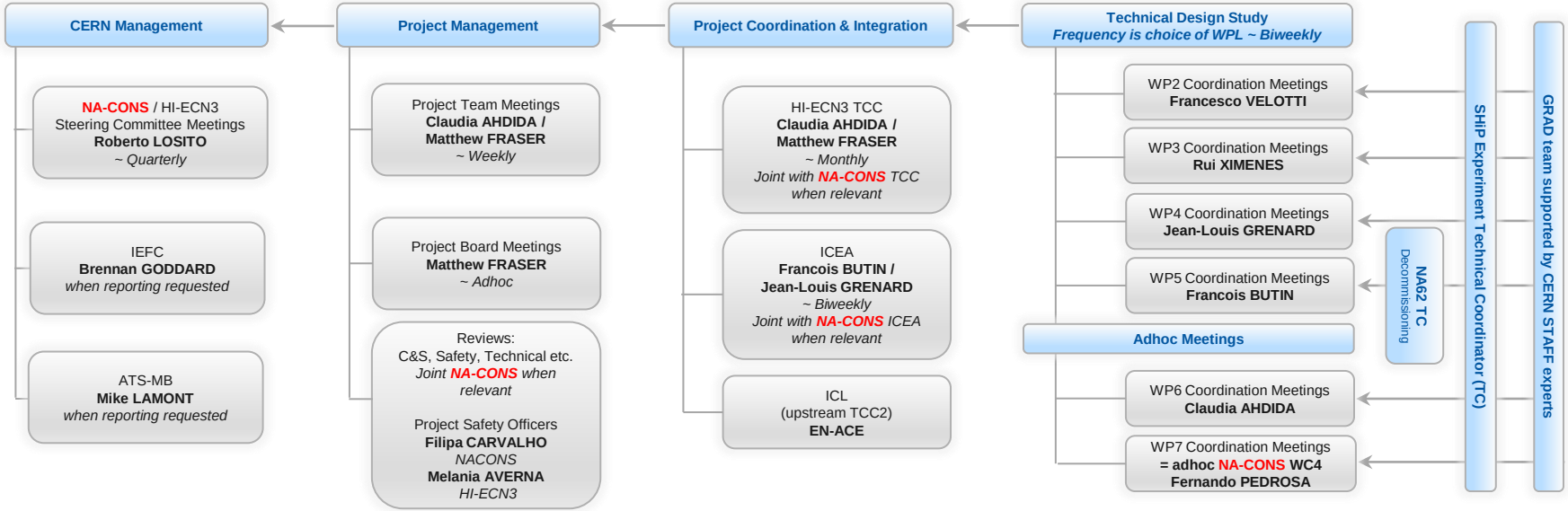
WP7 – Infrastructure, Services & Civil Eng.
Fernando PEDROSA

WP8 – Energy Deposition Studies & R2E
Luigi ESPOSITO

Project WBS v0.1

Project Organisation: Modus Operandi

- **Strong link to NA-CONS:**
  - STAFF supporting HI-ECN3 were nominated for their involvement in NA-CONS (exception is EN-CV)
- **Efficient use of time is a guiding principle:**
  - WPLs are responsible for targeted meeting agendas and invitations, news / round-table to take place first 10 mins so STAFF experts can leave (if agenda not relevant)



HI-ECN3 Study Project Scope

- **Study Project (TDR) transitioning into a Project simultaneously:**
  - **Budget profile (2024 - 2031):** update already provided and included in MTP2024
  - **Preparations for Long Shutdown 3:**
    - **Definition of interfaces with NA-CONS:** decouple access system and services so that upgrade work on TCC8/ECN3 can carry on in parallel to North Area operation (EHN1 and EHN2)
    - **Specification / design / installation:** upstream equipment, primary zones inc. NA-CONS equipment and installation of beam dump in P42: many items on critical path!
    - **Dismantling of TCC8 and ECN3:** cable/services identification, decabling, radioactive transport/waste mgmt
    - **(Radioactive) Storage**
    - **Sustainability / cost saving:** recovering shielding from PS TT7 Neutrino facility before LS3
- **WBS:**
  - AS TDR advances, together we must converge on a WBS with WP descriptions and agree cost & resources with the Budget Plan implemented by end 2025
- **Civil Engineering already on the critical path:**
  - Pre-studies ongoing, IRP Due Diligence moving to Design Study

Study Project Milestones

… do not forget this is a TDR Study Project transitioning into a Project simultaneously

- **NA-CONS C&S Review:** align for MTP2024 – **February 2024**
- **Experiment(s) Decision at Research Board – 6 March 2024**
  - **Launch Safety Discussion:** start Initial Enquiry for PESS Process
  - **Launch preparations for dismantling of TCC8 / ECN3**
  - **Launch CERN TT7 Shielding Recovery Project**
  - **Update MTP2024**
- **Formal HI-ECN3 Project Approval (MTP2024) – after CERN RB June 2024**
  - Mandate including transition from Study → Project
- **First draft TDR "lite" & WBS – by end 2024**
  - Work Package Descriptions (first drafts) agreed with groups
  - Project roadmap documentation (including budget plan, BC's, ATS person power plan, etc.)
- **IRP Due Diligence – May 2024**
- **IRP Authorisation – Q3 2025**
- **Final TDR & WBS – by end 2025**

Thank you !

Study Project (TDR) STAFF Experts (SY)

Support from CERN groups:

i. GRAD support (2 yr) TDR phase, only if STAFF supervision guaranteed **(no STAFF M2P)**
ii. Synergy to NA-CONS key (if possible, same STAFF member on both projects)
iii. WP descriptions (agreed deliverables & resources) to be written with the GRAD support

Group	Contact	Activity	GRAD Support 2024/25
SY-BI	David BELOHRAD	TL & Experiment Specific BI	
SY-BI	Christos ZAMANTZAS	BLMs	✓
SY-AR	Katarina SIGERUD	Project Admin Support: Diane KIVENDA MOKUBA (SY-ABT)	
SY-ABT	Francesco VELOTTI	WP2	✓
SY-EPC	Yves GAILLARD	TDR	
SY-EPC	Ivan JOSIFOVIC	TDR	
SY-RF	Giulia PAPOTTI	TDR (RF support for slow extraction)	
SY-STI	Rui FRANQUEIERA XIMENES	WP3	✓
SY-STI	Jean-Louis GRENARD	WP4	
SY-STI	Ruben ALIA	R2E support TDR	
SY-HDO	Anne FUNKEN	Safety Support	
SY-STI	Melania AVERNA	Project Safety Officer	
SY-STI	Luigi ESPOSITO	FLUKA support for TDR	✓

Study Project (TDR) STAFF Experts (BE)

Support from CERN groups:

i. GRAD support (2 yr) TDR phase, only if STAFF supervision guaranteed **(no STAFF M2P)**
ii. Synergy to NA-CONS key (if possible, same STAFF member on both projects)
iii. WP descriptions (agreed deliverables & resources) to be written with the GRAD support

Group	Contact	Activity	GRAD Support 2024/25
BE-CEM	Jerome LENDARO	Target Instrumentation	
BE-CEM	Luca BUONOCORE	Robotics / Tooling	
BE-GM	Camille VENDEUVRE	Survey	
BE-EA	Michael LAZZARONI	Integration (global via ICEA)	✓
BE-EA	Francois BUTIN	WP5	✓
BE-EA	Johannes BERNHARD	WP2	
BE-EA	Dipanwita BANERJEE	North Area Operation & Experiment Liason	✓
BE-EA	Laurence NEVAY	WP2	✓
BE-EA	Giulia ROMAGNOLI	Configuration Management	
BE-OP	Kevin LI	SPS OP	
BE-ABP	Hannes BARTOSIK	TDR	
BE-CSS	TBC	TDR	

Study Project (TDR) STAFF Experts (EN, TE)

Support from CERN groups:

i. GRAD support (2 yr) TDR phase, only if STAFF supervision guaranteed **(no STAFF M2P)**
ii. Synergy to NA-CONS key (if possible, same STAFF member on both projects)
iii. WP descriptions (agreed deliverables & resources) to be written with the GRAD support

Group	Contact	Activity	GRAD Support 2024/25
EN-AA	Anna SUWALSKA	TDR	
EN-AA	Tomasz LADZINSKI	TDR	
EN-ACE	Fernando PEDROSA	Planning / Coordination	✓
EN-ACE	Frederic GALLEAZZI	Integration for SPS / NA primary	
EN-CV	Roberto BOZZI / Francesco DRAGONI*	TDR	✓
EN-EL	Eva CANO GONZALEZ	TDR	✓
EN-HE	Roberto RINALDESI	TDR	✓
EN-MME	Luca GENTINI	TDR	
EN-MME	Stefano SGOBBA	Material R&D for TDR	

*Not named in NA-CONS WBS – to link with Serge DELEVAL

Group	Contact	Activity	GRAD Support 2024/25
TE-MPE	Antoine COLLINET	TDR	
TE-MSC	Philipp SCHWARZ	TDR	
TE-VSC	Anthony HARRISON	Primary VSC support for TDR	

Study Project (TDR) STAFF Experts (HSE, EP)

Support from CERN groups:

i. GRAD support (2 yr) TDR phase, only if STAFF supervision guaranteed **(no STAFF M2P)**
ii. Synergy to NA-CONS key (if possible, same STAFF member on both projects)
iii. WP descriptions (agreed deliverables & resources) to be written with the GRAD support

Group	Contact	Activity	GRAD Support 2024/25
SCE	John OSBORNE	Preparatory Civil Work	✓ TEMP → GRAD
HSE-OHS	Simon MARSH	PESS	✓
HSE-OHS	Oriol RIOS	FIRIA	✓
HSE-RP	Claudia AHDIDA	DPL / WP5	✓
HSE-RP	Renaud CHAROUSSET	Radioactive Waste Management	
EP	Awaiting EP's official nomination for SHiP Technical Coordinator		
EP	Hans DANIELSSON	NA62 Technical Coordinator	
EP	Richard JACOBSSON	SHiP EP Contact Person	
EP	Letizia DI GIULIO	SHiP EP Safety Correspondantn	

Study Project (TDR) GRAD Team

Person	Role	Group	Supervisor	Programme	BC Description	PRQ	Start Date
Ixone VAQUERO	Planning & Coordination	EN-ACE	Fernando PEDROSA	ORIGIN	HI-ECN3 / NA-CONS	Completed	1/10/2023
Xavier PALLE	Planning & Coordination	EN-ACE	Fernando PEDROSA	ORIGIN	HI-ECN3 / NA-CONS	Completed	1/3/2024
Kincso PAL	TDR	SCE	John OSBORNE	TEMP	HI-ECN3	Completed	1/1/2024
James CURRIE	TDR	HSE-OHS	Simon MARSH	ORIGIN	HI-ECN3	Completed	1/2/2024
TBC	FIRIA	HSE-OHS	Saverio LA MENDOLA	QUEST	HI-ECN3 / HSE	2024	Q3 2024
TBC	TDR → Implementation	SCE	Natacha LOPEZ	QUEST	HI-ECN3	2025	Q1 2025
Nikola ZARIC	TDR	EN-CV	Roberto BOZZI	QUEST	HI-ECN3	Completed	1/2/2024
Angelo PETRELLESE	Secondary Vacuum	BE-EA	Miguel SANTOS	ORIGIN	HI-ECN3 / NA-CONS / PBC	Completed	1/4/2024
Fabian METZGER	TDR	BE-EA	Laurence NEVAY	GRAF	HI-ECN3	Completed	1/4/2024
TBC	TDR / LS3 prep	BE-EA	Francois BUTIN	ORIGIN	HI-ECN3	2024/25	TBC
Beatriz MARTINEZ	TDR	BE-EA	Michael LAZZARONI	ORIGIN	HI-ECN3	Completed	2/5/2024
Ming LIU	TDR	EN-EL	Eva CANO GONZALEZ	QUEST	HI-ECN3 / NA-CONS	Completed	2/5/2024
Cristina DURAN GUTIERREZ	TDR	EN-HE	Roberto RINALDESI	ORIGIN	HI-ECN3	Completed	1/6/2024
Olin PINTO	TDR	HSE-RP	Claudia AHDIDA	QUEST	HI-ECN3	Completed	1/2/2024
Mike PARKIN	TDR	SY-STI	Rui FRANQUEIRA XIMENES	QUEST	HI-ECN3	Completed	1/3/2024
Giuseppe MAZZOLA	R2E / FLUKA	SY-STI	Luigi ESPOSITO	QUEST	HI-ECN3	Completed	1/2/2022
TBC	BLM	SY-BI	Christos ZAMANTZAS	ORIGIN	HI-ECN3	?	?
TBC	TCSC CONS	SY-STI	Nicolas SOLIERI	QUEST	NA-CONS	?	?
TBC	TDC2 / TCC2	HSE-RP	Helmut VINCKE	QUEST	NA-CONS	2024	TBC
Luke DYKS	TDR	BE-EA	Dipanwita BANERJEE	GRAF	HI-ECN3	Completed	1/9/2022
Alexander GORN	TDR	SY-ABT	Matthew FRASER	GRAF	PBC / SY	Completed	1/10/2023
Tamara BUD	ECN3 tasks on request	SCE	John OSBORNE	QUEST	PBC	Completed	1/1/2024
Francesca LUONI	ECN3 tasks on request	HSE-RP	Claudia AHDIDA	FELL	PBC	Completed	1/9/2023
Tirsi PREBIBAJ	ECN3 tasks on request	BE-ABP	Hannes BARTOSIK	GRAF	PBC	Completed	1/3/2023

Project Resources: quick reminder (i)

- **PBC ECN3 Task Force:** budget estimate (~ Class 3 - 4)
  - Agreed by CERN groups at 324th IEFC meeting 3 March 2023 **(no project STAFF M2P)**
  - Presented to the 244th CERN Research Board 6 March 2023
  - **Beam Delivery = 14 MCHF**

Cost Categories	Resource Context (including M2P)	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
		*[kCHF rounded to closest 25k]**									
Beam Delivery	Operation Critical (NA-CONS**) and HI specific	125	450	1150	2525	3550	2875	575	225	0	**11475**
	TDR: Engineering & Optimization Phase (GRAD)***	550	1125	1125	0	0	0	0	0	0	**2800**
	Sub-Total:	*675*	*1575*	*2275*	*2525*	*3550*	*2875*	*575*	*225*	*0*	***14275***

* Budget profiling is a very rough estimate (peaking after LS3) and needs to be iterated in TDR phase

** NA-CONS new baseline items motivated by risk to reliability of HI-ECN3 operation after LS3

*** TDR GRAD request based on same ratio of GRAD/CtC of NA-CONS project working out at ~ 2.8 MCHF or 10 FTE for 3 years

Project Resources: quick reminder (ii)

- **PBC ECN3 Task Force:** budget estimate (~ Class 3 - 4)
  - Agreed by CERN groups at 324th IEFC meeting 3 March 2023 **(no project STAFF M2P)**
  - Presented to the 244th CERN Research Board 6 March 2023
  - **Beam Delivery = 14 MCHF + BDF/SHiP facility (50 MCHF) → Total = 64 MCHF**

Cost Categories	Resource Context (including M4P)	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total	%
		*[kCHF rounded to closest 25k]**										
BDF/SHiP	Civil Engineering	0	100	200	300	500	2450	3350	2450	500	**9850**	**20**
	Target Station & beam dilution	0	200	425	625	1050	5250	7150	5250	1050	**21000**	**42**
	Infrastructure & Services	0	150	300	475	775	3850	5250	3850	775	**15425**	**31**
	Integration, Dismantling, Installation	25	150	375	825	1150	925	175	75	0	**3700**	**7**
	Sub-Total:	*25*	*600*	*1300*	*2225*	*3475*	*12475*	*15925*	*11625*	*2325*	***49975***	***100***

* Budget profiling is a very rough estimate (peaking after LS3) and needs to be iterated in TDR phase

Project Resources: quick reminder (iii)

- **PBC ECN3 Task Force:** budget estimate (~ Class 3 - 4)
  - Agreed by CERN groups at 324th IEFC meeting 3 March 2023 **(no project STAFF M2P)**
  - Presented to the 244th CERN Research Board 6 March 2023
  - **No significant cost difference between experiment options**
  - **Beam Delivery = 14 MCHF + HIKE/SHADOWS facility (46 MCHF) → Total = 60 MCHF**

Cost Categories	Resource Context (including M2P)	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total	%
		[kCHF rounded to closest 25k]										
HIKE / SHADOWS	Civil Engineering *(no additional access shaft requested)*	0	50	125	175	300	1500	2025	1500	300	**5975**	**13**
	Target Station	0	175	325	500	825	4150	5650	4150	825	**16600**	**36**
	Infrastructure & Services	0	175	350	525	850	4300	5850	4300	850	**17200**	**37**
	Integration, Dismantling, Installation	25	150	375	825	1150	925	175	75	0	**3700**	**8**
	Phase-II Beamline & Infrastructure Changes	0	0	0	0	0	0	0	0	2500	**2500**	**6**
	Sub-Total:	*25*	*550*	*1175*	*2025*	*3125*	*10875*	*13700*	*10025*	*4475*	***45975***	***100***

MTP 2023 request

- **MTP 2023 request of 2.85 MCHF for 2023 & 2024:**
  - This **included additional NA-CONS items** deemed critical for the future operation of the HI-ECN3 facility: ***we requested an increase in the Cost-to-Completion of NA-CONS***

								Requested budget per year in [kCHF]														
No	Classification for MTP document	Sector /Unit	Department	Project Name/ Operation	Type of Budget	Request short description	Request Justification / Comments	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total 2023 - 2033 [kCHF]	Total 2023 - 2028 [kCHF]	Total 2024 - 2033 [kCHF]	Total 2024 - 2028 [kCHF]	Total 2023-2024 [kCHF]
41	MTP Funding Request	ATS	ATS	ECN3	Materials	HI-ECN3 facility	Outcome of the ECN3 TF Study -> high-intensity beamline: ~14MCHF -> experiment dependent implementation (figures presented here as request for the SHIP case as the slightly more expensive one) SHIP ECN3: ~50MCHF HIKE/SHADOWS: ~46MCHF Resource summary: EDMS #2825627 ECN3 TF Study report: CERN-PBC-REPORT-2023-001	225	1,225	2,400	4,100	6,150	13,950	15,250	11,000	2,175			56,475	28,050	56,250	27,825	1,450
42	MTP Funding Request	ATS	ATS	ECN3	Grad	HI-ECN3 facility	see comments above	450	950	1,175	625	875	1,400	1,250	850	150			7,725	5,475	7,275	5,025	1,400
Total								**675**	**2175**	**3575**	**4,725**	**7,025**	**15,350**	**16,500**	**11,850**	**2,325**	**0**	**0**	**64,200**	**33,525**	**63,525**	**32,850**	**2,850**

MTP 2023 arbitration

- **MTP 2023 decision by the DG:**
  - *'Allocate **2.5 MCHF for 2023 and 2024** for the preliminary works, waiting for the project to be officially approved.'*

								Allocated budget per year in [kCHF]														
No	Classification for MTP document	Sector /Unit	Department	Project Name/ Operation	Type of Budget	Request short description	Request Justification / Comments	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total 2023 - 2033 [kCHF]	Total 2023 - 2028 [kCHF]	Total 2024 - 2033 [kCHF]	Total 2024 - 2028 [kCHF]	Total 2023-2024 [kCHF]
41	MTP Funding Request	ATS	ATS	ECN3	Materials	HI-ECN3 facility	Outcome of the ECN3 TF Study -> high-intensity beamline: ~14MCHF -> experiment dependent implementation (figures presented here as request for the SHIP case as the slightly more expensive one) SHIP ECN3: ~50MCHF HIKE/SHADOWS: ~46MCHF Resource summary: EDMS #2825627 ECN3 TF Study report: CERN-PBC-REPORT-2023-001	225	**875**	0	0	0	0	0	0	0			1100	1100	875	875	1100
42	MTP Funding Request	ATS	ATS	ECN3	Grad	HI-ECN3 facility	see comments above	450	950	0	0	0	0	0	0	0			1400	1400	950	950	1,400
Total								**675**	**1825**										**2500**				

Budget Transfer to NA-CONS

- **700 kCHF was transferred from HI-ECN3 to NA-CONS to advance on many new LS3 critical consolidation items requested for HI-ECN3:**
  - TCSC (Transfer Line Splitter Collimator) consolidation
  - RP support for primary NA zones
  - Transfer line magnets (magnetic measurements, spares, etc.)
  - Beam instrumentation
- **HI-ECN3 Study Project therefore has a shortfall in 2023/24 of 350 kCHF requested:**
  - 1.8 MCHF approved vs. 2.85 MCHF requested (after items assigned NA-CONS)

Type	Funding	Total
Goods	CERN	**278**
Grad	CERN	**1,521**
Total		**1,799**

TDR GRAD team budget

- **Discussion continue with CERN groups:** the team is now reaching the 2.8 MCHF TDR GRAD budget request:

Dep	Group	WP	Category	BC Description	Detailed Description	2023	2024	2025	2026	Total
SY	SY-STI	3&4	QUEST	TDR preparation: SY-STI	Target R&D		82.5	110	27.5	220
EN	EN-ACE	1	ORIGIN	TDR preparation: EN-ACE	Planning/Scheduling	10	40	30	0	80
EN	EN-ACE	1	ORIGIN	TDR preparation: EN-ACE	Planning/Scheduling		30	40	10	80
HSE	HSE-RP	6	QUEST	TDR preparation: HSE-RP	Including 25% RP source term contribution		101	110	9	220
EN	EN-CV	3&4&5	QUEST	TDR preparation: EN-CV	TDR		110	110	0	220
EN	EN-EL	4&5	QUEST	TDR preparation: EN-EL	TDR		55	55	0	110
EN	EN-HE	4&5	ORIGIN	TDR preparation: EN-HE	TDR		60	80	20	160
EN	EN-HE	4&5	TEMP	TDR preparation: EN-HE	External Contractor 4 months at average of 30%		11			11
BE	BE-EA	2	GRAF	TDR preparation: BE-EA-LE	TDR: Beam Line Support		110	110	0	220
SCE	SCE-PPM	7	QUEST	TDR preparation: SCE-PPM	Supporting handover to implementation phase		55	110	55	220
SCE	SCE-SAM	7	TEMP	TDR preparation: SCE-SAM	4-month handover to new PBC FELL		37			37
HSE	HSE-RP	6	QUEST	TDR preparation: HSE-OHS-RP	FIRIA - RP Environmental Engineer, FIRIA 25% contribution:			27.5	27.5	55
HSE	HSE-OHS	6	QUEST	TDR preparation: HSE-OHS-IB	FIRIA - Fire Safety Engineer, Shared 50:50 with HSE		14	55	41	110
HSE	HSE-OHS	6	QUEST	TDR preparation: HSE-OHS-PE	Technical Safety Engineer		101	110	9	220
SY	SY-STI	3&4&5	QUEST	TDR preparation: SY-STI	R2E / FLUKA studies			110	110	220
SY	SY-BI	2	ORIGIN	TDR preparation: SY-BI	Electronics for BLM work (oBLMS &ICs)		20	80	60	160
BE	BE-EA	2	ORIGIN	TDR preparation: BE-EA	Supporting P42 Vacuum upgrade, Shared with PBC and NA-CONS:		27	27		53
SY	SY-BI	2	TECH	TDR preparation: SY-BI	P42 BLM Part 2 TECH			42		42
BE	BE-EA	5	ORIGIN	TDR preparation: BE-EA	Integration support for dismantling and shielding recovery			80	80	160
BE	BE-EA	5	ORIGIN	TDR preparation: BE-EA	Integration support for ICEA		20	80	60	160
Total						**10**	**872**	**1'366**	**510**	**2'758**

Urgent Items (in view of approval)

Dep	Group	WP	M / P	Category	HI-ECN3 Category	BC Description	Detailed Description	2023	2024	2025
SY	SY-ABT	1		Material	TDR	Project Management			150	150
HSE	HSE-RP	2		Material	Beam Delivery	Additional RP Monitors for Beam Delivery		35	10	
BE	BE-GM	4&5		M+P	Experiment - HIKE/SHADOWS	TDR preparation: BE-GM			65	65
SY	SY-STI	3		Material	Experiment	Target R&D including Prototype Beam Test			230	470
TE	TE-MSC	2		Material	Beam Delivery	Production of Laminated Magnets for T4 Bump and P42 Dump			45	45
SY	SY-BI	2		Material	Beam Delivery	Repayment of P42 BLM Part 1				130
SY	SY-BI	2		Material	Beam Delivery	P42 BLM Part 2		0	39	27
HSE	HSE-RP	2		M+P	Beam Delivery	EHN1 ramp Classification RP			50	100
HSE	HSE-RP	2		M+P	Beam Delivery	ECN3 bridge shielding			50	150
SY	SY-STI	3		Material	Beam Delivery	P42 Beam Dump		20	180	
TE	TE-MPE	2		M+P	Beam Delivery	Machine Protection for Beam Delivery			100	100
SY	SY-ABT	2		M+P	Beam Delivery	Low-Z Electrostatic Septa			100	100
TE	TE-MSC	2		Material	Beam Delivery	Production of 11 Laminated MDX for P42			15	240
BE	BE-EA	2		Material	Beam Delivery	XTAX High Intensity Upgrade - Design			10	
SY	SY-EPC	2		Material	Beam Delivery	Production of 2 POLARIS for T4 Bump and P42 Dump				150
BE	BE-EA	2		Material	Beam Delivery	P42 Vacuum upgrade				200
SY	SY-ABT	2		QUEST	Beam Delivery	Extraction and Beam Transfer				28
SY	SY-STI	4		M+P	Experiment	TT7 shielding recovery			200	700
SY	SY-STI	4		M+P	Experiment	Target and coil handling system			25	25
SY	SY-STI	4		M+P	Experiment	Vacuum Vessel containing target system			35	55
SY	SY-STI	4		M+P	Experiment	Target system integration & R&D			50	50
BE	BE-EA	5		MPA	Experiment	Cable Identification Campaign Pre-LS3			10	10
EN	EN-HE	4&5		M+P	Experiment	TCC8/ECN3 transfer table refurbishment				100
EN	EN-HE	4		M+P	Experiment	Complete upgrade of the TCC8 crane				400
SCE	SCE-PPM	7		M+P	Experiment	SCE pre-studies needed in 2025			3	100
Total								**55**	**1'367**	**3'395**

HI-ECN3 Study Project Budget Request 2024/25

	2023 [kCHF]	2024 [kCHF]	2025 [kCHF]	…	Project Total [kCHF]
TDR GRADs	10	872	1366		-
Reprofile of Urgent HI-ECN3 Items	55	1367	3395		-
To NA-CONS	*206*	*495*	*920*		4733
HI-ECN3 Study Project	**271**	**2734**	**5681**		**65083**
MTP 2023 Request	**700**	**2175**	**3575**		**64250**
	-429	**+559**	**+2106**		**+833**