GS Department: Main Activities

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GS Department

LS2 DAYS
29-30 SEPTEMBER 2015

http://indico.cern.ch/event/436424/

OUTLINE

- GS-ASE ACTIVITIES
- GS-DI ACTIVITIES
- GS-IS ACTIVITIES
- GS-SE ACTIVITIES
- REMARKS

GS-ASE LS2

Ch. Delamare

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SPS Access System

- **Scope**
  - Replacement of the obsolete access system
    - For both access control and access safety functions
    - Injection, circulating beam and extraction lines
      - (North area EHN1, EHN2 not included)
  - Why
    - Reliability; Availability (spare parts)
    - Commitment towards Nuclear Authorities
  - From risk assessment to installation & validation
    - Dismantling
    - 16 Access Points; more than 200 doors
    - Support required from many groups
- **Budget**
  - 14.5 MCHF, planned
- **Schedule**
  - Tight planning and installation schedule
  - Installation centered on the LS2
    - Lot of co-activities in the SPS
    - Some access elements may need to be installed/assembled before
  - On-going:
    - MS replies being analysed (FC March 2016)
    - Specification, tendering
    - 3D scans initiated with EN-MEF
    - Cabling and fibre campaigns discussed with EN/EL

LHC Access System

- **Scope**
  - Preventive Maintenance
    - While system heavily solicited
  - Evolutions requested and planned so far
    - MAD & PAD PLC upgrade
    - Major change of the Evolynx system
    - Access Points controlled by PLC instead of Evolynx
    - MAD personnel detection improvement
    - Activation of Veto in TI2 & TI8
    - PZ65 – new Access Point
    - Integration of DMC and ODH to Access Cycle
      - See next slide
    - Move access points UJ23 and UJ87 (R2E tbc)
    - Interface allow Lift maintenance during RUN (ECR lifts)
    - Safety Training Center – Improvement Access Point
    - New zone around PMI2
    - HL-LHC
      - Risk analysis to confirm need for new EIS and zoning changes in LHC tunnel (to be implemented during LS3)
- **Budget**
  - ~2.5 MCHF 2019-2020, planned

Access – Speedy Boarding

- **Scope**
  - Lessons learned from LS1
  - Access is more and more complex for end-users
  - Autorisation, Safety Training, IMPACT, …
    - Proposal: on-line station to check access rights close but separate from Access Points and provide user-friendly help
  - Personal Protective Equipment (PPE)
    - ODH portable detector, DMC dosimeter, Self-rescue mask, TETRA
    - Proposal: lockers close to Access Points
      - New paradigm for PPE distribution
    - Analysis of the actual needs thanks to the access data (peaks/point)
- **Schedule**
  - Implementation before the LS2
- **Budget**
  - On-going project proposal with DGS-RP & EN-MEF
    - Example for lockers adapted to 200 ODH detectors: ~300kCHF

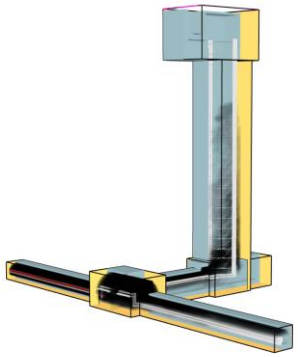
LHC Fire Detection

- **Scope**
  - Replacement of the 11 Surface centrals
    - Lifetime 15y
    - Underground centrals for machine & Experiments planned for LS3
- **Budget**
  - 830kCHF from 2017 to 2019
  - On-going request to ACC-CONS
- **Schedule**
  - 2017: proto; 2018: manufacturing & cabling
  - LS2: installation & commissioning

LHC Fire Detection

- **Scope**
  - Replacement of ~60 laser detectors
    - Obsolete and no spare parts
    - Easily replaced by standard ASD 535
  - Full project in EDMS 1538372
- **Budget**
  - ~500kCHF
  - On-going request to ACC-CONS
- **Schedule**
  - Around 15 detectors/y - 2016-2019

SPS Fire Safety Study



- On-going study
  - Well advanced
- Several recommendations to be considered now

Study of Fire Safety in the SPS

Introduction

During 2014, discussions have taken place at the SPS-CSAP and between the units concerned with safety and safety systems in the BE, EN and GS departments. It was decided to set up a group to study of the fire safety situation in the SPS. This study group will formulate recommendations for the management of the Accelerator and Technologies Sector, GS and HSE to decide on measures in time for LS2.

Study Group

The study group receives the mandate to:

1. study the fire safety situation in the SPS and propose measures that will make the fire safety in the SPS compatible with the modern standards.
2. draft a project for the implementation of these measures.
3. focus on evacuation, smoke detection, fire brigade extinguishing means and automatic extinguishing systems, fire and smoke sectorisation of the civil engineering structures that will allow fire-fighting in the underground.
4. define the resources needed and the schedule for the implementation and operation of the systems by equipment groups.

SPS Evacuation & BIW

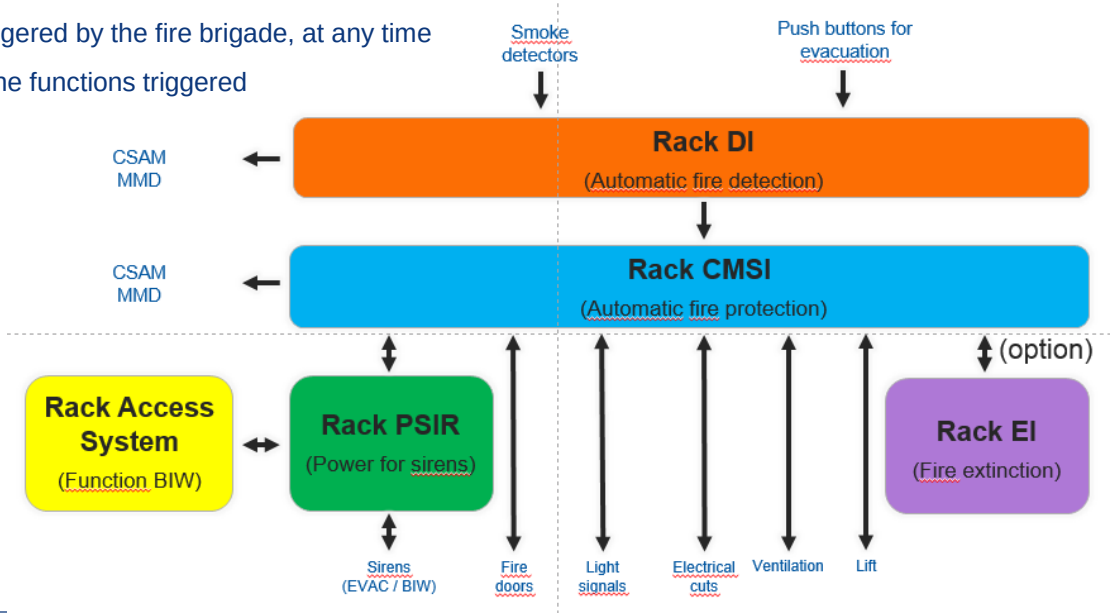
- **Scope**
  - Primary zones & Experimental North Area
  - Rack for Powering of the sirens – **to be renewed**
    - Safety concerns
      - Not possible to launch evacuation from SCR/CCC (but from surface)
      - No feedback information about sirens sounding correctly
      - Powered by ESD. A second power supply like in the LHC required ?
    - Equipment reaching end-of-live => No evolution is possible
      - No possible implementation of evacuation matrices (like in the LHC)
      - No more spare parts for the maintenance
    - Finalise the rationalisation of Evac & BIW for all accelerators
    - The SPS PSS project implies major works on the SPS BIW
  - Sirens & Break-the-glass devices – **to be replaced**
    - Equipment reaching end-of-live
      - 143 break-the-glass devices (1976) & 136 sirens (2000)
- **Budget**
  - 1.3MCHF (Primary) + 0.5MCHF (NA)
  - On-going request to ACC-CONS
- **Schedule**
  - 2017: proto; 2018: manufacturing;
  - LS2: cabling, installation & commissioning

SPS Fire Detection Improvement

- **Scope**
  - Air sampling smoke detectors (104) replaced in 2011: OK
  - Control & Indicating Equipement (centrals) – renovated 2012-2013 - OK
  - Large part of the SPS Fire detection system is made with air sampling network built with PVC tubes (60km) – **to be replaced**
  - The performance of the detection can be improved in the identified critical areas (pit; TA; ventil; etc.)
    - Compatible with fire-proof doors
  - Proposal LS2
    - Replace the current system by standard ASD in the critical areas
    - Replace the 3km of the concerned tubes
- **Budget**
  - ~1MCHF
  - On-going request to ACC-CONS
- **Schedule**
  - LS2. Remaining 57km tubes during the LS3.

SPS SMSI - Automatic fire safety actions

- **Scope**
  - SMSI = **Système de Mise en Sécurité Incendie**
  - Industrial dedicated PLCs for fire protection
    - to protect people and infrastructures
    - to facilitate the intervention of the fire brigade
  - Set of devices ensuring the automatic fire safety actions, according to a predefined scenario
    - Functions for Evacuation : sirens, light signals, …
    - Functions for Compartmentalization : fire doors, fire dampers, …
    - Functions for Smoke extraction : smoke dampers, start / stop ventilation, …
  - The SMSI are designed to ensure that
    - the automatic functions could be manually triggered by the fire brigade, at any time
    - the system can track and show the status of the functions triggered
- **Risk if not done**
  - Impossibility to implement safety matrices
- **Budget**
  - ~1MCHF (SPS ring) + 170kCHF (NA)
  - On-going request to ACC-CONS
- **Schedule**
  - 2017: proto; 2018: pilot;
  - LS2: cabling, installation & commissioning



Miscellaneous

- **Planned**
  - PS Access
    - Preventive Maintenance
    - Evolutions to cover the ECRs to be approved in 2017-2018 (~5 ECRs/y; sectorisation; EIS; etc.)
  - Linear smoke detection renovation
    - Intended to be performed before LS2
    - ~200 detectors – See EDMS 1432323 v.2
  - Alarm Transmission
    - CSAM – Replacement of UPS
- SPS Gas detection
  - EHN1 & EHN2; Replacement of old MX62 by Syntel
- PS Gas detection
  - Bld 157; Replacement of old MX62 by Syntel
- **To be discussed**
  - SPS Extinguishing system
    - Automatic fire extinguishing system would increase the ability for an offensive attack by CERN Fire Brigade, reduce impact on physics downtime for LHC and SPS, and increase the probability of cleaning intervention after a fire instead of reconstruction
    - To be studied
  - LHC Gas detection
    - ODH portable considered appropriate until LS3
      - Doubling of LHC ODH will be considered for LS3

LS2 Security additional services

Didier Constant
GS-DI

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ZORA mission

- ZORA agent at CSA from 7h00 to 19h00 – Cost/year : 83 600 CHF
- ZORA Patrol agent 24h/24h – Cost/year : 223 300 CHF
- The mission of this agents :
  - Intervention time of maximum 1h during the period 7h-19h (working days) maximum 2h (24/24) for the rest of the time , on the accelerator and experimental areas, surface and underground (controlled areas from the radioprotection point of view).
  - Guide remotely the patrols, providing the intervention instructions according to the specific mission.
  - Surveillance of the accelerators physical perimeters, intervention, information and analysis of the incidences. Manage the access of visitors and keep traceability.
  - Give remote support for the material access in the case of user difficulties.
  - Coordination with GS-ASE-AC for the evolution of procedures and methods.

Compensatory means to grant access in the case of PAD/MAD deactivation

- 2 agents 7h00 à 19h00 – Cost/year : 167 200 CHF
  - Interventions on lifts
  - Interventions on PAD and/or MAD
- The mission of the agents :
  - Control the personns willing to access the area using the portable control device during the duration of the works.
  - NB : If new needs are identified this estimation could be reviewed.
  - By 2018 a new contract for the guards service will be in place. The recruitment of additonal personnel will be more agile.

Vehicles

- 3 vehicles – Cost/year : 13 200 CHF

Materials and goods protection

- To avoid the numerous thefts of material and cables suffered during LS1 it's convenient to better protect the sites.
- A possible solution could be the provision of closed spaces under electronic surveillance (video, alarms,..). To be clarified the responsibilities in case of theft.
- Those protected areas could be specific for CERN groups and contractors.

- This investments would be evaluated in function of the needs.

Annual Costs(*)

Zora CSA	83 600 CHF
Zora patrols	223 300 CHF
Compensatory means	167 200 CHF
Vehicles	13 200 CHF
Material and goods protection	A chiffrer
TOTAL	**487 300 CHF/year**

(*) CHF/€=1.1

Estimate of LS2 materials budget requirements for GS-IS

Jurgen De Jonghe GS-IS

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Simplified assumption : LS2 = copy-paste of LS1

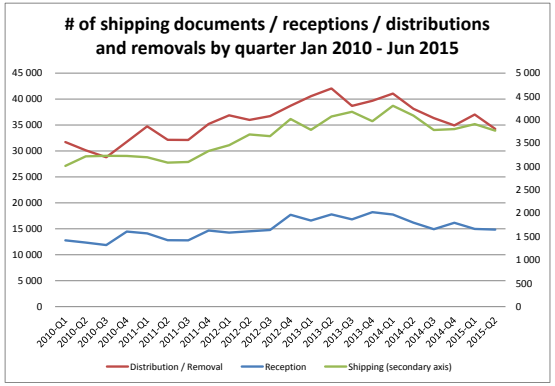
- Cleaning: same scope as during LS1
- Logistics: back to 2014 FTE level for shipping/ reception/ distribution / storage areas. Radioactive storage surface assumptions based on RSOC working group recommendations
- Mobility (passenger transport) / Accommodation: same number of visitors, same needs
- Stores: back to 2014 FTE level
- Waste: same quantity and nature of extra waste collection and treatment as during LS1

Cleaning

- LS2 cleaning activities should include:
  - Barracks / Bases de vie
  - Tunnels and experimental caverns
- Same scope as during LS1

Budget (kCHF)	2019	2020
Cleaning	178	232

Logistics



- « LS bump » for logistics-related services, starting several months ahead of the actual LS start
- LS1 additional manpower also required for LS2

Budget (kCHF)	2018	2019	2020	Comments
Shipping	22	88	89	1FTE, Oct 2018 - Dec 2020
Reception	20	83	84	1FTE, Oct 2018 - Dec 2020
Distribution	29	116	118	1.5FTE, Oct 2018 - Dec 2020
Storage areas	20	83	84	1FTE, Oct 2018 - Dec 2020
Vehicle purchase	60			For Distribution service
TOTAL	**151**	**370**	**375**	

Logistics – storage areas

Extra radioactive storage surface needs assessed at **1’913m²**

+ **350 m²** for easier access, faster handling, reduced radiation exposure, lower injury risk, and to reduced the storage height to maximum 3 magnets.

+ **350m²** to secure current storage areas.

⇒Total required floor space: **2’613 m²**

(5.3 MCHF IPP-2015-03 approved)

Mobility

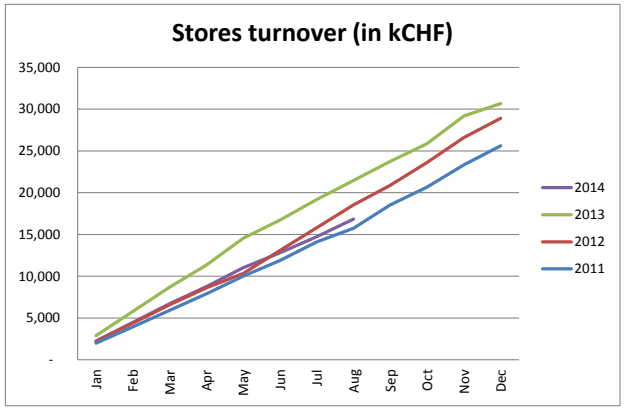
- Increased number of visitors during the shutdown. Hiring of an extra VIP shuttle driver (as during LS1) + back to 3 on-demand drivers (2014 level)

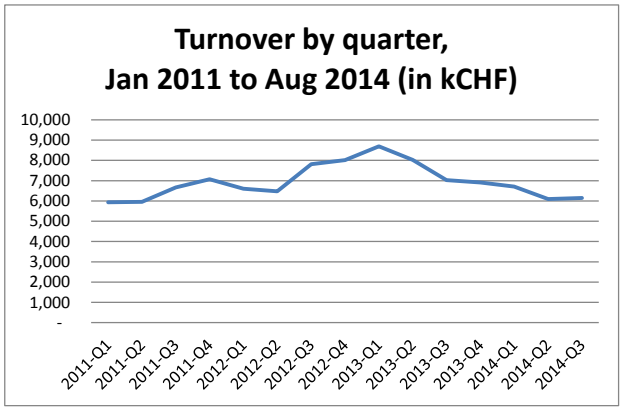
Budget (kCHF)	2019	2020	Comments
Shuttle drivers	154	157	2FTE, Jan 2019 - Dec 2020
Shuttle rental	70	70	27-seat shuttle
TOTAL	**224**	**227**	

- The increased number of cars during the shutdown is cost-neutral for us (but not for our clients!)

Stores

- LS1 generated a turnover increase (similar pattern as other activities within the group)
- Same FTE level as in 2014 to be planned





Budget (kCHF)	2018	2019	2020	Comments
Product management	55	112	113	1FTE, Jul 2018 - Dec 2020
Standard storekeeper	20	83	84	1FTE, Oct 2018 - Dec 2020
TOTAL	**75**	**195**	**197**	

Waste

- Additional waste produced during LS1, generating extra disposal costs
- A similar budget complement will be necessary during LS2 (with a planned 50% overcost linked to passing through customs in Ferney)

Budget (kCHF)	2019	2020
Waste	38	289

Estimate of LS2 budget needs: 2'551kCHF

Budget (in kCHF)	2018	2019	2020	
Extra temp. labor	**22**	**88**	**89**	
Shipping	22	88	89	1 FTE from 01Oct2018 to 31Dec2020
Extra sub-contract	**69**	**436**	**443**	
Reception	20	83	84	1 FTE from 01Oct2018 to 31Dec2020
Distribution	29	116	118	1.5 FTE from 01Oct2018 to 31Dec2020 (2014 level)
Storage areas	20	83	84	1 FTE from 01Oct2018 to 31Dec2020 (2014 level)
Shuttle drivers		154	157	2 FTE from 01Jan2019 to 31Dec2020 (2014 level)
Stores	**75**	**195**	**197**	
Product management	55	112	113	1 FTE from 01Jul2018 to 31Dec2020 (2014 level)
Standard store	20	83	84	1 FTE from 01Oct2018 to 31Dec2020 (2014 level)
Waste		**38**	**289**	LS1 cost incl. 50% overcost linked to Ferney customs
Cleaning		**178**	**232**	LS1 cost
Vehicles	**60**	**70**	**70**	
Distribution	60			based on cost of Iveco Daily 35 S 17
Shuttle rental		70	70	based on monthly rental cost for 27-seat shuttle
GRAND TOTAL	**226**	**1 005**	**1 320**	
		2 551		

LS2 budget needs for GS-IS

- Additional manpower for logistics activities, storage areas, stores and shuttles
- Extra radioactive storage space from dept. budget ; standard storage needs should not increase significantly
- Split by year based on « LS1 bump »
- Waste and cleaning budget similar to LS1 (tbc based on data from PLAN)
- One additional vehicle for distribution
- Rental of a shuttle

Activities and organization during LS2

Site Engineering group - GS department

Luigi SCIBILE GS-SE

LS2 DAYS

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Agenda

- Activities structure

- GS-SE Planned Items
- GS-SE group contributions

- Closing remarks

Activities(1/4)

- The works are structured in three types of activities:
  - **Large civil engineering works** for the realization of new buildings, roads and shielding structures (for example, civil engineering works for the SPS dumps, etc.)
  - **Maintenance of the infrastructures** only accessible during the long shutdowns (for example: tunnel floors and drains, underground sanitary equipment, roofs of operational buildings, etc.)
  - **Civil engineering works required by equipment groups** in their activities during the long shutdown (for example: creation of slabs, excavation of trenches, concrete coring, shielding walls, etc.).

Activities(2/4)

- **Large civil engineering works:**

STATUS	SOURCE	PERSON	INJECTOR	MACHINE EXPERIMENT EXPERIMENTAL ARE	Potential GROUP requester	ITEM	kCHF	2016	2017	2018	LS2 2019	LS2 2020	2021
Execution	LIU		LIU	PSB	TE/EPC	New building for MPS - 245	3'000	P	P	P			
None	Chamonix 2014	James Ridewood	SPS		EN/CV	CV New SPS cooling tower - New built This is replaced by the new cooling tower in SM18	400		P	P			
None	Chamonix 2014	James Ridewood	SPS		GS/ASE	SPS Access system - New-replace	1'000			P	P	P	
None	Chamonix 2014	James Ridewood	SPS		GS/ASE, EN/CV	Fire safey improvement - Fire compartment	1'000			P	P	P	
None	Chamonix 2014	James Ridewood	SPS		GS/SE	SE - monitoring	200				P	P	
Feasibility	Chamonix 2014	James Ridewood	SPS			New beam dump	4'000			Px	Px		
Feasibility	Chamonix 2014	Tommy Eriksson		AD & LEIR		AD-target concolidation, Building Renovation	500				P		
None	Chamonix 2014	A. Fabich		East and North area	EN/MMF	Renovations in the ENH1 area (Roofs, etc.)	1'000				P	P	
None	Chamonix 2014	R. catherall		ISOLDE and Ntof		Increased shielding	500				P	P	
Feasibility	Chamonix 2014	D. Forkel-Wirth		Prevessin site	GS/IS	New building for the storage of radioactive equipment	5'000	Px	Px	Px			
None	Chamonix 2014	W. Riegler		CMS	CMS	CMS - Extension of assembly hall (1000 m2)	4'000		P	P	P	P	
None	Chamonix 2014	W. Riegler		CMS		CMS - extension of CMS control room	1'000			P	P	P	
None	Chamonix 2014	W. Riegler		ALICE	ALICE	ALICE - potential extension of the computer farm	1'000			P	P	P	
None	Chamonix 2014	W. Riegler		ALICE	EN/CV	ALICE - building for the new detector cooling system (CV)	1'000			P	P	P	
None	Chamonix 2014	W. Riegler		LHCb	LHCb	LHCb - New computing farm	1'000			P	P	P	
None	GS-SE	L. Scibile		LHC	GS-SE	Renovation of underground sanitary systems	800				P	P	
Feasibility	EN/EL	Simon Baird	N/A	Meyrin site	EN/EL	CE works for the installation of the new GENSET	1'600		P	P			
							Total	FTE/y					
							27'000	2.5	4.7	9.2	8.8	6.8	0

Activities(3/4)

- **Civil engineering works (requests and**

STATUS	SOURCE	PERSON	INJECTOR	MACHINE EXPERIMENT EXPERIMENTAL ARE	Potential GROUP requester	ITEM	Works or Projects	Updated	kCHF	2016	2017	2018	LS2 2019	LS2 2020	2021
None	Chamonix 2014	Richard scrivens	LINACS	LINAC 3	EN/CV	LINAC 3 HVAC renovation	W	9/9/15	400				W		
None	Chamonix 2014	Simone Gilardoni	PS	PSB	TE	Cooling circuit main magnets	W		100				W	W	
None	Chamonix 2014	Simone Gilardoni	PS	PS Lattice system	TE	Magnet renovation	W		100				W	W	
None	Chamonix 2014	Simone Gilardoni	PS	PSB	EN/CV	CV activities - Replacement ventilation syste	W	9/9/15	500				W	W	
None	Chamonix 2014	Simone Gilardoni	PS	PS	EN/CV	CV activities	W	9/9/15	500				W	W	
None	Chamonix 2014	Simone Gilardoni	PS	PS-PSB	EN/EL	EL activities - New cabling	W	9/9/15	100				W	W	
None	Chamonix 2014	Simone Gilardoni	PS		EN/EL	PS-PSB cables - Cleaning and technical galleries	W		100				W	W	
None	Chamonix 2014	James Ridewood	SPS			SPS RF cooling (BE-RF) - Renovation	W		100				W	W	
None	Chamonix 2014	James Ridewood	SPS		EN/CV	CV Ventilation of BA (not the tunnel) - Renovation	W	9/9/15	500			W	W	W	
None	Chamonix 2014	James Ridewood	SPS		EN/EL	EL Eletrical consolidation - Renovate	W		100				W	W	
None	Chamonix 2014	James Ridewood	SPS		EN/EL	EL Cable campaign - Cleaning	W		100				W	W	
None	Chamonix 2014	James Ridewood	SPS		EN/EL	EL 48V systems consolidation - Renovation	W		100				W	W	
None	Chamonix 2014	James Ridewood	SPS		GS/SE	SE- consolidation of floor slab	W		500				W	W	
None	Chamonix 2014	A. Fabich		East and North area	EN/MMF	EHN1 internal spaces	W		500				W	W	
None	Chamonix 2014	A. Fabich		East and North area	EN/MMF	Parking	W		100				W	W	
None	Chamonix 2014	A. Fabich		East and North area	EN/MMF	Access restrictions to galleries	W		100				W	W	
None	Chamonix 2014	A. Fabich		East and North area		Infrastructure renovations of other groups	W		100				W	W	
None	Chamonix 2014	A. Fabich		East and North area	GS/ASE	Access system to experimental areas	W		100				W	W	
None	Chamonix 2014	R. catherall		ISOLDE and Ntof		New beam dump option	W		100				W	W	
None	Chamonix 2014	R. catherall		ISOLDE and Ntof		Off-line separator	W		100				W	W	
None	Chamonix 2014	J. Coupard	LIU	LIU-PS		PS and TT@ maintenance	W		500				W	W	
None	Chamonix 2014	M. Bernardini			EN-EL	Renovation of electrical substations	W		500				W	W	
Feasibility	EN/CV	Serge Delaval	N/A	Prevessin site	EN/CV	Renovation of the CCC roof	W	9/9/15	500				W	W	
None	EN/CV	Michele Battistin	PS		EN/CV	Consolidation of PS central buiding cooling station	W	9/9/15	100				W	W	
None	EN/CV	Michele Battistin	PS	booster	EN/CV	Consolidation of PS booster ventilation	W		100				W	W	
None	GS/SE	L. Scibile	PS		GS/SE	Consolidation of surface infrastructure	W		150				W	W	
None	GS/SE	L. Scibile	PS		GS/SE	Consolidation of underground infrastructure	W		200				W	W	
None	GS/SE	L. Scibile	SPS		GS/SE	Consolidation of surface infrastructure	W		350				W	W	
None	GS/SE	L. Scibile	SPS		GS/SE	Consolidation of underground infrastructure	W		700				W	W	
None	GS/SE	L. Scibile		LHC	GS/SE	Consolidation of surface infrastructure	W		100				W	W	
None	GS/SE	L. Scibile		LHC	GS/SE	Consolidation of underground infrastructure	W		200				W	W	
									Total	FTE/y					
									7'700	0	0	0.5	7.5	7.5	0

Activities(4/4)

- **Activities running in the same period of LS2:**

STATUS	SOURCE	PERSON	INJECTOR	MACHINE EXPERIMENT EXPERIMENTAL ARE	Potential GROUP requester	ITEM	kCHF	2016	2017	2018	LS2 2019	LS2 2020	2021
None	HL-LHC	I. Bejar Alonso		HL-LHC		Temporary storage areas and “bases de chantier”	500			P	P		
None	HL-LHC	I. Bejar Alonso		HL-LHC		Coring - long ducts from UJ76 to the TZ76	1'000				P		
None	HL-LHC	I. Bejar Alonso		HL-LHC		Technical gallery for Surface Cryogenics P4	500				P		
Study	HL-LHC	I. Bejar Alonso		HL-LHC		Undeground works for HL-LHC in point 1 and point 5	100'000			Px	Px	Px	Px
Execution	GS/SE	L. Scibile				Consolisation of site infrastructure programme	17'000	P	P	P	P	P	P
Execution	GS/SE	L. Scibile				Building 311	10'000	P	P	P			
Execution	GS/SE	L. Scibile				Building 107	35'000	P	P	P			
							Total	FTE/y					
							164'000	17	17	23.5	19.5	18	18

Resources

- The budget required for the projects and the works requests **is not considered in the our budget** requests! These should be in the groups requiring the works/projects.

- The budget required for the maintenance of the infrastructure **is planned in our budget**.

- The personnel resources for the known projects will be made available and covered by the actual GS-SE resources.

- As for the LS1, the resources needed to fulfill all the work requests will need to be complemented with 5-10 FSUs.

SPACE needs

- Are there space issues?:
  - Space needed on the various accelerator sites (LHC, SPS, PS) for carrying out activities for the LS2
  - Additional space needed by department to cover activities linked to the LS2 (typically for maintenance)
  - Space requested by departments not for the LS2 but required during the same period.

Closing remarks

- The large civil engineering works must be planned as soon as possible to start the preparation of the call for tenders.
- A clearer view of the requests from the other groups will be given after the exercise with the PLAN tool.
- For the small works, a three months notice would be ideal to organize the intervention of the contractors.
- From the LS1 experience, we will require 5-10 additional FSU to complement staff in the supervision of worksites due to the amount of work requests.

REMARKS

- GS-ASE. No additional personnel resources needed to cover the activities included in this presentation.
- GS-IS. No storage space needs by CERN groups have been specified up to now. Provisions to be communicated asap.
- GS-IS. Figures to be reviewed in function of the outcome of the LS2 days. Current estimations are coming from LS1 with no specific LS2 information.
- GS-SE. Non included needs to be defined asap, in order to be ready for the LS2.


CERN
LS2 DAYS
29-30 SEPTEMBER 2015