



TE-EPC Activities during the LS2 Period

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TE-EPC Activities & Contribution Requests LS2 PLAN V.1

Baseline & Statistics

Data extracted from PLAN LS2 V.1

- Activities under **TE-EPC responsibility**
- Activities planned up to LS2 (2020)
- Activities declared in PLAN tool with status = **“Under Approval, Resource Allocation”**
- **42** TE-EPC Activities
 - Leading to **298** support requests excl. TE-EPC own resources

Priority	Activity Qty	Main Topics
1. Safety	2	BEQ1, RAW113
2. Activities needed to reach 300fb-1 during run3	8	R2E, FMCM, ME59, POPS, SPS & PS RF
3. HL-LHC and LIU projects	25	
4. Approved projects	5	COMPASS, SFRS, AWAKE, ELENA
4a. Approved project if budgeted	1	BBC
5. Approved studies	1	CLIC
Total	42	



LS2 V.1

LIU project

LINAC4, PS Booster, PS machine and TT2

- 1 EYETS 2016
- 2 YETS 2017
- 3 LS2

PS

Injection low beta quadrupoles [2x Racks]
Injection bumpers [20x Racks]

Total = Around 200 Racks*

Rack* = Rack Equivalent (0.6m)

PSB

- > Injection stripping foil chicane (BRF2) [48 racks*]
- > Injection Qstrip (BCER, BAT) [5 racks*]
- > Injection stripping foil chicane (BRF2-Alcove) [Transformer]
- > Distributor BI.DIS (BCER, BAT) to be removed
- > Injection BI.BVT (BHP) [5 racks*]
- > Injection QNO Quad. (BCER) [5 racks*]
- > Injection DHZ/DVT correctors (BCER) [5 racks*]
- > Injection septa (BRF2) [5 racks*]
- > Transfer bending upgrade (BHP) [17 racks*]

PS

- > PS septum PI.SMH42

PS

- > Horiz. IPM magnets [1 rack]
- > Vert. IPM Magnets [?]
- > Low energy dipole [13 racks*]
- > Low energy focusing quad [7racks*]
- > Low energy skew quad [1 rack*]

TT2 Transfer Line
F16.QFO215 [2 Racks]

PSB

Main Power Supply + Trims

TT2

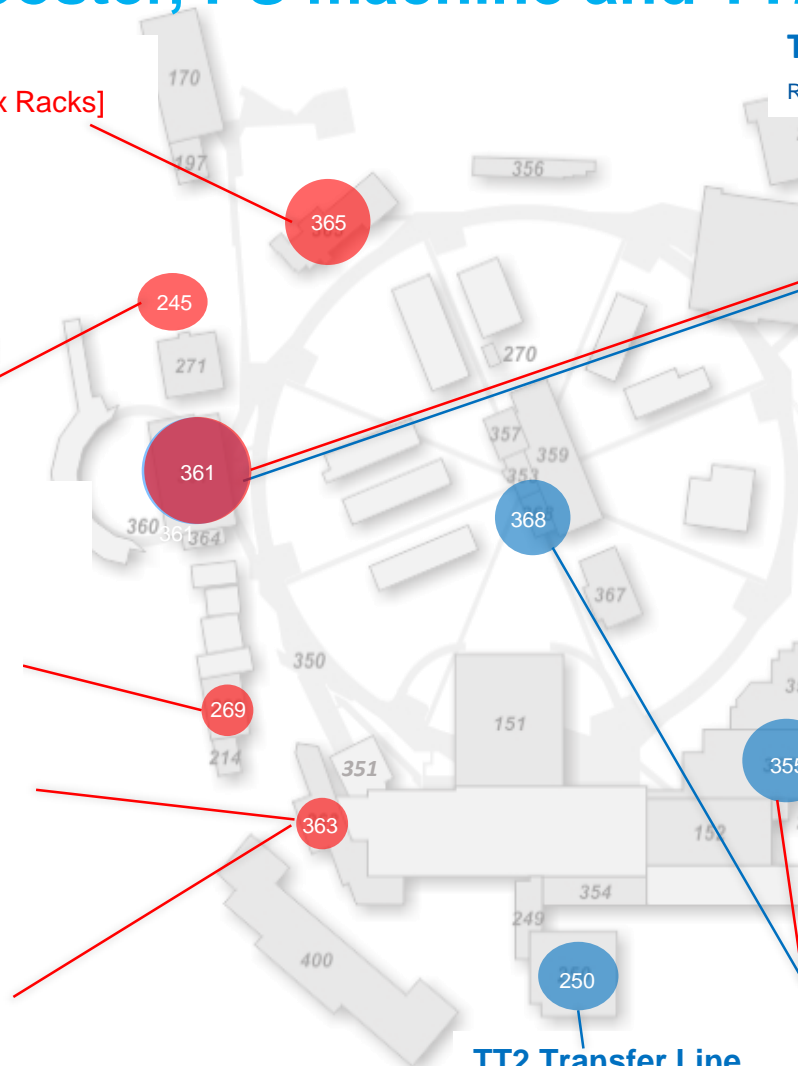
Complete renovation [100 racks*]

Linac transfer line Bendings

(LT, LTB, BI)
> LT.BHZ20 Bendings [02 racks*]
> LTB.BHZ30 & 40 [04 Racks]

LIU Ions

LBS.BVT10 magnets [02 Racks]



LIU project

SPS machine

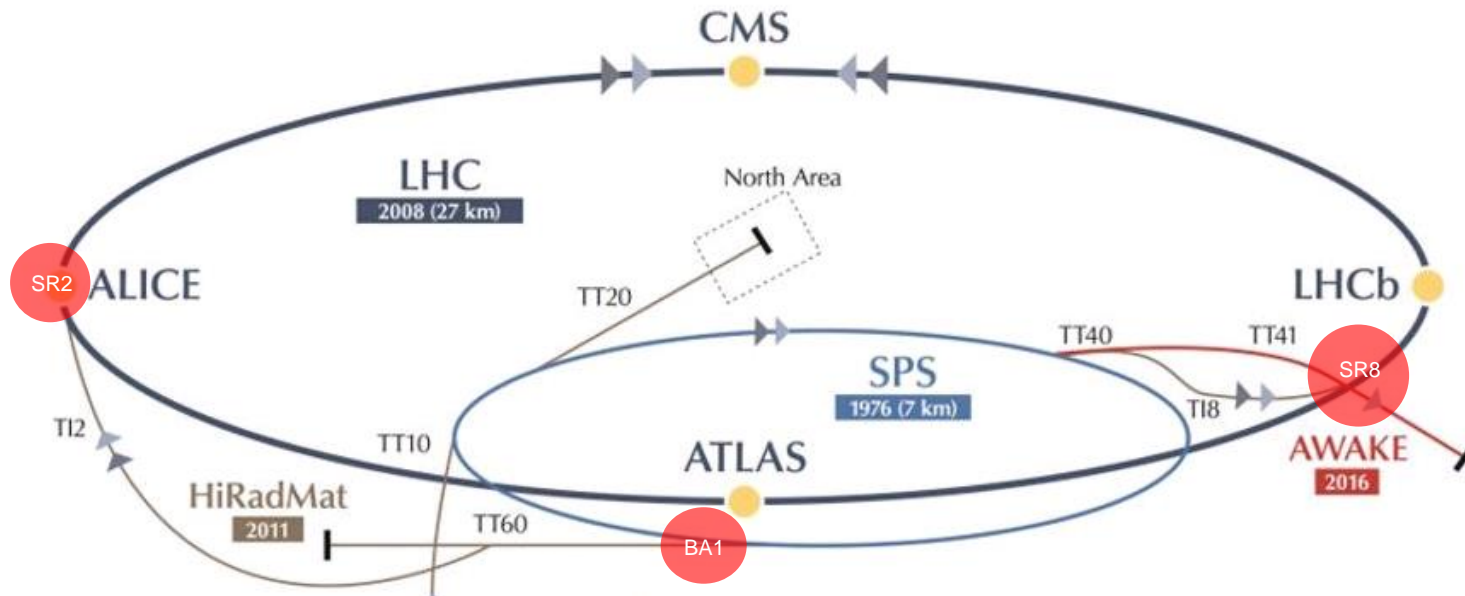
- 1 EYETS 2016
- 2 YETS 2017
- 3 LS2

LIU SPS TCDI [SR2]

- 1x New RQIF.28800 Power Converter [COMET-2p]
- 1x New MQIF.29000 Power Converter [COMET-2p]

LIU SPS TCDI [SR8]

- 1x new MQIF.87000 Power Converter [LEP Reno from TI2]
- 1x new MQID.87100 Power Converter [LEP Reno from TI2]



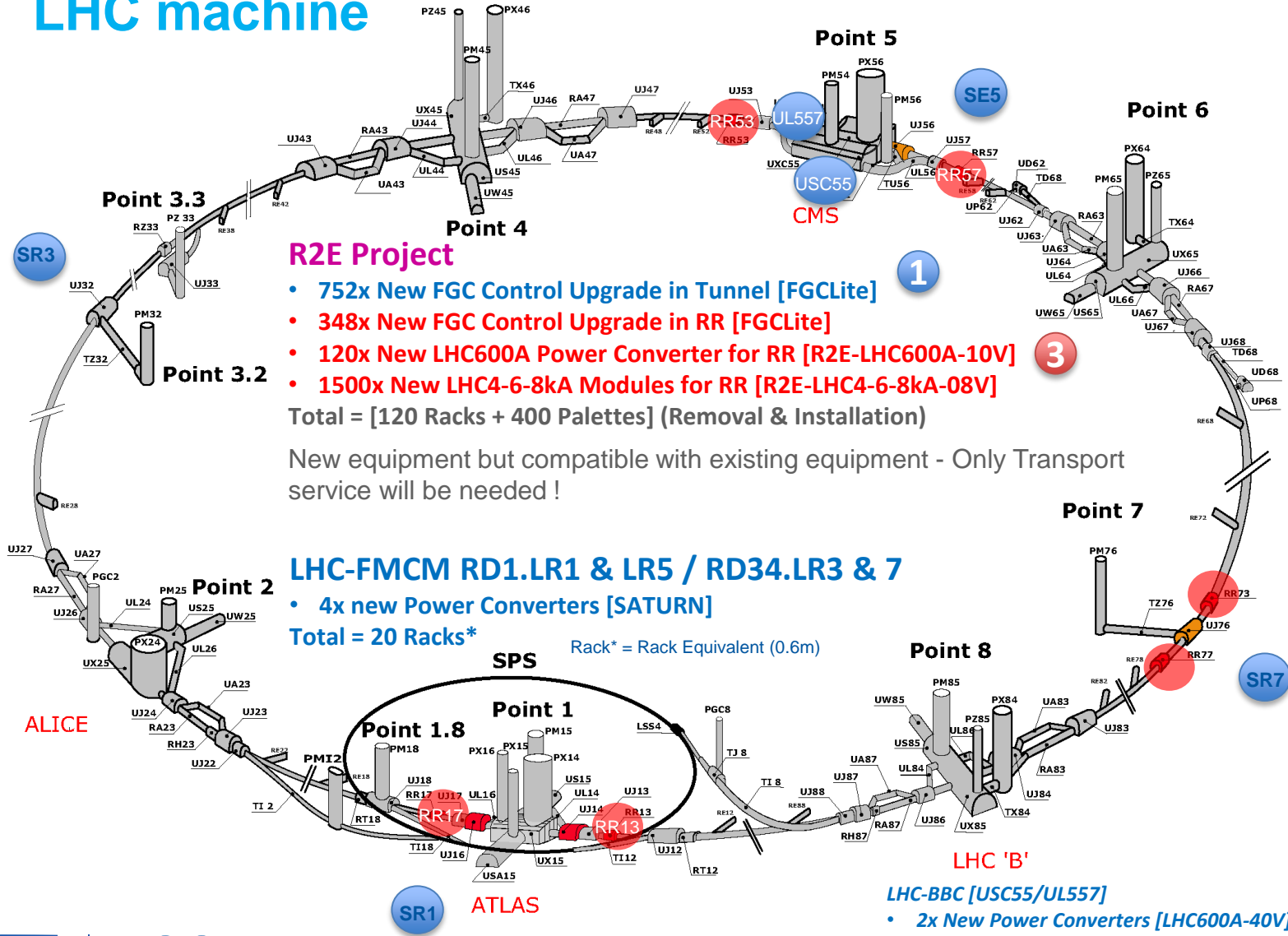
LIU SPS eCloud Test Bench

- Relocate 2 Power Converters from BA5 to BA1

Activities needed to reach 300fb⁻¹ during Run3

LHC machine

- 1 EYETS 2016
- 2 YETS 2017
- 3 LS2



R2E Project

- 752x New FGC Control Upgrade in Tunnel [FGCLite]
- 348x New FGC Control Upgrade in RR [FGCLite]
- 120x New LHC600A Power Converter for RR [R2E-LHC600A-10V]
- 1500x New LHC4-6-8kA Modules for RR [R2E-LHC4-6-8kA-08V]

Total = [120 Racks + 400 Palettes] (Removal & Installation)

New equipment but compatible with existing equipment - Only Transport service will be needed !

LHC-FMCM RD1.LR1 & LR5 / RD34.LR3 & 7

- 4x new Power Converters [SATURN]

Total = 20 Racks*

Rack* = Rack Equivalent (0.6m)

SPS

Point 1

Point 1.8

Point 8

LHC 'B'

LHC-BBC [USC55/UL557]

- 2x New Power Converters [LHC600A-40V]
- Total = 2 Racks

Activities needed to reach 300fb⁻¹ during Run3

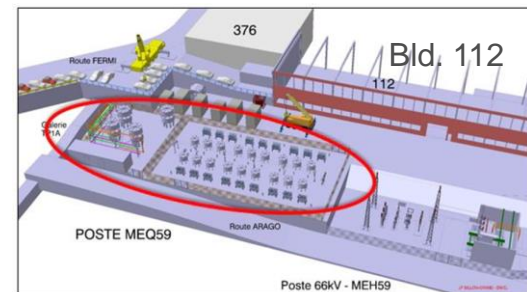
Injector machine

1 EYETS 2016

2 YETS 2017

3 LS2

- High-Voltage **PS RF Cavities Power Converters** 1 2 3
 - 5 new Power Converters in Bld. 355/R-021
 - Total : 5x [2700 mm x 800mm]
- High-Voltage **SPS RF Cavities Power Converter [SPS-200]** 3
 - 13 new Power Converters in Bld. BA3
- **New MEQ59 Static Var Compensator [Meyrin Machine]** 3
 - Needed when the Machine and General Service networks will be divided into separate networks

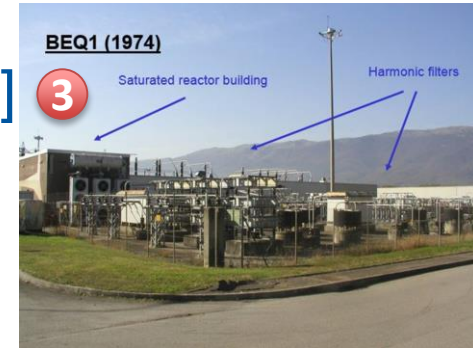


EDMS N°1731488 V.1

Safety Projects

SPS machine, Test Bed

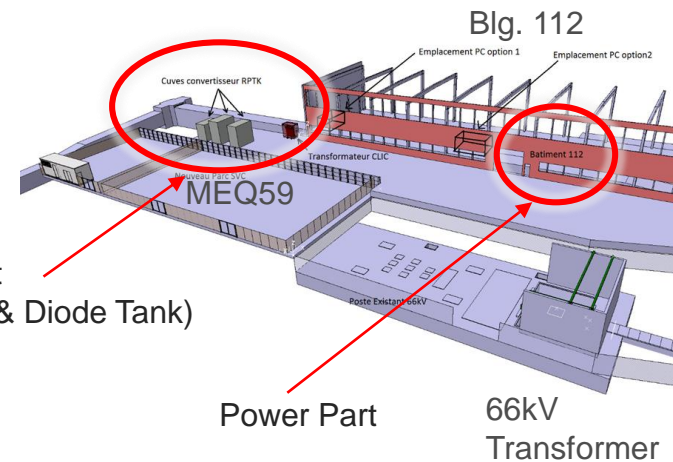
- **BEQ1** Static Var Compensator [SPS Machine]
 - Issue : Old **Oil** Saturated Reactor (1974)
 - 1 new SVC in/around Bld. 884



- **RAW113** [LHC RF Test Bed Bld.112] **3**
 - Issue : Old **Oil** Transformer & Diode tank (1981), Fire Protection near Bld.113, Noise in Bld. 113 (Power Part)
 - 1 Power Converter (LHC RF Type)
 - Oil Transformer and Diode Tank near MEQ59 SVC
 - Power Part in Bld. 112



Bld. 113



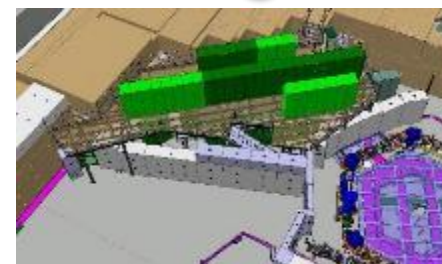
Oil Equipment (Transformer & Diode Tank)

Current Transformer & Diode Trank

Approved Projects

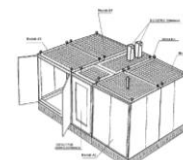
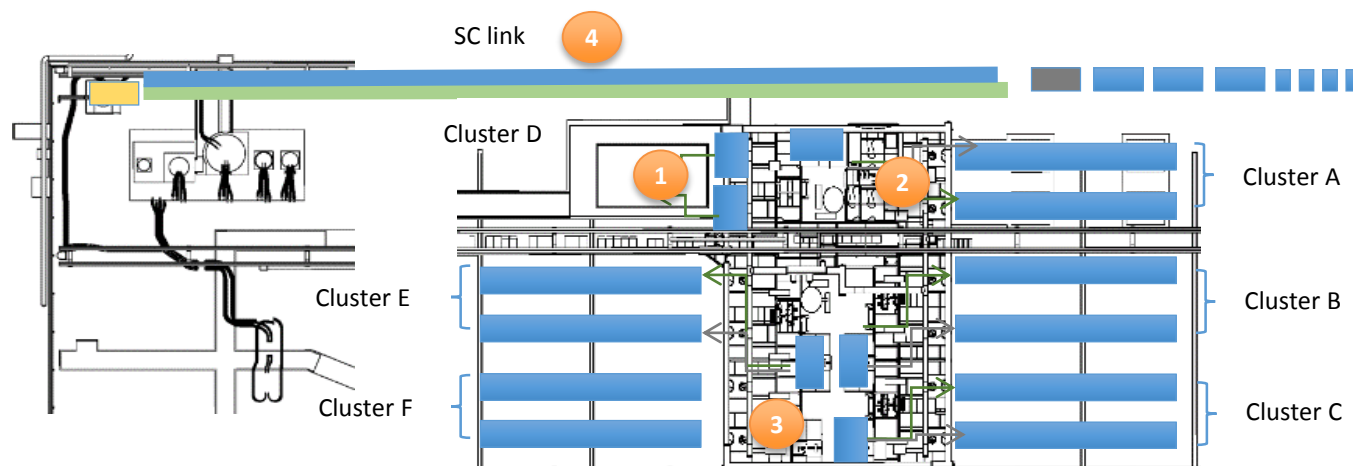
Compass, S-FRS, AWAKE, ELENA

- **Compass** [North Area] 1
 - New Power Converters for SM2 Spectrometer
- **AWAKE Electron Line** 1
 - 35 Power Converters moved from CTF3 to Awake Tunnel
- **S-FRS**
 - 9 Power Converters to be commissioned
- **ELENA**
 - Phase 1 – 110 Power Converters to be commissioned 1
 - Phase II - 302 New Electrostatic Circuits 3
[High Voltage Power Converters]
Total = 03 Racks Equivalent (0.6m)



HL-LHC Projects

SM18 Test Bench



Cluster A

- 1x [20kA/±61V] (upgrade of RM.A)
- 2x New Power Converter 2kA/10V [COMBO]

Cluster F

- 1x New Power Converter [20kA/±26V] [CMS type]
- 2x New Power Converter [2kA/10V] [COMBO]

SC Link

- 3x Power Converter [20kA/8V]
- 4x [±600A/±12V]

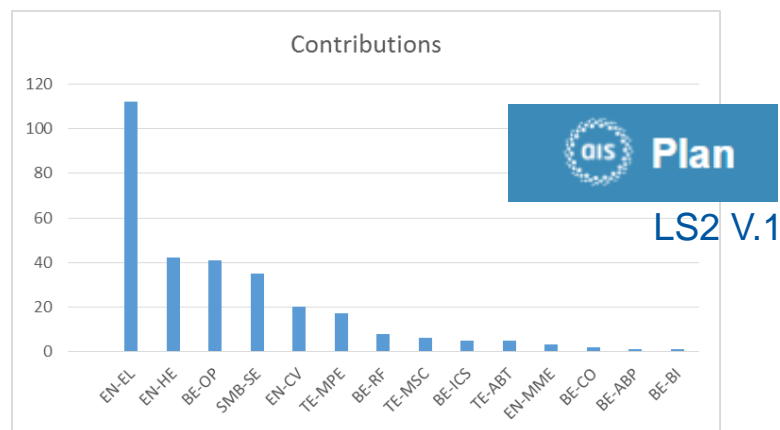
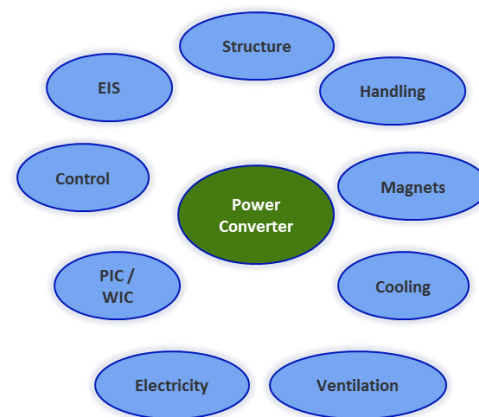
Cluster D

- 1 x [30kA/±16V] (RM.D + RM.F in parallel)



Contribution Requested Versus TE-EPC Activities

- **298** support requested by TE-EPC activities to other groups
 - EN-EL (Cables)
 - BE-OP (Commissioning)
 - EN-HE (Transport)
 - SMB (Structure)
 - EN-CV (Cooling & Ventilation)
 - BE-CO (Control)
 - TE-MPE (Circuit Protection WIC/PIC)



Contribution Resources Availability

Versus Activities

Contribution resources

- **282** contributions available

✓ Yes

- **03** contributions unknown

? Unknown

Integration of Low energy magnet protection to the SIS [BE-OP]

- **13** contributions (7 activities) unavailable

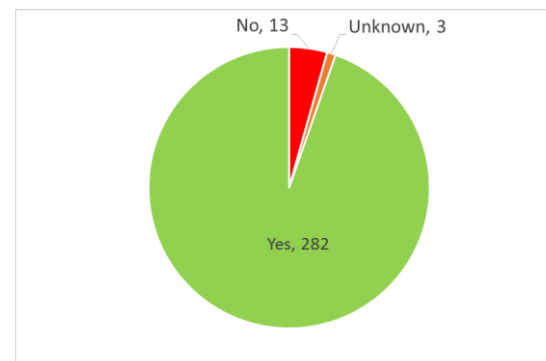
x No

Technical Missing Information [11x EN-EL, 1x EN-CV, 1x TE-MPE]

Activities still under specification



LS2 V.1



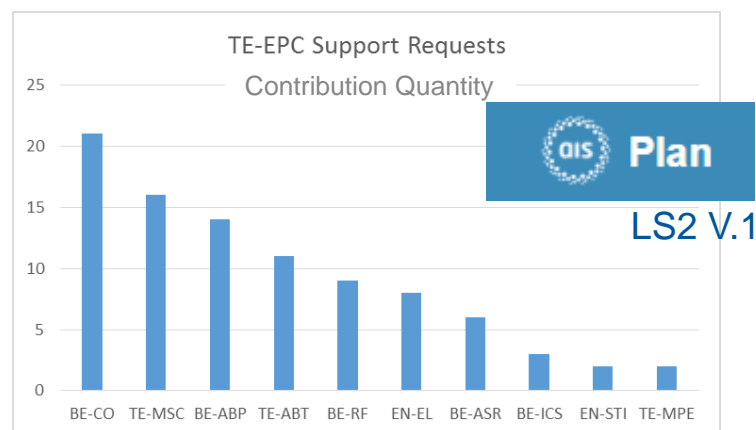
Resources Available

Requests to TE-EPC Support LS2 PLAN V.1

Contribution Requested

Versus other groups activities

- **92** support requests by other groups to TE-EPC
 - BE-CO (Control modification)
 - TE-MS (Commissioning, Tests and Inspection on magnets)
 - BE-ABP (*Operation & Maintenance*)
 - TE-ABT (*Mainly LIU activities*)
 - BE-RF (Test Beds)
 - EN-EL (ME65 new station, SPS network consolidation)
 - BE-ASR (Safety Files)



TE-EPC Contribution Resources Availability

Versus other groups activities

Contribution resources

- **79** contributions available Yes
- **13** contributions (7 Activities) unavailable No
 - **1x BE-ICS** New SPS Personnel Protection System
Technical Missing Information
 - **12x BE-CO requests**
Error, no TE-EPC contribution needed
PLAN data not up to date



LS2 V.1

TE-EPC New Activities LS2 PLAN **V.2**

New Baseline

Main new Activities



LS2 V.2

New activities approved under **TE-EPC** responsibility

- Activities declared in PLAN tool with status = **“Created”**
- **19** new TE-EPC Activities (+45% versus LS2 V.1) “Consolidation”
 - **LINAC2** part (LINAC4 to PS Booster) - 48x New converters
 - **PS Capacitor Discharge** Converters - 13x New converters
 - **AD Capacitor Discharge** Converters - 25x New converters
 - **SPS COD** - 300x New Converters
 - **Injector Converter Control** – New Electronics for hundreds converters to standardize one control over the Injector Chain
 - **East Experimental Area** - 62x New converters
 - **HL-LHC** - 2x 11T-Dipole Trim New converters
 - **Bld. 287** – Extension of TE-EPC Electronics Test Facility
- Activities scheduled for **LS2**

New Activities

Contribution Requested



LS2 V.2

New Activities induce new support requests

- **Not taken into account up to now in PLAN LS2 V.1**
- **Additional** support requests for
 - EN-EL (Cables)
 - BE-OP (Commissioning)
 - EN-HE (Transport)
 - SMB (Structure)
 - BE-CO (Control)
 - TE-MPE (Electronics board procurement)
 - TE-MPE (Circuit Protection WIC/PIC)

New Activities

East Experimental Area

- 62 new converters with its infrastructure
- TE-EPC resources **available with**
 - **Current baseline = Use of cycling Magnets**
 - Using of SIRIUS Power Converter family already designed for TT2 consolidation



Concerns

Logistics

Storage

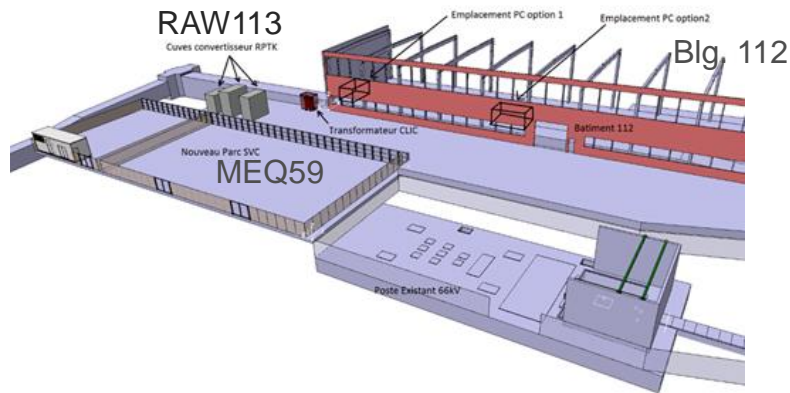
- **Irradiated Equipment**
 - Some equipment removed from the LHC tunnel for consolidation could be activated during Run2
 - **Need dedicated radioactive storage place**
 - **Need area for repairing / testing irradiated electronics (blg. 867)**
- **Storage**
 - TE-EPC will need buffer area to store
 - Converter parts received from industry before their test and integration in the power converters
 - Power converters 'ready for installation' before their final installation in the machines
 - Around **1000m²** needed (LIU project including)

Logistics

Infrastructure

- Need strong commitment on the Infrastructure on the planned delivery date especially on 2 activities.
 - Any delay will have an Impact for TE-EPC activity readiness
- Platform for **MEQ59 new SVC** and RAW113 consolidation
- Extension of **Bld. 287** for TE-EPC Electronics Reception / Test Facility.

Centralised facility with huge volume of activities



MEQ59 / RAW113



Bld. 287

Conclusions

Conclusions

LS2 PLAN V.1

- TE-EPC resources available
- Contributions requested to other groups available

LS2 PLAN V.2

- TE-EPC resources available
- Contributions requested to other groups **to be studied**

Storage and Infrastructure logistics to be clarified