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Minutes LS2 Days 2016 07-08 November 2016

Agenda: <https://indico.cern.ch/event/564604/>

J.M. Jiménez opened the LS2 Days and thanked the speakers for having accepted to present during this event.

1. Introduction – Objective of the LS2 Days

As an introduction, he confirmed that the general schedule remains unchanged and the Long Shutdown 2 will start in the end of 2018. The idea is to complete all activities related to the LHC until late 2020. Many accelerators, namely the Injectors, are foreseen to be closed after the 1st trimester of 2020.

He then recalled the LS2 activities and targets, the project scope, and the mandate and responsibilities of equipment groups, equipment owners and LS2 coordination. While the coordination remains with EN-ACE, equipment groups are responsible for the integration, installation and commissioning including the safety aspects. Equipment owners are involved in the overall coordination.

This approach, successfully demonstrated during LS1, will be maintained during LS2. **J.M. Jiménez** reminded that coordination is a common effort to achieve the goals of the LS2 challenge by building together confidence and knowledge. ECRs are approved by the LMC/IEFC and the follow-up is done by the LS2C. The main stream should never be blocked and delays should efficiently be used for training, testing and consolidation. Flexibility and early notice are key factors to ensure the best use of all available resources.

2. General Safety (E. Cennini)

E. Cennini started his presentation by recalling the HSE-SEE mission and gave an overview of activities and services provided by the group in general and in particular during LS2. He pointed out that the safety training has been moved to HSE-DI.

1. Safety Inspections:

- All new buildings, equipment, installations as well as safety valves and pressure vessels for requalification are to be communicated to HSE-SEE in order to prepare the planning.
- HSE-SEE must also be informed of the end of works to proceed to general safety inspections.
- Workshops and machine tools to be used during LS2 must be checked and made compliant.
- **E. Cennini** stressed that an inspection can only be performed if proper documentation, namely a complete equipment folder, is available.
- After LS2, a list of buildings, equipment and installations with access constraints should be provided to update the periodical planning.
- Resources for the known activities are foreseen based on the experience gained during LS1, including a margin for the “known-unknown”. Funding might be needed for additional unknown activities.

2. Projects & Experiments Safety Support (PESS):

- 278 projects have been followed since 2010 and 119 projects are currently active. They are being followed by 25 HSE correspondents.
- **E. Cennini** reminded that activities should be announced in PLAN as early as possible to allocate resources.
- Resources are scarce and a re-organisation is currently on-going in order to fulfil as many requests as possible. Priorities will need to be set.

3. Tendering Safety Support:

- All calls for tender are being followed and technical solutions linked to safety are proposed when needed.
- The consultation of the HSE unit is compulsory for LS2 and non-LS2 activities as of now. A response will be received within 7 working days.
- No additional resources are foreseen. Concerned groups are asked to anticipate to avoid delayed replies.

4. Worksite and associated Risks

- **E. Cennini** recalled that CERN is responsible for its sites and must manage safety on sites and safety linked to works and services. A coordination of operations between various stakeholders is crucial.
- LS2 has been classified as a “technical stop” for the complex and as category 1 or 2 for non-complex parts.
- While reminding of the principles of safety coordination for CERN complexes, he particularly emphasised that the “integration” of safety in meetings does not mean the physical participation, but reflects the need of contacting HSE prior to the meeting to establish an appropriate proposal. VIC, when necessary or requested, are piloted and minutes are written by each work supervisor.
- As a preparation for LS2, HSE-SEE will provide safety training for work/service supervisors as of June 2017 to help in the publications of IMPACT, VIC, etc., and, concerning category 2, in the drafting of a prevention plan and VICs.

5. Asbestos Risk Management

- It is crucial to anticipate and avoid last minute requests, which can cause significant delays and additional costs.
- 1.5 FTE is currently foreseen for this activity. Additional resources might be required.

6. Noise Risk Management

- HSE is trying to anticipate issues with computing simulations. This is currently done by a contractor, but will partly be taken over by HSE-SEE as of 2018.
- 1.5 FTE is currently foreseen for this activity. Additional resources might be required.

7. Emergency Preparedness

- The groups are asked to specify and revise emergency procedures, to signal new Alarm Level 3 to be validated. HSE-SEE-SV will do the testing of the safety functions of the new TETRAs.
- Resources are difficult to estimate and dependent on the actual demand. However, E. Cennini is positive that the requests can be fulfilled with existing resources.
- HSE has requested the LS2 Project Management's support to urgently approve the organisation of an exercise with CERN fire fighters and approximately 50 fire fighters from the host states' emergency services. If this drill is approved, an appropriate date and location will need to be found one year in advance. There will be no access for 14 hours during the exercise.

ACTION for the LS2C: Approve the principle of the drill test.

8. Safety Engineering

- **E. Cennini** reminded that HSE-SEE must be asked for clearance for activities involving chemicals, ionising radiation in the environment, risks related to new or modified electrical or mechanical equipment or structures as well as the risk of fire due to the use of exotic materials or storage in non-designated areas.
- Work on requested contributions has started, but some requests are still missing in PLAN, e.g. HL-LHC and Experiments. Resources for activities in the BAs are still missing, and the current resource – a fellow – needs continuity.

9. Environmental Protection

- HSE-SEE-EN is in charge of a substantial network of online monitoring stations, which includes more than 400 channels.
- Several critical issues concerning also but not exclusively LS2 were discussed. One of the lessons learnt from LS1 is that restarting operations is a critical phase and must be closely followed from an environmental protection point of view.
- It is expected for LS2 to train personnel and contractors properly, take prevention measures and check with HSE when needed.
- As for the resources, SEE-EN is monitoring permanently and will pursue its activities during LS2. In case of a major incident involving liquid chemicals, the fire brigade should be called. Near-miss situations should be declared using an A2 form in order to improve prevention.

E. Cennini emphasised that he counts on all groups to actively contribute to the safety prevention and fulfil safety duties and responsibilities.

Comments/Questions:

- **M. Bernardini** expressed that the allocation of safety responsibility to the different functions (Project Safety Coordinator, HSE, Safety Coordinator, etc.) is not clear. **E. Cennini** explained that safety is included in the responsibilities of line management. **T. Otto, A-P. Bernardes** and EN-ACE can advise in case of doubt. HSE provides support of all entities in charge of safety and can assist with executive tasks such as diagnostics if required.

- **M. Bernardini** also enquired whether the hierarchical line, on-site coordination or HSE is in charge of taking decisions when it comes to pulling cables when activities related to detectors are on-going in parallel.
- Reacting to the comment from **M. Bernardini** on the particularity of co-activities, **J.M. Jiménez** emphasised that all parties should do their best to support the risk analysis and allow an intervention in the safest conditions possible. The responsibility concerning safety is however clearly with the line management. If support is required, in particular in areas close to experiments, the concerned groups should not hesitate to request advice.
- **K. Foraz** asked for an increased HSE presence in coordination meeting during LS2 with respect to LS1. **E. Cennini** explained that it is unfortunately not possible fulfil all requests of participation. HSE members with experience in the field are needed in real-time in the field, which makes it difficult for them to take part in coordination meetings.
- **J.M. Jiménez** commented that the environmental protection is a high priority item. Any impact must be reported immediately to take an appropriate action. The faster the reaction, the higher the probability to successfully correct the issue.
- **B. Di Girolamo** asked whether the missing HL-LHC are not included due to a lack of information or a lack of resources. **E. Cennini** answered this the activities have simply not been entered and used the opportunity to remind groups to anticipate to allow HSE to allocated resources in time.
- Regarding the organisation of VICs for extensive co-activities, **E. Thomas** and **R. Lindner** enquired which work supervisor is responsible for initiating the process. **E. Cennini** replied that all involved parties need to discuss to define how to proceed. **K. Foraz** added that the rule is to perform one VIC per worksite, taking in account co-activities and the environment. **J.M. Jiménez** commented that the team who generates the risk is in charge to maintain safety of his own team, of other implicated groups, and of the hierarchical line. The task of the Safety Coordinator is to make sure that no involved group is forgotten in the information loop.

3. Radiation Protection (S. Roesler)

S. Roesler introduced three new procedures that are currently being implemented and will be in use for LS2.

1. Inter-site radioactive transport

- For inter-site radioactive transports on public roads, CERN regulations were applied in the past. In the future, the « Accord européen relatif au transport international des marchandises Dangereuses par Route » (ADR) must be respected, which implies the classification, labelling and adequate packing of radioactive material.
- All inter-site radioactive transports have been classified into 8 categories. Around 30% of inter-site radioactive transports belong to category 1-4, where characterisation can be done through measurements. 70% of the transports are however classified in category 5-8. For such materials, classification is more complex.
- A comprehensive study analysing the most common materials in different densities and volumes and simulating 896 irradiation scenarios has been performed. As a result, the lowest external dose rate at 10cm over all considered scenarios and parameters could be determined that corresponds to a certain ADR classification limit. The outcome has already been presented to the Host States Authorities, who agreed with this approach of transport classification by external dose rate measurement. The final agreement with the host states is expected at the tripartite meeting on the 24th of November.

- Depending on the radioactive transport classification, the size and bulkiness of the material, no packaging, industrial packaging or type-A containers can be required. Self-transport of small items is still possible, however, the type of packaging must be identified by HSE-RP.
- For big or bulky items which cannot be packed properly with existing means, special arrangements will be agreed with the Host States Authorities.

2. Vacuum cleaner management

- A centralised service managed by HSE-RP is currently being put in place and will be started as of the 1st of December in order to use the EYETS 2016-17 as a test period. The responsibility will include the purchase, storage, delivery and reception, periodical checks as well as maintenance and repair.
- All vacuum cleaner owners have already received e-mails requesting to include the vacuum cleaner into the new service by HSE-RP.
- Once the new service is operational, the need of a vacuum cleaner can be declared through <http://cern.ch/rp-vacuum-cleaners>, at least 24h in advance. HSE-RP will then provide the device in the buffer zone close to the intervention site or the radiation area or make it available for self-pick-up in building 574. A declaration in TREC by the user before and after the use is required.
- In order to reduce the 24-hour-limit, HSE-RP is planning to make available one functional vacuum cleaner in each buffer zone and replace it with a cleaned device as soon as it has been used.

3. Access to Radiation Areas for Associated Members of Personnel (MPA)

S. Roesler informed of a change of requirements for obtaining a dosimeter.

- Either a valid medical certificate or a radiation passport or an institute certificate is currently needed in addition to a valid CERN contract and a successful completion of the required RP training for the respective areas.
- The future requirements, which will be implemented after the EYETS, no longer foresee the medical surveillance of category-B radiation workers (concerning 98% of CERN workers).
- The medical surveillance of category-A workers will remain unchanged.
 - Future requirements for MPA: valid contract, RP training, institute certificate or radiation passport for EU, EEA, CH. If the latter two cannot be provided by the user an information to employer/home institute about classification with request for comment will be sent.
 - Requirements for short term visitors unchanged: valid contract, e-learning for Supervised Radiation Areas.

Following his presentation of three new procedures, **S. Roesler** recalled the importance of a close collaboration between the departments, experiments and RP concerning radioactive waste.

- Internal acceptance criteria are fundamental for the correct management of radioactive waste in order to minimise hazards, optimise resources and facilitate disposal (see EDMS 1364231). A new document including a few minor changes will be available by the end of November.
- **S. Roesler** presented the estimation of the radioactive waste volume until LS3. A new version will be generated in 2017 and groups asked to provide input.

As for the radiological classification of the LHC during LS2, he explained that most areas of the machine will be classified as Supervised Radiation Areas apart from collimation regions, dump caverns and areas adjacent to the LHC experiments ATLAS and CMS.

Comments/Questions:

- **S. Cherault** enquired whether the “double dosimetry” for contractors remains. **S. Roesler** confirmed that this is the case, as they must follow the legislation of their country of origin as well as the CERN legislation.
- **J.M. Jiménez** commented that the document concerning the acceptance criteria for radioactive waste must be checked and validated by stake-holders outside of RP. He also strongly encouraged groups to follow the rules concerning the radioactive transport in order to maintain the favourable agreement with Host States Authorities.
- **J.M. Jiménez** mentioned that dedicated training for the new rules and procedures should be organised by RP.
- **J.M. Jiménez** insisted that the list of category-A and category-B workers must be reviewed in view of the changes in the medical surveillance.

4. Electrical Safety (A-P. Bernardes)

In the first part of her presentation, **A-P. Bernardes** focused on electrical safety tips.

- She recalled that if equipment is concerned by a safety non-compliance, reparation must be included in the maintenance plan like any other technical maintenance.
- For new equipment, HSE should be consulted for verifications prior to the installation, as certain checks are often no longer possible once the equipment is installed.
- For electrical equipment that is being refurbished or upgraded, HSE should be consulted prior to dismantling the equipment in order to allow more time for safety actions that might be required.
- Before removing the lock-out after equipment installation, a survey of all electrical safety aspects concerning the equipment must be performed.

Based on an example (see slide 6), **A-P. Bernardes** pointed out that three measures aim to protect collaborators against the irradiation hazard: Work and Dose Planning (WDP) with the ALARA electrical principle to estimate individual and collective dose, Operational Dosimeter (DMC) alarm and HSE-RP survey. However, the lock-out procedure is the only measure concerning water/electricity hazards. The quality of the documentation is therefore crucial. She reminded groups to check internally which team members are properly trained to perform lock-out procedures on equipment for their own activities or for other groups’ interventions.

A-P. Bernardes then proceeded to the second part of her presentation focused on the actual lock-out activity and in particular the survey performed on the PSB (see presentation during LS2C, Indico 504062).

- The aim was to verify whether lock-out procedures are homogeneous, well understood and if the CERN electrical rules are applied.
- The outcome shows two classical situations: Whenever the lock-out is launched for the equipment owner, the actions are close to what is requested by NF C18-510 standards. Lock-out launches for interventions performed by other groups however involve more electrical roles and it is more difficult to comply with standards.

The LS2C recommended that she prepares a proposal for a solution to improve transversal activities and to test it during the EYETS 2016-17 on the PSB.

- In order to identify resources and methods to support groups during transversal interventions, the proposal should help to identify all equipment concerned by the lock-out

process before intervention and to ensure a safe electrical state of equipment close to the working place.

- The proposed solution which is currently under discussion includes the nomination of an electrical reference person to support the groups and EN-ACE by following 4 steps:
 - Step 1: identify concerned groups
 - Step 2: define a check-list of the lock-out process
 - Step 3: circulate it in EDMS and validate it
 - Step 4: deliver an “autorisation de travail” based on the check-list
- **A-P. Bernardes** requested the collaboration, input and feedback from all concerned groups. Based on the test during the EYETS, the added value of this procedure will be evaluated.

As a conclusion, she pointed out that for EYETS, YETS and LS2:

- any safety non-compliances must be included in the maintenance plan,
- a check for non-compliances should be performed when refurbishing or upgrading an existing equipment,
- a check on the safety elements is to be done prior to removing the lock-out,
- a qualified and trained person to perform a lock-out procedure must be identified.

As previously mentioned, **A-P. Bernardes** emphasised that the quality of the lock-out process is crucial to protect collaborators against electrical hazards.

5. Safety Training (C. Balle)

C. Balle opened his presentation by showing the peak of the number of participants in classroom and online courses during LS1. With an estimated number of 10000 participants in classroom courses, a further significant increase is expected during LS2.

In order to cope with this increased demand, HSE-DI has taken several measures:

- 15 new classroom and 6 new online courses have been released, while further courses are in the pipeline.
- A new course design with a modular approach has been developed. The same structure is used for all courses, the content is not overlapping and tailor made for CERN members, which will improve the learning experience for users.
- As for resources, an additional course designer is required.
- The safety training centre will be expanded from one classroom and two hands-on facilities to 8 classrooms and 7 hands-on facilities until LS2.
- The new services provided by the safety training include a ticket service (Service-Now) to improve customer care. The new course version will make sure that no access rights is lost. The RP courses are now open to contractors free of charge.
- A new procedure enabling Technical Coordinators to enrol the ENTC team, a migration of the current training catalogue to a self-service platform as well as the set-up of a translation service for classroom courses are in progress.
- A new administrative assistant is required.

C. Balle then appealed to the groups’ contributions for efficient safety training:

1. Input for training needs to be communicated as early as possible (course, learners, date).
2. People must receive information on the course required for their activities.
3. IT access for newcomers, contractors, users, etc. must be assured.

4. The groups are asked to help find voluntary trainers (i.e. for self-rescue mask training).
5. safety.training@cern.ch can be contacted whenever needed.

Comments/Questions:

- **S. Cherault** welcomes the introduction of a translation service for classroom courses as this was a major problem during LS1 and asked whether the supported languages have been defined. **C. Balle** commented that it is currently being discussed how this can be integrated; Spanish, Polish and Portuguese were in high demand in the past. He also encouraged groups to communicate special requests to HSE-DI as early as possible.

6. Update on LHC and non-LHC Experiments Activities during LS2 (M. Brugger)

M. Brugger presented the activities for the LHC and non-LHC experiments.

Starting with the LHC Experiments, he described briefly the different strategies taken by the Experiments:

- ALICE and LHCb have a significant upgrade of their detectors during LS2,
- ATLAS and CMS have a progressive upgrade spread over the 3 long shutdowns, LS2 being a/the vital preparatory period for the LS3. The usual maintenance plan is not part of his presentation, but not to be underestimated.

He also indicated that the TDRs and EDRs are being written for ATLAS and CMS to best exploit the physics potential of the HL-LHC era, even if the budget approval is still pending. The new design might have an impact on the facilities and the services required to build them even during the LS2 period.

M. Brugger then reviewed the LHC experiments upgrade scope, the critical activities associated and the impact on the different schedules. EN-ACE provides a master schedule frame, while facility coordinators are to implement detailed information.

- **ALICE.** A new Inner Tracker and a new electronic readout systems will be put in place to focus on high precision measurements of rare probes at low p_T . Some of the activities are on the critical path, such as: EN-HE for transport intervention at the opening and dismantling/mounting, EN-ACE for the Survey to be present during the TPC upgrade, TE-VSC for dismantling the current beam pipe and for installing the new beam pipe and its related equipment.
- **ATLAS.** In order to maximise the physics performance, ATLAS will improve the detector and read-out system and will prepare for LS3 (this is still under approval). The LS2 schedule is not seen in ATLAS as critical as there is enough contingency, and the most critical activity will be the installation of the new Small Wheel. Activities in PLAN are mostly declared even if activities for MME are still missing. It is important that the enlarged SR1 building is delivered before LS2. The UPS system will be upgraded as well as the cooling plant control system, the lift will be replaced. Possibly, storage place will be required at Point 1. There might be a potential concern for co-activities.
- **CMS.** Upgrade of CMS is spread over the EYETS, YETS and LS2, then the following YETS and LS3, as it is not possible to upgrade the phase I detectors in the 30-months window of LS3. **M. Brugger** highlighted the activities which are considered as mandatory to be done before and during LS2: phase II beam pipe (2020 installation), SX5 extension must be ready by the end of LS2 to allow the refurbishment of the ECAL during Run 3, some upgrades planned for

LS3 are in conflict with HL surface construction and commissioning so they could be anticipated for the LS2 period. A new building SX5Z to replace the old barracks cleared for HL-LHC is also asked, and a second 20 T crane bridge is awaited to be installed during the YETS 2017-18.

Action for LS2C: Follow-up extension SX5 (??)

- **LHCb.** To extend the physics reach, LHCb is going to replace almost all the front-end electronics and several parts of the detector. Triggering will be fully driven by software, no longer through hardware. The crucial equipment productions have started and are carefully monitored and on track. Concerning the installation, the critical activities concern the installation of the detectors – almost on the critical path – knowing there is a strong correlation between all the detectors – including the beam pipe – installations. The service needed mainly concern the storage at Point 8 – fast removal of equipment and shielding wall – and outside Point 8 during LS2. The availability of the Survey team – needed most of the time – is seen as highly critical. The transport team will also be requested.

Then **M. Brugger** summarized the common services asked by the Experiment to the Technical Sector and HSE by reviewing them by Department, the technical and scheduling follow-up methodology, the safety coordination and its concerns in terms of responsibility and support, and the working environment and radio protection – radiation cooling time, waste treatment and risk assessment.

To end this first part of his presentation, **M. Brugger** informed that most of the activities are inserted in PLAN and that a careful follow-up is needed on the scheduling. The LHC experiments have taken over during LS1 some activities that were done during the installation phase by the Technical Sector. The experiments raise their concern that this is no longer possible for LS2.

Moving on to non-LHC experiments, **M. Brugger** indicated an exhaustive list of activities foreseen in the North Area, HiRadMat, AD Area, Isolde and Awake, for the EYETS, YETS and LS2 periods. This covers consolidation and projects, including extensions and renovation.

- **North Area.** Collimator replacement in TDC2/TCC2 (EYETS) and TT81 to TT85 (LS2), irradiated cables replacement campaign and magnet cooling circuits in TCC2/TDC2 (LS2), XTDV installation on H2 and H4 lines (EYETS), gas detection system for EHN1, replacement of the power converters for SM2-Compass, the chilled water circuit consolidation in EHN1 and TT81 /TT82 (EYETS/YETS/LS2),... Some new studies might also occur before LS2 to answer the recommendations of Physics Beyond Colliders.
- **AD.** ALPHA/ASACUSA, extension (EYETS), Elena electron cooler installation (EYETS) , AD transfer lines dismantling and Elena transfer line installation (LS2), LHe and LN₂ fixed line installation (LS2), ALPHA and ASACUSA control rooms to barracks outside AD hall (LS2), BASE experimental area enlargement (LS2), AEGIS removal to new experimental area (LS2),... Concerning the services in the AD hall, Elena machine development can be done during LS2 but need services, BASE need services throughout LS2, Gbar needs a number of 1 to 2 months periods with all services, AEGIS and ALPHA need stable services on second half of LS2. The activities concerning the connection of Elena during LS2 are being entered in PLAN.
- **Isolde:** replacement of the frontends GPS and HRS (LS2), potential upgrade on beam instrumentation, beam line modification, extraction electrode controls, local cable replacement in the target area (LS2), the renovation ventilation systems and its control in the target area (LS2), the re-alignment to improve the transmission of secondary beams to experiments for the Isolde Hall (Q1/Q2-2020), a potential consolidation of the cryo-plant and the potential installation of an LN₂ auxiliary cooling system. For HIE-Isolde, the refurbishment of a cryo-module - an activity which might lead to potential calendar and

resources conflict with the HL project – and the REX consolidation. The request from Isolde is to have “winter physics” in 2019 and to restart by mid-2020. **M. Brugger** reminded that it is important for the physics community to know about the general possibility already now so that the experiments can submit physics proposals in time through the usual approval path and prepare activities accordingly (not only for ISOLDE, but also AD, etc.).

- **Awake.** Run 1 will take place during the 2016-2017 EYETS. The work required during LS2 will be defined by end of 2017. The operation of the facility is foreseen during LS2.
- **HiRadMat.** Beam Instrumentation (EYETS), He line exhaust installation (EYETS), TJ7 shielding consolidation. Due to LIU intensities and emittances, studies are required on several equipment (intercepting beam instrumentation, vacuum window, dump – and its windows,...) for a potential installation during LS2.

Concluding on this second part, **M. Brugger** stressed out the high number of activities, the importance of the consolidation projects for these areas, and the real concern on the availability of the services and resources during LS2. On the top of that, some studies might be triggered by the Physics Beyond Colliders working groups.

Comments/Questions:

- **A. Ball** commented that there are only two building SX5Z – replacing the old barracks – and the SX5X – as an extension of the current SX5 – to build.
- **L. Pontecorvo** expressed his worries about the concurrent openings of all the LHC experiments and on the load it might represent for EN-HE.

Action for M. Brugger: To define priorities with all Experiment and EN-HE. Report to LS2C.

- **J.M. Jiménez** expressed his concerns about a substantial number of activities for non-LHC experiments, for which either approval by management or budget allocation is outstanding. For the time-being, the focus should be on approved and financed activities. All other items must follow the official way of approval, i.e. Research Board, etc. **M. Brugger** commented that even prior to the approval, an idea must be provided to users concerning the technical feasibility.
- **J.M. Jiménez** informed that the LS2C will only treat infrastructure directly linked to the accelerator and not deal with those linked to projects and experimental areas. It is up to SMB and a working group led by F. Sonnemann to validate infrastructure needs and take care of their approval.

7. East Area Renovation (S. Evrard)

S. Evrard started by presenting the East Area (EA) zone, and by showing the decision making process for its renovation, from EA-Day in 2012 to the Finance Committee of June 2016. **S. Evrard** then went through:

- the new layout of the beam lines (F61-62-63 and T08-09-10-11) and their parameters,
- the new magnet powering scheme – with energy recovery – based on magnet pulsing,
- the new magnet system with laminated yokes and a reduced number of magnet types. This will also be an opportunity to redo magnet cabling without TB boxes, and to use the new TE-MPE standard on magnet interlocks (WIC),
- the renovation of the infrastructure – wall and roof cladding, windows, insulation, asbestos removal – including the ventilation system upgrade and the cooling circuit separation between primary and secondary beams,

- the other beam equipment such as collimation, beam instrumentation, beam loss monitoring system, vacuum control, converters and absorbers, beam stoppers, shielding, personal protection and alarms system,
- the master schedule – highlighting the period of intervention of the SMB Department during operation in 2018 – and the Work Breakdown Structure (WBS), available on EDMS 1730966,
- the insertion into PLAN of the activities that were approved.
- the resources needed to fulfil the activities and the initial budget. A discussion will take place in December 2016 at the Cost and Schedule Review to tune them, the logistics aspects with the worries on co-activities, storage – needed for cast iron, concrete shielding, magnets, access controls –, protection of the Cloud Experiment in 2018 and its possible run without beam in 2019 and 2020, waste management, and work in controlled areas. While the removal of asbestos was foreseen in the initial budget, the cost of disposal was not been included and must be clarified.

To conclude, **S. Evrard** indicated that the project tries to anticipate many activities during the EYETS, YETS and Run 2018 periods to relieve the LS2 one. Concerns on manpower and eventual missing resources are to be discussed in December 2016 at the Cost and Schedule review.

Comments/Questions:

- **S. Gilardoni** asked if the layout is now frozen. **S. Evrard** indicated that there are still a few open questions concerning magnets, but the location is known and defined.
- **S. Gilardoni** then asked if the requirements on the equipment were known. **S. Evrard** answered that documents including user requirements are currently being issued and will be distributed prior to the Cost and Schedule review.

8. Update on Framework Schedule from EYETS 2016-17 until LS2 (M. Bernardini)

M. Bernardini reviewed in her presentation the 3 periods of the EYETS 2016-17, the YETS 2017-18 and the LS2 itself for the LHC and its Injectors, then the L4 connection and the de-cabling project. She briefly presented the activities and the scheduling of the EYETS 2016-17 as this has been presented during the joint LMC-IEFC-LS2C meeting held on the 2nd of November (see the [minutes](#) on the IEFC/LMC/LS2C indico pages).

Switching to the YETS 2017-18 period, **M. Bernardini** exposed the baseline – 13 weeks beam to beam stop on the LHC, Xenon physics in the North Area, 3 weeks for commissioning in the Injectors before the beam in the LHC – on which she has built the scheduling frame for the LHC accelerator, before adding the new requests – emptying of all the LHC sectors of liquid Helium, UPS tests, and a complete EIQA campaign on the 13 kA and DSLC circuits. The powering tests have been extended from 1 to 2 weeks. This has an impact on the duration of the YETS 2017-18 and her proposal is to discuss this issue during the coming Chamonix workshop.

Action: Discuss the length of the YETS 2017-18 during the Chamonix workshop.

M. Bernardini then highlighted the HL-LHC activities that will take place during the YETS 2017-18 in the SPS and the LHC. She then explained the setup of the frame for the SPS listing the constraining activities and indicated that the minimum length of the YETS for the SPS is 13 weeks – including the Christmas break; the RP cooling time is not included. The installation of crab cavity infrastructure is on the critical path for the SPS. Doing the same exercise for the PS-TT2-PSB, she came to the conclusion that the minimum length of the YETS for the 3 areas is of 11 weeks – including the Christmas breaks but not the RP cooling.

Moving to the LS2 period, **M. Bernardini** gave the references of the master schedule in EDMS (ACC-PM-MS-0002). She started with the LHC accelerator and described the constraints that make the frame: warm-up to ambient temperature at the beginning and cool down at the end, the related electrical tests, the Copper-Stabilizer Continuity Measurement (CSCM), LSS3 and LSS7 RP cooling time. **M. Bernardini** listed the activities foreseen for the HL-LHC project – list which is quite substantial – and stressed out that no formal ECRs nor space reservation has been issued. She proposed to the LS2C to set the first quarter of 2018 as a deadline for these ECRs. Concerning the activities for the SPS, the PS&TT2 and the PSB during LS2, it is to be noted that the list is huge. The main activities and the critical paths were presented: LSS5 for the SPS, and the 44 magnets refurbishment for the PS ring representing half of the PS magnets with a potential bottle-neck within the magnet workshop. **M. Bernardini** insisted on the importance of defining the strategy foreseen for this activity to solve potential co-activity issues.

Action for LS2C: Define end of Q1 2018 as deadline for ECR for the LS2 installation.

Concerning the Linac 4 and its connection – at 160 MeV – to the PSB, 9 months are required for the shutdown the hardware and the beam commissioning. Because of the de-cabling campaign which will occur during the EYETS 2016-17, an early upgrade of the PSB machine for the 160 MeV cannot take place before March 2017.

Last but not least, **M. Bernardini** gave some update on the de-cabling project activities for the YETS 2017-18 and LS2 periods.

It is to be noted in her conclusion that the YETS 2017-18 duration needs to be discussed in Chamonix; that no ECR has been issued for the LS2 activities in the LHC, and that resources allocation between the huge amount of activities is being assessed through the PLAN tool.

Comments/Questions:

- **L. Scibile** commented that there is a request to paint the floor of the PS which might be in conflict with other activities. **M. Bernardini** answered that this is an activity coming from the consolidation program and that there might also be radiation protection issues. **S. Mataguez** informed that it can only fit during the EYETS 2016-17 as this work is to be done in conjunction with the vacuum group as the sectors need to be opened.
- **J.M. Jiménez** commented that the re-cabling campaign for replacing cables in TDC2-TCC2 has to be postponed to LS3. The reconfiguration of NA has been postponed as well. It does not make sense to perform a major re-cabling if the layout might change.

9. n_{ToF} & AD Targets Consolidation (M. Calviani)

M. Calviani gave an overview of the consolidation work for the n_{ToF} target and the AD target area to be done during LS2.

Firstly, he presented details on n_{ToF} target #3.

- The present Pb spallation target is water-cooled, producing neutrons.
- The target itself requires a very thin aluminium windows for physics. The currently installed windows are in operation since 2009 and have a life time of 8-10 years.
- The baseline for the new spallation target is to have a “cladded” design. This solution will avoid reducing too much the excellent physics performance and will limit water

contamination in the cooling loop, reduce the waste and improve the radioactive waste acceptance at the end of the lifetime of the target.

M. Calviani then proceeded to the challenges when dismantling target #2:

- The target is installed in a 10-meter-deep pit and contaminated pipes must be cut and removed. This activity is foreseen to be performed in 2019. Safety and radiation protection are currently being assessed. This concerns the n_ToF area only and will not lead to any co-activities.
- Experience from the removal of target #1 in 2013 will be extremely useful. Target #2 is expected to be removed from the service tunnel and transported directly to the ISR storage. The type of conditioning is still being discussed. A fully remote handling by an improvement of the monorail system is foreseen.

M. Calviani then went through the planning from 2017 until 2020 and LS2. For the time-being, no showstopper in the execution of the program is known even though many groups are involved.

M. Calviani then presented the consolidation plan for the AD-target area.

- This area is providing antiprotons for AD.
- The consolidation is challenging as the residual dose rate and therefore the contamination risk is high. Also, most devices were built in the 80s with little documentation and no spares are available. Nevertheless, a long-term operation in the ELENA era (until 2030 or 2035) must be guaranteed.

A consolidation is necessary for several reasons.

- In case of a major failure between LS2 and LS3, this would have a significant impact on the AD physics.
- The AD horn failure during LS1 highlighted issues related to the operation of the AD-target area.
- A global consolidation plan has since been proposed and approved by the Consolidation Program (ACC-CONS).

A project management document (released) describes the project and defines a total of 15 work packages established and financially approved. Amongst others, the following elements will be renovated:

- Air-cooled target replacing water-cooled target
- New magnetic horn
- New trolleys and movement system
- Upstream quadrupole magnets
- Target area ventilation system
- Consolidation of surface building and renovation of building 196

Most activities have already been started or planned in detail. The master plan is being assembled and must be agreed with EN-ACE. It is being investigated whether a global ALARA Committee will be required. Space for radioactive waste will be required in 2019. After discussion with all involved groups, no showstopper is known.

M. Calviani concluded his presentation mentioning that the n_ToF target replacement and the AD-target area renovation are on track to be executed during LS2. The final global master plan is still outstanding, but all activities seem to fit for the moment.

Comments/Questions:

- **K. Foraz** mentioned that information concerning cable-pulling must be clarified with EN-EL. **S. Gilardoni** answered that a discussion on this issue already occurred in the early morning.

10. BE-BI Activities during the LS2 Period (R. Veness)

The BE-BI activities during LS2 concern in-vacuum and non-vacuum instrumentations stored across the accelerator. During LS1, around 10% of this instrumentation was taken out; BE-BI contributed to CERN-wide projects such as SMACC, LSS1 cabling, etc. by the consolidation, maintenance and replacement of instruments.

After a short introduction, **R. Veness** proceeded to the activities foreseen for the EYETS 2016-17:

- 91 IMPACTs for BE-BI activities during the EYETS have been issued.
- A BE-BI shutdown coordinator for each facility has been nominated and the progress is closely followed in group-wide meetings.
- The aim is to bring forward installations wherever possible to reduce the workload during LS2.
- PLAN only represents 30% of BE-BI interventions during the EYETS. The remaining activities concern maintenance and operational changes. Late requests do not yet appear in PLAN.
- **R. Veness** briefly explained several uncertainties linked to the activities during the EYETS, mainly due to manufacturing readiness, decisions from others or operation results, e.g. the beam-gas ionisation monitor in the LHC or the secondary emission grids in the PS ring.

For the period up to 2020:

- 70 activities launched by BE-BI are currently in PLAN. Some of the requests correspond to a single item, some to entire projects, making the comparison difficult. The main client is LIU (40 requests) with the new wire scanners being a significant project for BE-BI. It includes the integration of a prototype wire scanner in the PS during the EYETS. The series installation planned for LS2 will lead to reaching the limits of EN-MME capacity. This is under discussion.
- 82 contribution requests have been received from other groups.

According to **R. Veness**, the following items might potentially cause issues:

- A close collaboration with EN-MME and TE-VSC is planned. Bottlenecks in the production of components to be delivered for LS2 deadlines are foreseen. External contracting is being discussed.
- Time sharing between installation and commissioning for some experts towards the end of LS1 were an issue. This must be improved for LS2.
- Agreed vacuum acceptance specifications are not yet available and must be established. This process is on-going.
- Additional industrial support is foreseen in order to cover resources needs. Support from projects and EN-ACE to better integrate the schedules has been preliminary agreed.
- 5 additional FTEs were needed during LS1 to cover additional, unexpected workload. This might again be the case for newly created operational requests between now and LS2.
- As for storage and logistics, additional laboratory space for LIU instruments assembly and additional radioactive workspace has been requested.
- Concerning safety, BE-BI is working closely with HSE-RP. Streamlining the workflow for radioactive transport to avoid scheduling issues is extremely important.

R. Veness concluded his presentation explaining the activities for LIU and HL-LHC are well defined. Many small projects, maintenance, operation, consolidation represent the major percentage of BE-BI activities. The group is requesting a significant workload from other groups; communication is good and improvements from LS1 have been implemented. Support from EN-ACE and the LS2 Project Management is essential for managing schedules for the same resources across the difference machines and for coordinating co-activities (or sharing) of experts during re-commissioning and installation still on-going for downstream machines.

Action for LS2 Team: Define and organise EN-ACE support to better integrate groups schedules (PJAS?).

Comments/Questions:

- Referring to the mention of delays in manufacturing, **F. Bertinelli** commented that such delays are usually caused by late decisions or design requests. He insisted that if the design requests are received in time and the estimated time frame for design and production is respected, delays can be avoided.
- **F. Bertinelli** also stressed that subcontracting to cope with bottlenecks in manufacturing does not mean that no internal resources are required. Moreover, this has a cost. Internal financial and personnel resources are needed for the selection and follow-up. **R. Veness** answered that he would like to re-internalise some manufacturing forces.
- **K. Foraz** enquired whether EN-ACE is also expected to manage the surface scheduling. **R. Veness** replied that his remains to be discussed.
- **K. Foraz** also requested further details on potential issues and co-activities/sharing related to the installation and commissioning with respect to LS1. She asked BE-BI to plan for more resources.
- Referring to **R. Veness'** statement that only 30% of the BI activities are visible in PLAN, **K. Foraz** asked whether this means that the remaining 70% do not involve support from other groups. **R. Veness** explained that this situation is rather caused by the fact that PLAN has a one-year lifecycle, and that some projects are completely internal to BE-BI like BLM maintenance and installation. Furthermore, items that have appeared very recently have not yet been discussed with other groups and are therefore still missing in PLAN. BE-BI also counts on direct contact with collaborating groups. It is also crucial to constantly compare the IMPACT and PLAN database, as IMPACTs are often duplicated, which leads to a double allocation of resources.

11. EN-HE Activities during the LS2 Period (C. Bertone)

C. Bertone gave an overview of handling engineering projects performed by EN-HE for LS2.

The following projects are crucial for LS2.

- Cranes: The consolidation of major cranes has started during LS1 and will be completed before the end of LS2. The only new project for LS2 is the modular crane for the PS switchyard.
- Lifts: **C. Bertone** went through a list of all lifts in the LHC and commented on their status as well as the schedule. A 10-week service interruption is required for each intervention. Main lifts without back-up solutions for access can therefore only be replaced during LS2. This has a large impact on the LS2 logistics and schedule. The replacement of a few minor lifts is foreseen for the EYETS 2016-17 or YETS 2017-18.

- Handling Machines: Many handling machine are very old and a consolidation is on-going. These machines have exclusively been designed for CERN; the aim of the consolidation is to improve their remoteness and make them more compliant with the ALARA principles. New handling machines are not expected before LS3.
- Road Vehicles: A consolidation of all road vehicles is planned. Many vehicles are being modified in order to comply with the ADR rules.

C. Bertone then proceeded to the transport support for heavy handling. 440 requests have been received through PLAN so far. The requests are ranging from minimal activities to a continuous 3-5 year support. So far, no showstopper was identified. Supervision will be increase by one person and the contractor team will be doubled from 50 to 100 people in order to cope with the demands.

Major projects supported by HE are the magnet campaign in all injectors, SPS-LIU dump from BA1 to BA5, extractions in BA2 and BA3, EA renovation, L4 interconnection, HL-LHC support and then AD dump area refurbishment.

C. Bertone commented on the critical points for the coming years.

- A huge peak of design needs for handling studies and tooling is foreseen for 2017-18 for LIU an HL-LHC as well as the design and modification of shielding walls. The EN-HE design office is currently being re-enforced.
- The availability of resources for supervision and operation during LS2 is still discussed.
- There is no contingency in the planning of the lift replacement in the SPS and the LHC.
- The maximum dose to personnel, in particular for key supervisors and operator, could be a limiting factor.

Comments/Questions:

- **E. Jensen** expressed his concerns about the missing contingency in the lift replacement schedule. He pointed out that activities for LIU-SPS are foreseen following the lift replacement in Point 3 of the SPS and a non-operational lift would lead to a significant delay. **C. Bertone** commented that it is currently being discussed with the Technical Coordinator of the SPS whether this replacement can be performed at the very beginning or the very end of LS2. **D. Lafarge**, who is in charge of the project, added that the first lift in BA2 will be replaced during the EYETS and the planning for LS2 might be improved based on this experience.
- Answering **S. Gilardoni**'s question on the transport of highly activated components during EYETS and in particular the TIDVG, **C. Bertone** answered that the order for the trailer was placed; the delivery is planned for the end of February.

12. EN-MME Activities during the LS2 Period (F. Bertinelli)

F. Bertinelli started his presentation with statistics on the office workload of the EN-MME design office.

- Almost 200 tasks are currently open, which represents a big increase of workload with respect to the LS2 Days 2015.
- The capacity has been increased from 44 to 50 FTE. This total number is composed by 15 staff members, industrial support (33) and temporary labour (2). He pointed out that no further increase in non-staff with respect to the existing staff will be accepted. The recruitment of additional staff for the design work has therefore been requested.

- The current design work in progress represents a workload for the coming 6 months. An additional 5% of the capacity will be absorbed by the CAD2020 project (replacement of the Smarteam database phasing out by 2020), which must either be supported by users/projects or centrally.

He then commented on the fabrication issues. Some bottlenecks concerning the workload capacity are known. The raw material availability continues being a significant issue. As previously mentioned, the existing WIP covers approximately 6 months of resources.

F. Bertinelli offered several recommendations to avoid delays.

- It is crucial for groups to think ahead in time for design and fabrication requests. Typically 6 months should be expected for new EN-MME design requests, and a further 6 months should be foreseen in the planning for EN-MME fabrication requests.
- He pointed out that a design request does not automatically result also in fabrication. Groups should act quickly when the design phase is approaching its end in order to submit the fabrication request as soon as possible. He also stressed that Integration (EN-ACE) and Design (EN-MME) are two different functions.
- PLAN and the Job Management Tool (JMT) are not synchronised. In order to facilitate activities for both the requesting groups and EN-MME, a link to JMT in PLAN must be entered, as well as having consistency between user name and title in JMT.
- Groups should have a clear understanding of the request-by date, which stands for the date of the EN-MME job completion, not the installation. “Deliverables” must also be clearly defined.
- Groups are advised to work back from the installation date and count 1-2 semesters depending on the work to be performed by EN-MME. Group/project leaders are asked to check whether this time frame was taken into consideration as well as the consistency of PLAN and JMT prior to signing JMT job requests.

F. Bertinelli then gave details on the Non-Destructive Test (NDT) radiography. This activity is being performed outside working hours by contractors (DEKRA) with EN-MME support to assist with access difficulties, HSE-RP issues and urgent technical issues. He stressed that the EN-MME support is currently on a best effort basis rather than involving a piquet team. It is currently being discussed whether this support can be migrated to existing piquet teams.

F. Bertinelli finished his presentation by mentioning that SMB consolidation support will be needed to finish the renovation of the general purpose RP workshop in building 109 in 2017.

Comments/Questions:

- **R. Veness** asked whether a progress concerning the availability of raw material was made. **F. Bertinelli** answered that this is still a huge issue, often caused by official rules implying purchase in host states or increased minimum quantities which forces CERN purchasing to couple smaller requests. The group is working on a plan for a long-term improvement of the situation, however, the whole procedure until contract start will take approximately 2 years. The good progress is that the re-ordering of material can now be done when the agreed minimum stock quantity is reached. The previous deal was to re-order only when the quantity was reaching zero.
- **P. Cruikshank** referred to a discussion with EN-MME last year on a possible minimum stock quantity, including the financing aspect. **F. Bertinelli** explained that this procedure was launched but takes time. Once the order will be placed, another 8-12 months for delivery

must be counted. **P. Cruikshank** requested another meeting to define an action plan; **R. Veness** agreed. **F. Bertinelli** invited groups to join the upcoming MME Advisory Panel and raise this topic.

- **G. Bregliozi** said that even though ECRs are often validated by all involved groups, physical resources are not always assured. **F. Bertinelli** said he would comment whenever he is aware of lacking resources. MME link persons to some User groups can help to monitor requests and raise resource issues.
- **P. Cruikshank** enquired about the way arbitrations are made when accepting additional urgent workload, as other activities can then no longer be performed in the defined time frame. **F. Bertinelli** confirmed that the MME Advisory Panel usually discusses such cases, and if necessary escalates recommendations for decisions. Only once a decision had been escalated to the IEFEC.
- **J.M. Jiménez** expressed his concern about providing the phone number of the fire brigade for x-rays rather than for example the TI control room. He insisted that the fire brigade shouldn't be overloaded. **F. Bertinelli** commented that they do not actually perform any work, but contact HSE-RP piquet who will take further actions. **J.M. Jiménez** would like to discuss with HSE-RP.

13. Update on LIU Activities during LS2 (S. Mataguez)

S. Mataguez started his presentation by reviewing the activities concerning:

- the LIU-Ions project for the EYETS and the YETS, nothing is foreseen for the LS2
- the LIU-PSB project for the 3 periods EYETS, YETS and LS2
- the LIU-PS project for the 3 periods EYETS, YETS and LS2
- the LIU-SPS project for the 3 periods EYETS, YETS and LS2

Please see the [slides](#) as they show graphically where the work is going to happen for each period.

Then **S. Mataguez** explained how the work for the LIU-PLI – Planning Layout and Integration – was organized in order to ensure proper collection, dispatching and processing of information. The web sites on tools – integration, configuration, layout, scheduling – and the references for the meetings – SPS, PS, and PSB coordination meetings – handled by the facility coordinators were summarized in a single slide. **S. Mataguez** reviewed the significant items for each of the components of the PLI working group:

- the integration studies always show the integration before and after the changes in a single drawing. These drawings get released before they're included in the ECR for validation. Integration studies also cover surface buildings.
- For the documentation, 37% of the ECRs are already approved, 22% under approval or in work, 41% still to come.
- For the scheduling, the work planning for the EYETS (EDMS ATS-PM-MS-0001 v2.3) has been refined with better estimations on the hardware commissioning tests and the beam re-commissioning. The scheduling for next year YETS in the Injectors chain is to be revised next year. The general master planning for the LS2 period (EDMS ACC-PM-MS-0002 v1.0) has been released. Going into details, the work planning for the Linac 4 connection, the PSB upgrade, the PS and TT2, and the SPS were presented. For none of these, the shutdown duration is critical, but it is important to respect them. In the SPS, the transport will be a challenge.

As a conclusion, **S. Mataguez** indicated that the injectors upgrade fits in the LS2 period. He stressed out that the hardware tests and the beam commissioning planned are on a critical path. Out of the possible impacts on the master schedules, the resource allocation between facilities, the additional works for consolidation and maintenance, logistics and safety constraints between facilities represent the biggest concerns.

Comments/Questions:

- **C. Bertone** asked if everything fits within the 3 periods of the LS2, in particular the 44 magnets refurbishment of the PS. **S. Mataguez** answered that what he presented corresponds to the LIU project only, and that the answer resides with the magnet group (TE-MS). Answering the same question, **J. Coupard** informs that the overview for all Injectors including the exchange of the magnet in PS, etc. will be given in Chamonix. It is very important that all the activities including consolidation and maintenance are declared to EN-ACE to prepare this overview and check the logistics and scheduling.

14. Update on HL-LHC Activities during LS2 (L. Tavian)

L. Tavian started his presentation by listing the 18 Work Packages of the HiLumi project impacted by the LS2 installation period. Showing the master schedule of the project, he highlights the EYETS, YETS and LS2 periods and presented a table and a map with the different activities concerned, indicating the targeted period and location. While the main installation activity will take place during LS3, activities start now and concern mainly:

- An SPS crab cavity module and its cryogenic system,
- the DS collimation items with the 11T dipoles, the connection cryostats, the by-pass cryostat holding a TCLD collimators,
- halo cleaning with a TCSPM collimator,
- the beam screen in-situ coating for the Inner Triplet and the D1 magnets in Points 2 and 8,
- the beam transfer elements and the kickers with the TDIS, the D1 mask and the injection kickers in Points 2 and 8,
- the beam instrumentation items with the high bandwidth BPM, the wire-in-jaw collimator and the BGV,
- the Point 4 cryogenic upgrade,
- the installation of a target absorber TAXN in Point 8,
- the new forwards shielding in Points 1 and 5,
- the civil engineering with the underground and surface construction,
- the re-routing of the EL services in Point 1,
- and the technical infrastructure for the UPR works.

Activities are spread across the whole ring apart from Point 3 and Point 6.

For each of the above items, **L. Tavian** indicated:

- the leading work package holder and the other work packages contribution,
- the corresponding mapping to the Accelerator and Technical Sector groups for their contribution to the installation,
- the current status of the LHC-ECRs and/or SPS-ECRs, and the corresponding PLAN activities – when known.

L. Tavian then reviewed these items in more details (see slides). He highlighted the following points:

- the first crab cavity cryo-module installation in the SPS is on the critical path of the EYETS and YETS,
- the 11T dipoles, bypass and cryostats connection related to WP11 during LS2,
- the in-situ coating of IT2 and IT8 beam screens. Tests of all tooling have been completed. The gap for introducing the coating device to coat 45 meters per string will need to be introduced in a 150mm-gap. A slot for the installation during LS2 has been allocated.
- no activities during the EYETS 2016-17 for the beam transfer lines/kickers. The prototype installation in the LHC is planned for the YETS 2017-18. The remaining MKIs are to be done in the end of LS2.
- a decision by mid-2017 is to be taken on how to equip the second beam with a BGV Detector. The installation of a prototype of the beam gas vertex detector is foreseen for the end of LS2.
- the evolution of the cryogenic layout. During LS2 upgrade, the superconducting RF cavities must be cooled down. The team is still working on an alternative scenario to avoid adding a new cryoplant and therefore an impact on the availability of the LHC. An upgrade of the refrigerating system in Sector 4-5 is being considered.
- the present baseline foresees the installation of a 50cm innermet mini-TAN at Point 8 during the 1st year of LS2.
- the installation of a new TAS in IR1 and 5 might be advanced to the LS2 period. A decision will be taken during Q2 of 2017.
- civil engineering at the surface. The construction of standalone building will be started during LS2 with the cooling towers and cryogenic compressor buildings followed by the SD around the pit. In Point 5, the construction of a new storage area is planned for the YETS 2017-18.
- concerning the underground civil engineering to be done during LS2, the four UPRs – 2 in Point 1 and 2 in Point 5 – will have to be fully equipped with doors, pressure air guards, access and alarms systems – by September 2020 at the latest to allow safe personnel access during Run 3,
- some calendars conflicts have already been identified during the last cost and schedule review. A plan B is under study to do some of the connections only during the YETS 2021-22.

For a conclusion, **L. Tavian** stated that the inventory on HL-LHC activities has been done, that most of the activities are now defined in PLAN and that the corresponding ECRs must be prepared. Installation periods and durations have been proposed but might be refined to fit the overall LS2 schedules. The civil engineering schedule is rigid but with low interaction with all other LS2 activities.

15. BE-ICS Activities during the LS2 Period (P. Sollander)

P. Sollander started his presentation by showing the 28 activities entered in PLAN, which is not completely up-to-date. BE-ICS is working on it. The activities are divided into “approved”, “delayed to LS3”, “pending approval”, “planned maintenance but pending resources”.

Going through the different main projects of the BE-ICS group, **P. Sollander** underlined some potential issues:

- for the SPS Personnel Protection System refurbishment (EDMS 1711842), the pilot will be installed in ECA5 in mid-2018 and the full installation is foreseen during LS2. He also mentioned some cabling requests made to EN-EL, the DSO tests and part of the

commissioning tests with groups. The installation during LS2 will be driven by the cabling installation and availability,

- for the PS Personnel Protection System modifications – for the Linac 4 to PSB connection and Medicis access installation – and maintenance – done in EYETS and YETS –, some cabling requests to EN-EL, some IT-CS network unavailability,
- for the East Area renovation project in which the BE-ICS intervenes on the access, alarms and WIC systems, the location of the shielding will have an impact on the fire detection layout. Resources are available but budget is missing,
- for the SPS Fire Safety project, requests from BE-ICS to EN-EL are pending the approval of the project.

Switching to the contributions asked to BE-ICS, **P. Sollander** explained that:

- 15 contributions from EN-CV controls systems appear to be declined in PLAN. These are in fact validated by BE-ICS as requested with the exception of the Linac2 ventilation activity 10644 which has been postponed to after the LS2. The BE-ICS group has a considerable program of work with EN-CV over the 2017-2020 period with a lot of code to prepare before LS2.
- For the QPS upgrades, where some specifications are missing – such as WinCC OA and FESA upgrades for the IT, IPD, IPQ, 11T –, the need in terms of resources cannot be evaluated. The test bed for the QPS, PIC, WIC circuit foreseen for the EYETS cannot be done.
- Concerning the WIC for the PS and the TT2, resources are ok from BE-ICS, but PLAN cannot be updated.
- Concerning the LHC Personnel Protection System, everything – PZ65, UAs and UPRs 17 and 57 – seems fine, including the upgrade of the access control infrastructure.
- For the HL-LHC project, the Work Packages 17.4 – access and alarms – and 17.5 – technical monitoring – need to be confirmed.

Comments/Questions:

- Concerning the EN-EL cabling activities that have been requested but not yet validated, **D. Ricci** said that EN-EL can only comment once the requests have been approved by the PLAN coordination team and priorities are defined. **K. Foraz** answered that approval is outstanding as those items will be reviewed in February for the version 2.
- **M. Nonis** informed that the CV group was waiting for an answer from BE-ICS in the EA renovation project. **P. Sollander** commented that this is not yet included in the planning.
- On another subject, **M. Nonis** enquired why BE-ICS has not answered on the IT-Hub. BE-ICS has not yet received the specifications for this project from EN-CV.
- **S. Deghaye** asked on where is the new cable request from CO in the lists presented..... --- Don't know what this was. It may concern the "External Conditions" project.
- Concerning the East Area, **J.M. Jiménez** believes that a considerable change to the infrastructure will imply the need of a new safety file including a renewal of the "certificat d'operation" (EIS) from French Authorities and it would take time to get an agreement. **P. Sollander** agreed that changes to a safety system must be validated and that this will take time.

16. SMB(-SE) Activities during the LS2 Period (L. Scibile)

L. Scibile covered in his presentation a large number of services such as Logistics, Stores, Waste, Cleaning, Mobility, Site security...

- Concerning the logistics, the additional foreseen manpower is already in the MTP.
- For the radioactive storage areas, the new Multi-Purpose Building (MPB) – delivered by Mid-2018 – will handle the light radioactive equipment transferred from the buildings 954 and 955. The threshold to classify equipment as light radioactive needs to be defined during 2017.
- The peak increase of manpower for the stores is based on the experience of LS1 and is already included in the MTP.
- The same applies to the Waste and the additional budget is also in the MTP.
- Concerning the cleaning activities, the scope is the same as for the LS1, for the barracks and “base de vie”, the tunnel and the experimental caverns. This service is on-demand and is not included in the MTP plan.
- For Mobility, the hiring of an additional VIP driver is not in the MTP plan, as this service is on-demand. The potential additional cars will be charged directly to the requesters.
- For what concerns Security, 3 missions are listed: ZORA, the monitoring of the worksites, the material protection (see slides for mission definitions). This is an on-request service, so not in MTP. The cost for each mission agent is listed. The material protection is not evaluated.

The second part of the **L. Scibile**'s presentation focused on the Civil Engineering projects of medium or large size, covering buildings, roads, and shielding structures for the LS2 period. 19 projects are accepted in terms of resources and financing, 8 are in approval waiting for the budget to be confirmed, 16 projects with resources not sufficient and a budget to be found. Before listing some of them, **L. Scibile** insisted that the work to be done for the HL-LHC project by the SE group is critical. The items included in the list are: the SPS Dump, the infrastructure and accelerators consolidations, B947, B90, ISR – Radio Waste Treatment Center, the SPS fire safety project, the Static Var Compensation in MEQ 59, the SM18 extension, the SF18 cooling towers, the new substation buildings for the SPS, etc.

L. Scibile explained that maintenance of some of the infrastructure is only possible during the long shutdowns for access reasons. This is under control, the activities declared in PLAN, and resources are identified and allocated in the MTP. Concerning the contribution asked to SE group, 5 to 10 additional industrial support – LS1 experience – are to be hired. The limit with the current resources is reached.

As a conclusion, **L. Scibile** insisted on giving attention to the CE works for the HL-LHC project: traffic will increase and this will have an impact even if there is no direct interference. The budget requires for the projects and the works requests is not considered in the SMB budget. As the estimates are based on the LS1 experience, a careful review of the requests for contribution will occur after the exercise with PLAN.

Comments/Questions:

- **R. Veness** asked for more laboratory space and asked if this is part of the MPB. **M. Meddahi** insisted on the availability of the MPB for the LIU project for both storage and workshop. **L. Scibile** informed that it will be there for emptying spaces and not to install laboratories or workshops. **J.M. Jiménez** informed that this will be re-discussed, but the construction of a new laboratory building would have been too late for LS2, having as a consequence that the MPB is turned into a storage place in order to empty other buildings which can be used for workshops. **J.M. Jiménez** informed that there is also a budget issue. **L. Scibile** answered that there was a similar crisis for space during LS1. Back then, no space for mounting was available while other areas were not being used as they were prepared for other activities. A

dedicated task force managed to resolve such issues and organised the temporary use of empty space for other activities. **M. Meddahi** emphasized that a task force would be extremely useful for LS2.

- **F. Bertinelli** considers that the raw material issue is more serious than the product management or storekeeping. Months of delay for raw material delivery and therefore delays in fabrication must be coped with. The raw material issue is mainly related to the fact that CERN is a small player regarding the order volume. CERN is often forced to move to the secondary markets and cover the need with items that are available at the time. **L. Miralles Verges** is trying to set up an overall solution for the stores. Raw material is a critical issue to be treated apart. **F. Bertinelli** added that the attempt to solve this problem must be a joint-activity between technical personnel in charge of the specifications, purchasing, SMB and users.
- **F. Bertinelli** queried about the status of building 109. **L. Scibile** informed that it is not in the list because it is supposed to be done by mid-2017.
- **K. Foraz** asked if the civil works in Points 1 and 5 include the “base de vie” in the contract. **L. Scibile** answered that this has been included for these Points. However, there is no other request for a “base de vie” for the other points. **K. Foraz** added that this will also need to be studied for the Injectors and LIU.
- Answering **K. Foraz**’ question on the meaning of “directive”, **L. Scibile** informed that it is to make sure that the material is being watched.
- **K. Foraz** mentioned that it will be decided before LS2, which group will hold the budget for cleaning. The level of service is also to be clarified at the same time.

Action for LS2 Team: Follow-up definition of level of service and budget.

17. PLAN Results (K. Foraz)

K. Foraz presented the results of the PLAN tool v1 as well as an outlook on the next phase.

She started with a reminder of the different phases and deadlines.

- It was initially planned to complete the resource allocation phase by 30th June 2016, however, this phase was extended due to lots of modifications of contributions and is still on-going.
- She pointed out that the term “postponed” is still under discussion and might be modified with a more accurate wording.
- Prior to the start of LS2, it will need to be determined which activities will certainly be achieved and which are potential options. Such decisions are based on priorities and available resources.
- Reports are now available through the PLAN tool, Pentaho or on request. Various overviews and charts on activities for each group or machine, FTE/weeks per group or other or other criteria can be extracted.
- During the approval phase, key groups were consulted to clarify requests and correct errors. The reason for rejected contribution has been entered in the PLAN tool.

After a short introduction on the general progress, **K. Foraz** proceeded to the provisional results. A total of 897 PLAN requests were successfully scrutinized during the past months.

- Approximately three quarters of these requests could be approved without resource issues.
- 12 requests are still under prioritisation. Details on the data quality are still outstanding.
- 153 requests were recently created and will be treated in PLAN phase 2.

- A list of pending Priority 2, 3 and 4 requests was shown.
- If requests were rejected, this does not automatically mean that no resources are available. The reason is often missing information or the fact that no contribution from the group is required.

Details on the provisional results per Department were presented next.

- For BE, EN and EP, some information is still missing.
- **K. Foraz** will meet **E. Cennini** concerning unsupported HSE requests.
- More than half of the IT requests were postponed. 93% of the rejected items were refused due to missing resources.
- 60% of rejected SMB items are due to missing information.
- Almost all activities for TE are approved.
- As for LIU, the number of unaccepted requests could be reduced from 54% to 20% since September due to the pro-activity of the LIU project. The remaining items are mainly due to missing information.
- Several HL-LHC items are still blocked due to the lack of information.
- Concerning AWAKE, the BE-BI resource issue must be solved.

All groups are asked to contribute to the rapid resolution of missing information issues or specify if no contribution is required. The deadline for missing technical information is 20th November 2016. **K. Foraz** and **M. Pojer** should be informed about all actions.

Once all information is available, last decisions on approval or postponing of activities will be taken. The final PLAN results are expected for mid-January. PLAN Version 2 will then be introduced.

- All information will be copied from v1. The status will be lost, however, groups will be able to retrieve the last status.
- A small working group to review the PLAN tool has been set up. Voluntary participation and input are welcome.
- Several open questions concerning granularity, the appearance of maintenance activities in PLAN, the frequency of PLAN exercises and possible key support are to be clarified.

K. Foraz summarised that most requests concerning v1 could be clarified since June and no showstopper is known for 75% of the activities. For v2, the support groups will have a better overall view of activities. She reminded that it is crucial to include all requests needing support in PLAN.

Comments/Questions:

- **M. Bernardini** asked how open activities for the EYETS 2016/17 are going to be managed and how it can be assured that they will be implemented. **K. Foraz** commented that the group blocking the request must define if the activity can be performed or not. It is always easier to plan for an activity in the schedule and to remove it if not approved. Individual requests must be discussed with the group/facility coordinator.
- **R. Veness** enquired how PLAN will be evolving between now and LS2. **K. Foraz** replied that the PLAN tool will be used for follow-up and to align the groups' effort in the same direction. PLAN requests will be reviewed at least once per year; the frequency might be increased with respect to the workflow and to improve flexibility.
- Related to **K. Foraz'** statement that requests can be entered into v2 after Chamonix, **F. Bertinelli** asked when the prioritisation stage for v2 will be closed and when resource allocation can start. **K. Foraz** said that no date has been specified but it is planned to give no more than one month for entering requests. **J.M. Jiménez** added that the estimated date is

the end of March; the resource allocation phase will then run until late May to provide time for group meetings in June and communicate details to coordination until the end of the summer. **F. Bertinelli** reminded of the EN-MME workload mentioned during his presentation during the LS2 Days and pointed out that not the actual execution, but the delayed setting of priorities is often an issue. The EN-MME design office is saturated for the next 6 months and was already forced to select the work to be done in the first semester of 2017 even though the PLAN tool should guide such decisions based on priorities. **K. Foraz** stressed that activities can already be entered and will be considered for v2.

- **N. Bellegarde** mentioned that it should be considered to review activities more than once per year. **K. Foraz** agreed that this is an option. She also pointed out that groups must be more pro-active with PLAN and take rapid actions. **N. Bellegarde** also enquired what happens to agreed contributions or projects that are postponed.
- **J.M. Jiménez** added that many projects were integrated during the year while the budget was still not confirmed. Most could be approved after the MTP revision in November. A way to properly integrate substantial decisions taken during the year, such as the consolidation of the East Hall, must be found.

18. TE-VSC Activities during the LS2 Period (G. Bregliozi)

G. Bregliozi reported that there are no major changes since last year's presentations during the LS2 Days. He therefore concentrated his presentation on activities which are not yet in PLAN or not properly defined in PLAN.

1. LHC Experiments

- Lots of activities are planned for CMS with a heavy involvement of EN-MME. The PLAN activity created but is not exhaustive.
- Several activities are foreseen for LHCb. The VELO upgrade has been introduced to PLAN.
- All activities for ALICE were declared. A few double activities are being revised.
- Several activities for ATLAS are approved; the production of a second gas injection system is still under discussion. A PLAN activity for HL-LHC VAX has been added but is not exhaustive.

For all LHC Experiments, routine activities are foreseen during the EYETS 2016-17 and YETS 2017-18. These are not in PLAN.

2. LHC Beam Pipes

- Interventions concerning LSS2/LSS8, TDE, BGI, ALFA station in LSS1, Roman pot detectors, SMOG LHCb and the A31L2 dipole exchange are scheduled during the EYETS 2016-17 and not in PLAN.

3. HL-LHC activities for LS2

- The main activities can be found in PLAN. They will however be revised, as resources during the EYETS 2016-17 are scarce and a solution for the implementation must be found. Several activities where no TE-VSC participation is requested will drop out.

4. Projects

- The installation of the ELENA transfer line will require 7-8 months of TE-VSC involvement. This activity is not in PLAN.
- Not all activities concerning HIE-ISOLDE are in PLAN. A heavy involvement of TE-VSC during the EYETS 2016-17 is foreseen.

- Several activities are duplicated in PLAN and must be revised.
- Interventions in AD during the EYETS 20016-17 are confirmed but not in PLAN.
- Activities concerning NA 62, LINAC4, LEIR, MEDICIS with TE-VSC participation are scheduled.
- Works in the PS/SPS complex during the EYETS 2016-17 and operational interventions in 2016 are not declared in PLAN. A margin for future resources must be planned.

G. Bregliozi then gave further details on the activities performed by TE-VSC in various facilities.

- Around 50% of activities with TE-VSC as coordinator are connected to consolidation, while 20% concern the upgrade of the machine.
- The main effort is invested in the LHC, while major upgrade activities for LIU in PSB, PS/TT2 and SPS represent another peak.
- 4 out of 5 sections were requested as contributors, while most activities concentrated on 2 sections (BVO and ICM). Almost 500 contribution requests were received. A major part of the TE-VSC resources is blocked for carbon coating on the SPS and inner triplet for LS2.
- As for the number of FTE weeks, the major part is spent on coordination with 4000 FTE weeks and installation in the machine with 2000 FTE weeks.

G. Bregliozi summarised that TE-VSC is heavily involved in the experiments and HL-LHC. Most resources during LS2 are blocked for LIU. Requests from projects should be clearly declared in PLAN in order to ensure a global strategy. In order to cope with the activities during the EYETS 2016-17, resources declared in PLAN for the whole period 2015/16 were doubled. He also added radiological considerations for PSB and PS might be a limiting factor for experienced personnel.

Comments/Questions:

- Referring to upcoming activities concerning HL-LHC, **L. Taviani** pointed out that the hollow lens installation was already declared in PLAN even though the item has not yet been approved. **J.-P. Tock** commented that this is treated as a low-priority item. HL-LHC will be informed once approved.
- Concerning the TDIS, **S. Gilardoni** enquired whether the term “layout not defined” concerns the machine or the object itself. **G. Bregliozi** confirmed that the object is defined, but the layout of the area will be reviewed in December.
- **S. Gilardoni** also asked whether it has been discussed with all involved groups to not include certain activities in PLAN, for very short periods for instance. **G. Bregliozi** commented that whenever resource allocation is needed in future, this should be entered in PLAN in order to obtain a global view.
- **M. Bernardini** enquired how HL-LHC activities which require TE-VSC support are going to be performed if the support was not validated. **L. Taviani** commented that in most cases, the issue is missing information rather than resources.
- **B. Di Girolamo** mentioned that the coating for Points 2 and 8 was declared and he wondered why this was not visible in the list presented by TE-VSC. **G. Bregliozi** answered that the list shown concerns only activities with issued.

19. TE-EPC Activities during the LS2 Period (V. Montabonnet)

V. Montabonnet started her presentation with an overview of the TE-EPC activities and contribution requests related to PLAN v1. 42 activities launched by TE-EPC are currently under approval or in the resource allocation phase. This leads to 298 support requests excluding TE-EPC own resources.

- Many activities are related to LIU and HL-LHC. **V. Montabonnet** gave a detailed overview of works planned for LIU in Linac4, PSB, PS machine, TT2 and SPS machine.
- As for the LHC, two main projects are foreseen: the R2E project, which will be initiated during the EYETS 2016-17 and completed during LS2, and LHC-FMCM with RD1 and RD34 circuits, which is planned for the EYETS 2016-17.
- For the Injectors, High Voltage PS RF Cavities Power Convertors will be treated during the EYETS 2016-17 and the YETS 2017-18, while the installations of new High Voltage SPS RF Cavities Power Convertors and the MEQ59 Static Var Compensator are foreseen for LS2.
- Safety projects concerning an old oil saturated reactor in BEQ1 as well as an old oil transformer and diode tank close to B.113 will be treated during LS2 as well.
- Several power converters installations concerning the approved projects Compass, AWAKE, S-FRS and ELENA have been planned.
- For HL-LHC, several activities linked to the SM18 Test Bench are foreseen until LS2.

As previously mentioned around 300 support requests have been sent to other groups. 282 activities have been validated so far; 3 contributions are without status and 13 contributions with unavailable status, mainly due to missing information.

TE-EPC has received 92 contribution requests from other groups. 79 requests could be accepted. The status of 13 contributions is "unavailable", one due to missing information and the remaining 12 as no TE-EPC contribution is needed.

V. Montabonnet then proceeded to new activities for LS2 PLAN v2.

- 19 new activities under TE-EPC responsibility, mainly concerning consolidation and the East Experimental Area, have been created in the PLAN tool.
- Additional support requests for many other groups have not yet been taken into account in LS2 PLAN v1.

The main concern for TE-EPC is the lack of storage space for irradiated equipment as well as an area for repairing and testing irradiated electronics. Also, TE-EPC will need a buffer area to store converter parts before the test and integration in the power converters. Approximately 1000 m² will be required, including LIU.

TE-EPC needs a strong commitment concerning infrastructure, in particular the platform for the new SVC in MEQ59 and the extension of building 287 for the reception and test facility internal to TE-EPC, as any delay would have an impact on the group activity readiness.

V. Montabonnet concluded that

- resources for all activities in PLAN v1 are available from TE-EPC side as well as support groups.
- resources from TE-EPC are available for activities already entered in PLAN v2. The availability of support groups is being studied.

Comments/Questions:

- Referring to the logistic requirements on slide 24, **L. Scibile** pointed out that the only issue is the outstanding approval. He also mentioned that whenever support for building activities is foreseen, this should be added to PLAN as early as possible in order to allocate resources, in particular if the time frame is tight. Sending the contribution request is however not enough; it is crucial to follow-up during the approval process. **V. Montabonnet** added that discussions concerning both activities are on-going with respect to delivery date.

- **J.M. Jiménez** agreed that a mechanism of feedback is important when decisions were made at the CIP meeting. It is crucial to send feedback via a memorandum to Department Heads and the concerned Project Leaders.
- He confirmed that the budget for MEQ59 has been assured and it must be clarified whether this request can be validated as it is essential for LIU (tbc).

20. EN-EL Activities during the LS2 Period (D. Ricci)

D. Ricci started by giving an overview and a status on the electrical and optical fibres networks. The consolidation that has been done during LS1 was related to LHC network mainly, while for LS2 main intervention will be on the 400 kV and 18 kV networks (SPS and Meyrin) with major renovations. Also the optical fibre network in the LHC has already been consolidated during the LS1, and the LS2 will concentrate on the SPS and the main distribution points on the Meyrin site.

D. Ricci then presented the main projects for the EYETS, YETS and LS2 period:

- LIU/Consolidation – 400kV network projects. **D. Ricci** informed that the priority for the renovation of the 400kV protection system and the consolidation of the 400kV Park in Preveessin will have to be re-discussed with the PLAN team and the LS2 Committee, as they deal with safety.
- 18kV network
 - new diesel generators in Meyrin for ME91, for which the civil works has started, the installation is foreseen during the EYETS, the commissioning during YETS next year.
 - the renovation of main Meyrin sub-station ME9 with an installation and a commissioning during the LS2 period.
- High and Low Voltage networks for the Injectors. Three main categories were listed (see slide 11) for the SPS, PS and PSB. The heaviest workload will be for the SPS. **D. Ricci** asked EN-ACE to pay particular attention to co-activities with other groups and to keep in mind that there are lots of other projects
- Injector de-cabling and new-cabling (mentioned by **M. Bernardini**). **D. Ricci** showed the full picture with priorities : the PS-Booster, then the SPS Point 5 (pilot project for removal of BB5 during RUN 2016), then SPS P5, and the PS ring-center and TT2 spread over YETS and LS2, and the SPS Point 3 during LS2.
- Signal & DC Cables. EN-EL cannot afford to replace irradiated cables in 4 different areas (TDC2/TCC2, TS2, TS4-, TS6+) at the same time. A decision by the LS2 Committee is requested for next year to set priorities on one or two areas. The replacement of the Water-Cooled Cables for Points 1, 2 and 5 is foreseen for the LS2 period.
- Fibre Optics.
 - There is a major consolidation of the backbone and the distribution points, first with the SPS during the EYETS, then, with all the areas accessible during the Runs, starting with LHC, then moving to Meyrin and Preveessin sites.
 - Deployment of the underground fibre infrastructure for the SPS in EYETS and LS2.
 - The survey for the fibrothèque database in all machines for the 3 periods.

Concerning the results of the PLAN v1 exercise, **D. Ricci** indicated that:

- 674 contributions requested from EN-EL including EN-EL activities
- 114 contributions are still in creation phase, with no priority yet assigned, and this is very urgent in order to anticipate the works for the EYETS and YETS.

- Many other large activities are not yet declared in PLAN, and this is also very urgent. Some of the activities concerned are listed: East Hall Upgrade, SPS Fire System, SM18, new data center, CMS and ATLAS activities,...
- The contributions asked to EN-EL were validated up to 55% in June, and up to 75% in October, assumption made that at least the same level of resources as for LS1 will be available for LS2, as requested by the LS2 Committee.
- 91 out of 129 activities are not yet validated in PLAN due to missing technical information. **D. Ricci** requested the users to check the back-up slides of his presentation for details and contact EL for detailed information.

Moving to the resources chapter in his presentation, **D. Ricci** informed that:

- an additional contract for electrical installation is likely needed to be put in place next year to be operational in 2018. A strategy is being developed with Experiments to tailor contract functioning to specific needs, e.g. fibre optics.
- Concerning the CERN manpower, EN-EL was requested to work under the hypothesis that resources will be made available to cover at-max the same volume as LS1. Complements to the existing resources need to be found with fellows, PJAS, Industrial Support and help from other groups.
- **D. Ricci** insisted on the fact that it doesn't seem realistic that all activities (more than 700 and some more to come) can be done. What can be easily achieved is to provide an estimated number of FTE for each activity within limit of sustainable growth. It is the LS2 Committee to recommend if and which corrective measures (increasing core staff, review planning, etc) are to be implemented.

For his conclusions, **D. Ricci** summarizes that:

- 75% validated, Users should provide missing technical information as soon as possible.
- Too many activities are not in PLAN and it is urgent to add them! A suggestion would be to push forward and review the pending activities monthly or even at a higher frequency. Project Leaders are to make sure that EN-EL is aware as early as possible of contribution by introducing them in PLAN.
- Priorities need to be re-discussed with the LS2 Committee.
- Some software developments in PLAN are suggested, to be presented by **S. Meroli** to the PLAN team to facilitate users' life. This is urgent to be implemented in the next few weeks.

Comments/Questions:

- **K. Foraz** commented that she can ask for having all the stages in parallel, but there might be issues with support groups. **D. Ricci** answered that having everything in parallel avoids missing the opportunity to anticipate both at the level of studies and installation. For instance, if there is a time-window opening in machine during an EYETS, it would be very useful to know which priority for future projects is to be picked up and done during the time-window, if possible.
- **J.M. Jiménez** asked about the flexibility and the margins of EN-EL if new activities get approved. **N. Bellegarde** answered that the problem is not for the EYETS, but for LS2 period. EN-EL need to advance and 25% of the request are not yet approved. **J.M. Jiménez** answered that it is not fair to start low priority activity and not finish in the end because priorities have changed. **N. Bellegarde** recommended to estimate the number of FTE for each activity, approve level 1 priorities, then level 2, etc. and, once the limit of the group is reached, to ask for arbitration from the LS2C. It is crucial to introduce newly approved

urgent project as quickly as possible in PLAN to verify feasibility and introduction based on current priorities.

- **L. Pontecorvo** asked why CMS and ATLAS activities are not in PLAN and this is surprising as the Experiments had discussions with the different groups already and they were expecting groups to declare the activities in PLAN. **K. Foraz** answers that projects and experiments introduce the activities, not groups, as they know better the correct granularity and what they want. **A. Ball** strongly disagrees to this statement, adding a simple case as example: CMS needs to have the beam 2 mm lower than today, but he doesn't know how to declare this in PLAN. He agrees that training or advice on this would be welcome. He also added that EP resources are not managed by the LS2C and therefore not in PLAN.

21. BE-CO Activities during LS2 Period (S. Deghaye)

The talk of **S. Deghaye** for the BE-CO group is divided in two parts: Software consolidation and renovation, Hardware consolidation and renovation.

Starting with the post-ACCOR renovation, **S. Deghaye** explains that

- there will be a major renovation of the low-level controls
- part of the controls infrastructure – FESA2, non-InCA framework, RDA2 and PROXY, GM and SLEQUIP, 32-bits machines, X-Motif – will reach its end-of-life. A roadmap to inform users has been issued and is suitable for most of them. Some items are on the critical path like the TE-MS b-train or with high risks as they still need to be validated in terms of technical solutions. This roadmap is being monitored by the CO3 committee.

Concerning the applications and databases consolidation, **S. Deghaye** announces that:

- some public API will be available with no backwards compatibility at the start of LS2, the old format being discarded at the end of LS2.
- The layout service will also be refurbished to focus on layout only – without controls configuration – and the first versions will be available by 2018.
- New database servers and storage – during LS2,
- The suppression of the COPUB public accounts – gradually until LS2,
- The suppression of ADECONTROLS – during LS2.

All the PLAN references are given in the presentation, see slides.

For the second part of the presentation concerning the hardware, the main systems under change are:

- WorldFIP infrastructure - a pilot during the EYETS, full replacement during LS2
- VXI platform eradication as part of the OASIS consolidation – EYETS and YETS is the period for partial removal, removal completed during LS2.
- Triggering network with White Rabbit as part of the OASIS consolidation – complete trigger generation and reception during LS2, gradual switch after LS2. EN-EL topology not finalized yet.
- Timing renovation – only small installations during the TS/EYETS/YETS, full installation during LS2. **S. Deghaye** highlights the IT-CS lack of resources for the moment.
- Migration of the central timing network and renovation with White Rabbit – YETS for the proof of concept, LS2 for deployment, post-LS2 for gradual switch.

- Unreliable legacy hardware replacement with modern industrial solution for the Central timing's external condition renovation in collaboration with BE-ICS – migration during LS2.
- De-cabling project: removal of the identified obsolete cables of BE-CO in the PSB, PS and SPS – EYETS and YETS.
- SPS intercom now integrated in the Fire Safety Project in BE-ICS.
- Replacement of the Technical Network routers and switches (IT). This is a critical activity not funded for the moment – request to the Consolidation program to be done.

For his conclusion, **S. Deghaye** summarizes the main chapter of his presentation and highlights the potential issues encountered so far.

Comments/Questions:

- **K. Foraz** enquired whether this has to be follow up with IT as a client. **S. Deghaye** confirmed that BE-CO will follow up.

22. TE-CRG Activities during the LS2 Period (A. Perin)

A. Perin started his presentation by showing the overall frame for the TE-CRG group, made of two parts, the first one with the activities concerning operation, maintenance and consolidation, the second one concerning projects.

Considering operation, maintenance and consolidation, the following points were presented:

- A new contract has started as of the 1st of July for the maintenance of all cryogenic installations and for the operation of non-LHC cryoplants.
- Major upgrade and consolidation actions are planned for SM18 and B163 from now to LS2.
- For what concerns maintenance and consolidation in the LHC accelerator and detectors for the EYETS, the YETS and the LS2 periods:
 - Compressors and Motor overhauling, mainly to be performed during LS2.
 - Activated charcoal for compressor and safety valves, spread over the EYETS, YETS and LS2. As for the safety valves, a significant number, which are difficult to access, will need to be checked prior to LS2. TE-CRG proposed strategy, to be agreed with HSE, is to check the valves which are accessible without an interruption of operation and postpone non-risk valves to LS2.
 - Helium management during the EYETS – inventory of S1-2 moved to the surface. Very limited risk of losing helium.
 - Sector 1-2 X-rays on all QRL bellows with possible repairs – 2 repairs possible without delaying the EYETS.
 - No major consolidation in the coming years (see slide 9)
 - A series of additional and potential consolidation items during LS2 (see slide 10) concerning mechanical work, controls, and instrumentation.

A. Perin then showed the master schedules used in TE-CRG for the projects, one concerning the HL project, the second one concerning the non-HL projects such as B180, HIE-Isolde, SM18, B163, SM18 and String 2. **A. Perin** announced that cryogenics for crab cavities at SPS BA6 must be operational in 2018 and that EYETS 2016 and YETS2017 are the only available window for installation.

For concluding his presentation, **A. Perin** reviewed the main topics presented, and indicated that operation, maintenance and consolidation are compliant with the requirements of the EYETS and YETS, that the major overhauling is compliant with the LS2 schedule, and that the SM18 and HL-LHC – SPS BA6 and LHC Point 4 – activities are critical projects.

Comments/Questions:

- **K. Foraz** asked if the TE-CRG group has the budget for the LHC consolidation items. **A. Perin** answered that they have it for all the approved ones. **D. Delikaris** confirmed this. However, some hot spares are neither approved nor financed for the time-being. This will be followed up in further discussions. The same applies to the LHC upgrade, presented in the last Chamonix workshop, with expensive consolidation, for instance b-valve.
- **M. Bernardini** mentioned that during LS1, 2 unexpected problems occurred on the DFBA and its bellows. She asked if there is any evolution or consolidation foreseen on the DFBA. **A. Perin** answered that, thanks to the detailed inspections and repairs performed on these bellows during LS1, the probability of further problems is very low.

23. TE-MPE Activities during the LS2 Period (A. Siemko)

1. EIQA Activities during LS2

- The EIQA activities planned for LS2 are similar to those performed during LS1. The group assumes to follow the same groups of activities; 5-10 magnets are to be replaced during LS2 (MSC baseline is 15).
- Apart from TE-MPE resources allocated to these activities, additional external resources will be required. A contract with HNINP Cracow for the upgrade of the EIQA test systems for LS2 is signed and active. A preliminary agreement on an additional contract for resources for LS2 EIQA activities with HNINP has been reached; the addendum is outstanding.

2. DYPQ Yellow Racks – Upgrade of Detection and Protection Electronics for RQ Circuits

- Activities foreseen for LS2 are similar to those performed during LS1. The amount of equipment is however smaller, as instead of the dipoles (approximately 1200 units upgraded during LS1), the main quadrupole circuits (approximately 400 units) will be treated during LS2.
- Internal resources have been allocated; the collaboration agreement for refurbishing/testing is not yet signed. The support from BE-ICS and EN-HE is essential for this activity.
- The main issue is the missing funding (300k CHF) for handling and transport, an expense which was not originally included in the group budget. Furthermore, a part of the required storage space is still to be identified.
- A detailed planning was presented and is now being integrating with the overall LS2 planning.

3. Maintenance of the 600A energy extraction system during LS2

- While being performed at the end of each year, an extended maintenance of more than 600 breakers is foreseen during LS2.
- Both internal and external resources are required. An addendum with BINP Novosibirsk is in the final stage of negotiations.

4. Maintenance of the 13kA energy extraction system during LS2

- The effort is higher than expected due to a recently discovered failure mode in the switches.

- Both internal and external resources are required. An agreement with IHEP Protvino has been signed for EYETS and YETS; the addendum covering LS2 is in preparation.

5. HL-LHC 11T S.C. Dipole Protection

- The QDS digital logic v1 has been produced and validated; the design phase of v2 has been initiated.
- This activity is mainly based on internal resources, however, a collaboration with AGH Cracow for programming has been signed. Support from BE-ICS is essential to include the protection system in the overall controls.

6. QPS Consolidation until the end of LS2

- This includes the consolidation of IPQ, IPD, IT protection and the 600A circuits quench detection, DAQ and current sensors. An upgrade of quench loop controllers for main circuits and the nQPS for automatic recovery of stalled local busses is foreseen as well.
- Internal resources are available; support for BE-ICS is essential.

7. New WIC (Warm magnet interlocks) Deployment until LS2

- The deployment of this type of interlocks is planned in five locations - connecting Linac4, PSB, PS, TT2, nToF and the East Area.
- As for the East Area renovation, all converters and upgraded magnets to be installed must be linked with the WIC. TE-MPE will be able to perform this activity during LS2. The commissioning is foreseen for 2021.

8. LHC Beam Interlock System (BIS) Upgrade to v1.23

- After the identification of the main weakness of optical links in the present system in the machine, TE-MPE is preparing an upgraded version 1.23 in order to ensure that the system will be operational and properly working until LS3.
- The main part of the installation is planned for the EYETS 2016-17 in order to switch to version 1.23 during LS2.

9. LHC Magnet Circuit Re-commissioning including IST and Powering Tests

- This activity is foreseen for the end of LS2 and will be similar to the HWC after LS1.
- It is crucial to increase the level of automation of these tests in order to limit required expert level resources, which are not evidently available, to a minimum.

A. Siemko mentioned that the main overall concerns for TE-MPE are related to logistics and storage, in particular concerning irradiated equipment. RP clearance will be required. No dedicated storage for radiation active QPS equipment to be removed for consolidation could be identified yet. In addition, a buffer storage for removed and later upgraded equipment ready for re-installation must be identified as well.

A. Siemko concluded his presentation explaining that

- all LS2 relevant MPE projects have been launched.
- internal resources have been allocated and external collaboration agreements are either signed or preliminary agreed.
- storage remains the main issue and the new building in Preveessin is important for TE-MPE.
- the vast majority of around 120 contribution requests received from other groups is approved. 7 requests are still pending, mainly due to missing information.

Comments/Questions:

- P. Sollander commented that BE-ICS has not yet received a contribution request for the HL-LHC 11T S.C. dipole protection as well as the QPS consolidation. A. Siemko replied that the requests will be submitted as soon as the final details are known. Some system engineering is still required to establish a full system and a full set of signals to be implemented in the databases.
- M. Bernardini enquired whether a CSCM test is foreseen during LS2. According to A. Siemko, the current planning does not include a CSCM. MP3 will be consulted for the final recommendation, to be approved by the LS2C.

24. Survey Activities during LS2 (D. Missiaen)

D. Missiaen started his presentation with an overview of the activities foreseen for the EYETS 2016-17 as a preparation for LS2.

1. Activities triggered by EN-ACE-SU:

- For the LHC, a vertical survey of two sectors as well as a horizontal survey of one sector are planned. Moreover, a re-alignment of LSS1, LSS5 and LSS6 will be performed.
- Concerning the SPS complex, several activities concerning TI2 (anticipation of LS2) and TT20 are foreseen.
- AD vertical measurements and alignment as well as LEIR, Linac3 and transfer lines will be done in the PS complex.
- For the inner triplets, maintenance and validation will be performed. A new calibration system for in situ calibrations will be used.

2. Contribution requests received

- All requests for AWAKE and ELENA have been validated in PLAN.
- For the experiments, network re-determination around each detector and the alignment of new detectors is foreseen.

D. Missiaen then proceeded to the next phase – the preparation of LS2 after completing EYETS activities.

- In the LHC, the fiducialisation of cryo-magnets for exchange and around 50 collimators must be done.
- Concerning the detectors, surface assembly for ATLAS New Small Wheel, LHCb trackers, etc. as well as CENF must be completed by the end of 2017.
- A consolidation of the inner triplet monitoring system in point 2 and point 8 will be performed.
- While resources for those activities are globally available, one staff is missing for the heavy workload linked to HL-LHC.
- The budget for EYETS is not yet finalised and no budget is foreseen for the IT consolidation (300k CHF). This issue must be discussed with the management of the consolidation project.

Action for EN-ACE-SU to ask for consolidation budget. LS2C to follow-up.

After discussing activities during the EYETS and until LS2, **D. Missiaen** gave details on activities during LS2.

1. Activities triggered by EN-ACE-SU:

- Concerning the LHC, a vertical and horizontal survey of all sectors, a vertical and horizontal survey of LSSs as well as a link to Experiments Networks are foreseen.
- All elements of T18 and TT10 will be measured and realigned in the SPS complex.
- In the PS complex, the connection between Linac4 and PSB and in particular the smoothing of the links must be done.
- Related to the inner triplet monitoring system, maintenance, consolidation and the re-calibration of sensors in Points 1 and 5 are foreseen.

2. Contribution requests received

- Several activities for ATLAS, CMS, ALICE, LHCb and Isolde are planned.
- New components such as collimators and 11T dipoles are to be aligned in the LHC.
- aC coating, a new beam dump as well as crab cavities will be done in the SPS.
- A large number of contribution requests for the PS including the PS ring, TT2 and the East Area have been received.
- Activities on the transfer lines from ELENA to AD are foreseen for 2019; this activity is not yet in PLAN.
- For HL-LHC, many activities such as the surface network (before LS2), orientation of new galleries, link to LHC tunnel, monitoring of LHC components after UPR construction, etc. are planned.

D. Missiaen pointed out that a significant number of contributions has been requested for the PS complex. All are validated in PLAN apart from Isolde lines (pending decision on budget) as well as the East Area and Transfer Lines from ELENA to AD, as for both cases no manpower is available in 2019.

Potential issues during LS2 are co-activities, which might lead to delays when smoothing the LSSs at warm and LHC which must be done below 100K.

As for the manpower required during LS2, **D. Missiaen** stated that

- the manpower should be similar to LS1. The estimation does however include 40% of field staff and a new contractor who has not participated in LS1.
- for the inner triplet monitoring, one fellow and one mechanical technician will be needed.
- while resources for ATLAS have been validated, manpower needs for ALICE, CMS and LHCb are still to be discussed.
- 2 LD staff members will reach the end of contract in 2020.

D. Missiaen summarised that the workload for SU during LS2 will be equally high as during LS1. In particular requests from SPS and PS require a significant number of resources. The manpower issues for the activities concerning the East Area and Transfer Lines between ELENA and AD are still to be solved. The additional workload for HL-LHC represents a challenge as activities need to continue during LS2. Budget issues for consolidation and experiments are to be clarified.

Comments/Questions:

- **B. Di Girolamo** asked whether the coating and the fact that interconnections must be open at Points 2 and 8 was taken into account. The need of surveillance is mentioned in the PLAN activity. **D. Missiaen** commented that EN-ACE-SU has recently been informed and confirmed that the monitoring system will need to be dismantled if the interconnections will be open. Answering **B. Di Girolamo's** comment that co-activities must be well synchronised, **D. Missiaen** mentioned the intention to perform this activity in the end of LS2 in order to avoid any co-activities.



25. A.O.B.

Following a comment during the LS2 Days, **E. Jensen** explained that BE-RF did not have a dedicated presentation as 90% of the activities during the coming years including LS2 are for LIU and HL-LHC. He emphasised that the group is fully committed to those requests. Apart from major activities for the two main projects, consolidation of Linac3 and the AD as well as a replacement of G64s in the PS are foreseen. High priority, but non-critical maintenance work is planned as well. He also pointed out that BE-RF is in contingency mode from a resource point of view.