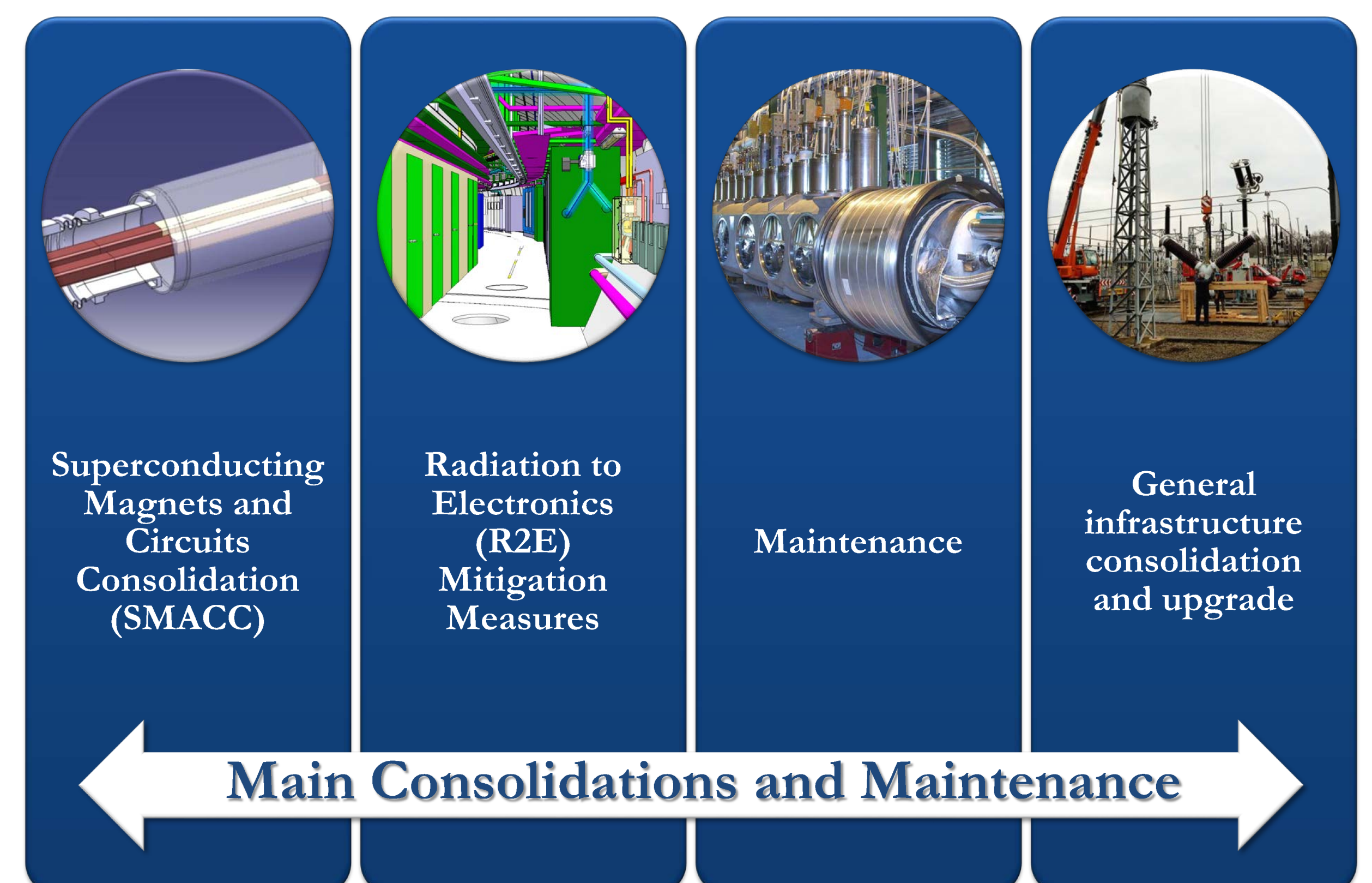
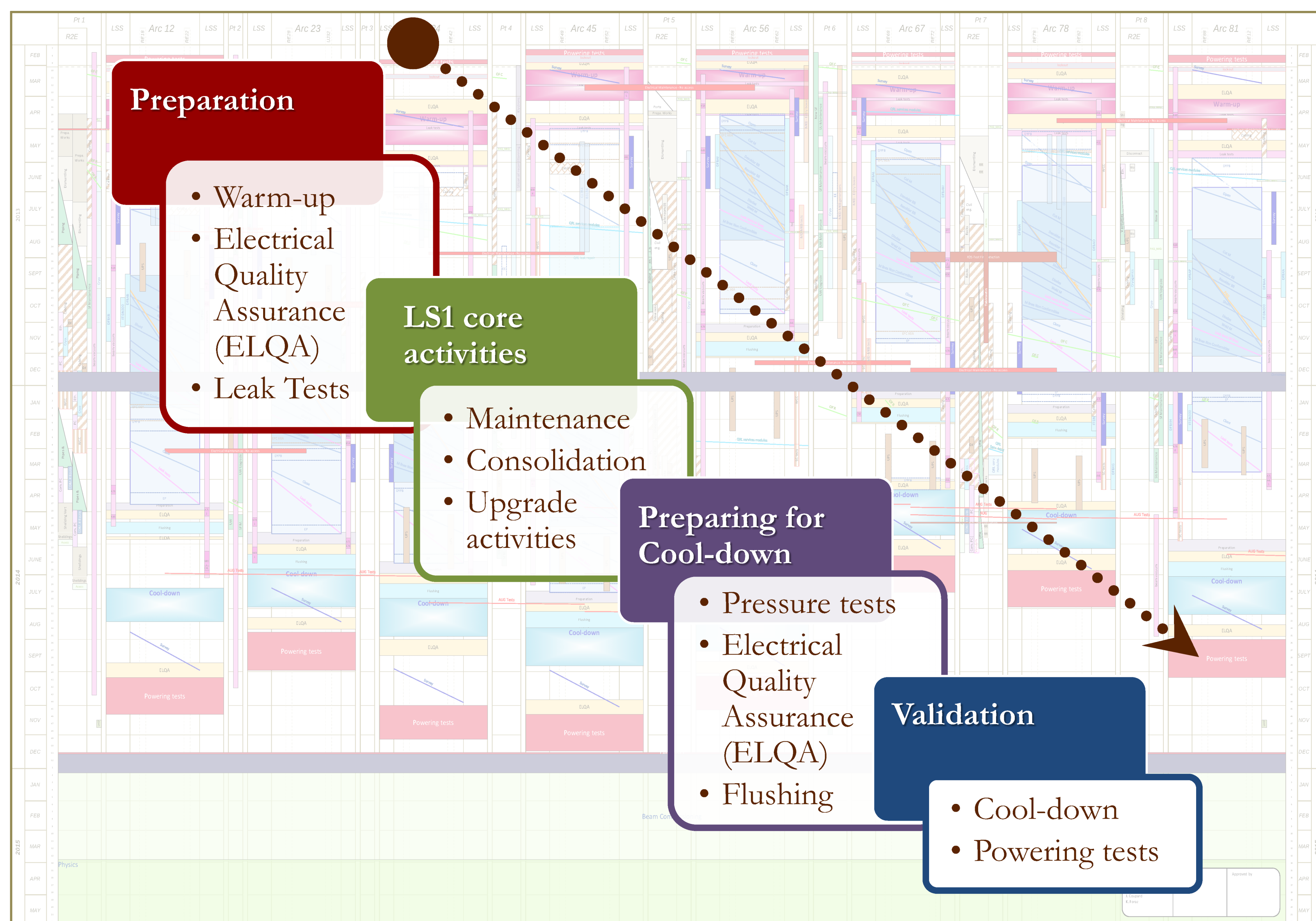


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Abstract

The LHC and its Injectors were stopped in February 2013, in order to maintain, consolidate and upgrade the different equipment of the accelerator chain, with the goal of achieving LHC operation at the design energy of 14 TeV in the centre-of-mass. Prior to the start of this First Long Shutdown (LS1), a major effort of preparation was performed in order to optimize the schedule and the use of resources across the different machines, with the aim of resuming LHC physics in early 2015. The rest of the CERN complex will restart beam operation in the second half of 2014. This paper presents the schedule of the LS1, describes the organizational set-up for the coordination of the works, the main activities, the different main milestones, which have been achieved so far, and the decisions taken in order to mitigate the issues encountered.



The focus of the works, which will be carried out, is on the consolidation of the Superconducting Circuits, the Radiation to Electronics (R2E) Mitigation Measures, and the maintenance. In parallel to the LHC shutdown, it is important to remember that the LS1 also includes major consolidation, upgrade and maintenance activities on the injector complex and on the general infrastructure supporting the accelerator complex.

Organization

All these activities, foreseen during LS1, are highly complicated to organize as they concerns not only the LHC and its experiments, but also the injectors, the associated experiments as well as the general infrastructure systems. Because of all of this, preparation is crucial.

The teams involved

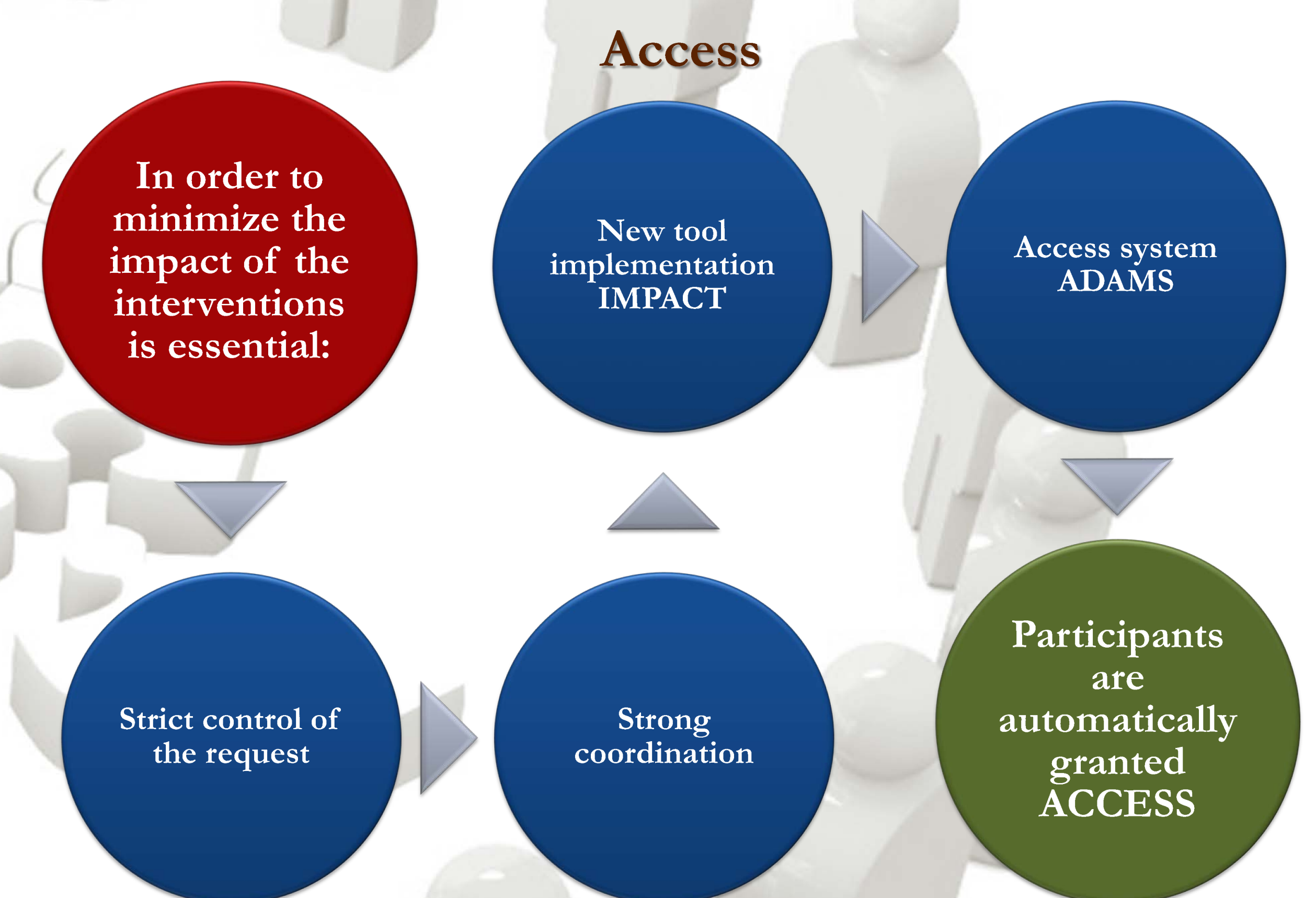
The peak of activities estimated is around 800 persons would be working underground in the LHC. The two major consolidation projects will be performed working two shifts per day, while the associated logistics and the tests (X-rays and electrical) will be done overnight. This will minimise the length of the shutdown.

The workers are either contractors, or CERN staff (of which more than a third is dedicated to LS1), or collaborators from different countries.

During the installation, a central team (EN-MEF) will prepare, schedule, organize and follow up the long shutdown activities. This team will report to the LS1 Committee (LSC).

The safety aspects

- ▶ The interventions are rigorously scheduled to minimize the co-activities.
- ▶ The description, logistics, safety hazards and associated compensatory measures are recorded in Work Package Analysis Documents.
- ▶ While the machine is in operation or short technical stops, the two major risks are the Oxygen Deficiency and the Electrical Hazards. The first phase of the shutdown consists in removing or minimizing those risks, by emptying the magnets and the circuits of helium, and by locking out the main electrical circuits. All the workers have to follow safety courses in relation to the existing hazards.
- ▶ Evacuation simulations have been performed, according to the schedule, to check that, in case of alarm, the evacuation of all the workers will be possible and to prevent the access of more workers than can safely be handled.
- ▶ In addition, the authorization to start each activity is subject to the approval of the coordination team and the safety coordinators.



Conclusion

The parenthesis for a challenge will be challenging! This first long shutdown involves a high number of personnel, and includes essential activities to ensure a safe and reliable operation of the LHC at around nominal energy. All the activities were carefully studied and planned, and the necessary resources allocated.

The LS1 has just started and so far, all the activities are progressing according to the schedule.