ELETTRA 2.0 – STATUS OF THE REMOVAL & INSTALLATION ACTIVITIES

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Abstract

On July 2, 2025, at Elettra, we began the "Dark Period" (DP): the definitive shutdown of Elettra's Storage Ring (SR) with its auxiliary equipment and most of its beamlines. During the first phase of the DP, we removed the entire SR lattice structure with its associated cabling, piping, and supports. At the same time, the Service Area (SA), where most of the equipment for operating the SR was and will be located, was emptied to allow for infrastructure work and the subsequent installation of new racks and equipment. "On the other side of the wall," most of the photon beam lines are being reconfigured, upgraded, or installed, which involves several changes to the configuration of the SR tunnel's outer shielding wall. The paper describes the status of DP activities, the difficulties encountered, and the mitigation strategies adopted. Logistics plays an important role in this scenario, organizing the handling, transport, storage, and arrival times of materials, equipment, and instrumentation racks. This flow is bidirectional and includes both what is removed and disposed of and the parts to be installed, with a significant coexistence of old and new material.

INTRODUCTION

After the first "stored e-beam" occurred in October 1993, over the years, Elettra received several improvements, the most relevant of all was the installation of the booster-based full energy injector in 2008 and the subsequent start of Top-up operations in 2010 [1].

Elettra 2.0 is the upgrade project of the existing Elettra synchrotron light source (see, e. g. [2]) with the complete replacement of the Storage Ring (SR) with a new low-emittance ring and the enhancement of the beamlines either with the upgrade of existing ones or the installation of new ones.

"The Final Beam Dump" on July 2, 2025 ended the 31-year long career of Elettra, starting the removal phase of the old accelerator from SR and its ancillary systems in the Service Area (SA). The decommissioning of the SR, including the removal of the concrete supports of the magnets, was completed on December 5, 2025.

The installation phase of the accelerator will begin as soon as the construction company has completed the first two sections and handed them over to Elettra's teams (as of end of May 2026 at the time of writing).

The activities on the beamlines in the Experimental Hall (EH) of Elettra comprise the removal of some obsolete beamlines, including their shielding hutches, the upgrade of some beamlines that keep the same position in Elettra 2.0 and the installation of three new beamlines and associated hutches.

During the previous years we anticipated many activities on the beamlines and on the shielding wall of the Storage Ring [3, 4]. We also addressed several logistics aspects with focus on the handling and storing of the old parts from Elettra and the new ones for Elettra 2.0 [5]. The so-called "Main Building" houses the SA, the SR, and the EH, and is also undergoing significant plant engineering work.

STORAGE RING AND SERVICE AREA

Following the LOTO of the plants and systems and the radioprotection initial checks, we started to remove the ~ 400, 5-ton each, concrete slabs covering the SR tunnel (Fig. 1), exposing the ring for its removal (Fig. 2).

Figure 1: Slabs removal from SR roof.

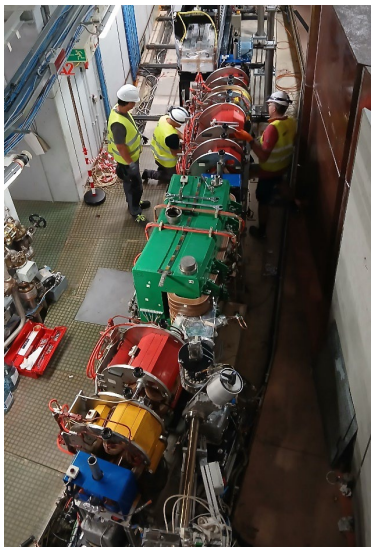

Figure 2: View of the SR (roof removed).

In parallel, in SA, after protecting the equipment to reuse and that had to stay *in situ*, with the support of an industrial demolition company, we completely removed all racks,

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cabinets, switchboards, and cables. By mid-September 2025 the SA was emptied and handed over to the construction company for the civil and plants works. The last magnet from the SR, a dipole, was extracted on November 11, 2025 (Fig. 3), granting the construction company full access to the SR.

Figure 3: Removal of the last magnet from SR.

At the date of this paper the construction company is active in both the SR and SA. The new concrete foundations in the SR have been completed while it is ongoing the grouting of the steel base plates for the granite blocks supporting the girders with the magnets of the SR (Fig. 4).

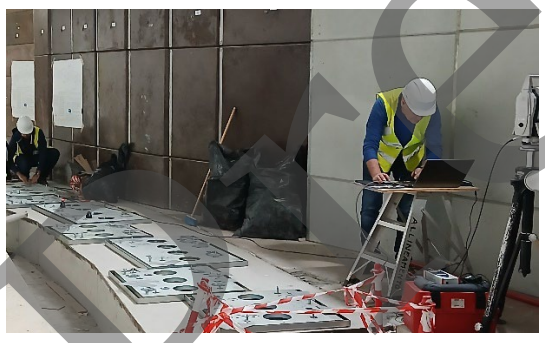

Figure 4: Base plates alignment prior grouting in SR.

In the SA the first two zones – corresponding to a sixth of the full area – are going to be handed over to Elettra for starting the installation of the 19" racks hosting the magnet power supplies and other equipment for the SR.

EXPERIMENTAL HALL

With the beginning of the "Dark Period" (DP) the former beamlines of Elettra have started their upgrade or complete removal (see e. g. [6, 7]). At the time of this paper, five beamlines have been removed and their hutches dismantled either for re-use or dispose and the hutches of two new beamlines have been installed. At the same time, the fluid and electrical plants of the beamlines' hutches – new or modified ones – have to be installed or updated, too. These activities heavily involve the Infrastructure Sub-Programme of the Elettra 2.0 Project.

LOGISTICS

Building a new Light Source (or any other type of accelerator) from "green field" requires a well-in-advance planning of the logistics aspects – scheduling of arrival and temporary storage of new parts, handling and transportation of components to install, definition of internal pathways for large vehicles (e.g. 16-meter-long TIR trucks) – to prevent "traffic jams" and congestion in the construction site. The complete removal of a previously operational accelerator, followed by the installation of a new machine along with the necessary building and mechanical/electrical works, significantly complicates matters.

Internal Transport Pathways

Over the course of Elettra's operational life, in addition to the replacement of the injector [1], several upgrades and modifications were carried out, including the construction and commissioning of the FEL-based FERMI light source (see, e. g. [8, 9]). FERMI, in particular, introduced changes to the internal pathways, making the passage of large trucks more difficult (Fig. 5).

Figure 5: 16-meter-long truck accessing the Main Building for unloading instrumentation racks.

Storage of Old and New Components

The materials extracted from the SR – magnets, vacuum chambers, cables, pipes, etc. – must be "characterized" by Elettra's radiation protection team and, following these measurements, their disposal or removal must be authorized in advance by the competent national authority. It is therefore necessary to find and properly equip a suitable space for their temporary storage. For this purpose, we have built a 700-square-meter building equipped with heavy duty shelves for storing the palletized magnets and industrial boxes containing the cut cables, pipes, and other materials. Figure 6 is a partial view of this building; the wooden boxes contain part of the new multipole magnets for Elettra 2.0 waiting to be transferred to another building for the magnetic tests and assembly on the girders (Fig. 7) prior installation in the SR. This building was also custom-built and houses the magnetic measurement and vacuum

assembly laboratories, along with heavy duty shelving for storing components to be assembled.

Figure 6: Old SR magnets temporary storage building.

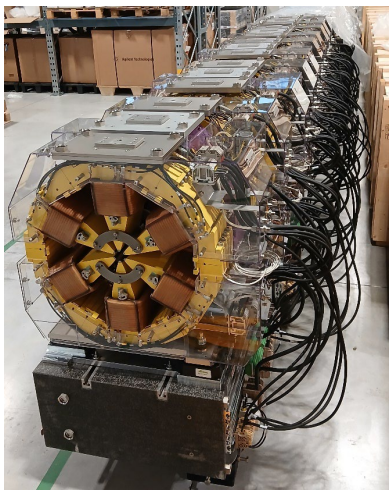

Figure 7: Multipole magnets assembled on the granite girders, ready for installation in SR.

ADDITIONAL CHALLENGES

There are currently three construction sites underway in nearly the same areas and at the same time: work related to energy efficiency improvements, carried out by a contractor as part of a public-private partnership; civil engineering and systems installation work in SR, SA and EH, carried out by the construction company; and, finally, work related to the installation of equipment and beamlines carried out by Elettra's staff or by contractors directly supervised by Elettra. Figure 8 shows the cranes around the Elettra's Main Building for the energy efficiency improvement works (the grey one is a permanent installation for Elettra.

Figure 8: Cranes around the Main Building of Elettra.

From the logistics point of view, an anticipated delivery, is sometimes more critical than a late one. Handling and storing many boxes and pallets, often both heavy and fragile, with a very short notification can create some logistics headaches, also considering the need of defining transportation "time slots" compatible with the work of the other two construction companies.

CONCLUSION

The E2.0 project has completed the removal phase and has begun the installation phase.

There are three concurrent construction yards on the premises dedicated to civil and plant engineering work, as well as to the construction of the machine and its beamlines. Logistics – including both the storage and management of materials to be kept for varying lengths of time, as well as the transport and handling of parts removed from the machine and those that need to be assembled and installed – plays a very important role in the smooth progress of the project.

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