

SPring-8-II

SPring-8, which began user operation in 1997, is Japan’s flagship third-generation synchrotron radiation facility. It has long been recognized as an indispensable platform for cutting-edge academic research and innovative industrial technology development. Although it boasted world-leading performance at the time of its launch, more than 25 years have passed, and the global trend has shifted from third- to fourth-generation light sources. To meet growing social demands, control rising maintenance costs due to aging, and ensure that SPring-8 continues to serve as a driver of innovation, calls for a major upgrade—hereafter referred to as *SPring-8-II*—have intensified.

RIKEN and the Japan Synchrotron Radiation Research Institute (JASRI) established a joint design team for SPring-8-II and published a Conceptual Design Report (CDR) in 2014. The concept has since been refined several times, incorporating design and operational experience gained from NanoTerasu, further improving its completeness. With the completion of NanoTerasu in FY2023, momentum toward realizing SPring-8-II grew rapidly. In the FY2024 initial budget, “Development Expenses for the SPring-8 Upgrade” were allocated for the prototype fabrication of key components. Throughout FY2024, various activities have been underway in preparation for the full-scale launch of the SPring-8-II Project, as outlined below.

In April 2024, RIKEN implemented an organizational reform to strengthen its preparation for SPring-8-II, establishing new accelerator-related groups and the *Strategic Office for SPring-8-II Project*. Around the same time, the Governor of Hyogo Prefecture, the mayors of Sayo Town and Tatsuno City, and representatives of local economic organizations visited the Ministry of Education, Culture, Sports, Science and Technology (MEXT) to request that the national government secure funding for a national project, thereby ensuring Japan’s continued leadership in international research and development utilizing synchrotron radiation and steadily advancing the comprehensive upgrade of SPring-8-II.

In June, the SPring-8-II project underwent an international review by an expert committee. The review report highly commended the project, noting that the technical feasibility had already been demonstrated through the design and construction of NanoTerasu, that preparations for launching SPring-8-II were fully in place, and that there were no significant issues in achieving the target performance. Consequently, the committee recommended the immediate start of the SPring-8-II Project.

In October, a paper outlining the design principles of SPring-8-II was published in the *Journal of Synchrotron Radiation*, one of the most prestigious international journals in the field of synchrotron radiation. The design combines several innovations—such as reduced storage-ring energy enabled by advances in insertion-device technology, the replacement of bending magnets with permanent magnets, the time-sharing use of the SACLA linear accelerator as an injector, and the adoption of a multi-bend achromat (MBA) lattice—to achieve roughly a 100-fold increase in source brilliance while halving power consumption. This design simultaneously addresses the ageing of SPring-8 and delivers a substantial enhancement in performance and energy efficiency.

As a result of these consistent efforts and strong requests from multiple stakeholders, the national government approved SPring-8-II as a five-year, ¥49.9 billion project under a multi-year commitment, with an initial allocation of ¥17 billion in the FY2024 supplementary budget. This decision marks the official start of the upgrade process, which will be carried out over five years, including about one year of shutdown for installation and commissioning.

In the future, the SPring-8-II initiative is expected to continue accelerating, necessitating strengthened collaboration among all related organizations. Through close cooperation with all stakeholders, the project will steadily advance toward the commencement of user operations in FY2029.