Wendelstein 7-X prepared for the next operation phase

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Wendelstein 7-X is an optimized stellarator with approximately quasi-isodynamic equilibrium. During the first operational phase, the heating energy absorbed by the plasma was limited to 4 MJ, the discharge length was limited to 6 s, and five inboard graphite limiters formed the plasma boundary. The first wall was all metal consisting of steel panels and CuCrZr heat sinks, the latter designed for coverage with graphite tiles. Despite these unfavorable wall conditions, a successful first physics program could be conducted during the first operation phase [1]. The next step in the development of the device is the installation of 8500 graphite tiles on the heat sinks (some of them already water cooled) and the assembly of ten island divertor modules with inertially cooled graphite target elements. These assembly works are completed within time and budget and the maximum allowable heating power absorbed by the plasma can be extended to 80 MJ. Plasma densities $\sim 10^{20}$ m$^{-3}$ at electron and ion temperatures 6-8 keV are expected and allow to develop credible discharge scenarios for divertor operation, especially in the high-recycling regime and detachment [2].

In addition to the improved wall, the heating capabilities and the diagnostics setup of Wendelstein 7-X are significantly extended. Accordingly, the control and data acquisition and data storage systems have been subject to a major upgrade, too. Finally, measures have been implemented to support safe operation of the superconducting magnets, even with imperfections in the high voltage insulation. The present paper reviews the current development status of Wendelstein 7-X and discusses the extended operation windows for the physics program of the coming plasma operation phase.
