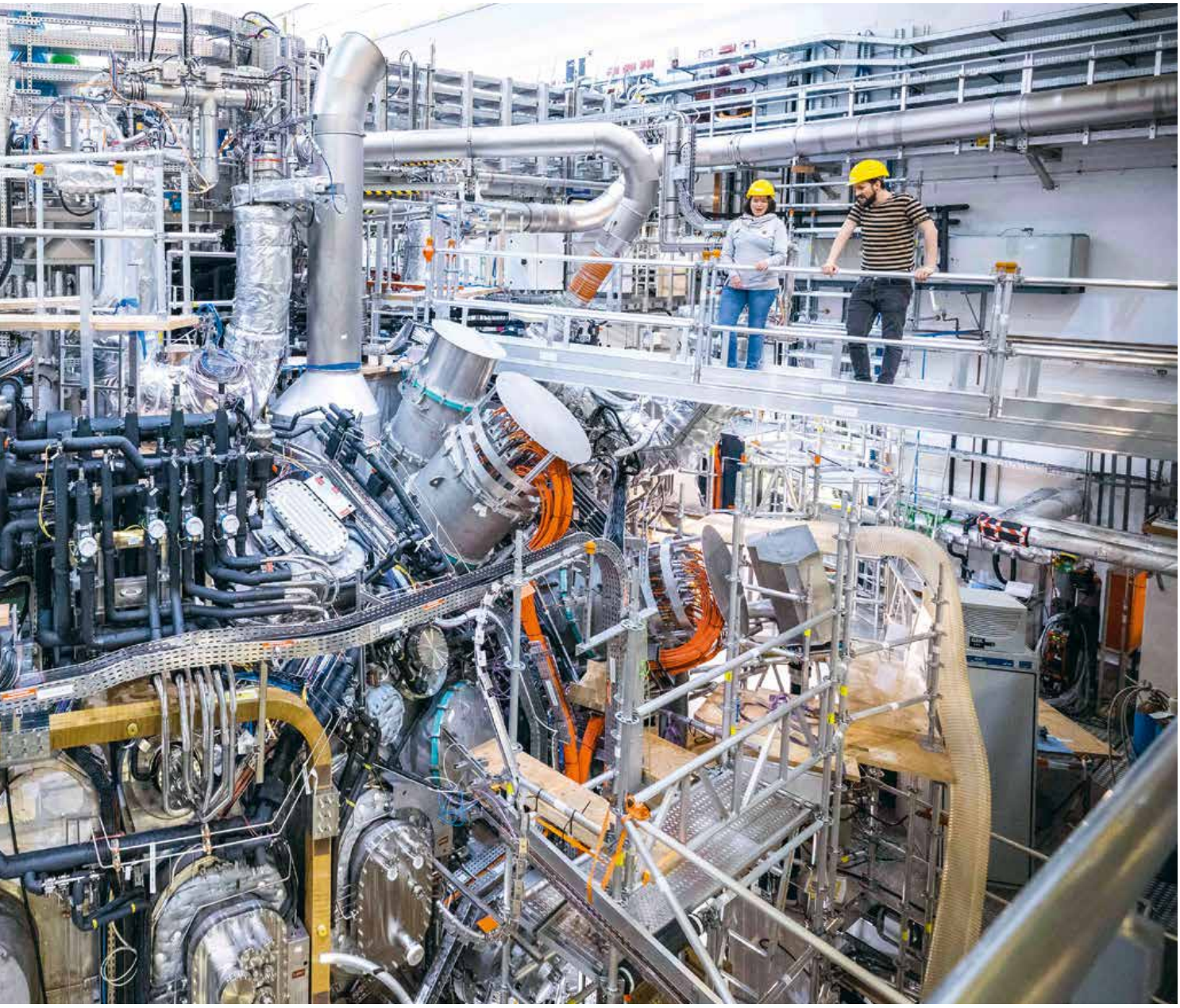
CAPTURED SUN

Cables and conduits, hoses and pipes surround this large apparatus like a cage. The assembly standing in the Max Planck Institute for Plasma Physics is Wendelstein 7-X, the world's largest and most state-of-the-art stellarator nuclear fusion installation. Researchers here are attempting to force atomic nuclei to fuse as they would in the sun. They have constructed an annular chamber from metal and graphite plates with a diameter of five-and-a-half meters for this purpose. The chamber will be filled with hydrogen gas that is to be transformed into plasma with a temperature of 50 million degrees. Plasma is known as the "fourth aggregate state," in which the electrons and nuclei in atoms separate from each other. When the plasma "burns," the atomic particles collide with great force and can fuse, which releases large quantities of energy that could be used to fuel power plants. That is the long-term goal of this research (see the infographic on page 24).

To generate plasma, electromagnetic waves heat up a few milligrams of gas. One of the greatest challenges is keeping the plasma, and thus the fusion reaction, stable over a longer period of time. Wendelstein 7-X is intended to prove that continuous stable operation is possible for 30 minutes. The stellarator uses 50 enormous magnetic coils for this purpose. They are positioned around the plasma chamber and essentially keep the plasma hovering in a magnetic field. To make the coils superconductive, the magnets are cooled to a temperature of -270 degrees Celsius.

Most of the conduits in the image are part of the cooling system. The other technology monitors and controls the plasma inside the chamber. Various measurement devices are located on the thick, protruding pipes. These measure values such as the temperature, pressure, density, and composition of the plasma. In the most recent phase of the experiment, the research team succeeded in heating the plasma to 20 million degrees and maintaining that temperature for eight minutes. Some 1.3 gigajoules of energy were used, and the goal is to increase this amount to 18 gigajoules in the coming years.

ON LOCATION



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