We are building a second sun!

In France, near Marseille, created a project whose goal is to thermonuclear fusion. If the experiment succeeds, mankind will have access to virtually energy sources.

Fusion reaction, or nuclear fusion is the junction of two lighter atomic nuclei into a heavier. As a result of this process emit gigantic amounts of energy. This produced in the sun arises in this way. Scientists have long wish to play a fusion reaction under controlled laboratory conditions. Unfortunately, from a technical point of view, it is extremely complicated. The resulting cost of 10 billion international thermonuclear Experimental Reactor (ITER) project is the first time in history to carry out cost-effective response to the merger. The main obstacle that hinders the merger is the fact that atomic nuclei are endowed with the same, a positive electric charge and therefore repel each other. Only at extremely high temperatures kernels may collect the amount of energy needed to overcome this barrier. Although the fusion reaction inside the sun occurs at a temperature of several million degrees centigrade, then it runs slow. On the one hand, thanks to the fuel burns very slowly and the star can shine for billions of years, but the other one cubic meter of solar energy kernels are separated from the power of less than 4 watts. To venture was profitable in thermoreactor there must be a temperature 150 million degrees Celsius. So far, none of the experimental reactor did not achieve such high temperatures. In the ITER hydrogen isotopes will be heated simultaneously in three ways - by the current flowing through the electrical circuits, microwaves and beam atoms excited (higher energy) - accelerated in the small particle accelerators placed around a reactor. Scientists predict that the amount of energy obtained will be ten times greater than inserted. But first we must construct the reactor, inside which the plasma will be more than ten times hotter than the sun. Even the most durable of known materials can not withstand temperatures greater than a few thousand degrees. Solution is to create a sort of cage of magnetic fields. Fuel will be called inside reactor. Magnets located on the outside of the ring form a spiral field, through which plasma to remain in one place. Will be used for their construction Superconducting coils of tungsten alloy with a total mass exceeding 10 thousand tonnes, cooled by liquid nitrogen. Another challenge engineers will be mass-produced neutrons in the reaction. Because they are electrically neutral, can easily pass through a magnetic field, so despite the presence of a magnetic frame, plasma is emitted outside megawatts of energy. Neutrons bombarding the walls surrounding the reactor will generate enormous heat. - "And that's what the heat is the end result of mergers, for which we want" - says Mario Merola, director of the department responsible for the ITER reactor internal parts. The walls surrounding the reactor (called the mantle) will be constructed of 440 steel plates thickness. Will be placed inside a tube, in which high-pressure water flow. Steel most issued from the reactor neutrons, which give to the energy as heat. The distance between the pipes containing hot water outlet does not exceed 2.5 centimeters since otherwise the steel. Neutrons emitted during the reaction have the ability to destroy the crystalline structure of all compounds they encounter on their way. Scientists are not worried about the strength of the mantle, however, because the crystalline structure used for the construction of austenitic steel (known to every day with cutlery and washing machine drum) is very stable and persists even when many atoms are minted from their seats. Therefore, the scattered neutrons can strike iron atoms from the surface of the mantle and sandwich them inside the reactor, the walls inside are covered with beryllium. Since this is a very light element, even if its atoms to enter the reactor and blended with the hydrogen isotopes do not interfere with the merger. The project assumes that each reaction in the reactor Fusion Reactor will be supported by approximately 1000 seconds, reaching 500 megawatts of capacity. If all goes according to plan based on the ITER power reactors rise to 4,000 megawatts.