Marcoule : G1, G2 and G3 reactors for plutonium production

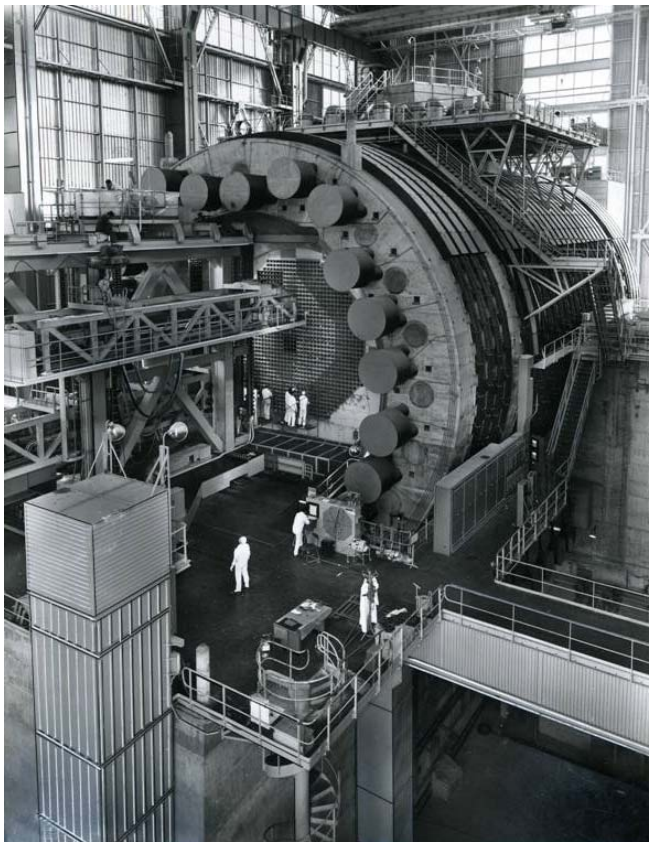
In the 1950s, the Marcoule site of the French Atomic Energy Commission, in the department of Gard, was selected for the first industrial-scale reactors for producing plutonium.

The technological choices were based on the use of natural uranium as the fuel and graphite as the moderator.

The G1 (G for graphite) reactor, first of the series, was built in 1955 and commissioned in 1956. Air-cooled at atmospheric pressure, with 46 megawatts of thermal power, it was also the first French reactor to generate electricity using nuclear reactions. It was operated until 1968.

The design of G2 and G3, initiated in 1954, included a number of improvements, notably the use of pressurised carbon dioxide (CO_2) for cooling. The two reactor units were cylinders measuring 34 m in length and 20 m in outside diameter. The walls were 3 m thick and made of concrete pre-stressed by 161 cables exerting 1200 tonnes of pressure.

The graphite moderator block (1200 tonnes) contained 1200 horizontal channels for the fuel and 51 vertical shafts for the control and safety rods. The total length of the cooling lines, in which CO_2 circulated at a pressure of 15 atmospheres, was 1672 m per reactor. The diameter of these lines varied between 0.5 and 1.6 m.



View of the G2 reactor unit, with the fuel loading system in the foreground and the platform for the control rod winches above the reactor

Having 250 megawatts of thermal power per unit, the G2 and G3 reactors operated from 1958 to 1980 and from 1959 to 1984, respectively. During this period, they produced plutonium for national defence purposes and also supplied the electricity grid with 11 billion kWh.

The G2 and G3 reactors on the Marcoule site