

28 January 1960

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## THE FRENCH NUCLEAR ENERGY PROGRAM

France's nuclear weapons program has a broad base in research going back to prewar days and in reactor construction, but it lacked adequate government and public backing until the Suez crisis in 1956 gave it an impetus which De Gaulle's coming to power accelerated. Plans for large-scale nuclear production of electricity now may get less emphasis, both because of the growing availability of conventional power and because of the heavy stress on nuclear weapons as a means of strengthening France's claim to great-power status. The first French weapons test--likely to begin in February near Zaouiet Reggane in the French Sahara--is expected to be a series of atmospheric shots, probably followed by underground tests later.

Although French scientists pioneered in the prewar re-

search on which military and peaceful applications of nuclear energy are based; postwar economic and political difficulties in France seriously crippled initial efforts to launch a national atomic



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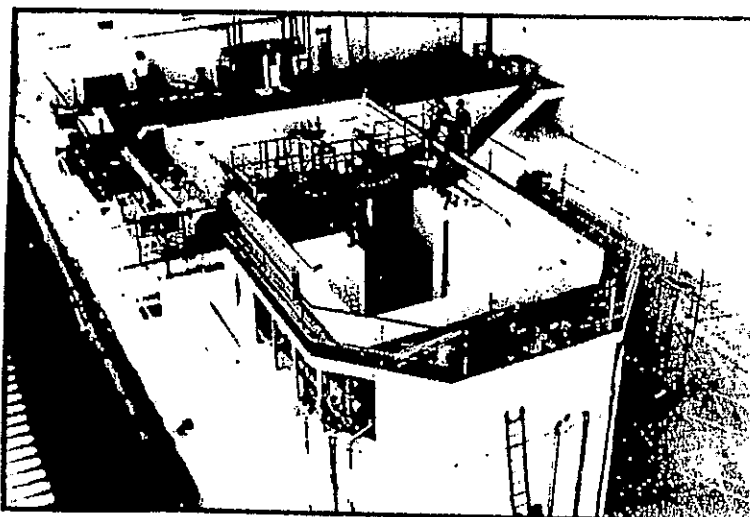
energy program. De Gaulle founded the Atomic Energy Commission (CEA) in 1945, but little else was done until the approval in 1952 of a "five-year plan" which led to the establishment of a large plutonium production facility at Marcoule.

The weapons program was long only a drawing-board project, closely guarded because of the emotional mood of French public and scientific opinion against nuclear weapons and because of the security threat posed by heavy Communist infiltration of the CEA. Only a few individuals, among them De Gaulle, publicly called for a national nuclear weapons program.

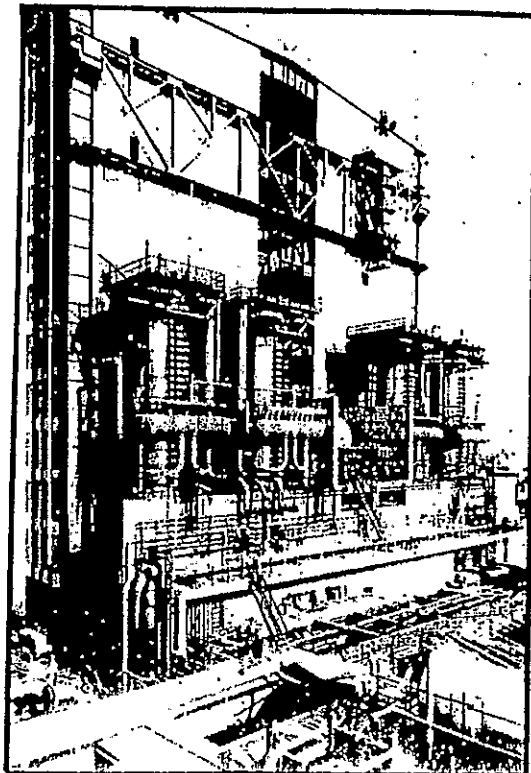
The government went on record in 1955 in favor of a "peaceful-uses-only" policy, but this was abandoned in 1956, when a rightist bloc successfully fought for a reservation giving France a military loophole as the price of accepting EURATOM.

"Peaceful Uses" Program

Seven research reactors at three centers--Saclay, Fontenay-aux-Roses, and Grenoble--provide experience in the operation of different types of reactors and training for technicians. A fourth research center--at Cadarache, near



Cadarache Pool Reactor at Grenoble



Atomic Pile at Marcoule

Marseille--will house three advanced reactors. France also has extensive deposits of uranium ore.

In addition to the electric power produced as a by-product at the Marcoule facility, three natural uranium reactors designed primarily to produce electricity are being built near Chinon by the French national electrical monopoly (EDF) in conjunction with the CEA. Reactors EDF-1, -2, and -3 are expected to raise France's installed electrical capacity of nuclear facilities to 850 megawatts by 1965. Completion of EDF-1 is expected near the end of 1960 and of EDF-2 at the end of 1961. Rumors that EDF-3, still in the planning stages, will be canceled have been officially denied.

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Although France is a heavy importer of electricity and future energy demands are projected on a sharply rising scale, EDF estimates that nuclear power reactors will provide only 1.5 percent of total energy needs in 1965. Nuclear-source electricity costs now about twice as much as that from conventional facilities. Even if the EDF nuclear reactors at Chinon can--as expected--reduce the production cost to approximately nine mills per kilowatt-hour, this figure would still not be competitive with the present thermal generator cost of five mills. Rapid exploitation of the oil and natural gas discoveries in the Sahara, new hydroelectric projects, and additional large thermal generators now under construction will further lower the costs of conventionally produced electric power.

Nevertheless, the present high cost and low volume of nuclear-produced electricity is justified primarily by the training and experience gained and by the officially expressed hope that nuclear power reactors, "some years from now," will provide the cure for France's energy deficit.

#### Weapons Program

French public acquiescence in a national nuclear weapons program stems from the Suez fiasco, which helped generate a more nationalist viewpoint on many foreign and military policy issues. Although occasional qualms were still voiced--even by Francis Perrin, the head of the CEA and one of France's ablest physicists--the military program was pursued thereafter with increasing vigor. A recent explanation of the nuclear program to the Senate by Deputy Premier Jacques Soustelle was enthusiastically received by all but the Communist members.

When De Gaulle took office in mid-1958, he gave new empha-

sis to the entire nuclear energy program, and particularly to the preparations for nuclear weapons test. General Buchalet, chief of the military applications division of the CEA, told American representatives in June 1958 that De Gaulle regarded atomic energy as a crucial issue of the same importance for France as constitutional reform and Algeria.

#### Weapons Test and Plans

The recent delay in the first French test has been primarily due to technical difficulties--e.g., producing the proper isotope of plutonium--problems of weapons research and development, and a shortage of trained personnel. The most recent postponements may have sprung from the desire to install test measuring equipment--much of it purchased from American firms--to obtain maximum diagnostic data.

The initial test series--the first shot of which will probably be a 300-foot tower shot yielding about 20 kilotons--is likely to be followed by underground tests. Buchalet has stated that France, if it fails to receive US underground test instrumentation data, intends, regardless of the cost, to acquire test measuring instruments to make possible effective monitoring of underground tests. Aside from the technical information to be gained, underground tests might have the advantage of lessening international political opposition to further French tests by removing the danger of radioactive fallout. They could also be closely tied to such peaceful uses as excavating harbors and exploiting deep petroleum deposits.

A \$110,000,000 gaseous-diffusion plant now under construction at Pierrelatte could provide the base for an advanced nuclear weapons program. The plant is designed to produce enriched uranium for

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increased reactor efficiency, and is expected to be producing non-weapons-grade U-235 by 1962. If expanded, it could produce by 1964 the highly enriched uranium needed for advanced nuclear weapons. Recent statements by Buchalet and Francois de Rose, coordinator of atomic affairs in the French Foreign Ministry, that France is planning to develop hydrogen weapons suggest that a decision has already been made to expand the gaseous-diffusion plant.

### Foreign Policy

The 1960 military budget ranks establishment of a French nuclear striking force second only to Algerian operations. Admission to the "nuclear club" is a symbol in French eyes of immediate parity with the other nuclear powers. The visit of Soviet Premier Khrushchev to France on 15 March and De Gaulle's insistence on delaying the East-West summit meeting until spring are both closely related to the timing of the French testing program.

De Gaulle may also ultimately envisage complete European control of a deterrent that could be used in defense of Europe's interests without dependence on American retaliatory weapons. A European-controlled deterrent is seen as a means of increasing Europe's over-all power position and perhaps of enabling it to act as the mediator between East and West.

### International Agreements

France's advanced national nuclear research and reactor

construction program assure a leading role in the International Atomic Energy Agency (IAEA), EURATOM, and the Center for European Nuclear Research (CERN). Paris has negotiated bilateral agreements with the United States covering civil uses of atomic energy and the transfer of enriched uranium for use in a land-based prototype submarine nuclear propulsion plant. Bilateral agreements also exist with Britain, India, Israel, Sweden, and Belgium--the last covering joint construction of a reactor in each country.

West German and Italian collaboration in the French atomic energy program is ostensibly limited to nuclear research and the peaceful uses program, and any collaboration on weapons is vehemently denied.

French participation in international nuclear energy agreements--covering either peaceful or military uses--is likely to be concentrated on bilateral or small-group agreements in which Paris would have assurance that its interests would not be subordinated. Aid, especially in the weapons field, will be welcome only if granted with a minimum of caveats limiting development of the national program.