It is a sign of the relative political strengths of the two programs that, when SCAD got into trouble, it was merely canceled; when the B-1 encountered problems, a massive corporate public relations campaign was mounted to protect it.

The Present

This year's fight over procuring the B-1 is the culmination of a 15-year effort by friends of the manned bomber. Administration officials, to say nothing of President Ford himself, are squarely behind the plane. The importance of this full-fledged Administration support was recently explained by a Senate staffer:

> The conditioned reflexes of Congress are against anyone trying to beat a proposed weapons system. It is stacked the worst in the House. In the Senate, there are 45 automatic votes for any system that the President and the Armed Services committee endorse, and only 30 votes against it. Even if you should beat these odds, when you go to conference, you are faced with some of the most inflexible members of the House. They're willing just to sit there all summer without changing a single comma just to get their way.

Advocates of the standoff option have been helped by the publication, early this year, of a Brookings Institution report which concluded that the standoff cruise missile, aided by air-launched ballistic missiles, was the most cost-effective option and that the B-1 program should be canceled. Nonetheless, the foes of the B-1 are still not unified on this option.

Cruise missile advocates are also not helped by having to skirmish with the Air Force over other problems. For example, the Air Force is studying an advanced tanker-cargo aircraft which Richard Garwin, of the IBM Corporation, an influential defense consultant and long-term champion of the standoff option, has testified should be designed also to be the cruise missile carrier. The Air Force denies, however, that the plane should be planned to do this since "there is no operational requirement" for a cruise missile carrier. Discussion of the design for this tanker has absorbed hours of congressional testimony and has become a controversy in its own right.

There are finally some signs that the either-or terms of this long-standing debate are shifting toward some sort of compromise: the Air Force may end up building the B-1 and a standoff cruise missile force too. The Pentagon is just releasing portions of the largest study it has ever undertaken of what actually can happen in a bomber attack on the Soviet Union; called the Joint Strategic Bomber Study (JSBS) it was managed by the DDR & E with Air Force and other groups participating.

"I think it has redefined the issues" says John B. Walsh, deputy director of DDR & E for strategic systems, whose office ran the massive computerized war games. "It concludes that you need both bombers and cruise missiles; the bombers to attack heavily defended targets and the cruise missiles to attack targets which are not heavily defended, that is, the majority of targets. And, among the different kinds of bombers needed to do the job, the one which can do it most cost-effectively is the B-1 bomber."

(The JSBS has many critics, but most admit it is DOD's first major cost-effectiveness study of various bomber forces—something not done before the green light given the B-1 in 1970.)

The JSBS says on the elevated plane of strategic analysis what some observers have been saying on the earthier level of Pentagon realpolitik. According to this view, a limited number of B-1's will be built, but, ultimately, the program will become too costly and be canceled. Then, long-range cruise missiles will be developed instead. The B-1 will have won, but the cruise missile will also have its day.

Observers of the Pentagon often offer a single interpretation of the controversy, which was expressed most colorfully by Marvin Goldberger, the Princeton physicist who has long been an adviser on weapons, as he remembered the pilots of World War I and the movies and books which glorify them. "I once testified, albeit facetiously, that the Air Force doesn't want the B-1. They don't want the windshield. They want to have the wind blowing past them, their helmets and goggles on, and long, white scarves around their necks and flowing out behind."

A high Pentagon official who has been intimately involved in the B-1 debate laughed when this statement was read to him, then added: "Let's just say that the Air Force *knew* there was going to be a new manned bomber. They analyzed the need for it afterwards."

—DEBORAH SHAPLEY

Nuclear Power: France Forges Ahead on Ambitious Plan Despite Critics

Paris. The oil shortage of the winter of 1973–74 had greater overt influence on energy policy in France then in any other industrial country. A few months after the Arab oil-producing countries imposed a partial embargo and a stiff price increase, the French decided to increase the share of electricity produced by nuclear plants from 8 percent to over 70 percent by 1985.* Despite the emergence of an antinuclear opposition in France, marked notably by a protest by 400 scientists last year, and the dire warnings voiced in the so-called nuclear debate in the United States, the French government shows little sign of having serious second thoughts about their nuclear decision.

For France the prima facie case for going nuclear is obvious. In respect to fossil fuels, France was virtually a have-not nation. French coal production was declining. Exploration for oil and natural oil offshore in the North Sea and the Atlantic has so far proved disappointing and future prospects are at best uncertain.

This, in practical terms, leaves nuclear power. France has domestic reserves and access to uranium in the former colonial territories of Niger and Gabon that give them an estimated 10 percent of world reserves. The French have built a strong base of nuclear technology, starting with their decision in the 1950's to seek a nuclear arms capacity independent of the United States and Britain. The Commissariat à l'Energie Atomique (CEA), the French Atomic Energy Commission, has operated an active civilian nuclear R & D program, and the government has fostered the growth of private nuclear industry. France in 1973 was the first country to put a breeder reactor (the Phenix) into service and have it produce power on a reliable basis. The French

*The French plan called for the ordering of some 50 nuclear plants by 1981, increasing nuclear capacity from less than 3000 MW in 1973 to between 40,000 and 45,000 in 1985.

plan to build a bigger breeder, the Superphenix, to be completed about 1983, in cooperation with the Italians and Germans, and the French obviously see themselves as having won a potential edge as a seller in the future international market for breeder reactors.

As important to the realization of the current nuclear building program as the maturing of French nuclear technology is the centralized governmental and industrial structure that makes it possible for the French to make decisions, raise investment capital, and organize industry to carry through such an ambitious plan. Electric power in France is generated by a nationalized company, Electricité de France (EDF), and the coal and natural gas industries, similarly, are government corporations.

Because of this dominance of government corporations and because of the tradition of national economic planning in France which has evolved since World War II—France's seventh 5-year plan is about to be implemented—energy policy is literally and figuratively more manageable than in the United States.

When the oil squeeze hit Europe in the autumn of 1973, it happened that the French, after a long period of vacillation, had already taken several crucial decisions on nuclear policy. The American Westinghouse pressurized water reactor (PWR) had been made the reactor of choice in French plans, and the government had hastened the consolidation of French nuclear industry. In the early 1970's the government had announced an expanded program of construction of nuclear plants. The French, therefore, were poised to take the nuclear plunge.

For nearly a year, the decision was not seriously questioned. Antinuclear activism in France had been limited to local protests at the sites picked for nuclear power plants. The environmental movement lacked the broad base and the financial resources of its counterpart in the United States. In the months after the new program was announced, adverse comment in the press increased, but there was scant evidence that the criticism was having much impact on the public.

Then in early 1975, 400 scientists signed an appeal asking the government to reconsider the nuclear program. The organizers of the appeal were academics from the prestigious Collège de France, the Ecole Polytechnique, and the science faculty of the Université de Paris at Orsay. The signers, however, included scientists and engineers from provincial universities and even from the CEA and the EDF. What distinguished the appeal from earlier protests was that the signers were scientifically qualified to comment on nuclear matters and represented no narrow political interest.

One of the organizers, Marcel Froissart, a professor of the Collège de France, says the signers held various views ranging from mild to absolute opposition to the program. What united them, he said, was that the decision was taken in a "closed circle" with no consultation with parliament or the public. It was a "technocratic decision," taken without discussion of problems of siting, safety, and investment raised by the critics. The appeal called for much greater consultation than has been the practice in France.

The original 400 grew eventually to 4000 and in November 1975, a Groupement de Scientifiques pour l'Information sur l'Energie Nucleaire was formally established. Drawing its membership largely from the Paris region, "le GSIEN," as it is called, functions primarily as a scientific information organization doing such things as organizing seminars for secondary school teachers and preparing a "counter commentary" on informational material put out by EDF, which the group thinks has a promotional bias.

Public Is Uneasy

While opinion polls have shown that the French public is uneasy about the nuclear program, there are few signs that the program has become a serious national issue. In April 1975 the French Friends of the Earth (Les Amis de la Terre) and the small Parti Socialiste Unifié did organize antinuclear "manifestations" in a number of places, including Paris, where some 20,000 people marched in what by French standards was a very relaxed and good-humored demonstration. Critics also managed to open at least a rudimentary dialogue with government officials during what was billed by the government as a week celebrating "nuclear maturity." But the political parties, by and large, have not dealt seriously with the issue and the major unions, with the exception of the Confédération Française Démocratique du Travail (CFDT), the major non-Communist union, have not been much more active.

The biggest French union, the Communist Confédération Générale du Travail (CGT) has had some conflicts over the program. With a Marxist bias for scientific progress, the union has been inclined to favor nuclear power. The union generally approved the national program for development of the gas-graphite reactor, but union spokesmen have criticized reliance on the American PWR. The CGT, however, has endorsed the breeder.

The CFDT, after a long debate, this spring urged the government to suspend the PWR program for 3 years and subject the program to study and discussion during that time. The CFDT was known as the Catholic union until the early 1960's, when it severed its ties with the church. Ideologically, the union accommodates several strands of French social thought, but its members subscribe generally to the doctrine of *socialisme autogestionnaire*, which very roughly means "self-managed socialism." The CFDT stresses "personalism," mistrusting centralized authority and powerful bureaucracies. As one union member said, "We think the nuclear tool is adapted to the centralized type of society. We think it increases all tendencies of the social division of workers and the hierarchical system, as well as problems with weapons."

The CFDT is organized along *syndicat* lines, with separate "vertical" unions, including managers, professionals, and workers in each industry. There is, for example, a Syndicat National des Personnels de l'Energie Atomique–CFDT, and members of this syndicate have been active and influential in bringing the union to ask for the 3-year moratorium on PWR plant construction. It is obviously difficult for a union to urge action that is likely to increase unemployment, which is already high in France, but as one member said, "It is the best opportunity to explain to people why stop."

If the antinuclear opposition in France finds itself faced with a government determined to press on with a big domestic nuclear program so as to be able to compete successfully in the international market for nuclear technology, the official fervor may in part be explained by the extent of the effort France has made.

When the French began their nuclear energy program after World War II, they deeply resented the restrictions the United States put on assistance to both the French military and civilian nuclear programs. The French decided to conduct an active program independent of both the Americans and British and followed a line of civilian power development dictated by circumstances. Only the United States and the Soviet Union had uranium enrichment facilities at that time, and the light water reactors then being developed by the United States, which used enriched uranium fuel, were ruled out by the French. They settled on gas-graphite reactors which used natural uranium as fuel. The gas-cooled reactors produced plutonium in their spent fuel.

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Plutonium could be used in the breeder reactors planned for the future, and, not so incidentally, as material for nuclear weapons for France's independent deterrent.

The French conquered the early teething troubles of the gas-graphite reactors which afflicted them when they were first put into service, but in 1969, after much debate, the French decided to suspend the gas-graphite program and to shift to American-style light water reactors. The French reactors, like their British gas-graphite counterparts, had capital costs so high that they were noncompetitive as export reactors. American reactors, particularly the PWR, were proving popular in industrial countries, and the French saw themselves becoming technologically isolated and foreclosed from competing successfully for sales abroad.

The choice of the Westinghouse PWR was logical enough. Westinghouse in the 1960's had licensed the building of two PWR's at Chooz in northern France and at Tihange, across the border in Belgium. EDF had been a partner in the projects with Belgian utilities and became a partisan of the PWR.

In the 1960's, the French government went through a long phase of encouraging maximum competition in the French nuclear industry, but finally concluded that only by reducing the number of firms could French industry operate efficiently domestically and effectively abroad.

The ultimate decision by the French government on nuclear industry can be seen as a victory for pragmatism over economic chauvinism. Framatome, which became the dominant company in the nuclear industry, is a subsidiary of the big Creusot-Loire steel company which is part of a conglomerate headed by E.-J. Empain. Baron Empain (the title is Belgian and he is a Belgian citizen) has had persistent difficulties with French officials reluctant to see a major industrial complex in non-French hands. The fact that Framatome was the French licensee of Westinghouse, an American industrial giant, certainly did not help. But Framatome had led the consortium which built the reactors at Chooz and Tihange and was the low bidder on contracts for an EDF reactor at Fassenheim and on subsequent contracts, and made itself indispensable.

For Westinghouse, however, the sharing of advanced technology with Framatome, raised the prospect of the company, so to speak, competing with itself in international markets. Licensing arrangements cover both patents and know-how. In the nuclear field, licensing agreements were becoming awkward because the time elapsing between the ordering of a reactor and when the reactor came on line was getting longer and longer. Framatome, which had made clear its intention to compete for export sales, might in the future use Westinghouse advanced technology to compete against the American company for foreign sales. Westinghouse, therefore, sought an equity position in Framatome, which would ensure that it would profit beyond licensing fees from any such sales. The French were far from eager to have Westinghouse as an active partner in Framatome, but they were anxious to have access to new nuclear technology.

In 1972, Framatome and Westinghouse, with the French government sitting in, renegotiated the licensing arrangement, extending it for 10 years and allowing Westinghouse to assume a 45 percent equity position in Framatome. Creusot-Loire held 51 percent and Jeumont-Schneider, another Empain company, the remaining 4 percent.

In addition to the PWR's ordered in the early 1970's, the French had ordered two boiling water reactors (BWR's) developed by American General Electric and for which the French General Electric Company was licensee. After the Arab embargo of 1973, with the French decision to standardize and proceed full tilt with the PWR, the BWR orders were canceled and French General Electric subsidiary, Alsthom, was made supplier of alternators for the plants and other electrical equipment.

Before long, the French were expressing dissatisfaction to Westinghouse with the cost and terms of the arrangement. It seemed evident that the French were uncomfortable with an American company holding an equity position in Framatome. Negotiations culminated in an agreement last December under which Westinghouse sold back 30 percent of its holdings and retained 15 percent, but without voting rights. CEA was to take over the 30 percent share of the company. The agreement also provided that the shareholders were to carry on a "mutually advantageous" R & D program with Westinghouse, CEA, and Creusot-Loire sharing the funding equally.

It is known that CEA wanted to participate in Framatome, in part at least to protect French interests in R & D matters. Although details are not available from any of those involved, there are differences between Westinghouse and the French partners about details of the R & D program. It is possible that the French will be ready in 1982 to go it alone. On the other hand, it is also possible that both sides will wish to extend the relationship. At any rate, the French and Americans must live with each other until then, and both sides are evidently bearing that in mind in the talks.

In April of this year, the government reviewed the nuclear program, and the only significant change was a reduction in the plant capacity to be ordered in 1978 to 5000 megawatts (MW) from the 6000 MW originally announced. French officials insist that the reduction was made simply to adjust the program to the projected future demand for electricity.

The officials do concede that the high costs of construction are putting pressure on the program. The minister of finance, for example, is known to have argued for a reduction to 4000 MW capacity in new plants to be ordered in 1978, but 5000 MW was settled on.

Informed observers suggest that circumstances—particularly financing problems or intensifying opposition to siting of new plants—could change the picture in coming years. Government officials, at present, however, appear confident that the nuclear program will not be blocked or seriously delayed.

Energy policy in France, of course, goes beyond the nuclear program. Plans call for intensive development of domestic fuel sources and a major program of R & D on new sources of energy. Strong efforts are being made to diversify foreign sources of fossil fuels. And conservation is being given heavy emphasis in energy plans, although after impressive initial success with conservation measures during the oil shortage the program seems to have lost headway. The progress of energy policy at large will doubtless influence the nuclear program.

Another set of questions is raised by the possibility of the parties of the Left winning a majority in the 1978 national elections. A government of the Left might well reappraise the nuclear program, but some observers think that, in view of likely concern about the economy in such a new government, the technocrats of the Left might not differ much on nuclear policy from the technocrats of the Right.

Whatever the speculation about the future, it is fair to say that, with the present momentum its nuclear power program has, France is leading the way toward what critics call "the nuclear society."—JOHN WALSH