

with the consequent potential of neglecting certain aspects of patient care, may now be as important in not-for-profit as in for-profit hospitals. (A second article will explore in greater detail the implications of cost-containment for the doctor-patient relationship.)

Increasingly, health care institutions in this country will be forced to juggle new economic realities with established concepts of mission and service. With this in mind, the majority of IOM committee members have concluded that ownership may not be the most important element in determining how our hospitals will behave in the future. Princeton economist Uwe Reinhardt, who was a member of the IOM committee, supports measures to prevent blatant conflict of interest but believes that ownership is not the real issue. "We have an excess of medical facilities and an excess of physicians," Reinhardt says, at a time when pressures to reduce costs are severe. Reducing spending in an environment of excess capacity will produce competition that may adversely affect physicians' behavior. "The issue of saving money versus the doctor's responsibility to the patient will be a more important force than ownership," he says.

Reinhardt and others, including Bradford Gray who was staff director for the IOM study, anticipate that the cost crunch and competition among health care providers will steadily erode the differences that theoretically distinguish for-profit from not-for-profit hospitals. The big chains not only own hospitals but also other types of health care facilities, such as "surgicenters," medical laboratories, and alcohol recovery homes. But the not-for-profit hospitals are also moving into the business of expanding their reach—joining forces with other health care providers, opening ambulatory care facilities, and establishing networks of various kinds. Just a few months ago, for instance, Johns Hopkins announced formation of the Johns Hopkins Health System, that includes not only The Johns Hopkins Hospital itself, but three other Baltimore area hospitals, and a health maintenance organization.

Gray observes that it is hard to find grounds for being critical of for-profit institutions per se in this rapidly changing environment in which business needs are driving all health care institutions. "As all health care systems become hybridized," he says, "it will be a challenge in the future for the not-for-profits to define what makes them different." ■ **BARBARA J. CULLITON**

This is one of a series of occasional articles on the implications of major changes that are taking place in the health care enterprise in the United States.

France Weighs Benefits, Risks of Nuclear Gamble

Unswerving political commitment, national pride, and firm state control of all levels of debate help explain the rapid growth of France's nuclear power program

IN the early 1970's, as Arab countries began using their virtual monopoly on world petroleum reserves to force a rapid escalation in oil prices, the French government responded by launching a massive expansion of its nuclear power program. It did so with the same fervor and determination that the United States had dedicated, over the previous decade, to putting an American on the moon.

In purely technical terms, the French record has been impressive. Thirty-six reactors have begun operation since 1977, 15 more are currently under construction, and two additional reactors have been given the go-ahead. In the early 1980's, when most other Western countries were slowing down their programs, five or six new reactors were starting up in France each year.

As a result of its \$50-billion investment program, France now produces 65% of its electricity by nuclear power. This compares with 16% in the United States, 31% in West Germany, and 19% in Great Britain. France is now the second nuclear nation, after the United States but well ahead of the Soviet Union, in terms of net output.

Furthermore, France not only boasts the lowest electricity prices in Europe, with electricity generated from nuclear power plants costing two-thirds that from coal-fired plants, but it is currently exporting more than 23 billion kilowatt hours a year to its European neighbors.

The factors that have led to the rapid growth of French nuclear power are complex. Both the structure and the practices of the nuclear industry are deeply embedded in the political and administrative traditions of French society. Because many of these would be unacceptable in other countries, it is difficult to transpose experience from one context to another.

One key to the French experience has been the sustained and single-minded commitment of governments of both right and left to the development of nuclear energy as a top priority over all other energy sources. This commitment rests in part on the practical concern that France lacks indigenous

sources of energy other than hydropower. But it also has political roots. For example, despite some preelection hesitations, the socialist government continued support for the program when it was in power between 1981 and earlier this year, primarily because of the jobs that would have been lost in the nuclear industry if the construction program had been brought to a sudden halt.

Political support combined with France's tradition of centralized administration have encouraged a simplified structure for the nuclear industry. Overall responsibility for design, construction, and operation of all nuclear plants lies in the hands of France's single, nationalized utility, Electricité de France (EDF). Since 1975 there have been single suppliers for reactor vessels (Framatome, operating until 1982 under license from Westinghouse), for turbine generators (Alsthom), and for many other construction contracts.

The advantage of this system over the fragmented structure of independent utilities in the United States is that it has allowed bulk ordering of reactors, an approach previously adopted for coal- and oil-fired plants. The French nuclear program has progressed through a series of steps, each containing a number of power stations of basically identical design, which have, as a result, been ordered and licensed almost simultaneously.

The first post-1974 order, for example, was made up of 16 pressurized water reactors (PWR's), each of 900 megawatts, based on technology and know-how licensed from Westinghouse. Altogether, 32 units of this size were constructed between 1977 and 1985. Currently under construction is a series of 20 PWR's of 1300 megawatts. And for the future, the government has given the go-ahead for two 1450-megawatt reactors, which EDF now claims will be "completely French," since they use technology based on the experience gained through the Westinghouse collaboration, but were developed independently.

Standardization undoubtedly plays a large part in explaining why average construction costs in France for a nuclear power station

are 35 to 40% lower than in the United States. Studies produced by EDF suggest savings from factors that range from the ability to share initial development and engineering costs to the accumulation of construction experience by contractors.

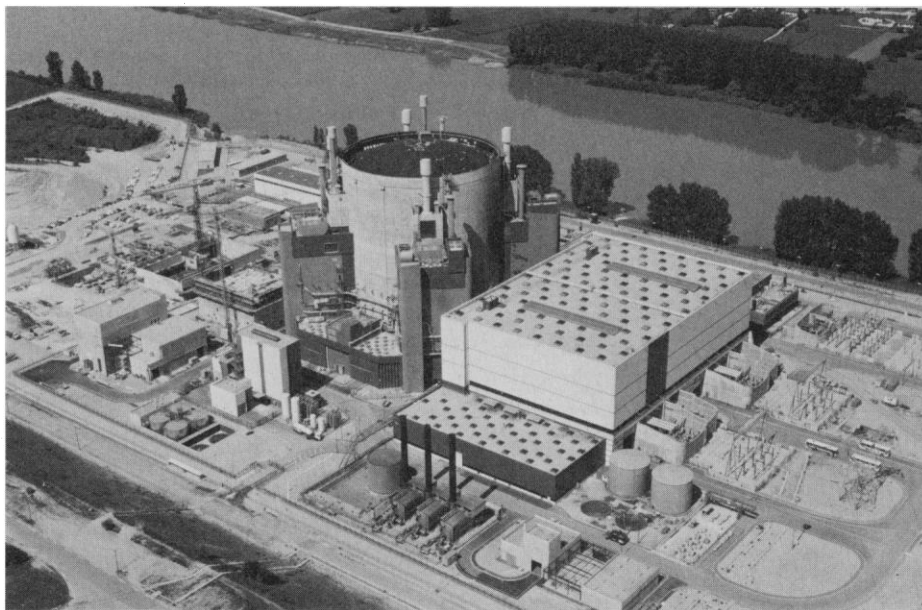
The government's decision to encourage the construction of several units on the same site has also produced economies. And a study carried out by the Electrical Power Research Institute in collaboration with EDF and the University of Paris-Dauphine, concludes that another important reason for the lower construction costs in France is the lower productivity (and hence larger size) of the labor force required in the United States.

Also important, however, has been the streamlined regulatory system. Construction time for new power stations has been brought down to an average of 6 years—in some cases less than 5—between placing equipment orders and bringing a plant into service. This has been made possible in part by the standardized decisions resulting primarily from internal negotiations between government departments, EDF, and the principal contractors. These negotiations are considerably simpler than in other countries because decision-making on nuclear issues has in general been left to a small, relatively closed circle of individuals, many of whom come from two of France's elite engineering schools, the Ecole des Mines (the traditional recruiting ground for the Atomic Energy Commission, or CEA) and the Ecole des Ponts et Chaussees (strongly represented in EDF).

Conversely, criticism of the program by outside pressure groups is made more difficult by the rigid protocols and procedures governing the intervention of private individuals and organizations in the licensing process. The dominant belief, as one senior official has put it is that "it would be totally unhealthy, counterproductive, and damaging for technical issues to be dealt with in public and constantly exposed to criticism and statements by just anyone."

In other countries, the split between a decision-making elite and grass-roots opponents has given rise to open conflict. In France, conflict has been kept to a minimum through constant efforts by the government to nurture support for its actions in the nuclear field, both materially—in terms of generous grants and taxes provided to local authorities close to nuclear facilities—and ideologically.

The resulting national consensus has also been able to draw on historical experience. Most of French society, its pride still deeply wounded after its defeat by Germany in 1940, rallied enthusiastically around Gener-



Superphenix. France's prototype fast breeder started operation earlier this year, but a slowdown in energy demand may delay construction of a successor.

al Charles de Gaulle when he announced in the late 1950's that France was to build its own nuclear weapons. This support soon widened to embrace nuclear power as well.

André Giraud, for example, director of the CEA during the period of the program's rapid expansion in the 1970's and recently appointed Minister of Defense in the new conservative government, told a conference in Paris last year that the stability of regulation in France was a direct consequence of the adoption of the nuclear program as a national challenge. "At its roots, the whole French nuclear world is united by the sense of challenge," he said; one result was that political authorities could not let the nuclear program founder in "demagoguery and weakness."

The role of the nuclear program as a high-profile national symbol partially explains the relative weakness of antinuclear groups in France, since their criticisms can be portrayed as a challenge to the image and integrity of the state. As another official puts it, "on a question of national importance, you cannot go against the central administration and the government."

Conversely, wide public acceptance of the national challenge has made it possible for the government to take the type of calculated entrepreneurial risks with its nuclear program that other countries would prefer to leave to the private sector.

Thus, although the government has in the past subsidized substantial construction loans to the nuclear program, reaching a peak of \$600 million in 1979, equally significant have been its guarantees, which have helped EDF secure major loans on both the domestic and international capital markets.

Today, 25% of the nationalized utility's income is needed to repay its accumulated debt, which currently stands at over \$30 billion.

The same willingness to accept calculated risks also operates at the technical level, helping to explain some of the design features that have resulted in lower development costs. For example, there is less flexibility in French command systems than in some other systems; the argument is that if a major problem develops, a power station will be closed down and no attempt will be made to maintain full-scale operation.

Whether this "calculated risk" philosophy makes French reactors more dangerous than those in other countries is a difficult question to answer, however. For the same variety of political, economic, and cultural factors that characterize the program as a whole also apply to the more limited area of the assessment and management of health and environmental risks.

French officials maintain that, viewed by purely objective criteria, their nuclear reactors are as safe as those in other Western countries. Their views are supported by the Electric Power Research Institute-University of Paris study, which uses calculations of the quantity of materials such as steel and concrete used in construction to conclude that the more cooperative regulatory-licensing system in France has not been achieved at the expense of safety.

Further endorsement of this view is expected to come from a study just completed by the U.S. Nuclear Regulatory Commission, due for publication in the near future, which has found no major differences in the safety performances of the French four-loop

1400-megawatt PWR's and U.S. PWR's of broadly comparable design.

At the same time, however, it also seems clear that construction costs have also been kept down in France by less demanding design requirements than those in some European countries. In Germany, for example, concrete reactor shells are designed to withstand the impact of a fighter aircraft, and stringent precautions must be taken against sabotage; in France, where the density of military flights is lower, the design requires merely guaranteed protection against the crash of a small private plane, while sabotage is considered less of a problem.

Britain's Central Electricity Generating Board has similarly upgraded the security aspects of plans for its first planned PWR, to be built at Sizewell on the Suffolk coast, in part to meet objections raised during a 27-month public inquiry that ended earlier this year. Remy Carle, the director responsible for power station design for EDF, is reported to have told a British parliamentary committee that safety levels at Sizewell—at least judged by French standards—seem unnecessarily high.

The differences in the perception of risk are reflected in the different dynamics of the political and administrative arrangements used to manage safety issues. In France, unlike many other countries, central government is not only the final arbiter on safety issues, but is also directly responsible for the economic health of the nuclear program.

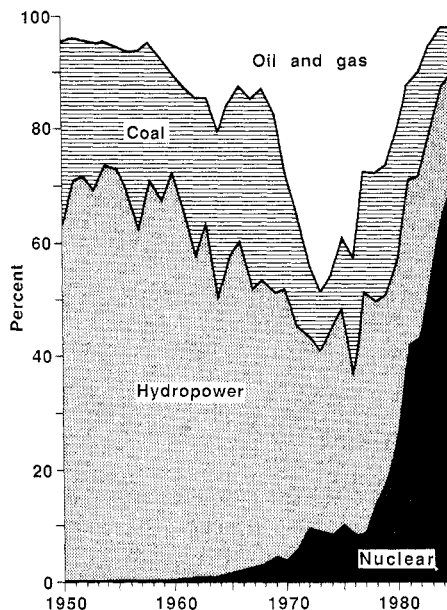
Standardization has made it possible to carry out a single safety examination for a series of reactors. In addition, central planning, standardization, and monopoly suppliers make it possible to introduce new safety standards—estimated to be largely responsible for the 50% rise in reactor costs over the past decade—over a carefully planned time scale arrived at by negotiation among all interested parties.

Nuclear officials also accept the risk inherent in standardization that if a major design fault requiring urgent attention were discovered, a wide-scale shutdown could prove necessary, with severe social and economic consequences. They argue, however, that the large amount of data gathered from similar plants makes the chances of an unanticipated common-mode failure less likely.

At the same time, a dominant desire to keep costs down means that, where possible, modifications and back-fitting are introduced according to a timetable that coincides with scheduled stoppages, rather than requiring emergency shutdowns.

This strategy is frequently criticized by antinuclear groups as running unnecessary risks, since power stations are often kept in

operation even after a defect is suspected. But opinion polls reveal clearly that there is much wider acceptance of the risks of nuclear power in France than in other European nations. French nuclear officials assert that this is due in part to the success of the information campaigns that they have mounted, emphasizing the economic, technical, and political arguments behind the nuclear power program.



Nuclear surge. France now produces two-thirds of its electricity by nuclear power, a greater proportion than any other Western country.

Some, such as EDF president Marcel Boiteux, also appeal to deeper beliefs, suggesting that the difference with other countries is that the French accept the state in the role of a "protective mother" and remain confident that it is protecting their interests—even if they are unaware of the precise measures being taken.

This image has been somewhat shaken in recent weeks, however, by revelations that some government authorities have been reluctant to inform the public of difficulties. Top officials have already admitted their embarrassment that the main body responsible for issuing statements on safety, the Service Centrale de Protection Contre les Rayonnements Ionisants, claimed that the radioactive cloud from the Chernobyl accident had only skirted France, when it later became clear that inspectors in many parts of the country were reporting abnormally high levels of radioactivity.

The embarrassment increased a week later when it was revealed that a major cooling-system failure that might eventually have proved as disastrous as that at Three Mile Island had almost occurred at a French power station 2 years ago, but had not been

given any publicity by EDF apart from a small note in a regular security bulletin.

The tradition of administrative secrecy is so deeply embedded in French society, however, that neither incident appears to have made a lasting impact on public opinion. At present, consequences of a different kind are occupying France's nuclear planners. At the top of the list is the fact that the anticipated demand for nuclear energy has not kept up with the rapid expansion of supply. The government has already cut back orders after 1987 to one reactor a year, and even this is justified only in terms of keeping development and construction teams together.

Concerns are also beginning to surface in Paris that the rapid expansion of the French program is putting France increasingly out of step with other Western nations, particularly after the Chernobyl accident. One area likely to be affected is the growing uncertainty over the European fast-breeder efforts, which France currently leads with Superphenix.

Superphenix started successful operation at the beginning of the year, and CEA engineers would like to begin construction of its successor, Superphenix 2. However, the high investment costs and declining projections of future electricity demands have dampened enthusiasm for an immediate start on Superphenix 2 in both the EDF and other European utilities that helped finance the program.

A second impact will inevitably be felt in the significantly reduced opportunity for the export of nuclear power technology. Original hopes that such exports would take up the slack from the slowdown in the domestic program were diminishing even before Chernobyl. Now they have almost evaporated.

Finally, political tensions are already growing as a result of the clear differences in the perceptions of nuclear risk between France and its European neighbors. Last month, for example, fierce protests were staged by German antinuclear groups, backed by officials from Luxembourg and the state of Saarland, about the safety norms being applied by the French government to a new nuclear plant scheduled to start operation soon at Cattenom, on the border with Luxembourg and a few miles from West Germany.

Thus, just at a time when France's nuclear gamble appears to be achieving the technical and economic goals set by the government 12 years ago, the country is ironically beginning to suffer the effects of increasing isolation from the international consensus on nuclear power, which has shifted significantly since the French nuclear program was conceived. ■ DAVID DICKSON