

ATOM - *supra nonobstante*

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Two decades ago, nuclear energy seemed to hold the promise of a new Golden Age. Few, of course, would soon forget the tall, poisonous clouds over Hiroshima and Nagasaki that in 1945 first brought the awesome power of the atom to world attention. But in the 1950s the U.S. spoke reassuringly of "atoms for peace." Nuclear explosives, it was predicted, would accomplish creative rather than destructive tasks; Project Plowshare (named for the prophecy in *Isaiah*: "They shall beat their swords into plowshares") envisioned the bomb as a gargantuan tool that would bore tunnels through the mountainside, chisel canals across the continents and gouge safe harbors out of dangerous coastlines. The grandest dream of all was nuclear power. Harnessed and domesticated into a rich new source of energy, the forces of the atom would fuel the millennium—erase poverty, eradicate hunger, promote peace among mankind.

**Atom Angst.** Now the nuclear reactor is a reality—and a harrowing, as well as a helpful presence. Not counting research reactors, there are today 194 nuclear-power reactors operating in 20 countries. By 1985, if construction continues as now planned, there will be more than 600 power reactors in at least

39 countries. Sleek, smokeless shapes in the landscape, they will fuel the future without dipping into the world's fast-dwindling reserves of oil. Yet these superautomated plants have become stunningly expensive servants: the average reactor ordered today will cost up to \$1 billion. For many people, moreover, the financial burdens of "going nuclear" pale beside the environmental and psychological costs of doing so. They are gripped by what some observers call "atom angst." Says Pierre Strohl of the O.E.C.D.'s Nuclear Energy Agency: "Peaceful application of nuclear energy seems inseparable from the nightmarish images of the atomic bomb." In Strohl's view, critics regard the nuclear reactor as a symbol of a "hopelessly technocratic, centralized, hierarchical society, dominated by giant industry and financial monopoly, implacably destructive of natural resources and human values." But beyond this generalized anxiety, there is a distressing realization that the atom that can produce prosperity can also make war: a nation that has a reactor can eventually have a bomb.

The proliferation of nuclear know-how has thus stimulated not harmony, but fear. Many people are terrified of

the reactors, convinced that it is only a matter of time before one of them accidentally spills a deadly dose of radiation across an entire countryside. Others envision some witless dictator run amuck, waving primitive A-bombs at his enemies, or a band of conscienceless terrorists holding entire cities for ransom in a grim game of nuclear blackmail (see box). Such nightmares are not merely the ravings of the uninformed and fanatic. Contemplating the potential for disaster, U.S. Nuclear Pioneer David Lilienthal, now 77, observes remorsefully: "I am glad I am not a young man, and I am sorry for my children."

**Court Rulings.** Nowhere is the furor over greater reliance on nuclear power so intense as it is in Western Europe. In Sweden last year, asserts ex-Premier Olof Palme, it was opponents of his plan to expand nuclear energy who helped to tip the scales against him and turned out the Socialist Party, which had held power for 44 years. In West Germany, sometimes violent antinuclear demonstrations at power-plant sites at Brokdorf, near Hamburg, and Wyhl, in Baden-Württemberg, have resulted in court rulings that halted construction on the two reactors and helped bring to a virtual standstill the most extensive nuclear-energy program on the Continent.

Upriver from Paris, at Nogent-sur-Seine, citizens' groups have been objecting to a complex of four reactors planned for the site; the protesters fear that pollution or an accident could turn the Seine into a river of poison washing toward Paris, just 60 miles away. Italians in Lombardy are worried about a similar proposed reactor complex on the Po, which they charge could raise water temperatures high enough to kill fish and even change the climate of the Po River Valley. During Easter week in Soria, a town 140 miles north of Madrid, thousands of Spaniards signed a petition against a planned nuclear-research facility in the area, damning atomic power as "a repugnant industry."

As if it were not enough to be harassed on the home front by their own citizenry, the governments of France and West Germany are also under attack from a prominent critic abroad—U.S. President Jimmy Carter. Carter's target is their burgeoning trade with developing countries in reactor hardware and technological expertise. Specifically, Carter is concerned about a \$5 billion deal between West Germany and Brazil, signed in 1975, that will provide Brazil with not only eight nuclear reactors (a purchase the U.S. does not oppose) but also a uranium enrichment plant and a nuclear fuel reprocessing plant (the

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parts of the deal that Carter would like to see rescinded). In France's case, the U.S. President has been trying to halt the consummation of a 1976 agreement for the French to supply Pakistan with a reprocessing facility.

Carter believes that both deliveries would add dangerously to the growing proliferation of nuclear technology. He has backed up his campaign against them by continuing to delay export licenses for highly enriched uranium destined for research reactors in a number of countries, including France and West Germany—a policy begun under Gerald Ford but pointedly used by Carter as nuclear leverage. This has enraged many Europeans, who view Carter's actions as both a threat to a potentially vital export industry and an attempt to keep their nations dependent on U.S. nuclear technology. "A new form of colonialism," warned West Germany's Social Democratic Party Leader Egon Bahr last week, "is not the answer."

**Pilot Plants.** The confrontation has pushed relations between the U.S. and West Germany steadily downhill. Last week, in an interview on West German television, Chancellor Helmut Schmidt declared that his country would not alter its agreement with Brazil (indeed, Bonn had already issued licenses for pilot enrichment and reprocessing plants in Brazil the week before). Schmidt said further that his country would stop selling nuclear technology only if all rival exporters did the same.

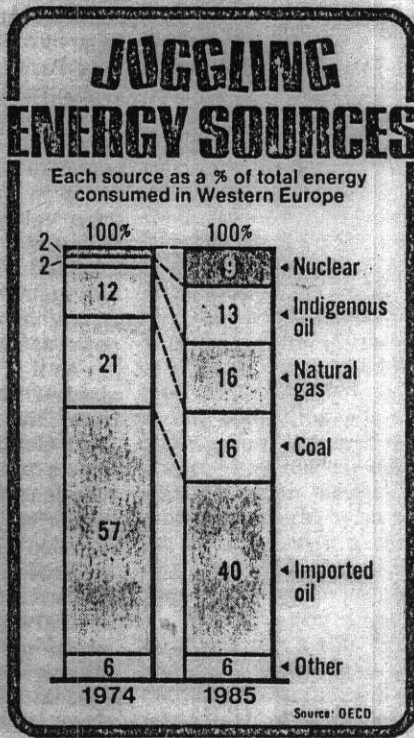
France, by contrast, has proved more amenable. While officially insisting that the sale of a reprocessing plant to Pakistan would proceed, the Quai d'Orsay has privately assured Washington that it will not, apparently hoping to persuade Pakistan diplomatically to cancel the purchase. Moreover, French President Valéry Giscard d'Estaing has halted all further French sales of reprocessing plants abroad and has tightened safeguards on power-plant exports—a move that a senior U.S. diplomat in Paris calls "an act of selfless statesmanship."

The heat of the nuclear-energy issue in Western Europe is a good index of its importance. Development of nuclear power has become an urgent matter for the Continent as a result of the worldwide energy crisis, which last week prompted Jimmy Carter to propose the first comprehensive U.S. energy program (see TIME U.S.). Put simply, the problem is that the world is running out of its primary fuel—oil—faster than it is finding or creating a substitute. According to the latest studies by the Paris-based Organization for Economic Cooperation and Development, the non-Communist industrialized states will need to import 35 million bbl. of crude oil per day from the 13 nations of the Or-

ganization of Petroleum Exporting Countries (OPEC) in 1985. The OPEC nations themselves will consume another estimated 4.3 million bbl. a day, and anything needed by developing countries will increase the total still further. Yet OPEC's maximum projected output for 1985 is only 45 million bbl. a day—a slim margin of safety, especially when many oil-producing countries are already keeping their output well below capacity in order to stretch their income of petrodollars further into the future.

The O.E.C.D. figures, moreover, assume that the industrial nations will be generating 325,000 megawatts of nuclear power in 1985—a target they can meet only if all currently planned nuclear reactors are completed and operating. If industrial nations halt nuclear-power development at its present level, another 9 million bbl. of oil would be required each day to fill the gap. The resulting competition for OPEC oil would be likely to drive prices upward in another crippling spiral. That would hurt not only industrial nations but, as did the last spiral, much more cruelly penalize the Third World.

To Europeans, the U.S. seems to have an *embarras du choix* as alternatives to imported oil. Aside from its own sizable petroleum reserves, the U.S. has enormous deposits of coal and important regional hydroelectric-power sources. In contrast, Japan and most countries of Western Europe are in a double bind. To keep their economies growing, they have needed (except for a painful interlude during the 1974-75 recession) increasing



TIME Chart / The Chartmakers Inc.

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## Is It Easy to Steal a Bomb?

The recurrent nightmare of those who fear nuclear proliferation is that fanatics could lay hands on enough plutonium or enriched uranium to terrorize a nation. But how easy is that to accomplish? If fissionable material, especially plutonium, is so lethal, would it not be too dangerous to steal?

Unfortunately, no. Mixed with other highly radioactive wastes in spent fuel, plutonium and uranium would indeed be too hot to handle. But plutonium itself is an immediate danger only if it somehow enters the body. Any airtight container would protect a thief from a suicidal dose.

In their classic study on nuclear theft for the Ford Foundation, Arms Control

Expert Mason Willrich and Atomic Physicist Theodore B. Taylor considered who might steal fissionable material, and how. Some chilling possibilities:

**THE LONER:** He faces the problem of getting his booty past sensor alarm systems at plant gates. If security were lax he could do so bit by bit. Otherwise, he could fake a plant emergency that would allow him to escape with a large quantity. A nuclear thief would need about 25 lbs. of plutonium to construct a crude bomb, but just a few pounds to threaten a city, perhaps by incinerating the material upwind from it.

**THE EMBEZZLER:** Plutonium and enriched uranium are carefully accounted for. But because of the complexity of the

nuclear processes, there is a chemical margin of error. By discreetly juggling that margin, an unscrupulous plant manager could seem to account for his stock while diverting a deadly portion.

**THE CONSPIRATORS:** Ordinary criminals, who might want merely to peddle plutonium on the black market (estimated price: \$7,000 per lb.), would want to make an undetected getaway. They would probably choose a method like hijacking nuclear fuel on its way to a reactor. Terrorists, who might well want the theft itself to be visible, could make a direct assault on a reactor or reprocessing plant. In 1973, in fact, urban guerrillas in Argentina occupied the Atrucha reactor site—which was, fortunately, not yet in operation.

**THE COUP:** In some nations, note Willrich and Taylor dryly, force is "com-

quantities of energy to run their industries. Yet they are energy have-nots, deep in hock for the costly oil imports of recent years and largely unendowed with any indigenous replacement.

If these industrial nations are to arrive in the 21st century with anything approaching their living standards of today, nuclear power seems to be an unavoidable necessity. Without it, industries will close down, jobs vanish, economies decay—perhaps causing the very sort of instability and international violence that anti-atom forces fear. "When you add up all the possible sources of energy that will be available in 1985, you're left with a gap," says Deputy Director J. Wallace Hopkins of the International Energy Agency. "From now until the end of the century, the only way to fill that gap is with nuclear energy. If you don't fill the gap, you're really talking about no-growth." Nuclear Physicist Edoardo Amaldi of the University of Rome, a longtime collaborator of the Manhattan Project's brilliant Enrico Fermi, puts it even more strongly: "We have no alternative. While we may talk of other sources of energy, they will not come tomorrow—not for 50 years."

**Deadly Forms.** Europe's quarrel with Washington over nuclear policy stems from the specter of the Continent once again developing a near-total energy dependence on a single rich source: the U.S. According to Washington studies, the U.S. has as much as 3.7 million tons of uranium reserves—which it is currently using at the rate of only 9,500 tons a year. Untold tons of idle fissionable material also reside in missile silos and roving submarines. The most optimistic estimates give Western Europe only 460,000 tons of uranium. Nearly all of Europe's uranium supplies are now imported from Canada or the U.S.

Carter's opposition to the French and West German export deals is rooted in a new effort to contain at least the deadliest forms of nuclear materials. An

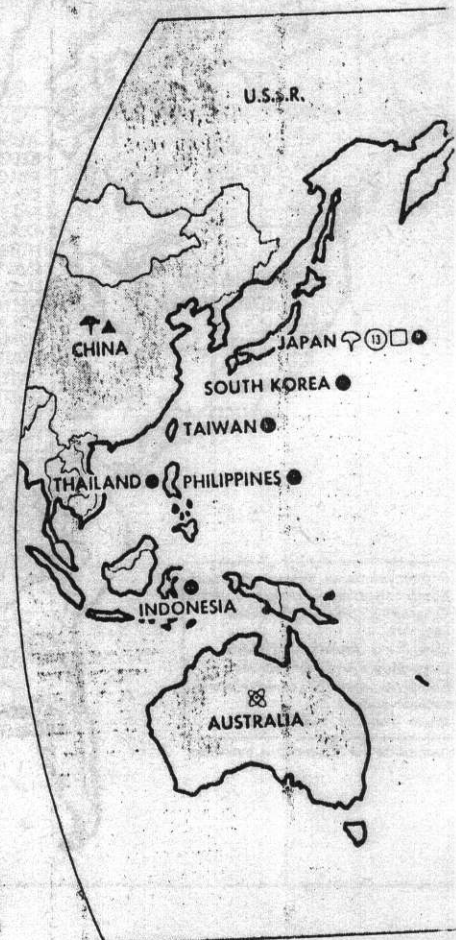
enrichment plant, though intended to make nuclear fuel, can also make weapons-grade uranium.\* A reprocessing plant, besides recovering unused fuels from reactor wastes, makes plutonium. Either material is the raw stuff of nuclear bombs—much more readily usable for military or terrorist purposes than the same elements mixed in normal reactor wastes. And plutonium, to make its potential all the more horrifying, is 20,000 times as toxic as cobra venom. Says a Ford Foundation report: "A few thousandths of a gram of plutonium, if inhaled, can cause death from fibrosis of the lungs within a few weeks."

Dramatically underscoring his determination to prevent these substances from being further proliferated: Carter in early April ordered a ban on commercial reprocessing in the U.S. (TIME, April 18). He also halted U.S. development of a prototype fast-breeder reactor at Oak Ridge, Tenn., a variety of nuclear reactor designed to use plutonium for fuel and ultimately to manufacture more of this fuel than it uses—thus dangerously increasing the world's stock of plutonium. Carter's move was intended partly to placate domestic antinuclear forces. He also intended to bring home to European nuclear exporters the dangers of spreading reprocessing and breeder technology. Still, Carter was careful to acknowledge the "special needs" that Europe might have for those developments, a point he evidently re-emphasized to European Commission President Roy Jenkins in a White House discussion last week. Jenkins reported a "sympathetic" hearing on the European nuclear viewpoint, and added: "We will have to make up our own minds on the issue."

Europeans will probably conclude

\*Natural uranium, U-238, is a stable element that contains less than 1% of the fissionable isotope U-235. It must be enriched to a level of 3% to 4% U-235 to be usable as reactor fuel, and to a level of about 90% to become bomb material.

that they need a local capability for enrichment and reprocessing. For one thing, the reusable fuel created by these processes would eliminate much of the need for disposal of nuclear wastes, a tricky problem in heavily populated regions. More important, local-processing advocates fear that uranium reserves may be smaller than predicted. If a shortage develops, they contend, the countries that have little of their own will suffer serious shortfalls, price hikes



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WORLD -- LEARNING TO LIVE WITH A DANGEROUS GIFT (3)

monly used as a means of transferring power and authority." In such cases, nuclear facilities would be prime targets for both attackers and defenders. A thought to give pause: What if there had been a reprocessing plant in Lebanon during the 1975-76 civil war?

The Willrich-Taylor study prompted sharply tightened security and more accurate accounting within the nuclear community. Major transfers of nuclear materials are often made in such huge containers that thieves would need a crane to move them. Such precautions have helped keep nuclear materials among the most difficult in the world to obtain illegally. The question that persists is whether even these strict safeguards will be effective as the traffic in fissionable materials increases exponentially over the next several decades.

or both. This concern has been heightened by the current delay in receiving enriched uranium from the U.S.—although Carter apparently told Jenkins that deliveries would be resumed soon.

The fear of uranium dependency was at the heart of the nuclear pact between Brazil and West Germany. As the leading oil importer in the developing world, Brazil will shell out more than \$4 billion for petroleum this year to feed its growing industrial base—a massive

drain on its balance of payments account. In 1972 the U.S. agreed to help Brazil build a nuclear power plant at Angra dos Reis, on the coast between Rio de Janeiro and São Paulo—but in 1974, after India achieved a nuclear explosion, the U.S. would not guarantee a permanent supply of enriched uranium fuel. The upshot was the 1975 bargain with Bonn, which will give Brazil what the U.S. would not: a full nuclear cycle. For their part, the Germans get at least \$5 billion worth of work for some 300 companies involved in their languishing nuclear industry, at least 20% of any uranium ore found in a joint uranium-prospecting venture with the Brazilians, and a percentage of enriched fuels made in the Brazilian plant.

If Carter's anti-plutonium posture disturbed Europe's apostles of energy independence, it also provided aid and comfort to a much stronger army of home-grown antinuke critics. Though both sides are reacting to problems that prevail throughout the Continent, the shape of the nuclear issue varies widely from country to country. A summary:

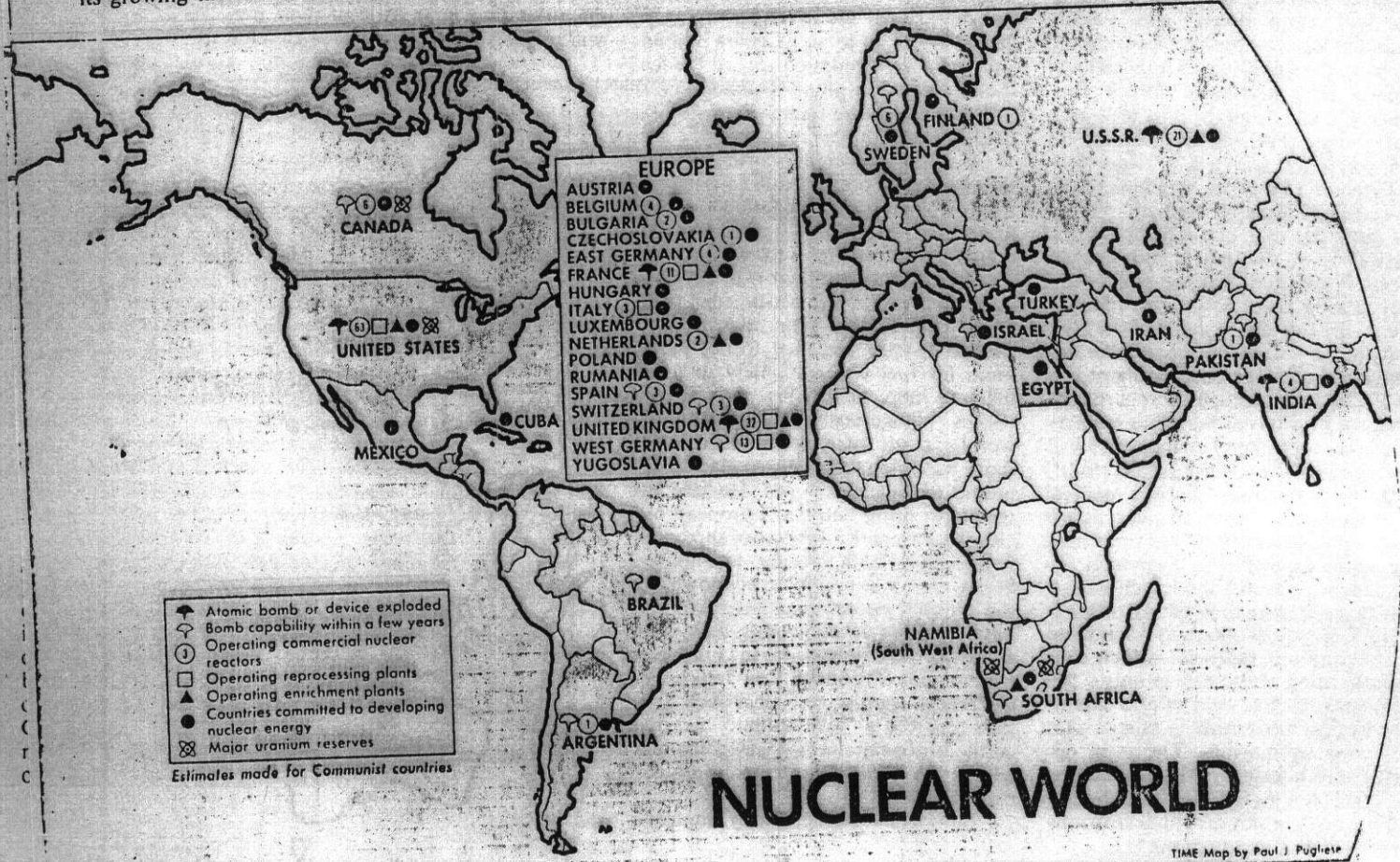
**WEST GERMANY: SUDDEN RAGE.** In no other European country is the opposition to nuclear power so fierce, so organized or so effective as it is in West Germany. The movement came virtually out of nowhere just last fall. It has a sizable leftist element, but is basically a much broader citizens' coalition, in-

cluding farmers, city officials, housewives and professional people. Its leading spokesman is a bespectacled 53-year-old Karlsruhe pharmacist, Hans-Helmuth Wüstenhagen.

The early court victories of this citizens' army have drastically curtailed West Germany's nuclear power program. Since the 1973 energy crisis, every parliamentary party has supported an ambitious nuclear energy policy formulated by Chancellor Schmidt's government: to have 30 power reactors in operation by 1985, supplying 45,000 megawatts of power and half the nation's electricity. Now 13 plants are in operation, but construction at eleven others has been slowed or stopped, and six remain on the drawing board while the government tries to convince citizens of their safety.

The demonstrators show no sign of easing up. In the bloodiest battle so far, about 20,000 demonstrators, heavily infiltrated with extremists, clashed with 4,000 police in March at a plant construction site in the town of Grohnde near Hannover. The demonstrators used spiked clubs, chains, iron bars and Molotov cocktails; the police tear gas, water cannons and clubs. Eighty demonstrators and 237 police were left injured.

**FRANCE: RADIOACTIVE TOMORROW.** France, a promoter of nuclear energy and weaponry since the days of Charles de Gaulle's call for a *force de frappe*,



# NUCLEAR WORLD

TIME Map by Paul J. Pugliese

(MCCRE)



has so far resisted a wave of demonstrations against its nuclear projects. At Fessenheim in Alsace, a new reactor went into operation in March despite a two-week hunger strike by protesters there. Plans for the reactor complex at Nogent-sur-Seine continue unabated, despite the vocal opposition of antinuclear forces.

The most cherished nuclear project of France, as the majority partner in a six-country consortium, is the 1,200-megawatt Superphénix fast-breeder reactor to be built at Crays-Malville near the Swiss border. This endeavor could be in trouble. The Superphénix will be fueled by a 4.5-ton load of plutonium (more than a hundred times the amount in the Nagasaki bomb). It has provoked outraged protests from scientists, doomsday slogans from ecologists (INACTIVE TODAY, RADIOACTIVE TOMORROW), and even a raid on research offices during which participants stole frightening contingency plans for dealing with a Superphénix disaster—which they promptly published.

In 1976 France temporarily closed down its pilot Phénix reactor—a 250-megawatt station incongruously planted among the vineyards of the *côtes du Rhône*—because of leaks in the cooling system. Superphénix might become a casualty before it is built. If the breeder becomes unpopular enough, Premier Raymond Barre, already eyeing his budget for anti-inflation cuts, might gladly dispense with the expensive project.

**BRITAIN: LEISURE TO DECIDE.** Britain responded positively to Carter's concerns, perhaps because the country can afford more leisure than most in deciding energy questions. It has a 300-year supply of coal, a developing abundance of

North Sea oil and a conventional nuclear program dating back two decades that supplies 13% of the nation's power. Prime Minister James Callaghan has ordered a thorough re-examination of British policy on nonproliferation and expects the topic to be discussed at the summit meeting of Western leaders in London next month.

Britain leads the world in fast-breeder-reactor research (two prototypes are operating at Dounreay in Scotland), but Energy Secretary Anthony Wedgwood Benn has called for a national debate over the breeder's future. Benn is aware that antinuclear forces in Britain are mainly opposed to the fast breeder, and he has his own concerns about the potential cost of a full-scale commercial breeder—more than \$3 billion. "If we once build one," concedes an energy department official, "we'll be committed on a scale that will dwarf the Concorde."

Benn's other worries center on the potential for U.S. interference in the British reprocessing facilities at Windscale on the northwest English coast. Westminster is planning to spend \$1.2 billion to enlarge the facility and is negotiating an \$850 million agreement to reprocess 4,000 tons of spent fuel from Japanese reactors in the 1980s. The question now is whether the U.S., which supplies enriched uranium to Japan and therefore controls the spent fuel, might move to ban the re-export of Japanese wastes to Britain.

**ITALY: BUNGLED PROMISE.** Italy's nuclear program has been stalled not so much by protesters—though they are becoming increasingly vocal—as by simple bureaucratic bungling that destroyed a once promising program. In the early 1960s, three commercial nuclear power

plants were under construction. Operational in 1969, they put Italy in third place in nuclear power, after the U.S. and Britain. But Italy nationalized its electrical industry in 1963 and shifted back to traditional power production. Its expansion plans ran into a nest of problems involving permits, antipollution controls and other delays. Brownouts and blackouts became endemic.

Belatedly, in the summer of 1975, the Ministry of Industry proposed a massive return to nuclear power through the construction of 20 reactors by 1985 and 40 more by the century's end. Initial cost estimates: \$16 billion by 1980, a figure that has soared to \$24 billion now. The full nuclear program is still under debate in parliamentary committees. A single new reactor (the country's fourth) is scheduled to go into operation this summer at Caorso, on the Po in northern Italy, and contracts are being let for four more. But they may be too late. If current projections stand, Italy is due for a major power crisis by 1983.

**OTHER COUNTRIES: YES AND NO.** Elsewhere in Europe, decisions on nuclear energy are a blend of pragmatism and principle. Norway, a singular exception, has the luxury of both. The country does not now need nuclear energy: 100% of its power is hydroelectric, a source that is not yet fully exploited. North Sea oil and natural gas are adding to Norway's energy independence. Even so, when Norwegians learned several years ago that they might need supplementary nuclear power by 1985, Oslo decided deliberately to limit economic growth to 3.3% a year to stretch the available non-nuclear power at least until 1990.

Sweden has not been so fortunate. Its new Premier, Thorbjörn Fälldin, was



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swept into office last fall partly because of a campaign promise to lead his country "out of the atomic society." But Fällin leads a three-party coalition, and the other partners favor a cautious nuclear program with stringent safeguards. Fällin, accordingly, let the country's sixth nuclear power plant open on schedule in March.

Denmark, which has sparse coal deposits and a yet unknown quantity of uranium in Greenland, is currently dependent on imports for virtually all its energy needs. But because of widespread opposition to nuclear energy, the government is pondering such alternatives as wind and solar power.

The Netherlands is torn sharply by the nuclear issue. Its government is deeply involved in nearly every phase of Europe's nuclear energy programs, but a poll in March found that fully 53% of the Dutch have doubts about nuclear energy in any form. Action groups led by politicians of the Catholic Radical Party are fighting anything nuclear. They oppose the scheduled construction of three new power plants, which would bring Holland's total to five. They decry Dutch participation in fast-breeder research with Belgium, France and West Germany. They reject plans to bury nuclear wastes in subterranean salt layers in northern Holland.

**Going Nuclear.** The fears in Holland are reflected in Belgium, but citizens' groups there have not yet mounted the same sort of intense campaign. Belgium already has four reactors—two near Liege and two near Antwerp—that provide 20% of the country's electricity. Despite critics' protests, the government is pressing to get three more in operation by 1980. Similarly, the growing wave of antinuclear feeling in Spain has not yet prompted any change in an ambitious Spanish reactor program that calls for 17 nuclear power stations by 1985. Austria, however, has postponed plans to put its first reactor into operation later this year, and Chancellor Bruno Kreisky has decided to call for a plebiscite on the issue to determine whether Austria "goes nuclear" at all.

Such one-man, one-vote options are virtually unheard of throughout the rest of a world seemingly hell-bent on fission. South Korea is scheduled in November to put its first commercial power reactor into operation. Taiwan's first nuclear power plant is also due to go on line this fall, although that country, to its credit, has voluntarily disassembled a research reactor that could have made enough plutonium for a bomb each year.

Less comforting, France agreed last year to build a \$1 billion nuclear power complex for South Africa, which is scheduled to open in 1982. Though South Africa desperately needs power, it has made no promises about bombs. "If we are attacked," says Minister of Information Cornelius Mulder, "no rules apply at all." That attitude can only help to nourish a balance-of-terror mentality

## Getting the Citizens Involved

*Since the beginning of the year, when he took over the European Commission's energy portfolio, former West German Diplomat Guido Brunner has been pressing member governments to develop a coherent European energy policy based on conservation and the development of new energy sources. So far he has been only partly successful. Last month the Council of Ministers agreed to float \$600 million in bonds to help finance construction of more nuclear power stations. But leaders of the Nine have failed to reach agreement on JET, an advanced research project aimed at developing nuclear fusion as an energy source. Sipping a glass of cherry juice in his Brussels office, Brunner, 46, reviewed the energy issues with TIME Correspondent Henry Muller. Excerpts:*

**ON NUCLEAR POWER.** In the past, politicians have tended to describe nuclear energy as a panacea: low-priced, clean, without risk. Now we know better than that, and citizens rightly have the feeling that they are not involved in the decision-making process. Never in the past two decades has the question been put to the public for decision and participation. Now we must get the citizens involved. At the same time, we have to tell them about the need for nuclear energy, about the sacrifices in living standards involved if we do not develop nuclear energy.

**ON CARTER'S DECISION TO STOP REPROCESSING IN THE U.S.** We welcome President Carter's mentioning that the situation in Europe is not identical to that in the U.S. He said that European dependence on uranium supplies makes it difficult for us to follow the same line on reprocessing, and that is accurate. If we look into the 1980s, it is clear that we in Europe will have a difficult energy situation. Not being able to exploit coal to the same extent as the U.S., we will have to rely more and more on nuclear energy. Given that we need 20,000 tons a year of uranium by 1985 and that it will be more expensive by then, we cannot cut off reprocessing as the U.S. can. Moreover, a halt in reprocessing would compound our problems of siting nuclear waste within a narrow geographical area. Europe is prepared to have a dialogue with the U.S. on all aspects of the question, but it has to be an open dialogue, based on trust. Therefore it would be a good thing if shipments of nuclear material—especially highly enriched uranium, for which we depend on the U.S. for 95% of our supplies—were resumed quickly.

**ON A EUROPEAN ENERGY POLICY.** For several more decades we will be dependent on foreign energy sources; by 1985

we will still be getting 59% of our energy from abroad. The risk lies in putting all your eggs in one basket. If you don't diversify your imports of energy, political problems can directly affect your lifeline, as we learned in The Netherlands in 1973. An energy policy would also create jobs—something we need very badly at a time when more than 5 million people in the Community are unemployed.

**CONSERVATION:** We also have to make a big effort in terms of energy saving. We have to ensure better insulation of buildings, we have to see that household appliances are designed in such a way as to avoid waste of energy, and there is much more to be done to reduce gasoline consumption by cars. But at the

same time we have to see to it that we don't kill the economic recovery. It would be wrong to stress energy saving to the extent that increased production was not possible.

**ON THE JET FUSION PROJECT.** European public opinion is fed up with the delays. Everything is ready; it's just a matter of finding a suitable site. For four years we have been training hundreds of scientists, but if this goes on much longer the team will disintegrate.

**ON SOLAR POWER.** In our area, especially northern and central Europe, solar power can never play a big role. We have calculated that by 1985 we could have 3% of our overall energy production based on solar power, but even this implies a big effort. The geographical location of Europe prevents the drive for solar energy possible in the U.S. or such sunny countries as Israel.

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in the rest of Africa. Last February, Nigeria—an oil-exporting nation with massive hydroelectric resources—revealed that it was negotiating with West Germany to buy nuclear power stations. Trumpeted a Lagos newspaper: "The black African giant is about to join the race to become a nuclear power."

The march toward nuclear capability will continue: Israel, Iran, perhaps even mercurial Libya. These nations are asking for reactors, not bombs, but the threat of one is inherent in the technology of the other. What can be done to minimize the risks?

For one thing—only a stopgap measure, to be sure—nuclear suppliers should take greater care in screening the countries they court. It may sound principled to justify a questionable sale on the ground that no nation, whatever its ideology, should be denied the benefits of nuclear power. But in fact no present supplier nation would consider selling nuclear technology to Idi Amin's Uganda—a form of discrimination for which its neighbors are profoundly grateful. Moreover, said an editorial in Nairobi's *Standard* last month, smaller nations should be actively denied the wherewithal to manufacture nuclear weapons. "Unless this is done," declared the paper, "the situation may arise whereby, as America and Russia reduce their nuclear arsenals, any progress toward peace may be nullified by the actions of the smaller powers."

The assumption of eventual superpower disarmament should jar the consciences of the two nuclear superpowers. A step in that direction would be the most important initial act in containing nuclear proliferation. In a thoroughgoing new Council on Foreign Relations study about nuclear proliferation, Atomic Physicist Theodore B. Taylor and Public Policy Scholar Harold A. Feiveson warn that "pressures for nations to acquire nuclear weapons will persist at least as long as the nuclear-weapons states continue to behave as though they feel more secure with nuclear weapons than without them." With the dawn of disarmament, nuclear glamour would begin to fade.

**Bad Bargain.** Though that fond development would help put a moral cap on proliferation pressures, the technological threat persists in the growing stockpiles of plutonium around the world, ever more scattered and thus more accessible. Taylor and Feiveson fear that the world is in a "dangerous drift" toward what they call a "plutonium economy," culminating in an arsenal of fast-breeder reactors capable of turning out tons of plutonium. The fast breeder seems a particularly bad bargain: in a world rightly concerned about environmental hazards, the manufacture of huge quantities of a poison with a half-life of 24,000 years is too risky even for the energy rewards it may promise.

Unfortunately, no nuclear fuel cycle is totally free of plutonium. But Tay-

lor and Feiveson suggest a technological option that while not yet fully explored by physicists, would be markedly safer than other methods. Called the "thorium cycle," it is based on a reactor fuel using the element thorium (widely found in nature), natural uranium, and small quantities of U-233, a highly fissionable uranium isotope derived by bombarding thorium. In this process, plutonium is only a minor byproduct. The major radioactive byproduct, more U-233, has several advantages over plutonium. It is less poisonous and shorter-lived, and most important, it can easily be "denatured" for transportation and storage by being mixed with natural uranium.

**Old Feuds.** Promoters of the nuclear industry are often impatient with the time-consuming and expensive detours that a switch to the thorium cycle—or any other innovation—might involve. But a demonstrable concern with present and future safety may be the only way they can persuade a worried public that they are not casually guiding the world into self-destruction. Nations whose economic future depends on nuclear technology must similarly create a climate of credibility by showing their willingness to cooperate in applying stringent international safeguards. Many experts, political and scientific, agree that all phases of production that involve weapons-grade materials—uranium enrichment, reprocessing and fast-breeder technology of any sort—should occur under multinational supervision, including a sturdy security force.

This would involve intense international cooperation among the world's nuclear powers and a heightened concern for the needs of less developed countries. Under a system that strictly accounted for waste, those nations with a demonstrated need could have power reactors (but no other nuclear technology) of their own. At the very least, they would be entitled to power from the internationalized nuclear centers.

That is an extraordinary expectation from a selfish world. It presupposes sacrifices: a willingness to shed national pride, to allow intrusions on national sovereignty, to bury old feuds and seek regional and global accommodations among competing political and social philosophies. It would require—just as a start—that nuclear energy be looked upon not as an industry to be peddled around the world by so many fast-talking salesmen with a shoeshine and a smile, but as a global patrimony over which every nation is a guardian.

Nuclear power is not a demon to be exorcised. It is a gift—but a terribly demanding gift. It might—just might—be the fearful prod that will move the quarreling tribes of the planet toward the beginning of some kind of effective world government. Like the vision from the moon of Spaceship Earth, it reminds us once again how small we are, and how we must learn to live together, to live at all.

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