

Breeder Reactors and the National Environmental Policy Act

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A meltdown at an experimental breeder reactor outside Detroit brought officials close to calling for the evacuation of the city's 1.5 million inhabitants. An Atomic Energy Commission (AEC) projection of damages from a nuclear accident at a hypothetical small nuclear power plant 30 miles from a city smaller than Detroit included 3,400 people killed and \$7 billion in property damages. A subsequent report updating the projections has been suppressed. Congress, under heavy pressure from utilities and insurers, has passed the Price-Anderson Act limiting federal liability in the event of such an accident to \$560 million.

The AEC's safety record with plutonium, the principal constituent of breeder reactors, is appalling. A 1969 fire at the AEC plant outside Denver, where all plutonium triggers for American nuclear and thermonuclear weapons are made, released substantial amounts of plutonium into the environment. Increases in the general background radiation level may be causing an as yet uncharted rise in the incidence of cancer and leukemia. Yet the Atomic Energy Commission refuses to prepare an environmental impact statement on the breeder reactor program which may put more than two thousand giant reactors all over the United States.

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The style of this passage is severe. The juxtaposition of episodes and charges is alarmist. But the substance is accurate. In the nuclear energy policy of the Nixon Administration and the AEC, there may well be irresponsibility which merits serious public concern.

This article considers the Federal Government's development program for breeder reactors in light of the National Environmental Policy Act (NEPA), which requires it to prepare statements of the environmental impact of major federal actions, policies and proposals for legislation. This paper emphasizes the controlled fusion reactor as an alternative to the breeder reactor.

At the same time that the importance of preserving the environment has become increasingly apparent, many people have become alarmed over a national "energy crisis" and the rapid rate at which we are depleting fuels and other natural resources. Energy production, particularly electric energy production, will be crucial to the quality of our lives, if not to our survival. Between now and the year 2002 the United States will consume more energy than it has in its entire history and will be consuming twice as much energy in all forms as at present.¹ By the year 2000, projections anticipate, electricity will constitute 38 per cent of our total energy, compared with 25 per cent of a much smaller total today.² Nuclear energy, when compared with energy produced from the burning of fossil fuels, is an attractive, apparently "cleaner" alternative. While nuclear energy provides 0.3 per cent of our total energy today, it may provide nearly 20 per cent of our total energy in 2000.³

Present nuclear plants and those currently planned for commercial use are pressurized water fission reactors. These plants are expected to be supplanted (for reasons of economy, pollution and uranium depletion) by other types of nuclear reactors during the next 10 to 30 years. Two of the most likely candidates for commercial use are the liquid metal fast breeder reactor (LMFBR) and the controlled thermonuclear fusion reactor.

The LMFBR is a fission reactor fueled with plutonium oxide and uranium oxide in which fissile plutonium atoms split apart emitting neutrons which continue a chain reaction by splitting other plutonium atoms. More neutrons are emitted than are needed to continue the reaction, and these neutrons are captured by nonfissile atoms of uranium 238, transforming them into plutonium atoms which form the fuel for other reactors. Because more plutonium will be formed than will be used up, the reactor will be a "breeder." The splitting of the atoms also releases a great deal of heat which is absorbed by liquid sodium and used to heat steam to drive turbines and produce electricity.

A controlled thermonuclear fusion reactor would fuse the nuclei of isotopes of hydrogen (deuterium and tritium), forming helium and releasing heat as well as neutrons to split lithium atoms into tritium atoms to continue the process. The fusion reactor could produce electricity indirectly with a conventional turbine or, some researchers hope, directly with a device to trap charged particles.⁴

Since 1946, the AEC has built five breeders, spending altogether \$650 million.⁵ And according to current projections, another \$3.3 billion must be spent in order for the LMFBR to become commercially feasible by 1986.⁶

Although the AEC's 1962 report to the President pointed to the breeder's promise, and its 1967 report established the LMFBR as its highest priority civilian reactor development effort, until February 1971, the AEC's internal priority was not reflected in breeder program funding.⁷ In March 1971, however, President Nixon received a report from the Energy Policy Subcommittee of the Domestic Council which recom-

mended development of breeder reactors. Because of that report, and perhaps (it is charged) for extraneous political reasons, the Nixon Administration "decided that instead of pressing for the development of 'clean' fusion reactors, it will throw heavy budgetary support behind" the liquid metal cooled fast breeder reactors.⁸ In June 1971, President Nixon's Message to Congress on Energy Policy announced plans to build the first LMFBR demonstration plant while asking for no new funds for research in controlled fusion.⁹ In September, President Nixon announced the decision to build a second breeder demonstration plant.¹⁰ In January 1972, the AEC announced that the first breeder would be built and operated by the Tennessee Valley Authority and Commonwealth Edison Company of Chicago.¹¹

The focus of our concerns in this sequence of developments is the decision embodied in the June Message to Congress which, for the first time, stated a "commitment to complete the successful demonstration of the liquid metal fast breeder reactor by 1980" and accepted the AEC priority to make the breeder the nation's power source for the future, which would mean the building of 2600 breeder plants by the year 2020.¹² In the June message Nixon requested an additional \$77 million for the breeder programs, \$27 million in fiscal year 1972 for technological development of the AEC's liquid metal fast breeder reactor program and \$50 million for the demonstration plant.¹³ This set the level of appropriations for the AEC reactor development programs, as reflected in the Senate Appropriations Bill for Fiscal Year 1972 (July 31, 1971), at \$430 million, of which \$340 million was for breeder reactors.¹⁴

Nixon also announced his request for "the early preparation and review by all appropriate agencies of a draft environmental impact statement for the breeder demonstration plant in accordance with Section 102 of the National Environmental Policy Act" to "ensure compliance with all environmental quality standards before plant construction begins."¹⁵

In contrast with the long statement and large budget for breeder reactors, Nixon's comments on controlled thermonuclear fusion were few. He requested no additional money at the time of the statement, though in regular budget requests he had asked for \$2 million extra.¹⁶ Fusion research has been funded at a level allowing about the same number of man-years of effort since the mid 1960's, but the fusion funding of \$30 million in 1970 reflects the gap that, relative to breeder funding, has been growing every year since 1966.¹⁷

These commitments to major federal spending and to the development of a whole new technology were followed in July 1971 by the AEC Draft Environmental Statement for Liquid Metal Fast Breeder Reactor Demonstration Plant which deals with a single unspecified breeder reactor. The AEC has not yet made the Statement final, nor has it prepared any other environmental statement dealing with the breeder reactor

program as a whole.¹⁸

The substantive inadequacies of the Draft Statement in its own terms will be discussed at length later. The President's recommendations, by their heavy emphasis on the funding of breeder reactor development, imply a commitment to the breeder, largely to the exclusion of alternative future sources of energy. That broader commitment suggests that the AEC Draft Statement was far too narrow for what was really being recommended.

There needs to be an environmental evaluation of the whole breeder program, not just a single breeder plant. And, indeed, in May 1971 the Scientists' Institute for Public Information, Inc. (SIPI), a group of 35 distinguished scientists led by Drs. Barry Commoner and Margaret Mead, filed suit against the AEC to require the preparation of a NEPA 102 (2)(C) Statement for the liquid metal fast breeder reactor program.¹⁹

While all of Section 102 is set out in the notes, the crux is as follows:

"all agencies of the Federal Government shall - . . .

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on -

- (i) the environmental impact of the proposed action,
- (ii) any adverse environmental effects which cannot be avoided should the proposals be implemented,
- (iii) alternatives to the proposed action,
- (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
- (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."²⁰

The act is limited in application to only some kinds of documents, statements and actions, that is, to "recommendations or reports on proposals for legislation and other major Federal actions" drafted by any federal agency. In this Message to Congress Nixon was setting out his "program," including "a commitment to complete the successful demonstration of the liquid metal fast breeder reactor by 1980."²¹ Surely this constitutes a recommendation for legislation. That Nixon's major recommendations as to specific legislation were to increase certain pre-existing budgets does not keep them from being recommendations on proposed legislation. Appropriations are among the most important types of legislation.

While it seems clear that the Energy Message and its underlying decision included recommendations for legislation, they also fall within the other heading, "major federal action." The Energy Message and breeder program fall within the definition of "actions" of the Guidelines of the Council on Environmental Quality (CEQ) as appropriations, as projects or continuing activities supported by the Federal government and requiring Federal licenses and as policy.²²

Moreover, the impact statement requirement cannot be avoided or narrowed in focus by a claim that the proposals are preliminary or experimental or that a single breeder is insignificant to the full breeder program. Again according to the CEQ Guidelines, whether or not an item is a "major federal action" is to be decided "with a view to the overall, cumulative impact of the action proposed (and of further actions contemplated)" and should include "proposed actions the environmental impact of which is likely to be highly controversial." ". . . [T]he effect of many Federal decisions about a project or complex of projects may be individually limited but cumulatively considerable" as ". . . when one decision involving a limited amount of money is a precedent for action in much larger cases or represents a decision in principle about a future major course of action. . . ." ²³

The argument that a statement on each breeder as it is built will suffice as to the whole program is answered by the Guidelines:

Agencies will need to identify at what stage or stages of a series of actions relating to a particular matter the environmental statement procedures of this directive will be applied. It will often be necessary to use the procedures both in the development of a national program and in the review of proposed projects within the national program.²⁴

Behind these official interpretations of Section 102 of the NEPA is a plain intent to inject concern for environmental considerations into all stages of agency deliberations. The CEQ Guidelines put it simply:

The principle to be applied is to obtain views of other agencies at the earliest feasible time in the development of program and project proposals.²⁵

Judge Wright's opinion in the case of *Clavert Cliffs' Coordinating Committee, Inc. v. AEC*, the most important interpretation of the NEPA to date, likewise confirms this view of the statutory requirements for timing and scope of environmental impact statements.²⁶

This then is the intent of NEPA's draft requirement. The case for its application to the AEC and to the President in the specific matter of the Energy Message proposals for the breeder reactor program ought now to be considered. To begin with, the involvement of the Presidency in the presentation of the appropriations proposals should not be made a ground for exempting them from the NEPA draft requirement. The environmental impact statement requirements apply to "all agencies of the Federal Government," and the CEQ Guidelines are directed toward "Federal departments, agencies and establishments."²⁷ Thus, if an agency, like the AEC, has failed to draft an adequate environmental impact statement for its proposal, the President should not act on the proposal by sending it to Congress. Of course, neither the AEC nor the President prepared or considered an environmental impact statement in deciding to recommend the greatly increased breeder reactor program.

The draft statement which the President announced he would request from the AEC would only be able to guide Congress, not the AEC or the President, in the decision. Even should the President be exempt personally, the AEC is clearly an agency within the terms of NEPA. The environmental statement required for the breeder program (or plant) should have been prepared long before the decision reached the Presidential level, for the Act states that the detailed statement "shall accompany the proposal through the existing agency review process."²⁸ Yet here, judging by the President's remarks in his Energy Message, no draft statement was prepared at the time the agency or the President made the decision to recommend. There is not the slightest doubt of the Act's applicability to the AEC, as is demonstrated by the decision in the *Calvert Cliffs'* case. Both individual administrative decisions, such as the building of a particular plant, and the general procedures by which such plants will be evaluated are subject to the Act's language and relevant judicial decisions.

Nor is there any doubt that the AEC will have to go to Congress with requests for appropriations to carry out the research and development of breeder reactors. Nixon's Energy Message requested \$77 million of supplemental appropriations for fiscal year 1972. The AEC, however, is not persuaded that the NEPA requires it to draft an impact statement for the whole projected breeder reactor program beyond the one it drafted in July 1971.

As mentioned earlier, on May 25, 1971, the Scientists' Institute for Public Information filed suit against the AEC in the District of Columbia²⁹ asking for a declaratory judgment that the AEC had failed to comply with Section 102 of the NEPA and mandamus directing the AEC to prepare and circulate an impact statement on the whole breeder program.

In the answer to the SIPI complaint, the AEC claims three defenses, all appearing to be restatements of the same theme. The first defense is that the complaint "fails to state a claim upon which relief can be granted." The second is that the AEC's Draft Statement of July 1971, while dealing with the prospective demonstration plant project, necessarily discusses and considers the broader aspects of the entire program. The authorization of appropriation funds for the program will only allow the Commission to continue its base research program, which has been in existence for 20 years. Thus, as far as this program is concerned, no major actions which will significantly affect the environment will be taken until defendants actually enter into a demonstration plant agreement or prior to the construction of a demonstration plant."³⁰ The third defense is that the Draft Statement made the case "moot."

The defendants seem to claim that the breeder program as a whole is exempt because it was started before the NEPA (which they allege is not retroactive) was passed. They argue that any new appropriations, proposals for legislation or other actions are satisfied by their Draft Environmental Impact Statement of July 1971. But more basically, the AEC appears to feel that it is not required to file environmental impact statements

for any actions other than the licensing and operation of specific facilities. In its own guidelines issued as a response to the *Calvert Cliffs'* decision (the AEC did not appeal the decision), no mention is made of impact statements for policies, proposed legislation, appropriations, continuing programs or other broad questions.³¹

This position contrasts with the language of the NEPA which refers to "the policies, regulations and public laws of the United States" and with the Guidelines of the CEQ as quoted earlier. The whole Act is designed for long-term actions as well as short-term actions and for a broad rather than narrow geographical scope. Consider these examples of its language: "requirements of present and future generations of Americans," "continuing responsibility of the Federal Government," "responsibilities of each generation as trustee of the environment for succeeding generations," "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity," "recognize the worldwide and long-range character of environmental problems" and "quality of mankind's world environment."³²

Finally, the holding in *Calvert Cliffs'* confirms this broad view. It upheld the Act's applicability not only to the particular decision of the Atomic Energy Commission in granting a construction permit or an operating license but also to "the Commission's recently promulgated rules which govern consideration of environmental values in all such individual decisions."³³ Like the rules, the breeder policy decision has implications reaching far beyond the individual plant-by-plant decisions, implications which would affect the environment profoundly.

To turn briefly to the problem of the retroactivity of the NEPA, the argument of the AEC in their answer to the SIPI complaint appears to rely on the establishment of a priority breeder reactor program before the passage of the NEPA as evidence that an environmental statement is not necessary. In support of that position, the AEC cites U.S. interest in breeders beginning in the early 1940's and the 1962 and 1967 reports to the President which "reaffirmed the promise of the breeder for meeting our long-term energy needs and established the Liquid Metal Fast Breeder Reactor (LMFBR) program as the AEC's highest priority civilian reactor development effort."³⁴

Even if the decision to embark on a large-scale development of breeder reactors were made before the NEPA became law, which is doubtful in view of the relatively low appropriations for the breeder program before the Energy Message, the Council on Environmental Quality's Guidelines require NEPA procedures. "To the maximum extent practicable the section 102 (2)(C) procedure should be applied to further major Federal actions having a significant effect on the environment even though they arise from projects or

programs initiated prior to enactment of the Act on January 1, 1970. Where it is not practicable to reassess the basic course of action, it is still important that further incremental major actions be shaped so as to minimize adverse environmental consequences. It is also important in further action that account be taken of environmental consequences not fully evaluated at the outset of the project or program.”³⁵ It would be wise and practicable to reassess the whole breeder program, particularly in view of the major new emphasis on spending that is being given it. At the very least, the present steps to increase the program are “further incremental actions” which should be evaluated environmentally, allowing further notice to be taken of environmental consequences not evaluated earlier.³⁶

It is true that some cases have held that the NEPA is not to be applied retroactively, particularly in the context of highway projects.³⁷ However, even these cases require the program to be relatively near completion before it can avoid the required environmental impact statement.

The entire breeder reactor program is not sufficiently near completion to escape the requirement.³⁸ The decision to build breeder plants for commercial use changes the program from experimental research to a massive national effort.³⁹ The breeders that have been built are one-twentieth the size of those projected.⁴⁰ While five or six have been built, the AEC predicts that 500 more will be operating by the year 2000 and 2,600 by the year 2020.⁴¹ The first commercial breeder is not expected until the year 1986. No company has even been selected to build the first of at least two, and perhaps several, demonstration plants to precede the first commercial reactor.⁴² The appropriate comparison with the highway construction program would be to ask whether the fact that the country had built many “U. S. highways” before the “interstate system” was started would have foreclosed the necessity of an environmental impact statement concerning the interstate system. The interstate system’s impact on the environment was so much greater than the previous road system’s, whether for better or worse, that the answer is clearly that a new impact statement would have been necessary. The breeder reactors being contemplated, in size and number, are also so much different from anything that has been built up to now that a new environmental impact statement dealing with the whole program should be required.

Implicit in the AEC’s position are arguments that have already been rejected in the *Calvert Cliffs*’ decision. The AEC has implied that one reason it is reluctant to go into environmental matters is that it would take a lot of time. The AEC, in fact, argued in the *Calvert Cliffs*’ case that the phrase, “to the fullest extent possible,” in the act (Sec. 102) made compliance “discretionary.” Judge Wright replied, “this language does not provide an escape hatch for footdragging agencies; it does not make NEPA’s procedural requirements somehow “discretionary.”⁴³ “Considerations of administrative difficulty, delay, or economic cost will not suffice to strip the section of its fundamental importance.”⁴⁴ As to the Commission’s argument in that earlier case for the need

for an “orderly transition” to the NEPA procedures, Judge Wright responded, “the obvious sense of urgency on the part of Congress should make clear that a transition, however ‘orderly,’ must proceed at a pace faster than a funeral procession.”⁴⁵

There is also the major fear of the power industry, the AEC and others that there is no time for careful consideration of alternatives in the face of a growing energy crisis.⁴⁶ To this, the *Calvert Cliffs*’ decision says:

“In the end, the Commission’s long delay (in adopting procedures for preparing 102 statements) seem based upon what it believes to be a pressing national power crisis. Inclusion of environmental issues might have held up the licensing of some power plants for a time. But the very purpose of NEPA was to tell federal agencies that environmental protection is as much a part of their responsibility as is protection and promotion of the industries they regulate. Whether or not the spectre of a national power crisis is as real as the Commission apparently believes it must not be used to create a blackout of environmental consideration in the agency review process.”⁴⁷

With the lawyer’s case against the AEC stated, it remains to be shown what may be at stake environmentally in the struggle to force the AEC’s compliance with the NEPA. The inadequacies of the 1971 AEC draft impact statement are serious, and they obscure the real and sometimes terrifying hazards that lie in uninformed executive and congressive decisions which have environmental consequences. The most persistent blind spot in the impact statement is the none too impressive safety record of the AEC itself.

To be fair, the AEC Draft Environmental Statement does at least mention most of the environmental impacts that should be considered:⁴⁸ waste heat production (thermal pollution), wastes from the demonstration plant itself, wastes from the demonstration plant fuel cycle, plutonium safety considerations, diversion of plutonium, radioactivity production, effects on terrestrial and biological eco-systems and land use and demographic changes. But the consideration of them is not at all detailed and thus does not provide the information necessary to carry out the purposes of the NEPA.

To take one example, the Statement says that “the extreme toxic nature of plutonium is recognized and adequate precautions are available to protect the public, as is the case with many other toxic or dangerous substances used in industry.”⁴⁹ Unfortunately, the record of the AEC in handling plutonium is not spotless. On April 21, 1964, the AEC “lost” 2.2 pounds of plutonium 238 in a navigational satellite rocket that failed to orbit. The plutonium lost in this incident, if distributed evenly to all human beings, would be sufficient to kill them all.⁵⁰ Plutonium was also lost in the crashes of nuclear weapons-bearing aircraft in Spain and Greenland.

There was a disastrous fire on May 11, 1969 at the AEC facility operated by the Dow Chemical Company.

This plant, 21 miles from downtown Denver and five miles from Denver suburbs, is where all plutonium triggers for nuclear and thermonuclear weapons manufactured by the United States are made.⁵¹ The fire, said to be the most costly industrial accident in United States history, carried an unknown quantity of plutonium away from the plant. Despite the AEC's successive attempts to deny and then minimize the amount of plutonium that was lost, it now admits that substantial amounts did escape. Two AEC scientists, in an official report, said the amount of plutonium released might have been as great as 5.8 curies, and the nuclear chemist who originally exposed the AEC coverups thought the amount to be over 15 curies.⁵² The "permissible" exposure to plutonium is 16 nanocuries (16 one-billionths of a curie) per lung, a standard which has been under severe attack by scientists and doctors as being much too high. The AEC Director of Research and Ecology is, indeed, correct when he says, "the difference between 1, 6, or 15 curies is not significant from a public health standpoint."⁵³ What he does not bother to say, however, is that even one curie, if it were evenly distributed in human systems, would be ample to kill, not only the population of Denver, but of the whole Rocky Mountain area. The workers at the Dow plant are "routinely exposed" to plutonium in "accidents and small fires and explosions." According to management there were 70 small fires in 1969 and 35 in 1970.⁵⁴ Plutonium loses half its radioactivity only after 24,000 years, so that any amount lost now will plague the earth indefinitely.

The AEC report states that "one of the potential problems in working with plutonium, which arises in all stages in its fuel cycle, is the possibility of accidentally achieving a critical mass."⁵⁵ There has already been a fuel melt down and a similar serious accident in two of the very few breeder reactors that have ever operated. The meltdown occurred in the Enrico Fermi Power Plant in 1966 and was serious enough to require consideration of evacuating Detroit and its 1.5 million inhabitants.⁵⁶ The reason for considering evacuation is clear. The Fermi reactor held about 1,000 pounds of uranium, of which a very small amount, if it melted together, could cause the release of radioactivity far greater than explosions at Hiroshima and Nagasaki. The reactor was not inspected for 17 months after the accident for fear that the meltdown had created a critical mass.⁵⁷

The type of breeder planned by the AEC would hold about 4,000 pounds of plutonium. If as little as 4 pounds of this melted together, it could cause a critical mass and explosion. In the AEC's Brookhaven report, a 1957 projection of damages from such a nuclear accident (in a conventional, non-breeder reactor) postulated an accident at a small, 100,000-200,000 kilowatts electric, nuclear power plant located about 30 miles from a city of one million people and projected 3,400 people killed, 43,000 injured and \$7 billion in damaged property. People could be killed at distances of 15 miles and injured at 45 miles. Land contamination could extend over 150,000 square miles.⁵⁸

It is not comforting that the government suppressed a subsequent report which updated the possibilities. The

commercial breeder reactors are expected to be 5 to 10 times larger than the reactor postulated (or 1,000 megawatts instead of 100 megawatts). Some modern reactors are being built much closer than 30 miles from large cities, (for example five miles from Trenton, 10 miles from Philadelphia and 24 miles from New York).⁵⁹ Some of these reactors are being built near metropolitan areas of populations closer to 10 million people than 1 million. To contaminate 15,000 (or how many more?) square miles of the Eastern seaboard is to contaminate most of it. These predictions and AEC mishaps have provided the reason for passing the Price-Anderson Act which limited total liability for a radiological accident to \$560 million.⁶⁰

The AEC Draft Environmental Statement mentions the production of excess radioactivity by breeder reactors. However, it does not reply to the charges made by two former AEC scientists in a book entitled *Poisoned Power: The Case Against Nuclear Power Plants*,⁶¹ which attacks the idea that any level of additional environmental radiation is safe. They found that if the U.S. reached the present level of radiation allowed by the AEC of .17 rads per year average, we would have an additional 32,000 cases of fatal cancer and leukemia per year.⁶² While current levels of radiation are far below the permitted levels in most locations, the AEC opposes any attempt to lower the permissible radiation levels, perhaps because the addition of many breeder reactor plants around the country would greatly increase the existing radiation levels.⁶³

The Draft Statement admits that breeder reactors will necessitate very long-term (thousands of years) storage of high level radioactive wastes. It says, "The location proposed for this repository is adjacent to an abandoned salt mine near Lyons, Kansas. The natural geologic formation of bedded salt deposits provides ample assurance that materials placed therein will remain isolated from man's environment, with minimum surveillance, over geological periods of time."⁶⁴ The idea of using this repository in Lyons has been seriously attacked because of demonstrations that water leaks into the storage area could carry radioactivity into the water supply.⁶⁵

One aspect of the plutonium fuel cycle the AEC Environmental Statement does not cover is the mining of uranium and plutonium. It has been a matter of some embarrassment to the AEC to have had it made public that, after extensive mining of nuclear fuels in western Colorado, they invited construction crews of a whole town, Grand Junction, Colorado, to use mine tailing as a fill in construction projects.⁶⁶ It has been found that this fill is highly radioactive, making many of the homes in that town unsafe for their inhabitants. The AEC is attempting to

avoid taking responsibility for this error to relocate those families whose health is in danger.⁶⁷ Yet despite the AEC's having made most of the town unsafe to live in, its impact statement fails to refer to the dangers present in the mining part of the fuel cycle.

Perhaps the most serious defect in the AEC Environmental Statement is its trifling treatment of alternatives to breeder reactors. In this "alternatives" section of the statement the AEC wholly fails to consider the building of any kind of plant other than a breeder reactor, such as fusion reactors, conventional or other types of power plants, quite apart from failing to raise the possibility of reducing the astronomical growth of power consumption. This narrow focus of the statement can be justified only on the theory that the report is meant to deal merely with a particular demonstration breeder reactor plant. It clearly does not compare alternatives to the whole breeder reactor program. This underlines the importance of the pending SIPI suit. The weighing of these broad alternatives is precisely what is to be gained by its successful prosecution against the AEC.

The one discussion of alternative power sources comes in a three-page cursory and conclusionary glance at so many other potential sources of power that most, literally, get only one sentence. For example, the full section on fusion is the following: "According to the best judgment of most experts, there is little chance that alternative power producing systems, such as those utilizing solar and geothermal energy, tidal power or controlled thermonuclear fusion, or alternative power conversion systems, such as magnetohydrodynamics (MHD) and fuel cells will contribute significantly to the production of bulk power prior to the end of the century." "The feasibility of controlled nuclear fusion for the production of electricity has not yet been demonstrated. It is unlikely that nuclear fusion will be a major contributor to power generation in this century."⁶⁸ The first statement is not footnoted. The source of the second statement is a speech by Glenn Seaborg, former chairman of the AEC, entitled "The Erehwon Machine." But a citation of the head of the agency which is developing the breeder at the expense of all alternatives including fusion is rather like no citation at all.

What makes these pronouncements especially misleading is that the date when fusion is developed depends to a great extent on the AEC, and thus any predictions by the AEC will become self-fulfilling prophesies unless challenged. The AEC has not increased fusion research (in terms of annual man-years) since 1964, despite tremendous research advances.⁶⁹ Yet, according to the AEC's Assistant Research Director, funding difficulties rather than scientific obstacles are currently limiting fusion progress. Modest investment of resources on exploratory studies of fusion reactor technology could materially reduce the time and cost of developing commercial fusion reactors.⁷⁰ This is also a time when scientists and engineers are unemployed because of defense and aerospace cutbacks and would be available at reasonable salaries to do research in the fusion field.

Finally, the AEC developed its priority program for the breeder and has maintained it without using the global and long-range criteria for the assessment of a program's impact that are required by the NEPA. One of two important criteria that appear not to have been considered carefully by the AEC is an assessment of the action from the NEPA's perspective that "each generation is trustee of the environment for succeeding generations."⁷¹ If the breeder is simply a stopgap between the present reactors and fusion, then a really long-range assessment might lead to a different decision, for example, to stretch the uranium supply or to use more conventional power in order to avoid the possibility of killing future generations by the use of the terribly toxic plutonium. Another neglected criterion is Section 102 (2)(E) which requires the AEC, as a federal agency, to "recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment." Since numerous other countries are involved in building breeders and in fusion research, the AEC should reevaluate the possibility of international cooperation as a means of reducing the U.S. effort or of making it more efficient.⁷² In addition, taking a global view of the problems of using plutonium instead of deuterium might lead to a reconsideration of the relative merits of breeder and fusion reactors.

Perhaps fusion would be enough better in environmental terms that this country should concentrate its research on making it a reality at the expense of a rapid development of breeders which other countries will surely build, partly because they have advanced further in research on the breeder than we have.⁷³ The Soviet Union is well along in construction of a liquid metal fast breeder reactor twice as large as the proposed U. S. demonstration plant. In fact, six nations—Russia, the United Kingdom, France, Germany, Italy and Japan—may be ahead of us in this technology. All these except Japan expect to build commercial size reactors (1000 MWe) by 1981, five years before the U. S.⁷⁴ The AEC seems to take the approach that our balance of payments and national pride require that we catch up to and beat these countries in another technology race. The NEPA suggests, as does the fact of an increasingly interdependent world, that greater cooperation and less competition might have beneficial effects not only on the environment but also on world peace and economic development.⁷⁵

Although the AEC ought to consider in its draft statement the irreversible and irretrievable commitment of resources to this project, it considers only a particular breeder plant. There is no sensitivity in the discussion to the way in which building one breeder plant tends to commit the government to building other breeder plants,

to prevent the consideration of alternative energy sources, either conventional or fusion, and perhaps to lead to the building of thousands of breeder reactors all over the country. For if the AEC and the utilities invest significant amounts of money in breeder research and construction, they will be reluctant to change technologies before they have extracted their profits from the breeder program—which probably will be well after the turn of the century.⁷⁶

As a matter of fact, the process of irretrievable commitments of resources has already begun. Since the preparation of the Draft Statement, the AEC has convinced President Nixon to announce that he would authorize the building of a second breeder demonstration.⁷⁷ Nixon did this, in September 1971, not only without an environmental impact statement but without consulting most AEC officials, officials of the Office of Management and Budget, members of the Joint Committee on Atomic Energy or representatives of the nuclear industry.⁷⁸ Building two breeders will cost nearly \$1,000,000,000⁷⁹ and perforce use nearly all of the AEC's research funds in that program while preventing the possible development of any other technology. These matters are not considered at all in the AEC Draft Statement.

Unfortunately it would not be unprecedented for the federal government to put all its research eggs into one basket. For years about 83 per cent of federal energy research money has gone into radioactive power plant research, and almost nothing has been provided for other possible sources of power. In 1970 the government spent approximately \$255 million on developing radioactive nuclear power plants, \$30 million on developing fusion power, \$300,000 on developing magnetohydrodynamic generators but nothing on developing geothermal technology or on developing solar energy.⁸⁰

This pattern of allocation of resources may exaggerate the largest apparent advantage the breeder has over fusion reactors—that it is technologically nearer commercial exploitation. But the AEC does not project that breeders will be ready to operate commercially until 1986.⁸¹ Fusion reactors are expected to be ready for commercial use around 2000, 15 years later, though some optimists say they will be ready by 1990, and some pessimists, it must be admitted, say never.⁸²

The brevity of the period for which it is projected that breeders will be available—and fusion reactors will be unavailable or not environmentally and economically superior—is very important.⁸³

General Electric and Westinghouse invested over \$300 million in light water reactors (the kind presently in use) in the 1950s and 1960s, but it is only within the last year that the companies have begun to generate a positive cash flow on their reactors.⁸⁴ The same problem is already developing with regard to the breeder. In successive steps, the Nixon administration has offered to take on more and more of the costs of the breeder program in order to make it attractive to industry. At first, the government was to contribute \$50

million, one-tenth the cost of the first demonstration plant. Then \$100 million. Now the government is offering to pay \$250 million, one-half the cost, and the nuclear industry is still unwilling to raise the matching money.⁸⁵

It may be that the industry is just holding out its cup and seeing how big a contribution the taxpayers can be forced to make.⁸⁶ However, the great AEC and administration pressure that was applied in attempts to get the matching money suggest that the industry itself has looked at the investment and decided it is a bad one, even in internal economic terms.⁸⁷

In conclusion, to highlight the importance of the omissions in the July 1971 AEC Draft Statement, let us compare, in turn, each of the major environmental impacts of the breeder and fusion plants. The breeder is expected to produce nearly as much waste heat as a proportion of total output as do present conventional power plants which are more efficient (waste less heat) than present fission reactors. Breeders may have 50 per cent thermal efficiency, compared with 41 per cent for present fossil fuel plants (and perhaps 50 per cent for advanced ones), and about 32 per cent for present reactors.⁸⁸ If steam turbines are required for fusion, they will probably be about 50 per cent efficient, but there is hope that fusion might allow direct electrostatic energy recovery which would push its efficiency very high indeed, an operating characteristic that could be extremely important to a thermally polluted world.⁸⁹

The breeder would produce numerous radioactive products within the plant, including krypton-85, Iodine-131 and tritium. The fusion reactor would produce only tritium, although in larger quantities than the breeder. David Rose, Director of Long Range Planning at the Oak Ridge National Laboratory, suggests that the fusion reactor would have a substantial advantage over the breeder in containing these radioactive products.⁹⁰

The breeder would use large amounts of liquid sodium, which is highly dangerous when it comes in contact with water or air. But most configurations of fusion reactors would involve similar amounts of lithium or fused salts and would involve similar dangers.⁹¹

Fusion would have a major advantage over the breeder in not having fuel reprocessing plants. Tritium would be recovered from the reactor and used on site for the fuel cycle.⁹² The other fuel, deuterium, would be burned up in the power production process, and the reaction would form the element helium, which would not be harmful or radioactive. Thus, the fusion plant would not have the difficult problems involved in transporting dangerous fuel to and from reprocessing plants. Removing the fuel reprocessing plants would reduce the opportunities for nuclear accidents and for the emission of radioactivity to workers or the public. It would also diminish production of low-level radioactive wastes.⁹³

The most important advantage of fusion over the breeder results from the nature of the fuel employed in each. The fusion plant uses only deuterium and tritium and produces helium, while the breeder depends on the highly toxic and long-lived plutonium and produces radioactive iodine as well. Deuterium and helium are common substances in nature and apparently not harmful. Tritium is radioactive and capable of entering the biological cycle as water (in T₂O), but it is relatively benign in its radioactivity.⁹⁴ On the other hand, although a fusion reactor would produce as many curies of radioactive tritium as a breeder would of iodine, the iodine is more dangerous because it is concentrated in living things and has higher energy radioactivity.

Further, the use of hydrogen isotope fuel minimizes the risk of reactor explosion. The hazards of a meltdown in a plutonium breeder reactor were described earlier. In comparison, a fusion plant would have less than 1 gram of reacting nuclear mass at the core, far too little to explode.⁹⁵ If the reactor did not work properly, the plasma would dissipate, giving up its energy to the walls of the reactor, but not providing any explosive increase in the heat released.

Moreover, the fuel used in fusion is probably not so subject to the widespread production of nuclear weapons as is that of the breeder. The hydrogen isotopes will fuse only at extremely high temperatures, producible only in reactors or in hydrogen bombs. But hydrogen bombs must themselves be triggered by atomic bombs. Thus, while the spread of breeder reactors and plutonium all over the world could provide plutonium for the nuclear armament of nearly every nation, and perhaps of small conspiracies within nations, it is at least possible that most types of fusion reactors could be placed all over the world without danger of bomb production, provided that all plutonium and other fissionable materials necessary for the atomic trigger bombs were controlled. On the other hand, attempts are being made to develop high-powered lasers as an alternative trigger for fusion weapons. These lasers would focus their energy on a small pellet of hydrogen isotope fuel, heating it to fusion temperatures before it could vaporize and disassemble. This technique, if successful, would provide a way either to produce electricity—or to ignite hydrogen bombs.⁹⁶

370 **T**he breeder reactor program is likely to be the first of many high-technology government programs to face the environmental assessment potentially available through full enforcement of the National Environmental Policy Act. The Atomic Energy Commission has been reluctant to comply with the Act, even though there has been some reorganization within the AEC to stress environmental matters and the development of fusion.⁹⁷

The suit brought by Scientists' Institute for Public Information against the AEC is an important attempt to force the AEC to develop an environmental impact statement for the whole LMFBR program—a program which is projected ultimately to involve more than 2,000

breeders throughout the United States at a cost of hundreds of billions of dollars.⁹⁸ William Reilly, of the Council on Environmental Quality staff, has characterized it in this way: "What these guys are asking for is a broad-gauged technological assessment. So far as I know, this is the first time such an expansive interpretation of the Act has come before the courts."⁹⁹

Though the claims of SIPI are undoubtedly broad, they deal with a crucial subject. The legal arguments of SIPI are strong. The environmental case against breeder reactors, here briefly sketched, is disturbing and impressive. Yet the arguments for a broader impact statement by the AEC on the whole breeder reactor program succeed even if the environmental arguments are unconvincing. Environmental impact statements under the NEPA are not meant to set out just the evidence in favor of the final recommendation and decision of the federal agency concerned. Rather, they should provide a balanced background of the plausible environmental considerations. Without the benefit of this balanced background, final decisions in the public interest cannot be made. By this standard, the AEC's reluctant and limited concessions to the requirements of the NEPA are wholly inadequate.

1. Stair, *Energy and Power*, 225 Sci. Am. No. 3 at 37 (Sept., 1971).
2. *Id.* at 44.
3. *Id.* at 39,44.
4. See Summers, *The Conversion of Energy*, 225 Sci. Am., No. 3 at 149 (Sept., 1971).
5. Barfield, *Nuclear Establishment Wins Commitment to Speed Development of Breeder Reactors*, 3 National J. 1494 (1971) (Cited Barfield I). U.S. AEC, *Draft Environmental Statement for Liquid Metal Fast Breeder Reactor Demonstration Plant*, 23 (July, 1971) (Cited *Draft Statement*).
6. Barfield I at 1494.
7. U.S. AEC, *Civilian Nuclear Power—A Report to the President* (1962). Official Summary reprinted in CCH, *Atomic Energy Law Reports*, Sec. 10,064 at 16,136 (1962). U.S. AEC, *The 1967 Supplement to the 1962 Report to the President on Civilian Nuclear Power*. Official Introduction and Summary reprinted in CCH, *Atomic Energy Law Reports*, Sec. 10,369 at 16,582 (1967).
8. N.Y. Times, March 8, 1971, at 1 Col. 2. For discussion of the possibility that the decision was influenced by Nixon's desire to get Congressional approval of his plan for reorganizing federal departments and agencies, see Barfield I.
9. *President's Message to Congress on Energy* (June 4, 1971). BNA, *Env. Rptr.* 21:0371, 0372 (1971) (Cited *Message*).
10. Barfield, *Nixon Approves New Pilot Breeder Plant*, 3 National J. 2047 (1971) (Cited Barfield II).

11. BNA, 2 Env. Rptr. 1142 (1972).
12. See *Message* at 21:0371.
13. *Id.* at 21:0372.
14. 3 Nat. J. 1676 (1971). This level was set before Nixon announced he would back a second demonstrative LMFBR. See 3 Nat. J. 2057 (1971).
15. *Message* at 21:0372.
16. See *Message* at 21:0373.
17. See, Energy Policy Staff of the President's Office of Science and Technology, *Electric Power and the Environment* 45 (Aug., 1970).
18. 2 Env. Rptr. 1142 (1972).
19. *Scientists' Institute for Public Information, Inc. vs. Atomic Energy Commission*, et al, Civil Action No. 1029-71, D.C. The legal arguments which follow are similar to the ones made by SIPI, although developed independently.
20. In full Section 102 reads:
 "The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall—
 (A) Utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;
 (B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;
 (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—
 (i) the environmental impact of the proposed action,
 (ii) any adverse environmental effects which cannot be avoided should the proposals be implemented,
 (iii) alternatives to the proposed action,
 (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
 (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
 Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal Agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, U.S. Code, and shall accompany the proposals through the existing agency review processes: . . ."
- National Environmental Policy Act of 1969, 42 U.S.C. Sec. 4321, 4322 et seq. (1971 Pocket Part). (Cited NEPA).
21. *Message* at 21:0371.
22. " 'Actions' include but are not limited to:"
 "(i) Recommendations or favorable reports relating to legislation including that for appropriations: . . .
 (ii) Projects and continuing activities: directly undertaken by Federal agencies; supported in whole or in part through Federal contracts, grants, subsidies, loans, or other forms of funding assistance, involving a Federal Lease, permit, license certificate or other entitlement for use;
 (iii) Policy, regulations, and procedure-making."
 Council on Environmental Quality, *Statements on Proposed Federal Actions Affecting the Environment*, Guidelines, 36 Fed. Reg. 7723 (April 23, 1971), 1 E.L.R. 46045 (Cited *Guidelines*).
23. *Id.*
24. *Id.* at 7725.
25. *Id.*
26. *Calvert Cliffs's Coordinating Committee, Inc. v. AEC*, (D.C. Cir., Nos. 24:839 and 24:871, July 23, 1971), 2 ERC 1779 (Cited *Calvert Cliffs*).
 The *Calvert Cliffs*' case involved an attack on the rules which the AEC devised to comply with NEPA on the grounds that the rules nevertheless violated the requirements of Section 102 of NEPA. The particular rules under attack provided (1) that the atomic safety and licensing board would not consider environmental issues not raised by a party to any hearing, but would carry out such consideration outside the hearing process; (2) that no party could raise non-radiological environmental issues at hearings for which notice was given before March 4, 1971; (3) that the hearing board would not consider certain environmental factors if other agencies had already certified compliance with their own standards; and (4) that facilities for which construction permits had been issued would not be considered from an environmental standpoint until the time of issuance of the operating license.
 Judge Wright stated, "Compliance to the 'fullest' possible extent would seem to demand that environmental issues be considered at every important stage in the decision making process concerning a particular action—at every stage where an overall balancing of environmental and non-environmental factors is appropriate and where alterations might be made in the proposed action to minimize environmental costs." (at 1785).
 Compliance to the fullest possible extent must include active assessment of the impact statement as well. In striking down the AEC rule which allowed consideration of environmental factors outside the hearing process, Judge Wright said, "the Commission's crabbed interpretation of NEPA makes a mockery of the Act. What possible purpose could there be in the Section 102 (2)(C) requirement [that the "detailed statement" accompany proposals through agency review processes] if "accompany" means no more than physical proximity—mandating no more than the physical act of passing certain folders and papers, unopened, to reviewing officials along with other folders and papers? . . . It must, rather, be read to indicate a congressional intent that environmental factors, as compiled in the "detailed statement," be considered through agency review processes." (at 1784, 1785).
27. *Guidelines* at 46049.
28. Sec 102 (2)(C).
29. *Scientists' Institute for Public Information, Inc. v. AEC*, (Civil Action No. 1029-71, Dist. Ct. D.C.) (Cited *SIPI*). See E.L.R. Dig. 182.
30. *SIPI*, Answer at 11, 12.
31. *Licensing of Production and Utilization of Facilities: Implementation of National Environmental Policy Act of 1969*, 36 Fed. Reg. 18071 (Sept. 9, 1971).
32. NEPA, Sec. 101, 102.

33. *Calvert Cliffs*' at 1783.

The "Section by Section Analysis of the NEPA," set out in the Congressional Record of Oct. 8, 1969, also helps to illuminate the meaning of major actions:

"Each agency which proposes any major actions, such as project proposals, proposals for new legislation, regulation, policy statements, or expansion or revision of ongoing programs, shall make a determination as to whether the proposal would have a significant effect upon the quality of the human environment. If the proposal is considered to have such an effect, then the recommendation or report supporting the proposal must include statements by the responsible official."

Reprinted in 16 Howard L.J. 125 (1970). (Emphasis added).

34. *Draft Statement* at 11, 12, 14.

35. *Guidelines* at 7726.

36. Even the AEC regulations concerning licensing of facilities recognize the requirement to review some projects begun before the passage of the NEPA. U.S. AEC, *Licensing of Production and Utilization Facilities*, 36 Fed. Reg. No. 175 at 18071, Sec. C at 18075 (Sept. 9, 1971).

37. See *Pennsylvania Environmental Council v. Bartlett*, U.S. D.C. Middle District, Pa. No. 70-123 (April 30, 1970), 1 ERC 1271 (1970), *Brooks v. Volpe*, W.D. Wash. (Sept. 25, 1970), 2 ERC 1005 (1970).

38. For example, in *Texas Committee on Natural Resources v. U.S.*, U.S.D.C. Western District of Texas, Civ. No. A69-CA-119 (Feb. 5, 1970, 1 ERC 1303 (1970)), the Federal Housing Administration had processed and approved a loan for housing but no money had been spent and no construction had begun. The Court held that an Environmental Statement was required.

In *EDF v. Corps of Engineers*, U.S.D.C. D.C. No. Civ. 2655-69 (Jan. 27, 1971, 2 ERC 1173 (1971)), a preliminary injunction was granted to stop construction of the partially-completed Cross-Florida Barge Canal where "further construction and related operations now planned might irreparably damage marine and plant life and a primary source of drinking water for the state of Fla." *Id.* at 1175. "The NEPA recognizes a 'continuing responsibility of the Federal government' to strive to preserve and enhance the environment and requires a detailed and systematic consideration of the environmental impact of Federal actions." *Id.*

In *EDF v. Corps of Engineers*, 325 F. Supp. 749 (1971) the district court stopped construction of the Gillham Dam Project when it was approximately two-thirds completed, saying "the Congress of the U.S. is intent upon requiring the agencies of the U.S. government, such as the defendants here, to objectively evaluate all of their projects, regardless of how much money has already been spent thereon and regardless of the degree of completion of the work." 325 F. Supp. 749, 752.

Finally, in a case where the Corps of Engineers had received authorization for a reservoir and dam project in 1938, the Court held that the fact that the Corps of Engineers had not filed an Environmental Impact Statement was a valid defense to an action in eminent domain more than 30 years later. *U.S. v. 247.37 Acres*, U.S.D.C. S.D. Ohio W. Div. No. Civ. 7769. (Sept. 9, 1971, 3 ERC 1098).

39. See *Draft Statement* at 23.

40. *Id.*

41. U.S. AEC, *Cost-Benefit Analysis of the U.S. Breeder Reactor Program*, Wash. 1126 at 49 (1969). Barfield I at 1502.

42. Barfield I at 1497.

43. *Calvert Cliffs*' at 1782.

44. *Id.* at 1782, 1783.

45. *Id.* at 1788.

46. See e.g., Barfield, *Calvert Cliffs' Decision Requires Agencies to Get Tough with Environmental Laws*, 3 National J. 1925, 1931 (1971).

47. *Calvert Cliffs*' at 1788.

48. *Draft Statement* at 41-47.

49. *Id.* at 50.

50. R. Curtis and E. Hogan, *Perils of the Peaceful Atom*, 134 (1969) (cited *Perils*).

51. Rocky Flats: *Credibility Gap Widens on Plutonium Plant Safety*, 174 Science 569 (1971).

52. *Id.*

53. *Id.* at 570.

54. *Id.*

55. *Draft Environmental Statement* at 48, 49.

56. *Perils* at 1.

57. Lyon, *Nuclear Power and the Public Interest*, 3 Bennington Rev. 59 (1969).

58. U.S. AEC, *Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Plants*, 740 Wash. (1957). *Perils* at 60.

59. J. Gofman and A. Tamplin, *Poisoned Power* 355 (1971) (cited *Poisoned Power*).

60. See *Perils* at 248-256.

61. See *Poisoned Power*.

62. *Id.* at 97.

63. C.f. the Rocky Flats Plant, which might have to be closed if permissible radiation standards were lowered. 174 Science 570 (1971). See also Barfield, *Attack On Federal Radiation Standards Threatens Nuclear Development Programs*, 2 National J. 2483 (1970); and Holcomb, *Radiation Risk: A Scientific Problem?*, 167 Science 853 (1970).

64. *Draft Statement* at 53.

65. See the four part series on the repository by Fred Brown in the Denver Post; 1 Col. 2 (Sept. 26, 1971); 28 Col. 1 (Sept. 27, 1971); 51 Col. 4 (Sept. 28, 1971); and 83 Col. 1 (Sept. 29, 1971). See also *AEC May Abandon Lyons Plan*, Denver Post, 53 Col. 4 (Oct. 3, 1971). *N Waste Problems Arise*, Denver Post, 23 Col. 1 (Jan. 6, 1972); BNA 2 Env. Rpt. 1213 (1972).

66. *Radioactive Bldg. Sand Stirs Dispute*, 1 Col. 3 New York Times (Sept. 27, 1971).

67. *U.S. to Finance Grand Junction Birth Defects Study*, Denver Post, 81 Col. 1 (Jan. 12, 1972). *'Scrubbing' Cleanses Mine Air*, Denver Post, 3AA Col. 1 (Dec. 8, 1971).

68. *Draft Statement* at 63, 64.

69. BNA 2 Env. Rptr. 828 (1971).

70. *Id.* at 855 (1971).

71. NEPA, Sec. 101 (b)(1).

72. C.f. *Draft Statement* at 22, 23.

73. *Draft Statement* at 22-23.

74. Barfield I at 1501.

75. See NEPA Sec. 102 (2)(E).

76. Another reason to fear a snowballing commitment is the attitude of a strategically-placed politician, R. Chet Holifield of Calif.—a charter member of the Joint Committee on Atomic Energy (JCAE). From 1961 to 1971, Holifield was the chairman and vice-chairman of the JCAE in alternate years, giving up that position to take the chairmanship of the Government Operations Committee. Holifield, 67 years old, has said “. . . my main goal before I hang up my gloves is to see that it [the breeder] is well funded and organized and backed with a clear national commitment. The breeder should be given the same priority we gave to the development of nuclear weapons in the 1940's and to the space effort in the 1960's.” Holifield's position of authority was probably influential in Nixon's breeder decision, even if, contrary to speculation in the press, there was no deal made whereby the President would get approval of his Department of Natural Resources from the House Government Operations Committee, in return for Holifield's bigger breeder reactor program. See Barfield I at 1503.

77. Barfield II at 2057.

78. *Id.*

79. *Id.*

80. *Poisoned Power* at 366.

81. Barfield II at 2057.

82. Rose, *Controlled Nuclear Fusion: Status and Outlook*, 172 *Science* 797 (1971) (cited as Rose). See also Thomsen, *Getting on the Tokamak Bandwagon*, 97 *Science News* 373 (1970).

83. See Hammond, *Breeder Reactors, Power for the Future*, 174 *Science* 807 (1971) for criticism that the presently planned breeder may be uneconomical; that Milton Shaw is an inadequate administrator; and that the helium gas cooled, water cooled, or molten uranium salt cooled breeders may be superior. Shermom, *Radiation-Induced Swelling of Stainless Steel*, 173 *Science* 987 (1971) raises questions both of safety and economy, because of unforeseen swelling of the structure that holds the fuel core of the breeder. Following any concurrent or alternative paths to the breeder would slow the breeder down still more, making any timing advantage of the breeder over fusion yet narrower.

84. Barfield I at 1499.

85. Barfield, *Breeder Reactor Program Likely to Make It Despite Industry's Default, Environmental Fears*, 3 *National J.* 1602 (1971) (Cited Barfield III). See 2 *Env. Rptr.* 1142 for a report that utilities have conditionally pledged \$240 million, as of Jan., 1972.

86. S. David Freeman, of the President's Office of Science and Technology said, “These guys [of the nuclear industry] are getting the best deal of their lives. The government is going to end up paying two or three billion dollars for the breeder, and they'll only be asked to kick in a couple of hundred million. . . . I suspect that as the magnitude of the government's underwriting of this becomes known, the whole question of public ownership of nuclear power will be raised again.” Barfield III at 1602.

87. See Barfield III.

88. Rose at 806.

89. *Id.* at 801.

90. *Id.* at 807.

91. *Id.* at 807.

92. *Id.* at 806.

93. See *Draft Statement* at 44-46.

94. See Rose at 806.

95. Rose at 798. See also Sullivan, “Clean” Reactors Delayed in Drive for Atom Power, *New York Times*, 1 Col. 2 (Mar. 8, 1971); and Sullivan, *Fusion Power is Still Facing Formidable Difficulties*, *New York Times*, 30 Col. 1 (Mar. 11, 1971).

96. See Rose at 805.

97. *AEC to Overhaul Structure, Goals*, *Denver Post*, 5 Col. 1 (Dec. 8, 1971). In recent days, this reorganization of the AEC has involved the two main subjects of this article, environmental affairs and controlled nuclear fusion. An *ad hoc* office of environmental affairs created in 1970 was moved up to be one of the 30 AEC divisions. In addition, according to a recent report in *Science*:

[T]he controlled thermonuclear research (CTR) program, has turned out to be the Cinderella of the new research branch. Once consigned to a niche in the physical sciences division of the research and development branch, CTR now rates a division all its own in the new research unit. . . .

“Without engaging in a crash program,” Schlesinger says, “we are eager to press on, to push it as rapidly as seems appropriate in the light of a long-term program.” He said that the AEC hopes to begin “major construction” of new facilities sometime “in the next couple of fiscal years.”

Other sources say this construction would almost certainly involve building as many as three large new experimental machines—each to test a different approach to sustaining a fusion reaction. . . . Roy W. Gould, the director of the CTR division, has said that a stepped-up program such as this would cost \$616 million through 1980, or about twice what the AEC said last year that it planned to spend on civilian fusion work in the 1970's.¹⁵⁰

These developments, reported only in mid-January of 1972, make even more urgent the development of a full environmental impact statement comparing the virtues and problems of the breeder reactor, controlled fusion reactors and other alternatives. See R. Gillette, *Schlesinger and the AEC: New Sources of Energy*, 175 *Science* 147 (Jan. 14, 1972).

98. As of the middle of March, 1972, the suit has progressed through the following steps: complaint and answer, a scheduled pretrial conference which was not held, and, in Feb. of 1972, the filing by plaintiffs of a motion for summary judgment. The case has not been decided, and may be appealed to the Court of Appeals and to the U. S. Supreme Court before any final answer to the questions raised can be given.

99. Barfield III at 1607.