STATEMENT OF

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OF THE

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Nuclear Power Hearings
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My name is Thomas B. Cochran. I am a staff scientist at Natural Resources Defense Council (NRDC), a non-profit environmental law firm with offices in Washington, D.C., New York, and Palo Alto. Prior to joining NRDC in 1973, I was a Senior Research Associate at Resources for the Future (RFF) here in Washington, where I wrote The Liquid Metal Fast Breeder Reactor: An Environmental and Economic Critique. Since 1971 I have been engaged full time following developments in the civilian nuclear power industry, concentrating principally on the Federal government's Liquid Metal Fast Breeder Reactor (LMFBR) program. Just over a month ago, J. G. Speth, Dr. Arthur R. Tamplin, both on the NRDC staff, and I prepared Bypassing the Breeder: A Report on Misplaced

Federal Energy Priorities. Mr. Chairman, with your permission, I would like to submit this report and the accompanying Appendix for the record and then take this opportunity to highlight some of the points made in the report.

Since 1967, the LMFBR program has been the nation's highest priority reactor development program and since 1971 it has been accorded the highest priority among all the Federal government's energy research and development efforts.

The LMFBR's dominance of the energy research and development scene stands out clearly in recent budget estimates. During the coming fiscal year the new Energy Research and Development Administration (ERDA) plans to spend roughly one-third of its budget for energy R&D on this single reactor program, more than the combined allocations for fossil energy development, solar energy development, geothermal energy development, advanced energy research and energy conservation.

The total cost of developing the LMFBR is now estimated to be $10 billion, and this estimate, made by proponents of the program, must be judged as conservative. The true cost will probably be more nearly twice this amount.

Already the LMFBR program has experienced tremendous cost overruns. Two years ago total program costs were put at less than half of today's estimate. The principal test facility of the program, the Fast Flux Test Facility (FFTF) was originally planned to cost $87 million, but the latest estimate is over $1 billion, more than a ten-fold increase. Congress was told in 1973 that the proposed Clinch River Breeder Reactor Plant (CRBR), the first LMFBR demonstration plant if one overlooks Fermi-I, would cost $700 million. Today, the estimate is over $1.7 billion. There is no sound reason to believe these trends will not continue.

And it is not just the overruns. There are still hidden costs in the program. Recognizing that the next generation of plants following the CRBR will not be commercially competitive, ERDA has recently restructured the LMFBR program. All but one of the demonstration plants have been eliminated. These have been replaced by a Plant Component Test Facility to be followed by a commercial-size prototype called a Near-Commercial Breeder Reactor (NCBR). What ERDA does not publicize is that it has earmarked only $300 million for the government's share of the NCBR. Yet subsidy of at least one billion dollars will be

required. Can we expect the utilities to absorb this loss? Experience suggests that we cannot. The federal government will be the major source of funding for the project, just as it had to fund the CRBR.

The fundamental question now before the Congress and ERDA is whether the breeder program deserves this priority attention and great commitment of present and future resources. In my judgment it does not. There are several considerations which highlight the grave weaknesses in the LMFBR program:

*At a time when energy costs are soaring, federal policy is focused heavily on developing the LMFBR even though it will be 35 years or longer before the LMFBR will be able to produce electricity as cheaply as existing sources.

*At a time when utilities are deferring and cancelling nuclear plant orders because they simply cannot finance these very capital intensive facilities, energy officials are giving the highest priority to developing the most expensive of all nuclear reactors -- the LMFBR.

*At a time when the public is becoming increasingly concerned at the way we waste energy, federal energy officials are justifying developing the LMFBR by saying

Americans will demand 10 times as much electricity per capita in 2020 as they use today.

*At a time when new non-fission energy alternatives, including solar, geothermal and fusion energy, are poised for major breakthroughs, federal energy funding is heavily weighted toward the LMFBR even though that program is experiencing cost overruns of such magnitude that they will severely restrict the funding available for these alternatives.

*At a time when the wisdom of a national commitment to nuclear fission power is increasingly doubted, federal energy policy is according highest priority to development of the LMFBR even though it promises to be more hazardous and problematic than today's reactors.

*While the Nuclear Regulatory Commission is admitting that its programs for safeguarding nuclear materials from theft are inadequate, our first priority is directed toward the LMFBR, a source of energy that can only exacerbate the safeguards problem.

*With the plutonium fuel cycle associated with present day reactors in disarray and on the verge of economic collapse highest priority is given to developing an energy economy based on plutonium generated in LMFBRs.

*The LMFBR with its plutonium fuel offers an inexhaustible source of energy. But in using this energy, we will be forced to bear a terrible burden. We must carry into the future an inexhaustible source of high level radioactive waste (whereas we are presently debating whether we will be able to manage this material), an inexhaustible supply of nuclear weapons material and safeguards problems (even though to date we have not developed an adequate safeguards program even on paper), and an inexhaustible supply of reactors whose explosive potential is not known. An accidental LMFBR explosion is considered a realistic possibility by many nuclear safety experts. A defensible upper bound cannot be placed on the LMFBR explosive potential at this time and it is an open issue whether the explosive potential of commercial size LMFBRs can be economically contained. With Catch-22 logic utility representatives are saying, "we should not install a core catcher (a safety device) in the demonstration plant or in commercial LMFBRs because the public will interpret this to mean that LMFBRs are not safe."

In addressing the LMFBR timing issue it is important to understand that the issue has nothing to do with blackouts or brownouts or the exhaustion of uranium fuel for the

current generation of nuclear reactors. The breeder may ultimately promise to be cheaper because of its very low uranium cost per unit energy. But fuel costs represent only a small fraction of the cost of electricity from nuclear reactors. A five-fold increase in the price of uranium (from \$12/lb U_3O_8) is roughly equivalent to a \$2/barrel increase in the price of oil. Nuclear power may be abandoned for any number of reasons, but it is in no danger of losing out to other fuels because of higher uranium prices. As Professor David Rose of MIT notes, "economic introduction of the LMFBR at the turn of the century would be a sign of technology good fortune, not of resolving an energy crisis with a time limit."

The breeder economic issue is an issue of timing. When will the higher fuel cost of today's reactors offset the higher capital cost of the breeder? The basis for our view that the LMFBR program is not economically justified at this time is contained in our economic analysis of the potential of the LMFBR set forth in Bypassing the Breeder and reviews of cost-benefit analyses performed by other organizations. With respect to the latter, the Atomic Energy Commission has now written and released three cost-benefit analyses of the LMFBR program. In addition to the AEC's analyses, cost-benefit analyses of the breeder program have been

performed by breeder proponents in the nuclear industry and the Electric Power Research Institute (EPRI), the research arm of the utility industry. All of these analyses, including ours, depend critically upon the accuracy of assumptions regarding (a) the choice of the discount rate; (b) the cost of the breeder research and development program; (c) the capital cost difference between LMFBR's and conventional nuclear reactors; (d) the future demand for electricity; and (e) the domestic supply of uranium.

It is clear from a review of the economic analyses that have been performed on the breeder that the critical input assumptions can be juggled to come up with widely varying LMFBR cost and benefits. A tempting and too easy way out is to point to these varying conclusions and dismiss economic analysis on that basis. Yet the basic arguments for the current LMFBR program are economic, and it is essential that Congress look critically into these economic analyses to determine whose assumptions are in fact reasonable.

In order to appreciate the degree to which the economic analyses of the LMFBR prepared by the AEC and the nuclear industry suffer from a fatal promotional bias,

one need only look at the electrical energy growth projection used by the AEC in its most recent analysis. The steepness of the growth curve, as depicted in the attached graph provided by the AEC, staggers the imagination.

A second area where the AEC resorted to unsupportable assumptions to justify the program is the issue of capital cost differences between LMFBR's and present-day reactors. It is possible to accelerate the date when breeders become economically competitive by arguing that as more breeder reactors are sold the unit price will be reduced. Economists refer to this possibility of decreasing costs with increasing number of units produced as "learning." Hence, a central issue is whether it is appropriate to apply a learning curve to the capital cost of LMFBR.* The AEC in its latest cost-benefit analysis applied a sharp learning curve to the breeder reducing its capital cost to parity with light water reactors in the short 13 year period following commercial introduction. Remarkably, light water reactors are assumed not to experience any learning at all. There is really no justification for this approach. The AEC has been predicting a learning curve in the cost of present day nuclear plants for the past decade. To the contrary, the cost of commercial nuclear plants has been increasing at an alarming rate, even in constant dollars. So in fact there is no justification for assuming learning

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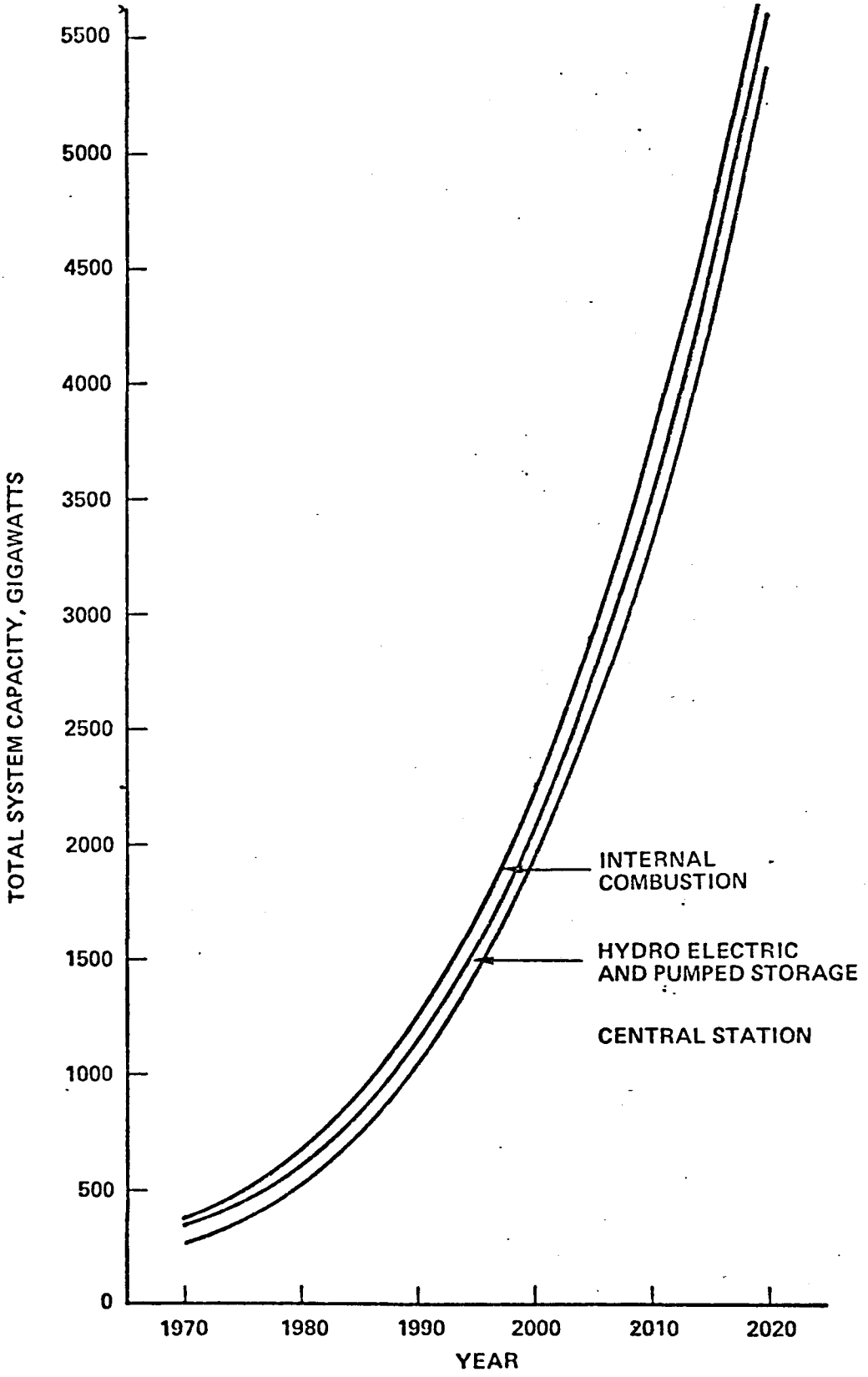
* This learning effect is separate from the subsidies associated with first-of-a-kind or prototype plants. The AEC has simply ignored these first-of-a-kind costs.



PROJECTED DEMAND FOR ELECTRICAL GENERATING CAPACITY 1970-2020

Source: AEC, Proposed Final Environmental Impact Statement for LMFBR Program (December, 1974), Vol. IV, p. 9.1-3.

for either reactor type. Moreover, if a learning effect is ever experienced, it will be felt by light water reactors before it is felt by breeders. This would increase the capital cost difference between breeders and existing reactors and shift the date of LMFBR commercialization further into the future.

What makes the AEC's LMFBR learning curve even more unbelievable is that in the same short period, 1987-2000, when LMFBR capital costs are rapidly falling due to learning there is a shift to an advanced LMFBR design in 1991 and again in 1995. Furthermore, in 1990 plant unit sizes increase from 1300 MW to 2000 MW with an additional 12 percent decrease in price.

We believe that if the Congress undertakes a careful analysis of all the critical input assumptions it will come to share our conclusion that the LMFBR will not be commercially competitive with existing energy sources until one or two decades after the turn of the century. Yet the current LMFBR effort is aimed at having the new reactor developed by 1990, more than two decades before it could be economically attractive. In our view the LMFBR program is thus quite premature and could be delayed substantially without incurring any risks relative to meeting future U.S. energy needs. The sense of urgency and crisis that program supporters have promoted to garner support for the LMFBR has no foundation in fact.

On simple economic grounds, then, the push to develop the LMFBR can and should be postponed. Moreover, such a delay would provide the time needed to show what many experts now believe to be the case -- that environmentally preferable, nonfission energy options can be made available in time to eliminate the need for the LMFBR altogether. As summarized in the attached table, recent estimates of the potential contribution of solar, geothermal and fusion energy together with energy conservation measures indicate that these sources alone can more than account for the energy expected from the LMFBR in the year 2020, when the reactor is projected to have maximum impact. Indeed, they can account for the energy expected from all fission reactors at that time.

These considerations indicate that a major LMFBR effort is not needed now and probably never will be. And the risks of continuing the present drive to commercialize the LMFBR are great. The most serious danger is that the LMFBR program will proceed as now planned, consuming the $10 billion presently estimated and plenty more besides, cutting deeply into energy R&D funds, and holding back the development of the preferable non-fission technologies. Then, having spent enormous sums the country will find itself with a reactor which must eventually be used only because of the great public and private investments in it and our failure to have developed appropriate alternatives. Our error will be

Table I

Energy Sources for Electricity Production

in the Year 2020 Without the Breeder

	Trillions of Kilowatt Hours	Percent of AEC Projection	Source
AEC Projection	27.6	100	(1)
New Energy Sources			
Solar	5.5	20	(2)
Geothermal	1.7	6	(3)
Fusion	2.2	8	(4)
Organic Wastes	.6	2	(5)
	10.0	36	
Correction for Market Factors and Energy Conservation	13.8	50	
Total Accounted For	23.8	86	
Remainder for Other Sources (principally fossil fuels)	3.8	14	

Sources:

1. Proposed Final EIS for LMFBR Program, Vol. IV, p. 11.1-25
2. NSF/NASA, Solar Energy as a National Resource (1972), p. A-5
   Proposed Final EIS for LMFBR Program, Vol. IV, p. 11.1-19
3. Proposed Final EIS for LMFBR Program, Vol. IV, p. 11.1-20
4. Proposed Final EIS for LMFBR Program, Vol. IV, p. 11.1-22
5. Proposed Final EIS for LMFBR Program, Vol. IV, p. 11.1-21

compounded because any attempt to deploy the LMFBR widely would raise the energy-environment confrontation to an unprecedented intensity.

Our recommendation in light of these conclusions is that the Federal Government take the opportunity it now has to break with the mistakes of the past, that it postpone for a decade or so any push to commercialize the LMFBR, cancelling the CRBRP and relegating the overall program to a relatively low-priority effort, and that it accelerate the development of attractive non-fission alternatives such as solar, geothermal, fusion and energy conservation. Much can be learned during the coming decade -- most likely we will learn that the breeder can be bypassed -- and the delay would impose no penalty on the nation.