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STATEMENT OF
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ENERGY AND MINERALS DIVISION
BEFORE THE
SUBCOMMITTEE ON ENERGY RESEARCH AND PRODUCTION
HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY
ON
NUCLEAR POWER IN THE COMING DECADES

HSE035-12

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to be here today to discuss the role of nuclear power in the U.S. energy system and the implications of that role for U.S. energy policy

Recently we issued a report, "Questions on the Future of Nuclear Power: Implications and Trade-offs", (EMD-79-56) In this report we analyzed widely differing nuclear growth rates to provide a perspective on the degree of flexibility that the Nation has to substitute other fuels for the generation of electricity. We examined how the Nation's hopes for using coal to meet non-electric needs will be affected by the growth rates in nuclear power and in electricity demand. Today I will be discussing this report and its conclusions, particularly in the light of recent Government energy initiatives.

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QUESTIONS ON THE FUTURE OF NUCLEAR POWER

Currently nuclear power generates only about 13 percent of total U.S. electricity; nevertheless, nuclear power has accounted for the largest single increase in domestic energy supply since 1973, a little more than the equivalent of 1 million barrels per day of oil. If nuclear growth were to continue at pre-Three-Mile-Island trends, by the end of the century it could increase U.S. domestic energy supply by the equivalent of almost 10 million barrels a day over 1978 levels. The resulting energy would be greater than the maximum production of U.S. petroleum achieved in 1971.

However, the desirability of maintaining this trend in nuclear energy has come under increasing question. The recent accident at Three Mile Island has heightened the volume of debate and the emotion associated with nuclear power issues. This accident has called into question in stark terms the future role of nuclear power.

Both the desirability and necessity of nuclear power have been questioned on issues such as waste disposal, nuclear proliferation concerns, economics, safety, and falling growth rates in electricity demand. On the other hand, there are three major reasons why nuclear power merits consideration for a continued and possibly expanded role in the U.S. energy system: (1) it is a domestic

energy source, (2) it can provide additional supplies of electricity, and (3) it does not emit carbon dioxide.

I would point out, in regard to this last reason, that nuclear may have to be seen as a complement to, not a competitor with, solar energy because neither emit carbon dioxide. Should growing concentrations of carbon dioxide in the atmosphere prove to be a growing problem curtailing the use of fossil fuels, both nuclear and solar would probably be necessary to provide additional growth as well as to substitute for fossil fuels.

In the last three years, nuclear power has been described as the energy source of "last resort." This description implies that there are other options which would allow the Nation to minimize the nuclear role while still increasing domestic energy supply, reducing imports, and meeting electricity demand. The two major options currently available are conservation to reduce the demand for electricity and coal to substitute for nuclear power.

Future electricity growth rates are very uncertain. From 1960 to 1973 electricity consumption grew 7.1 percent a year; since 1973, the average annual growth rate has fallen to 3.2 percent. However, during this period, the Nation experienced

--the most severe economic downturn since the 1930s,

--a severe drought on the Pacific Coast which reduced electricity use (e.g , the Bonneville Power Administration electricity sales were down 20 percent), and

--the longest national coal strike in U.S. history (industrial electricity use in the East Central States was down an estimated 10 percent to 20 percent).

Repetition of such events would tend to restrain electricity demand further; however, we do not believe that basing energy policy on the repetition of such events is very prudent.

Future electricity growth will come from: (1) growth in existing markets, and (2) growth resulting from the substitution of electricity for oil and gas. Continued conservation will reduce growth in existing markets; however, substituting electricity for declining oil and gas supplies will tend to increase electricity growth rates. For example, to substitute electricity for 150,000 barrels per day of oil consumption, which is less than 1 percent of total oil consumption, would increase electricity demand about 2.5 percent.

Unless the Nation can increase oil and natural gas supplies through increasing imports or domestic production, electricity growth rates could remain relatively high, even with very successful conservation programs. The recent estimate by the State of New York of an electricity growth rate of only 2.2 percent a year through 1994 depends significantly on the ability of New York to have increasing imports of natural gas.

Our analysis of electricity growth rates since the end of the recession in 1975 indicates that electricity

consumption is growing about 4.5 percent a year or more. Recent estimations of electricity growth rates through 1990 are consistent with a continuation of this trend. Of course, this assumes a reasonably healthy economy, and few singular events such as a major coal strike, severe droughts, or deep recessions.

We analyzed the implications for coal and conservation in the light of three nuclear growth scenarios: (1) almost no new operating licenses which would result in a maximum nuclear capacity of 64 GWe, (2) no new construction permits with a resulting maximum capacity of 152 GWe, and (3) continuation of the pre-Three Mile Island trends with a resulting maximum nuclear capacity of 340 GWe in 2000. We assessed the ranges of electricity growth achievable as well as the amount of coal available for uses other than electricity generation in the light of these nuclear growths. The resulting coal availability for purposes other than electricity generation is shown in Exhibit I.

In all three cases, there is a significant likelihood that the coal supply available for non-electric purposes will cease to grow in the mid- to late 1980s, or may actually begin to decline. This is largely the result of the phasing out of petroleum and natural gas electric power facilities. If nuclear growth is curtailed without compensating increases in non-nuclear electricity sources or compensating reductions in electricity demand, coal

availability will be restricted even further. Since synfuels from coal could probably not begin to make a significant contribution to energy supplies until the mid- to late 1980s at the earliest, any major program to encourage the development of synfuels would have to be accompanied by commensurate programs to increase coal availability. The expansion in coal availability could be speeded up to faster than 5 percent a year, or availability could be increased through more conservation, or restraining the phase-out of oil and gas generation of electricity, or additional nuclear capacity.

We analyzed the possibility of maintaining a steady growth in coal availability for non-electrical uses through 2000. We found that this depends critically on nuclear power growth. For example,

If nuclear power peaks at	Then annual electricity growth must be held below
340 GWe	4.25%
152 GWe	3.0%
64 GWe	2.5%

This shows that only the electricity growth achievable under continued nuclear growth is consistent with current trends. As a result, if actions are taken to limit or halt the growth of nuclear power, they must be accompanied by actions to limit electricity requirements below those levels indicated by current trends, or by programs to

expand coal supply or other non-nuclear fuels. Otherwise, serious shortfalls of electricity supply are likely to occur within the next 5-10 years. The alternative is to sharply curtail coal use outside the electrical sector.

We also examined the impact on electricity growths under the extreme assumption that in the year 2000 2 billion tons of coal are used to generate electricity. Our analysis showed that

If nuclear power peaks at	Then annual electricity growth must be held below
340 GWe	5.5%
152 GWe	4.5%
64 GWe	3.5%

We found that under such circumstances a nuclear moratorium could be achievable. However, this would leave no coal available for synthetic fuels or industrial use unless coal production were significantly larger than 2 billion tons by 2000.

RECENT PROPOSALS

Our analysis has indicated that the trade-offs among nuclear power, coal, and conservation will be very critical. Demands on U.S. coal supplies and the need to reduce electricity growth will be increased, particularly in the near and mid-term, by recent Administration proposals. These are to:

(1) Accelerate the phase out of oil and gas generation of electricity, and

(2) To develop 1 to 1.5 million barrels a day of synfuels from coal by 1990.

Our analysis assumed that about one-third of U.S. generation of electricity from oil and natural gas would be phased out by 1990. The Administration proposes a faster phase-out, indicating that as much as two-thirds could be phased out by 1990.

This additional decline in electrical generation by natural gas and oil will probably have to be compensated for by additional coal consumption. Demand for coal could be increased by about 2 quads (about 100 million tons) in 1990. The result would be a steepened decline in coal availability for non-electric uses for the mid-1980s through the early 1990s This would lead either to further reductions in the possible growth rates in electricity use, or to further constrictions in the coal available for non-electric use. Furthermore, the accelerated phase-out of oil and gas would extend the likelihood of constricted coal supplies well into the 1990s.

The additional coal needed to fuel even a moderate synfuels industry would further tighten the electricity growth constraints. The Administration estimate of 1 to 1 5 million barrels a day of coal liquids and gases would increase coal demand by about 4 quads (200 million tons).

The impacts of these additional demands for coal on the achievable electricity growth rates through 1990 are

shown in Exhibit II, under the assumption that no growth in direct use of coal is allowed beyond 1977 levels. Exhibit II indicates very clearly that an almost immediate nuclear moratorium would leave no new coal available for any use except electricity generation. To attempt to achieve both an accelerated phase-out of oil and gas generation of electricity and the Administration synfuels goal would require reduction of electricity growth to below 2 percent a year. Even with continued nuclear growth at pre-Three Mile Island rates, electricity growth would have to be held below 3.4 percent a year, well below current trends. If direct burning of coal grew at a modest 3 percent a year, the achievable growth rate in electricity use would be reduced an additional half percent a year.

Under a more modest, phased synfuels demonstration program which would allow more time for testing and selection of technologies and likely delay achieving the Administration synfuel goals until 1995, the constraints on electricity growth rates would be raised somewhat. However, these increased growths are still below current trends, although the potential growths achievable under continued nuclear growth at pre-Three Mile Island rates is relatively close to current trends. This is illustrated in Exhibit III.

CONCLUSION

The major conclusion to be drawn from our analysis is that nuclear energy and coal are complementary to, not substitutable for, each other. If added demands are placed on coal, they must be compensated for by (1) additional nuclear, (2) increased conservation, or (3) all-out coal development beyond a 5 percent growth rate.

The Nation has placed great hopes on the future development of coal in order to

(1) Replace oil in the industrial sector,

(2) Substitute bor oil and gas in electricity generation,

(3) Provide a basis for synthetic liquids and gases.

The extent to which nuclear is curtailed without a compensatory reduction in electricity demand is linked directly to the Nation's hopes for coal use outside of electricity generation and for a reduction in oil imports.

Based on a continuation in current trends in electricity growth, expansion of nuclear power along pre-Three Mile Island lines would at best sustain only modest growth in some--but not all--of the areas of future coal use outside of electricity generation. Significant non-electric coal use probably cannot be achieved by 1990, or even possibly 1995, unless there is a continued nuclear program coupled with an active electricity conservation program, and/or an all-out expansion of coal availability beyond a 5 percent a year growth rate.

Mr. Chairman, this concludes my testimony. I would be pleased to respond to your questions.

EXHIBIT IA

Non-Electric Coal Availability

for 64 GWe Maximum Nuclear Capacity

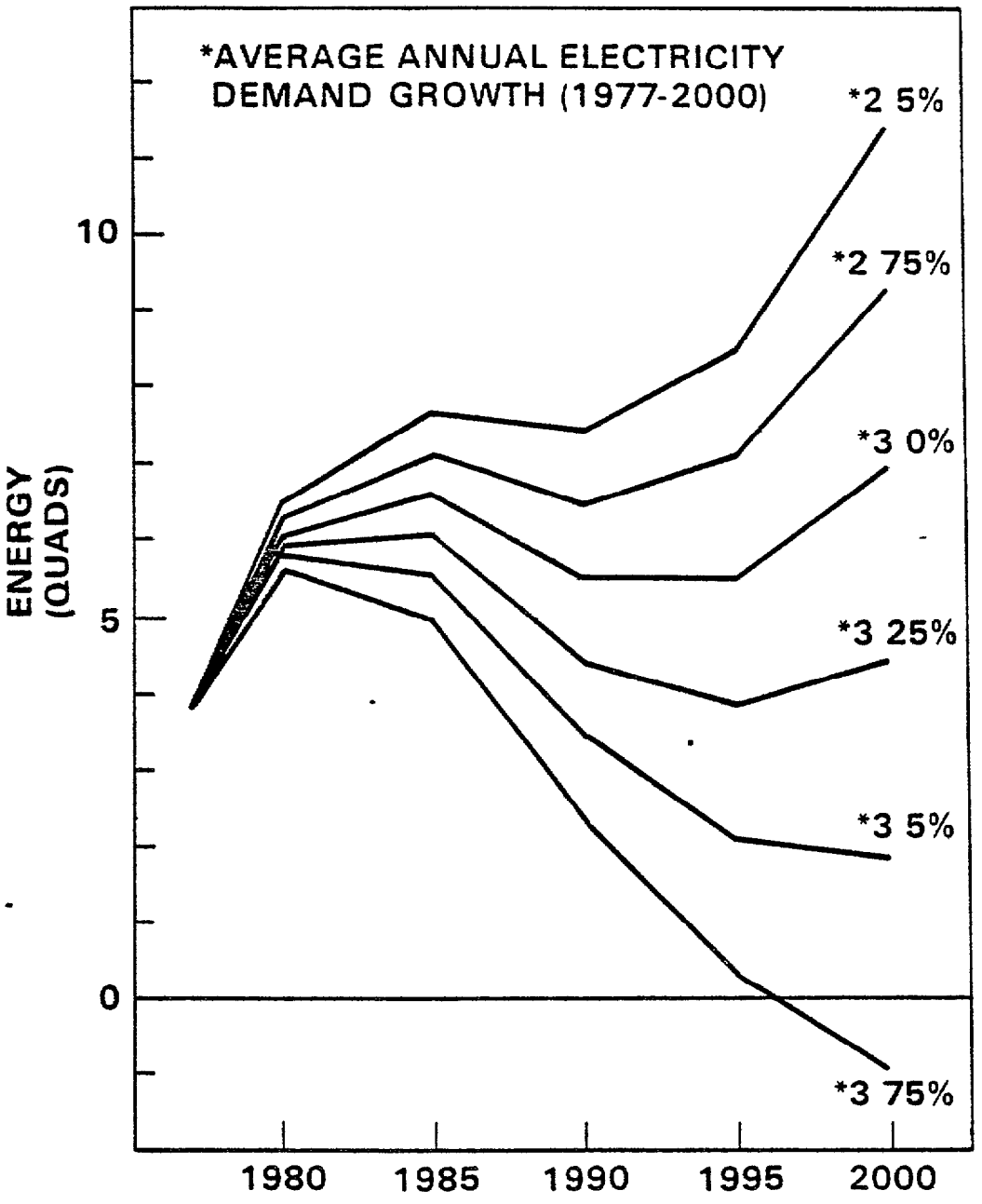

EXHIBIT IB

Non-Electric Coal Availability

for 152 GWe Maximum Nuclear Capacity

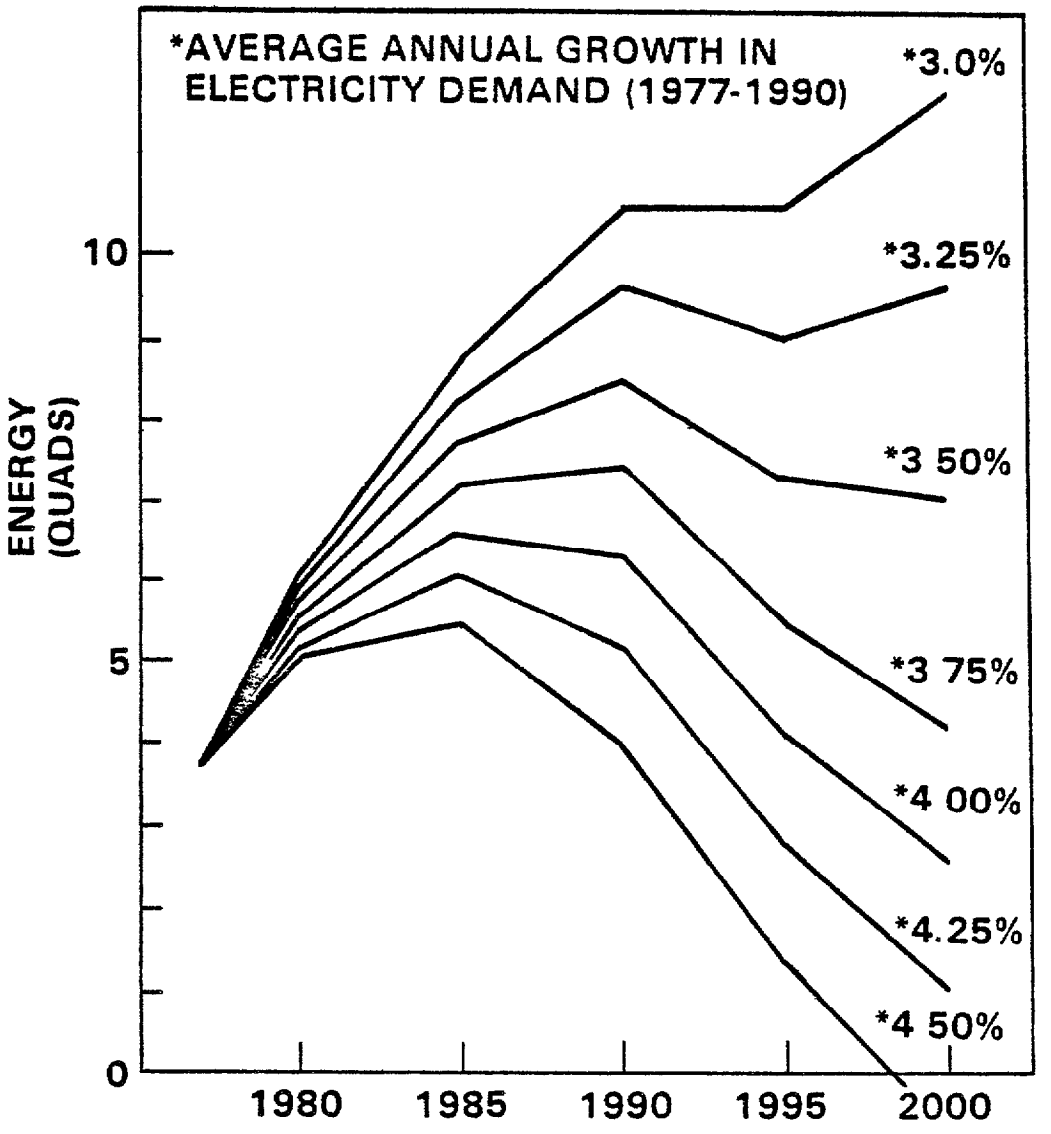

EXHIBIT IC

Non-Electric Coal Availability

for 340 GWe Maximum Nuclear Capacity

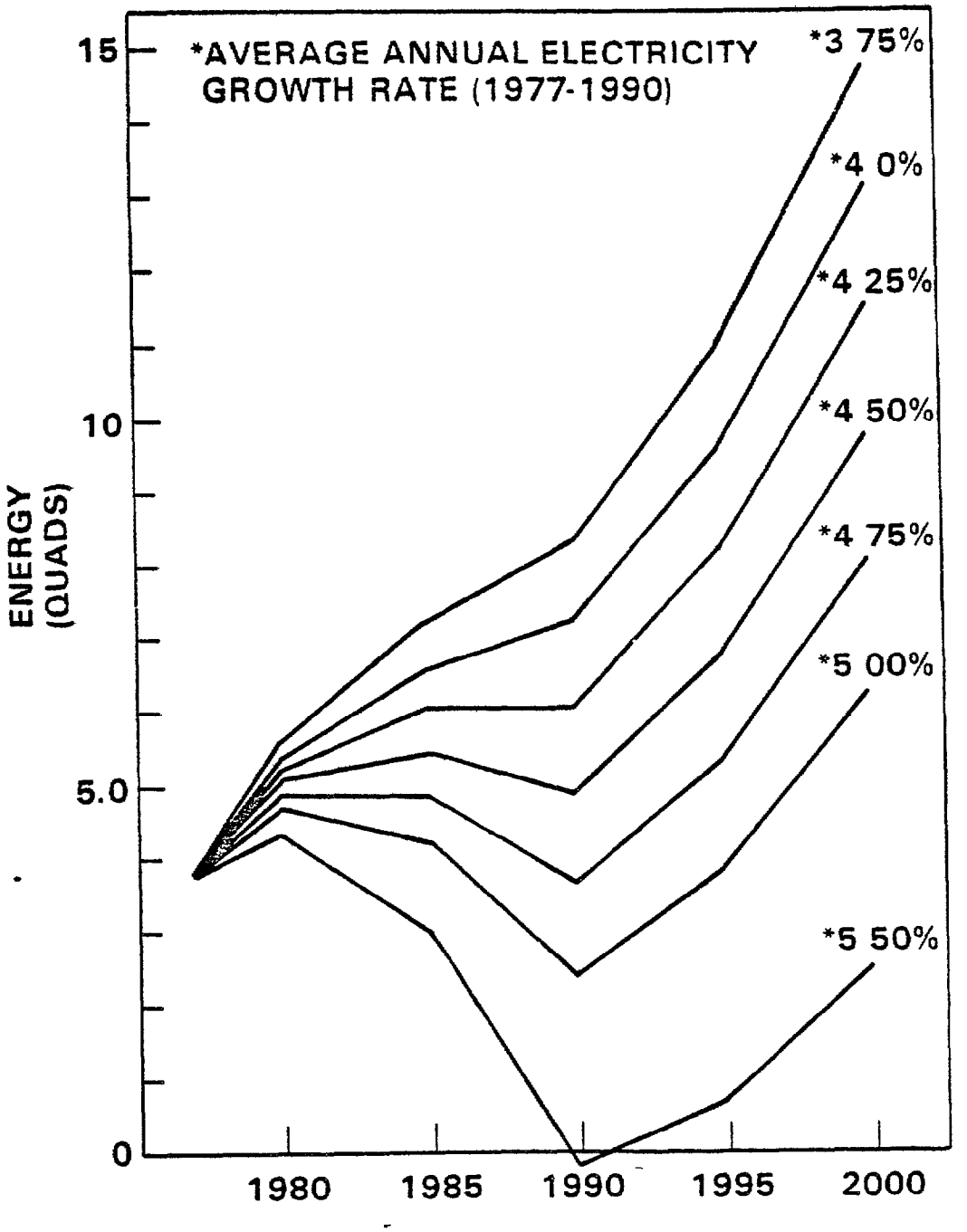

EXHIBIT II

If Maximum Nuclear Is	Then Electricity Growth through 1990 Cannot Exceed		
	Base	Accelerated Oil/Gas Phase-Out	Synfuels
64 GWe	3.41%	2.87%	1.79%
152 GWe	4.54%	4.07%	3.15%
340 GWe	4.72%	4.25%	3.35%

EXHIBIT III

If Maximum Nuclear Is	Electricity Growth through 1995 Cannot Exceed		
	Base	Accel O/G	Synfuels
64 GWe	3.26%	3.02%	2.37%
152 GWe	3.97%	3.75%	3.19%
340 GWe	4.66%	4.47%	3.96%