STATEMENT OF
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U. S. ATOMIC ENERGY COMMISSION
HEARINGS ON
"DEVELOPMENT, GROWTH, AND STATE OF THE NUCLEAR INDUSTRY"
BEFORE THE
JOINT COMMITTEE ON ATOMIC ENERGY
FEBRUARY 5, 1974

I am very pleased to have this opportunity to testify to the development of the nuclear power industry. Commissioners Anders, Larson, and Doub will also present statements on the AEC's Nuclear Power Development Program, the Nuclear Industry, and the AEC's Regulatory Program, respectively.

In view of the Joint Committee's request expressed in the announcement of the hearings, the Commission's testimony will present the AEC's view of the state of the nuclear power industry and will also include information on the development of other significant energy sources.

AEC - Industry Relationships

I would like to begin with a brief review of AEC's past working relationships with industry. These relationships have been close - designed to encourage the development of a nuclear industry while, at the same time, requiring a high level of performance from it. This can probably best be illustrated by reviewing some of the major actions, vigorously supported by the Joint Committee on Atomic Energy, that have brought the nuclear industry to where it is today, capable and ready to assist in making the United States self-sufficient in energy.

First, I would like to mention AEC's basic method of performing research and development, that is, through contractual arrangements with industrial

organizations and educational institutions. We believe this method of operation has resulted in efficient performance of research and development, carried out in a manner that greatly assists industry in early and widespread use of Government sponsored technological development.

In the civilian nuclear power area, the AEC's power reactor demonstration programs (First, Second, Third, Modified Third, and Fourth Rounds), involved successively increased industry participation and responsibility. They have served to transfer the techniques of construction and operation of nuclear power plants to the manufacturing, construction and utility industries at early stages.

The nuclear fuel cycle consists of several steps, the major ones are usually categorized as production of uranium, conversion of yellow cake to uranium hexafluoride (UF_6), enrichment of uranium, fabrication of fuel, processing of spent fuel, and management of radioactive wastes. The viability of the uranium production industry was maintained by stretching out AEC's purchases from 1966, when they were originally scheduled to cease, through 1968, and contracting for additional deliveries in 1969 and 1970. This action sustained the uranium industry during the lean years between the cessation of Government needs and the beginning of purchases by the civilian power industry. In 1957, the AEC awarded a contract for conversion of yellow cake to UF_6 to industry in order to establish an industrial base in this segment of the fuel cycle. Today, the AEC is working closely with private industry to apprise it of uranium enriching technology. Much of the technology used by the fuel fabrication industry was developed in AEC programs and then transferred to industry. The AEC also helped to establish an industrial spent fuel processing capability by contracting a portion of AEC's spent fuel processing load to industry.

Every year since 1962 (with the exception of 1972) the AEC has published a report entitled "The Nuclear Industry". This document has provided information to the public on current industrial capabilities in the nuclear field, on future requirements for nuclear material and services, and on developing nuclear-related opportunities. While it is currently being printed, I would like to present an advance copy of the 1973 report to the Committee for the record. Copies are expected to be available to the public from the Superintendent of Documents in a few weeks.

All of these actions illustrate a past and continuing close working relationship with industry. This relationship has always had two components: to foster the growth of a vigorously competitive nuclear industry and at the same time to insist that it adhere to the highest standards of performance and quality to protect the public health and safety. We expect this relationship to continue to grow in both the nuclear and non-nuclear energy fields.

PROJECT INDEPENDENCE

Now let me say a few words about Project Independence. To reverse the trend toward fuel shortages which were beginning to make sharp inroads into the American economy, the President announced on November 7, 1973, adoption of "Project Independence," as a new national goal. Project Independence proposes that the energy resources of this country be developed to a level where the Nation's expanding energy needs can be met without significant dependence on potentially insecure supplies of foreign petroleum. Achievement of this goal, as President Nixon said, will require concentrated effort on certain tasks. The first task is to cut back on our use of energy. The second is to maximize use of our existing oil, gas, coal and shale reserves, and to exploit the substantial

contribution which can be made by nuclear power through an acceleration of the construction of nuclear power plants. The third task enunciated by the President is that of developing new technologies through a well managed and substantially accelerated energy research and development program, so that we may achieve and retain self-sufficiency in the years to come. If we do not now concentrate on these three fronts, our pre-embargo prosperity may be endangered.

As we all know, the demand for petroleum products has been growing at a rate of over 4 percent annually, but domestic oil production has been decreasing, so that in 1973 we were dependent upon imported petroleum for 35 percent of our deomestic requirements for oil. In an ordinary free market, by 1980, we would probably have been importing one-half of all our petroleum needs. This Committee has been aware of growing energy shortfalls for some time. They were well enunciated in an excellent study prepared by the Committee staff, which stressed the importance of presenting the Nation's energy problems in a readily understandable form.

The reaction of the energy-oriented business community to the President's announcement is typified in a letter from John W. Simpson, President of Westinghouse Electric's Power Systems Company, to the President, dated December 4, 1973. Mr. Simpson expressed complete support of the President's efforts toward energy self-sufficiency for the United States. He stated that the capability for achieving self-sufficiency can become apparent by the start of the next decade and put into effect by 1985. Mr. Simpson stated that progress will obviously be difficult, and "will have to be accomplished with fuels which are already in commercial use -- petroleum, natural gas, coal and nuclear fission."

Although I subscribe to the sense of urgency conveyed by Mr. Simpson, it is not yet clear that we can set hard, quantitative targets for the exact contribution of each kind of fuel as long as ten years from now. Therefore, I believe we need to move expeditiously to increase our production capability in all available fuels and let the forces of the free market determine the exact composition of the fuel mix that will make us most independent of foreign imports, as soon as possible, and at as low cost as possible.

It is, obviously, in the field of nuclear power that the AEC can make a major contribution toward the success of Project Independence. We are looking forward to the practical demonstration of our Liquid Metal Fast Breeder Program early in the 1980's, so that utilities can begin exploitation of this advanced power plant technology, thereby extending indefinitely our effective reserves of uranium. More immediately, we are also working on several measures to improve our reactor licensing process to enable more rapid decision making on applications to construct and operate light-water power plants and to bring them on line faster. We are also working to prove high temperature gas cooled reactors in commercial operation. We are working with the reactor vendors and power plant engineers to improve plant reliability; investigating construction bottlenecks caused by shortages of components and fabricated items; and talking to unions about solving labor problems to avoid delays in power plant construction. Nuclear power is here now. We will have more of it tomorrow, and it is available without any dependence on foreign sources of supply.

Commissioner Doub will review in more detail new initiatives underway in the industry and the AEC to advance safe, reliable nuclear power. The major reactor builders have submitted plans for standardized reactor designs for AEC licensing review. Standardization can effect time savings in the processing of

license applications for individual reactors while at the same time enforcing safety and reliability. In another application of the standardization concept, four utilities, operating under the name Standardized Nuclear Unit Power Plant System (SNUPPS), recently ordered six identical power reactors from Westinghouse; one AEC licensing review will cover the basic review aspects for each facility. A still further standardization effort is reflected in the manufacturing license application filed by Westinghouse and Tenneco for multiple reactors designed for use in off-shore nuclear power plants.

In 1965, twelve nuclear stations generated over four billion kilowatt-hours, and during 1973 the atom produced an estimated 83 trillion kilowatt-hours of energy at 40 power plants. This represents over four percent of the total production of electricity during that year. By the end of 1973, 42 central station nuclear power plants, with a total capacity of over 25 million kilowatts, had received operating licenses from the AEC. Their capacity represents almost six percent of total U. S. generating capacity. This percentage is expected to increase significantly in the coming years. During 1973, full-term operating licenses were issued for 15 nuclear power plants with a total capacity of over 11 million kilowatts.

In the years ahead, nuclear power will account for a substantial portion of this Nation's electricity supply. The 42 central station units currently licensed to operate have the capacity to produce electricity that would require 700,000 barrels of fuel oil daily, if it were generated in oil-fired units, or 65 million tons of coal per year. Without these plants, the current fuel shortage would be some 25 percent more acute than it now is. It is a source of tremendous satisfaction to all of us involved with nuclear power that, with the help and foresight of the Joint Committee on Atomic Energy, the atom is truly beginning

to make a significant contribution to the generation of electricity.

Returning to the larger problem of the implementation of Project Independence, the President has assigned that responsibility to the Federal Energy Office (FEO) under the able direction of Mr. William Simon.

The actions required to achieve energy self-sufficiency can be grouped into three action categories: immediate, short run and long run. The immediate actions, which are currently feasible, consist of energy regulations and allocation, to promote greater efficiency in the use of current fuel resources. On the short run action level, we can work to increase the production of fuels through improved utilization of existing technologies. On the long run level, the AEC is playing a direct role, which I will discuss shortly.

Achievement of energy self-sufficiency will be seriously affected by a variety of factors including environmental, economic, technical, and regulatory problems. All of these impose constraints on any major increase in the commercial production and industrial use of synthetic fuels. The President has asked the FEO to make an interagency evaluation of financial and economic incentives, or regulatory changes, that may be needed to stimulate domestic production. The AEC looks forward to participating in that evaluation.

Energy Research and Development

The long run type of action needed is a carefully planned long term research and development program to increase production from new technologies and to explore new energy sources. This is, of course, the area in which the AEC is playing a direct role.

Such a review was requested of me last June by the President. A task force worked throughout the fall to define the Nation's future energy capabilities, and to recommend an integrated energy research and development program for the

Nation. The report of this study, entitled "The Nation's Energy Future," submitted to the President on December 1, 1973, recommends such a plan.

As an outgrowth of my December 1, 1973, Report to the President on energy research and development, a number of energy demonstration project ideas responsive to Project Independence were identified. Prior to the establishment of the Federal Energy Office, an AEC task force began a study to determine the feasibility and desirability of eight such projects. They are:

1. Production of Liquid Fuel from Oil Shale
2. Production and Use of Methanol for Transportation
3. Synthetic Fuels from Coal
4. Direct Combustion of Domestic Coal with Least Possible Environmental Impact
5. Construction of a Nuclear Power Center
6. Solar Heating of Federal Buildings
7. Advanced Reclamation Methods for Western Coal Extraction
8. Rapid Deep Drilling Methods

Upon completion of the AEC staff study, the results will be forwarded to the FEO.

In response to a request from Senator Ribicoff, the AEC, in conjunction with the FEO, is also studying the implications of a large-scale synthetic fuels production program using existing technology. This program was presented to Senator Ribicoff's Subcommittee for consideration during the hearings on the energy reorganization legislation. In a preliminary response, requested by Senator Ribicoff, we indicated that the best approach to creating a synthetic fuels industry might well be one which has been recommended by a number of industry representatives. This approach would structure the total synthetic fuels production program into two phases. During Phase 1, one commercial-scale plant for each of the most promising synthetic fuel technologies would be

constructed. This would probably involve a total of some four to six plants. Top priority efforts would be focused on getting these plants on line, measuring the results, and modifying the plants as required in order to get production costs down as far as possible, as soon as possible.

Phase 2, on which a decision would be deferred until sufficiently precise supply, demand, and production cost estimates could be developed, would include an expanded construction program on whatever scale might be required. The program would use the best available technologies based upon the experience of the Phase 1 plants. Phase 2 could, of course, be initiated before the completion of Phase 1, if this were required.

This two-phase approach appears to have a number of advantages:

- It gets the Nation moving now on creating an in-place synthetic fuels production capability. The implications of such positive action will not be lost on those who now export fuels to the U. S.
- Given the limited technical manpower and construction capabilities the Nation has in this area, the two-phase approach probably would slow the ultimate outcome by only a small amount of time. Depending on what is learned in the first phase, this approach could well speed up the eventual attainment of self-sufficiency and substantially lower its cost as well. Starting with a few plants, and thoroughly testing the processes at commercial scale will likely prove to be the speediest route to total self-sufficiency.
- The two-phase approach postpones the decision to engage in a massive investment program in technologies with which we lack any domestic commercial experience, until better information is available.

We are continuing to work with the FEO in refining our conclusions, which are due to Senator Ribicoff by March 3, 1974.

The President submitted his budget for energy research and development to the Congress yesterday. I would like to submit, for the record, a classification of this budget according to the five tasks set out in my report of December 1. A comparison of the FY 1975 budget recommendations for each of the five tasks presented in my report demonstrates very good agreement on the priorities established.

Concluding Remarks

If nuclear power is to be one of the prime movers for "Project Independence," and I believe that is must be, we must begin now to expend every effort to build new capacities, remove construction delays, and undertake initiatives including advanced technical development for its promotion. There is no time left for delay. These hearings should prove very helpful in highlighting this need.

Mr. Chairman, that concludes my prepared statement. I shall be pleased to try to answer any questions the Committee members may have after you have heard the testimony of my fellow Commissioners. Commissioner Anders will next discuss the Nuclear Power Development Program. Thank you.

BUDGET RECOMMENDATIONS BY FIVE MAJOR TASKS AND AGENCY ALLOCATIONS, FY 1975
PRESIDENT'S ENERGY MESSAGE, JANUARY 1974

	Actual FY 74	President's FY 75	AEC	DOI	EPA	NSF	Other
Conservation	89.3	164.7	18.6	60.0	17.0	23.6	45.5
Reduced Consumption	32.3	55.0	3.0	32.0		9.5	10.5
Increased Efficiency	57.0	109.7	15.6	28.0	17.0	14.1	35.0
Oil and Gas	23.7	54.1	11.0	42.4		0.7	
Production	14.1	28.7	4.7	24.0			
Resource Assessment	9.6	25.4	6.3	18.4		0.7	
Coal	220.2	565.8	4.5	408.1	149.0	4.2	
Mining	7.5	55.0		55.0			
Direct Combustion	15.9	36.2		35.0		1.2	
Synthetic Fuels	99.8	264.5	4.5	257.0		3.0	
High-Btu Gasification	33.0	65.3	4.5	60.0		0.8	
Coal Liquefaction	45.5	108.5		107.0		1.5	
Low-Btu Gasification	21.3	50.7		50.0		0.7	
Pioneer Program	0.0	40.0		40.0			
Common Technology	97.0	210.1		61.1	149.0		
Environmental Control	57.0	151.0		2.0	149.0		
Supporting R&D	40.0	59.1		59.1			
Nuclear	528.6	732.8	716.8		16.0		
Safety, Enrichment, HTGR, Other	156.6	219.6	203.6		16.0		
Safety and other	56.3	91.2	75.2		16.0		
Uranium Enrichment	57.5	66.0	66.0				
High Temperature Gas Reactor	13.8	41.0	41.0				
Light Water Self Sustaining Reactor	29.0	21.4	21.4				

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(continued)

	Actual FY 74	President's FY 75	AEC	DOI	EPA	NSF	Other
Nuclear (continued)							
Breeder	372.0	513.2	513.2				
Liquid Metal Fast Breeder Reactor	357.3	473.4	473.4				
Gas Cooled Fast Breeder	4.0	11.0	11.0				
Advanced Technology	10.7	28.8	28.8				
Other Energy Resources	93.2	236.8	125.0	38.5		73.3	
Fusion	57.0	112.3	112.3				
Confinement	57.0	102.3	102.3				
Laser	0.0	10.0	10.0				
Solar	13.8	50.0				50.0	
Geothermal	10.9	44.7	12.7	9.7		22.3	
Miscellaneous	11.5	29.8		28.8		1.0	
Subtotal	955.0	1,754.2	875.9	549.0	182.0	101.8	45.5
Military Laser Fusion Program	44.1	56.3	56.3				
Total	999.1	1,810.5	932.2	549.0	182.0	101.8	45.5
Support Programs (Incremental Only) (Base)	270.5	216.0	66.3		82.0	67.7	
Environment	169.7	133.7	38.6		82.0	13.1	
Basic Research	94.5	80.1	27.5			52.6	
Manpower Development	6.3	2.2	0.2			2.0	