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CONF-771221 (ADDENDUM)

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DOE Role in Nuclear Policies and Programs

Official Transcript of Public Briefing

ADDENDUM

**December 13, 1977
Washington, D.C.**

February 1978

Sponsored by

U.S. Department of Energy

**Assistant Secretary for Intergovernmental and
Institutional Relations
Office of Consumer Affairs**

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INTRODUCTION

On Tuesday, December 13, 1977, the Department of Energy's Office of Consumer Affairs sponsored the first in the series of public briefings on DOE policies and programs. The first presentation in the "Consumer Information Series" was entitled "DOE Role in Nuclear Policies and Programs."

The briefing was conducted in the GSA Auditorium, 1800 F Street, N.W., Washington, D.C. from 9:00 a.m. to 12:45 p.m. The proceedings were opened by DOE Under Secretary Dale D. Myers and by Phillip S. Hughes, DOE Assistant Secretary for Intergovernmental and Institutional Relations. Tina C. Hobson, Director of the DOE Office of Consumer Affairs, moderated a panel which consisted of:

John F. Ahearne, assistant to the Secretary of Energy (at the time of this briefing).

Eric S. Beckjord, Acting Director, Division of Nuclear Power Development, Energy Technology.

John M. Deutch, Director-Designate (at time of briefing), Office of Energy Research.

Colin A. Heath, Assistant Director for Waste Isolation, Waste Management Division, Energy Technology.

A full transcript of the proceedings has been published. This is an addendum to that full transcript. At the conclusion of the public briefing, a series of questions were read into the record for answering at a later time.

This addendum presents those questions and the Department of Energy's answers to them.

Published copies of the full transcript may be obtained from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161. The estimated cost is \$7.00 per copy.

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A total of 24 questions were read into the official record at the public briefing on nuclear policies and programs. The answers published here were researched and written by personnel of DOE's Office of Energy Research, Office of Energy Technology, and the Secretary's Office.

A few questions were sent to the Nuclear Regulatory Commission for review and for preparation of answers.

QUESTION #1

MS. CHASEN: I am with the U.S. Labor Party. I don't know if there was any discussion regarding the implications internationally. I would like to address that in my question.

The Third World has made it abundantly clear that they feel the future lies with nuclear power in all its forms. If we are, in fact, facing an impending fossil fuel shortage, how do you answer the charge made recently by Senator Harrison Schmitt that the Administration's policy of sabotaging rather than aggressively developing nuclear energy is "blatant technological imperialism," and how do you justify the large-scale famine and death that would result in the underdeveloped sector from the worldwide energy shortage that would ensue should your Administration succeed, which is unlikely, in stopping the rapid employment of reprocessing and breeder technology?

ANSWER

Although many Lesser Developed Countries (LDC's) have expressed varying degrees of interest in nuclear power, the assumption that nuclear energy will play a central role in the energy and economic future of all developing countries is questionable. Only a few LDC's have actually committed themselves to nuclear power on a large scale. The Office of Technology Assessment estimates that, by 1990, only five of these nations will use nuclear generating stations on a large scale. Many are looking to non-nuclear sources of energy, including those which can cheaply and easily be deployed at the village level, and which preferably make use of local materials and renewable

resources. In this connection, the Department of Energy, together with other agencies, is undertaking a program to assist lesser developed countries in assessing their non-nuclear energy resources.

Further, it is not clear that nuclear energy is necessarily the best or most appropriate energy source for all LDC's.

A report* prepared for one of DOE's predecessor agencies, ERDA, concludes that nuclear power may not provide the cheapest electric power in most LDC's. Currently, U.S. industry shares with other countries the belief that 1000-megawatt plants are the most economical. Few LDC's have electrical grids capable of absorbing such large generating capacities. Other recent studies have questioned the relationship between economic growth and continued increases in electrical generating capacity and consumption. Food production and economic well-being seem to expand fastest when full employment, which usually requires labor-intensive development, is emphasized. The World Bank, the United Nations Development Program, and other international agencies concerned with improving life in the Third World have recognized this by shifting their aid away from such capital-intensive projects as nuclear power plants to the improvement of agriculture and employment opportunities, which usually require investment in human resources.

Thus, while nuclear energy can play an important role in the development of some LDC's, we do not share the view that nuclear is the best or most appropriate energy source for all LDC's. We are

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* R.J. Barber Associates; LDC Nuclear Power Prospects, 1975-1990; Commercial, Economic and Security Classifications: 1975, pp II-1, II-52.

prepared to assist all developing countries in coping with the energy crisis without imposing this or any other perspective as "best."

The record of the United States in assisting LDC's in the development of the peaceful uses of nuclear energy is clear. Since the beginning of the Atoms for Peace Program in 1957, the United States has shared its knowledge, experience, technology and hardware with all nations willing to accept internationally-administered safeguards designed to prevent the diversion of nuclear material for the production of weapons. According to a recent GAO (Government Accounting Office) study,* the U.S. provided twelve LDC's with research reactor grants worth, on the average, \$350,000, plus several million more in equipment grants between 1952 and 1962. Between 1968 and 1974, the Agency for International Development administered \$83 million in aid for the peaceful uses of nuclear energy in developing countries. Loans and sales of equipment and fissionable materials have continued under the auspices of the Atomic Energy Commission and its successor agencies, ERDA and now the Department of Energy. The Export-Import Bank has financed at preferred rates sales of equipment, reactors and fuels to several Third World countries.

In all cases, these transfers have taken place under bilateral agreements for cooperation negotiated between the recipient country and the United States. In no case has the U.S. declined to honor its commitments or refused to negotiate agreements with countries willing

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* U.S. Financial Assistance in the Development of Foreign Nuclear Energy Programs: General Accounting Office, Washington, May 20, 1975, pp 8, 10, 11, 14-16, 17, 22-23, 24, 25, 26-28.

to honor non-proliferation obligations and internationally-administered safeguards. Presently, these safeguards are the responsibility of the International Atomic Energy Agency, whose membership includes nearly every LDC which has or contemplates a domestic program for generating electricity through nuclear power.

In addition to its bilateral program of cooperation for the peaceful uses of nuclear energy, the United States has supported the technical assistance programs of the International Atomic Energy Agency. The IAEA has recognized the special needs of developing countries through numerous resolutions of its Board of Governors. According to the same GAO study, the United States contributed a total of \$76 million to the IAEA between 1957 and 1974, including regular budget assessments, of which the U.S. share is the largest, cash contributions, gifts in kind of fellowships, fissionable material, technical experts, and services. These gifts and contributions continue under the Carter Administration.

Thus, we do not believe that the term "technological imperialism" describes U.S. policy toward nuclear energy.

It is also important to clarify U.S. policy toward the reprocessing of spent reactor fuel. Because of the serious proliferation risks associated with this technology, President Carter proposed an indefinite deferral of commercial reprocessing in the United States. Furthermore, the President concluded that, for the United States, there is no compelling economic or energy-resource grounds for proceeding with either the liquid-metal breeder reactor or commercial reprocessing at

this time. The President has also directed that the U.S. breeder reactor program examine more proliferation-resistant breeders, as well as maintain a solid base R & D program in liquid-metal breeders. However, it should be emphasized that the United States is not opposed to the breeder per se, or to the research and development programs of other countries. It does believe that any decision to initiate a global energy economy involving the widespread use of plutonium, a material well suited for use in nuclear weapons, must be carefully considered by the entire international community. Toward this end the United States has invited all interested nations to participate in an International Fuel Cycle Evaluation (INFCE).

Forty nations, including nearly all LDC's having or contemplating domestic nuclear power or research programs, the United States, the Soviet Union, and other major industrial states, launched INFCE at an October, 1977 organizing conference in Washington, D.C. INFCE is a two-year study designed to assess the role of nuclear power in meeting world energy needs, while simultaneously discouraging the proliferation of nuclear explosives. Each of the eight working groups, some of which are led by Third World nations, will pay explicit attention to the special needs of developing countries in meeting energy and economic growth requirements.

In conclusion, the U.S. has no intention of sabotaging nuclear energy. Rather, our objective is to assure the continued development of nuclear power to provide an option for meeting energy needs, but

in a manner in which all nations can feel secure that risks of nuclear explosives proliferation are minimized.

QUESTION # 2

DR. JOHNSRUD: I'm Judith Johnsrud from the Environmental Coalition on Nuclear Power. What action does DOE plan to undertake in its health effects research programs on assessment of appropriate exposure levels for those more sensitive portions of the general public who have been identified by Irvin Bross and his associates at Raswell Park Institute? What other studies would DOE either sponsor or recommend on the adequacy of existing public standards for exposure to ionizing radiation?

ANSWER

Dr. Bross and coworkers claim that the risk of leukemia from low-level radiation exposure in "susceptible" children is significantly increased. Susceptible children have been defined as the offspring of mothers with a "bad reproductive history" - such as multiple miscarriages or stillborn births or children suffering from a variety of diseases such as asthma, hives, or eczema.

Dr. Bross' analysis is based on 92 children exposed in utero to ionizing radiation and who subsequently died from leukemia. A close inspection of data reveals, however, that only in 27 cases had the mother received radiation to the abdomen. In the remaining cases the fetuses were exposed to inconsequential doses, since the mothers had received diagnostic radiation to other parts of the body. As a result of this, the findings of Dr. Bross' analysis have been questioned.

Findings of studies of low-level radiation exposure are continually monitored and assessed as to their potential impact on existing guidelines for exposure limits of the general public and occupational

groups by national and international radiation advisory organizations independent of the Department of Energy. At this time, an expansion of the DOE program is not anticipated.

QUESTION # 3

MS. SEELMAN: I am Katherine Seelman and I am a consultant for the National Council of Churches. When risk estimates are based on uncertainties, as was the case in calculating risks for future generations, what standards are acceptable for the uncertainties established? Who should set the standards for these unacceptable or acceptable uncertainties?

ANSWER

Radiation exposure standards are recommended by the National Council on Radiation Protection and Measurements (NCRP) and by the International Commission on Radiological Protection (ICRP). These organizations and their various committees include extremely knowledgeable and competent scientists from both the private and government sectors of the United States and the world, respectively. Members are selected on the basis of their scientific ability, judgment and breadth of background. Such groups are charged with the task of evaluating genetic risks and uncertainties and making recommendations on standard setting. The government, with input from such groups and from the public, has the responsibility for setting and implementing standards. In the United States, the Nuclear Regulatory Commission and the Environmental Protection Agency exercise this responsibility for setting and implementing standards. Such a system of continual review, with input from the public, is expected to continue to meet future needs.

The estimate of the magnitude of genetic risk from a given radiation dose, dose rate and quality has some uncertainty associated with it.

The uncertainty is related to the difficulty in deriving genetic information from human populations, the reliability of extrapolating data derived in experimental animals to man, and the problems associated with utilizing cellular and molecular research to understand changes in whole animals. In spite of these difficulties, it is possible, using a number of approaches, to estimate genetic hazards and set radiation exposure standards to protect our genetic heritage and to insure the safety of future generations.

Another important group of scientists which was convened by the National Academy of Sciences/National Research Council was the Advisory Committee on the Biological Effects of Ionizing Radiation (BEIR). This committee made an independent evaluation of the effects on populations of exposure to low levels of ionizing radiation. By reviewing their approach to this problem, one can develop an understanding of how the levels of genetic uncertainties are evaluated and of their acceptability. The BEIR Committee applied four approaches to evaluate genetic risks from low levels of ionizing radiation:

1. Evaluate the risk relative to natural background radiation.
2. Evaluate the risk for specific genetic conditions.
3. Evaluate the risk for severe malformation and disease.
4. Evaluate the risk in terms of overall health.

The first method is the most reliable and does not require quantitative genetic information. Its only need is to acknowledge the fact that manmade radiations are not qualitatively different from natural radiation and that they will not produce unique biological effects.

Years of research have been directed toward evaluating the effects of radiation on animals, cells, genes and DNA. This research provides a basic understanding of how genes act, how mutations are formed, and what the dose/response relationships are for radiation-induced changes in genes. It provides assurance that manmade radiation does not produce genetic effects which are different from those produced by background radiation. Thus, we can be assured that, if the radiation dose is maintained in the range of the natural background, additional genetic risks and uncertainties will not differ in kind or in quantity from those experienced throughout human history.

The second approach in evaluating hazards involves the use of experimental animal data. Here the radiation-induced mutation frequency in mice is compared with the spontaneous levels of mutations found in man. From this information, a doubling dose (that dose required to double the spontaneous mutation frequency) is derived and the increase in mutation frequency is estimated as a directly-proportional function of dose. The range of doubling dose derived from this method is 20-200 rem. (The rem is a unit measuring the biological absorption of energy resulting from exposure to radiation. According to the BEIR Committee, the average exposure of the public to naturally-occurring environmental sources of radiation is 102 millirem, or 0.102 rem.) Information from survivors at Hiroshima and Nagasaki, as well as research on dominant mutations in mice, offers strong evidence against the doubling dose being as low as 20 rem for chronic irradiation. However, the value of 20 rem is retained and utilized to maintain a conservative estimate in the interest of the

public health and safety.

The third and fourth approaches utilize as a data base the risk relative to the current incidence of serious disabilities and risk in terms of ill health. These data bases create great uncertainty because it is necessary to incorporate untested and in some cases unprovable assumptions into the calculations to utilize these data. First it is necessary to assume a direct correlation between mutation rate and the incidence of complexly-inherited disease and, second, it must be assumed that the mutation frequency plays an important role in determining the disease incidence. These assumptions are conservative, since many non-genetic factors influence disease incidence and expression. Finally, it is necessary to define the mutational component of these complex diseases. The radiation advisory bodies tend to overestimate this component in order to maximize potential hazards and thereby more severely limit radiation exposure.

Using these four methods, estimates of the genetic risk and of the associated uncertainties of the risk can be made. The first method is very firm, since no assumptions are needed. The second requires the use of experimental animal and human epidemiology data and is somewhat less certain. The third is even more uncertain because of needed assumptions, and the fourth is little more than an informed guess. Using any of these methods, if the entire population were exposed to radiation at the level of current standards, the increase in genetic damage would be only a fraction of the natural incidence of genetically-controlled and related diseases.

Furthermore, recent research suggests that current estimates of genetic risk are higher than would be observed in an exposed population. Experimentation has shown that genetic damage in both sexes can be repaired so that radiation given at low dose rates is less effective in producing genetic abnormalities than is the same radiation dose given at a high dose rate. Since exposure limits were established on the basis of estimates of genetic hazard due to a high dose rate, the limits are additionally conservative to the extent of the difference in effectiveness between high and low dose rates. It also has been discovered that females are, for much of their lifetime, very resistant to radiation-induced mutations. Finally, accumulation of genetic damage has been assumed in standard setting, even though recent studies have demonstrated that there is little evidence for accumulation of such damage.

This should help place genetic risks and uncertainties in proper perspective and illustrate that research continues to more clearly define the genetic effects of radiation. DOE continues to support such experimentation, which is expected to provide a more complete data base upon which those evaluating the genetic hazards of radiation can base their recommendations and decisions.

QUESTION # 4

MS. FILDERMAN: I am Lynne Filderman, with George Washington University. How have you considered the impacts on future generations who will be faced with the decommissioning of many nuclear power plants? I am interested in more than just a cost calculus. This is important, because this would be a very serious issue as a result of today's actions.

ANSWER

The need for eventual decommissioning of nuclear plants has been

considered in three categories: development of a philosophy for approaching the problem, developing necessary technology, and implementing a policy for solving the problem.

First, the philosophy of approach in both government and private operations is to recognize and make specific provisions that will minimize the risk of human exposure and environmental burden of radioactivity arising from inactive or obsolete nuclear power facilities. This means that both government and private nuclear power facilities will have a planned ultimate disposition that does not constitute a perpetual hazard or a chronic burden of radioactivity in man's environment. The Federal Government has active programs to manage the surplus facilities it owns, including the planning of decommissioning projects that will progressively reduce the inventory of such facilities and properly dispose of radioactive material from the decommissioning operations. The Nuclear Regulatory Commission requires private nuclear power operators to license their facilities and maintain control as long as they possess the radioactive material. Part of the licensing requires assurance that resources are available to the licensee to meet responsibilities such as decommissioning. The required "assurances" which licensees must meet for decommissioning of nuclear power plants are outlined in the Code of Federal Regulations (CFR), Title 10.

10 CFR Part 50.57 (a) (4) requires that, to issue an operating license, the Nuclear Regulatory Commission must find the applicant "technically and financially qualified to engage in the activities authorized by

the operating licenses...." The requirements to demonstrate financial qualification are delineated in 10 CFR Part 50.33 (f).

10 CFR Part 50.33 (f) states that the licensee is required to show that he "possesses or has reasonable assurance of obtaining the funds necessary to cover the estimated costs of operation for the period of the license or 5 years, whichever is greater, plus the estimated costs of permanently shutting down the facility and maintaining it in a safe condition."

Thus, the "assurances" are established on a case-by-case basis. In some instances, the licensees have received the approval of their local rate commissions to cover D/D costs through the use of a "negative salvage value." Establishment of sinking funds have been proposed but have not received the approval of the rate commissions.

The development of technology for decommissioning nuclear plants is a continuing effort within DOE's program. Specific projects include development of methods to reduce the volume of contaminated equipment by smelting, methods to reclaim contaminated metals, and methods to decontaminate concrete.

Most of the technology is acquired by actual decommissioning projects, and several of these have been accomplished in the Federal Government program. Each project is documented so that the techniques and unique equipment developed can find application in future projects. The technology of dismantlement has been demonstrated at the Elk River reactor in Minnesota. This work was closely followed by the nuclear

power industry and the techniques and experience formed the basis of a private study sponsored by the Atomic Industrial Forum. This study outlined the procedures for estimating the cost of decommissioning large power reactors. The NRC is currently sponsoring additional studies of all types of private facilities associated with nuclear energy, to provide a technical basis and realistic estimates of the cost for decommissioning.

The implementing policy for decommissioning of Government-owned nuclear facilities is stated in the report, "Plan for the Management of AEC-Generated Radioactive Waste," (WASH-1202(73)), which states:

1. New facilities shall be designed and operated to maximize the probability that they can be converted to other beneficial uses, with a minimum of restrictions, when no longer useful for their original purpose.
2. Existing facilities originally designed to permit eventual decontamination and conversion to other uses shall be operated during the remainder of their original programs so as to facilitate such decontamination and conversion.
3. Existing facilities, where design and operation have made eventual conversion to other uses impractical, shall be operated during the remainder of their original programs so as to minimize the needs for post-shutdown surveillance and maintenance, and to facilitate possible continuing use.
4. All operational plans shall consider the needs for eventual decommissioning and decontamination, to a degree of detail

consistent with the estimated remaining useful life of the facility. For facilities determined to be excess, plans shall be maintained to protect employees and the public from potential hazards from the facilities. Further, decontamination and decommissioning plans shall be developed and carried out consistent with the possibilities of conversion to other beneficial uses, the possibilities of reducing surveillance and maintenance needs, the degree of effort required for decontamination, and the interactions with continuing activities, if any, on the same general site.

5. During the last few years of operation of a specific facility or site scheduled to become excess or shut down, the program division has the prime responsibility for planning and budgeting for the decontamination and decommissioning as part of the remaining operation and final shutdown plan. Particular emphasis should be placed on planning to permit knowledgeable people to remain available.

Future impacts of decommissioning are considered in several ways. The NRC is investigating, in its studies, the methods of financing decommissioning costs of nuclear facilities. These include provisions for establishing the necessary funds as part of the cost of nuclear power to current consumers.

The impact and cost of decommissioning activities to future generations in terms of ill health also has been considered. This is considered to be a part of the total nuclear fuel cycle, and the protection both

of the public and of the work force from radiation is reflected in the radiation exposure limits for both categories of persons.

The amount of radiation exposure which will occur during decommissioning is dependent on the method utilized. There are regulations which limit radiation exposures and there are commitments by the government and by private industry to eliminate perpetual hazards or chronic burdens of radioactivity in man's environment. Thus, exposure of the public to radiation as a result of decommissioning will be limited. Any exposure that might occur is expected to be occupational in nature and can be measured, controlled, and the hazards evaluated. As in other activities of the nuclear industry, the worker population potentially exposed during decommissioning of nuclear plants will be very small compared to the total population (or genetic pool), and the exposure doses will be controlled. As discussed above, there will be minimal chance for offsite releases and population exposure during decontamination and decommissioning of nuclear plants. Thus, the health costs are expected to be minimal or non-existent in terms of either somatic (i.e.; carcinogenic) consequences or a genetic load upon future generations.

QUESTION # 5

MR. REIS: I'm Mark Reis, with Friends of the Earth. ERDA feels that gas technology is ready for commercialization. Robert Thorne was quoted as saying that, "Now is the time to fish or cut bait." What is the Administration's policy on this matter? Is it being considered as a successor to the LWR? If so, what is DOE's policy concerning HTGR commercialization?

ANSWER

The HTGR is a reactor concept that has been developed to a point where some utilities feel it to be a promising commercial reactor concept for certain applications. The commercial introduction of HTGR's will depend on utility interest in adopting this concept for their particular needs. If utility interest, as evidenced by their willingness to provide funding, are sufficient to demonstrate a need for further development of the HTGR, DOE would consider supporting further R & D on the concept. DOE will in no case, however, fund construction of any commercial reactor.

QUESTION # 6

MR. SCROGGIN: I'm Don Scroggin. I work with the Center for Law and Social Policy. Many scientists view the proliferation of nuclear weapons to be the greatest hazard of continued nuclear development. India exploded a nuclear bomb developed from its peaceful nuclear program at a time when U.S. and international agreement forbade weapons use. Since then, Brazil has negotiated for nuclear capability and Pakistan and Argentina are anxiously pressing for similar nuclear development. The State Department expressed confidence that these other nations would be convinced that there was a difference between them and their requests for nuclear reprocessing facilities and the recent grant to Japan of reprocessing facilities.

My question is, is it realistic to expect these other nations to forego weapons development despite the political pressures they face, as long as the United States continues its own nuclear program and as long as no realistic alternatives are offered to them by the United States?

ANSWER

The Administration is very concerned about the potential for the proliferation of nuclear weapons capability resulting from expanded development and use of nuclear power. This was made clear by the President's Nuclear Policy Statement of April 7, 1977. Following up

on this concern, the President has caused to be organized an International Nuclear Fuel Cycle Evaluation. An organizing conference was convened in Washington, D.C. in November, to which 40 countries and 4 international organizations were invited. The participants agreed that effective measures can and should be taken at the national level and through international agreements to minimize the danger of proliferation of nuclear weapons, without jeopardizing energy supplies or the development of nuclear energy for peaceful purposes. The participating countries are seriously concerned about nuclear weapons proliferation. This evaluation should help shape international and national policies in the future to limit the possibility of proliferation. We are working very hard to find those technical and institutional arrangements which can be implemented internationally to reduce the risk of nuclear power as a path to nuclear weapons proliferation, and we believe the problem is solvable. The U.S. has deferred indefinitely the commercialization of plutonium breeders and plutonium reprocessing, and has encouraged other nations to do likewise.

QUESTION # 7-A

MR. HART: I am from the Rock Creek East Civic Association. I would like to ask a couple of questions.

If the United States develops the breeder commercially, will there be enough uranium in the United States to meet our needs, and how much uranium is available today?

ANSWER

The Department of Energy estimates that the U.S. reserves of uranium that have been well defined by drilling are about 840,000 tons of U_3O_8 .

An additional 3.3 million tons of U_3O_8 that do not meet the stringent requirements of reserves are classified as potential resources. In addition, some 140,000 tons of U_3O_8 as a byproduct of phosphoric acid and copper production is projected through the rest of this century. Thus, the present estimate of the U.S. total uranium resource base is about 4.3 million tons of U_3O_8 .

U.S. nuclear capacity in the year 2000 is currently projected to be 380 million kilowatts. The uranium requirements for this capacity through 2000 would be a little more than 1 million tons, using the present light-water reactors without reprocessing spent fuel. The 30-year lifetime requirements for this 380 million kilowatts would be on the order of 2 million tons. Thus, the estimated U.S. uranium resource base could sustain a light-water reactor-based nuclear power system well into the 21st. Century.

The breeder reactor concept has the potential to be a net producer of fuel (that is, more fuel is produced than is consumed). Thus, the breeder reactor is seen as an extender of uranium resources.

QUESTION # 7-B

What type of nuclear waste disposal would you recommend? Why? And when will this be decided?

ANSWER

The consensus is that permanent disposal in deep geologic formations is the most satisfactory method to ensure the permanent isolation of radioactive wastes from the biosphere. As early as 1957, a panel of the National Academy of Sciences recommended disposal in deep salt

as the most effective method, although there are advantages in using rock formations rather than salt. Exploration for specific sites for radioactive waste repositories had been conducted at a relatively low level until about two years ago, at which time Congress provided a significant increase in funding in response to the request of the then-new agency, the Energy Research and Development Administration.

Vigorous exploration activities are now underway, directed toward initial repository operations by 1985. Final decisions to place radioactive wastes into repositories at specific locations will be made after complete site investigation and consideration of all pertinent issues in a specific environmental impact statement.

QUESTION # 8

MS. NOBLE: I'm from the National Black Media Coalition. As an organization, we are concerned with the GNP of this country. In order to improve the employment picture, we must have energy. If we agree that oil and natural gas are scarce, then the most promising alternative is nuclear.

If we are to use nuclear, do you not agree that we must have the breeder as the next advanced technical stage? And do you agree that we cannot wait, because it takes eight to ten years to develop a new plant?

ANSWER

Breeder reactors or advanced converter reactors could indeed be used to extend the energy potential from uranium ore, if sufficient low-cost uranium ore to fuel the current generation of light-water reactors becomes scarce or unavailable at competitive prices. The time it takes to develop and deploy commercially the breeder reactors is indeed substantial, and DOE is considering this lead time in analysing the

need and timing of the breeder as an energy source.

DOE agrees that sufficient energy supplies are necessary to maintain a healthy U.S. economy that can create additional job opportunities. (See Question 14, on page 48 of the full transcript of the briefing, and its answer). Although much of our needed energy is planned to be supplied by an extensive expansion of coal coupled with a vigorous conservation program, the rest of the energy deficit in the near and mid-term (up to the year 2000) will have to come from light-water reactors.

Because the extent of uranium resources in the U.S. is uncertain, the period during which energy can be supplied by light-water reactors is not well known. However, as mentioned in the answer to Question 7-A, the estimated U.S. uranium resource base could sustain all nuclear power systems based on light-water reactors well into the 21st Century. DOE has embarked on the National Uranium Resource Evaluation (NURE) program to better characterize uranium resources over the next several years. (See Eric Beckjord answer to Question # 8, and John Ahearne comment - Page 31 of full transcript).

A research and development program on the liquid metal breeder will be continued, but commercialization will not be pursued. In the meantime, DOE is expanding its evaluation of alternative breeder and advanced-converter systems that might be more resistant to the proliferation of nuclear weapons, as well as more economical.

QUESTION # 9

MR. MOULTON: David Moulton, Congress Watch. Conservation is generally considered to be one of the most cost-effective ways to "produce" energy. Numerous studies have estimated that we currently waste, and thus have the potential to recapture, as much as 40 to 50 percent of today's energy production.

Does DOE agree with this assessment? If not, how much wasted energy does the DOE estimate can be recaptured today, either through technological adjustments or through adjustments in our lifestyles? How do these estimates affect DOE's forecast of the amount of production that must be provided by nuclear power over the next twenty to twenty-five years?

ANSWER

DOE agrees that conservation appears to be the quickest, cheapest, and most practical way of meeting our energy demands. For this reason we have structured our energy policy proposals to encourage energy conservation through persuasion, incentives for more efficient energy use, standards for improved industrial processes, and support for R & D in all forms of conservation.

DOE analyses performed to date indicate that technological and economic (mostly price) adjustments could reduce energy use in the year 2000 from fifteen to forty percent below what it would be if pre-1973 conservation measures were still being used. The percentage would be lower if measured from a 1977 base year, since higher fuel prices and specific efficiency targets for industry mandated by law have spurred many users to install energy conserving equipment and to adopt energy saving practices. The calculations include mandated improvements in automobile mileage per gallon of gasoline.

Estimates of savings over a shorter time span will, of necessity, be more modest. For 1985, DOE analysis indicates a possible fifteen

percent reduction in energy use relative to a continuation of pre-1973 conservation practices; or ten percent compared to estimated 1976 energy-use patterns. For the nearer-term, the percentage would be less than ten percent for overall national energy use. Some industries already have attained over twenty percent improvement, and some homeowners certainly have experienced more than fifteen percent reduction in energy use.

Conserving energy takes three forms: 1) reducing use of existing equipment, 2) energy management in existing facilities, and 3) installation of energy-efficient devices in either new or retrofit situations. Most of the conservation to date has been of the first two forms, except in new installations where almost all equipment shows higher energy efficiency ratings than older models. Generally, energy costs have not gone high enough to make it prudent to replace existing buildings, plants, or processes as a means of controlling fuel costs. The third form of conservation will take decades, the normal economic lifetime of buildings, furnaces, and process equipment. Average attainable conservation is always less than improvements possible with the latest device or technology. If the conservation assumed in the DOE analyses occurs, it will lessen the growth in demand for oil, gas, coal and nuclear fuels. For nuclear power this translates into an estimate of 380 GWe of nuclear power in the year 2000.

QUESTION # 10

MS. MILLER: I'm with the Center for Science in the Public Interest. In light of DOE's cooperative efforts with the NRC in developing the safety tests for the light-water reactors, I would like to know what plans there are to inform the public, on a continuing basis, of the

status of the various safety programs that are involved with the current safety of light-water reactors. And, in particular, since there is a major criticism of these study efforts, namely of how the results can be reliable and fully extrapolated to the full-scale, commercial reactors, how the two agencies' combined efforts are planning to meet the criticisms of the lack of comparability in so many aspects?

ANSWER

DOE's cooperative efforts with NRC on light-water reactor safety research will be reported publicly in a variety of ways. Key results will be published in scientific and technical journals (e.g.; "Nuclear Safety") and discussed in meetings such as the public briefing on nuclear policies and programs and in public meetings of advisory groups (e.g.; NRC's Advisory Committee on Reactor Safeguards). Also, there will be NRC and DOE press releases following major tests, usually followed by articles in leading newspapers.

The light-water reactor safety research program is designed to produce reliable results. In cases where extrapolation of results to full-scale, commercial light-water reactors is of concern, models used for the extrapolation will be verified to the extent possible. For example, the objectives of the LOFT (Loss of Fluid Test) program are to help validate, along with other analytical and experimental programs, the predicted accident response of light-water reactor nuclear power plants and the performance of plant components and safety systems and to help substantiate the analytical techniques used in the safety assessments for these plants.

QUESTION # 11

MR. CONRAD: I am with the National Farmers Union. Will nuclear waste disposal sites be selected in areas of low population density? If so, why should rural people be more threatened than urban dwellers and what guarantees will there be that waste disposal sites are safe and not discriminatory to rural people?

ANSWER

The selection of sites for geologic repositories will be based upon a number of criteria established to ensure that the geologic formation provides the necessary features to provide isolation of the wastes from the environment. The types of factors which are considered are the following: topography, fluvial and glacial activity, wind erosion and weathering, stratigraphy, rock thickness and depth, mechanical strength, thermal properties, fractures, geohydrology, tectonic history and seismicity.

Other siting factors include suitable means for transporting material, availability of land, and local land-use planning. A combination of all these factors may very well result in repositories being sited in low-population density areas. In any case, safety analyses and necessary environmental protection factors will be based upon analysis of hazards to any individual living at or near the site boundaries, ensuring that a minimum threat to the health and safety of that individual will be posed by the repository operation.

The safety analyses and the review of environmental impacts associated with operation of geologic repositories will be reviewed and analyzed with participation by State and local officials and members of the public, through the licensing process which will be conducted by the Nuclear Regulatory Commission. It is planned that public hearings, at which these issues will be discussed, will be conducted as part of the review of the suitability of any proposed repository location.

QUESTION # 12

MS. GEORGE: I'm from the National Society for Fissionable Energy. Each month that a nuclear plant is delayed, it costs the rate payer \$25 million. What can the DOE do to speed up the licensing of nuclear power plants so that it takes only five to seven years to build one, rather than the ten to twelve years it takes in this country?

What can the DOE do to relieve a situation where a small group of people can bring suit and cause the delay of nuclear plants for years?

ANSWER

Other than introducing legislation to improve the licensing process, there is little that DOE can do by itself to speed up the licensing of nuclear power plants. This is primarily a problem for the Nuclear Regulatory Commission and the utility industry. DOE supports licensing changes that would lead to shortening of the construction time for nuclear power plants. Such measures as early site reviews/ approvals, pre-approved sites, generic review of plants, and standardization of plants, if implemented, could lead to shorter construction times and minimize delays due to litigation, while maintaining plant safety.

QUESTION # 13

MR. BANCROFT: I'm with the Public Citizens' Litigation Group. In light of the range of waste disposal technologies being considered and the refreshing remarks of Mr. Deutch about the great uncertainties in projecting future costs, how is it possible for the Department of Energy to talk about a one-time storage and disposal fee for nuclear fuel?

ANSWER

Initial cost estimates will be based upon the most recent design studies. Based upon our current plans, however, the actual fee paid would not be finalized until the time of delivery to the

approved storage facility. Since five years advance notice of intent to transfer fuel is currently planned, DOE would not expect to routinely accept fuel until 1983, and cost data would be based upon firm design and some construction experience available at that time. In addition, the fee will be revised periodically and any early cost estimate errors could be corrected and accounted for in later fees.

QUESTION # 14

MR. BROSEN: I am David Brosen with the Potomac Alliance. Do you think we can find a permanent technical solution to nuclear waste disposal when it is impossible to predict during the next tens of thousands of years natural phenomena, such as subsurface geological movements, and human events such as wars, political and social changes and terrorism?

ANSWER

The concept of waste disposal in geologic formations places minimal reliance on future human surveillance and maintenance. Suitable geologic formations, such as bedded salt, were formed hundreds of millions of years ago and have remained undisturbed by natural surface or subsurface events over that period of time.

After a repository has been developed and the radioactive material is emplaced, it is intended that the repository space will be filled, all shafts filled and sealed and the surface facilities removed. Only monitoring devices and suitable surface markers will remain after decommissioning.

Extensive calculations and experiments are being conducted to ensure that the introduction of the radioactive material will not break the record of geologic stability shown for hundreds of millions of years.

The radioactive wastes will then be so deep below the surface that only a concentrated, deliberate effort would result in these wastes being recovered. The selection of repository sites include a requirement for no long-term human surveillance, so that social changes should not influence the effectiveness of geologic isolation.

QUESTION # 15

MS. MORELAND: (no affiliation indicated) There have been examples of mishandling of radioactive material, some of them in such unlikely places as junkyards. How does DOE guarantee that no materials, supplies or equipment or waste will ever leak into civilian channels? What guarantees does DOE make as to protection against sabotage and terrorism in the transportation of radioactive material?

What guarantees can DOE give us that our civil liberties are not being infringed upon to provide these guarantees?

ANSWER

Whether the number of cases of "mishandling" is many or few is a matter of perspective. Over the past 30 years, there have been nearly 20 million packages of nuclear materials shipped in the U.S. During that time, there have been only about a hundred instances where there has been some leakage from a shipment. These leakages took place in packages containing only small amounts of radioactive materials, usually destined for hospital or industrial use. They were minor leaks, injuring no one and causing no widespread or serious contamination problems.

There is no question that shipments of industrial or medical isotopes could be stolen in the course of transportation. But these are not the kinds of materials from which nuclear weapons may be made.

What about the materials that could be used to make an atomic bomb? All strategic quantities of such DOE-owned materials are now shipped

in special "attack-resistant" vehicles, escorted by armed guards, and under constant communications surveillance. Privately-owned materials are required by NRC regulations to be handled in a similar protected fashion. Highly radioactive materials, such as spent nuclear fuel, and in the future possibly high-level nuclear wastes, are shipped in very heavy shipping casks weighing as much as 100 tons, and such a multi-ton cask is not conducive to clandestine theft or hijacking.

The consequences of sabotage or terrorist attack on spent fuel shipments concerns DOE also, and a program has been sponsored at the Sandia Laboratories to study this matter. The work done by Sandia thus far has shown that an attack on a spent fuel cask using weapons and explosive devices which are readily available to saboteurs or terrorists will not break open a cask. Even if a cask could be breached, the consequences would be far from catastrophic. Recent NRC reports (NUREG 0170 and 0194) arrive at this conclusion.

DOE's transportation of strategic quantities of special nuclear material is handled by DOE in a manner consistent with Federal standards and requirements and is coordinated with Federal, State and local law enforcement agencies. We see no area where anyone's civil liberties have been or will be infringed upon as a result of providing protection against malevolent attacks or serious accidents.

QUESTION # 16

MS. JACOBS: I am with the Potomac Alliance. I would like to know what exactly are these technologically viable solutions to long-term storage of waste. I would like to know what is being done, or can be done, to minimize the hazards of the hundreds of thousands of gallons of nuclear waste that have already escaped into the environment, and what can and is being done so there will be no further such releases?

ANSWER

The technical solutions to long-term storage of nuclear waste have been documented in a 5-volume report, "Alternatives for Managing Wastes From Reactors and Post-Fission Operations in the LWR Fuel Cycle" (ERDA-76-43), published in May, 1976.

Copies of this document are available on request. As discussed previously, the most promising technique for ultimate disposal of radioactive wastes is permanent isolation from the environment in deep geologic formations.

The releases of waste referred to in the question appear to be a reference to leaks from single-wall waste tanks in the desert area at Hanford, in Eastern Washington State. Approximately 115 thousand gallons of liquid waste did leak into the sandy soil there. The most volatile radioactive element (ruthenium) has traveled no more than 50' downward and 75' radially from the leak site (or 89' maximum depth below the surface). The water table at this location is 200 feet below the surface, and no contamination of ground water has occurred.

Programs are currently underway at Hanford and at Savannah River in South Carolina to reduce these liquid wastes to a salt-cake

material by evaporation. All liquid wastes are being transferred to double-wall tanks, with provision to transfer the liquids if the inner wall of any tank develops a leak. The liquid wastes at Hanford have now been reduced to only a working inventory. The bulk of the material is in moist salt cake form. A similar condition will be reached at Savannah River by 1979.

In the long term, alternative disposal methods to achieve minimal surveillance and maintenance requirements are under review. Defense Waste Documents which describe the technically practical alternatives for long-term disposal at each of the three DOE sites have recently been issued. Environmental impact statements to assess this aspect of each alternative are currently being prepared prior to selecting the preferred alternative.

QUESTION # 17

VOICE: Could I ask you to comment on Dr. Sternglass' report concerning the Millstone, Connecticut site, where he cited that site as causing an increase in infant mortality through its dealings with strontium 90?

ANSWER

While we are not familiar with the specific data upon which Dr. Sternglass bases his report on the Millstone nuclear reactor site, his allegation that strontium 90 released to the environment from various reactor sites has, as a result of fallout, caused an increase in infant mortality has been discussed by Dr. Sternglass for many years.

In the early 1960's he attempted to establish a relationship between infant mortality and strontium 90 in fallout. In the

early '70's, he directed his attention to examining the mortality patterns around nuclear power plants in an attempt to find postulated health effects.

Dr. Sternglass' work on postulated effects of low levels of radiation (in the range of natural background radiation) has received widespread attention both within and outside the scientific community. Many knowledgeable persons and organizations have reviewed his findings and found them to be unsubstantiated by the data he presents. A partial list of those who have conducted such reviews include:

1. A special investigating committee appointed in 1974 by Governor Shapp of Pennsylvania (Committee Report).
2. The U.S. Environmental Protection Agency. Tompkins, E.A., "Infant Mortality Around Three Nuclear Reactors," Pollution Conference of the Biological-Health Section of the Sixth Berkeley Symposium on Mathematical Statistics and Probability, July 19-22, 1971, Berkeley, California. Tompkins, E.A. (U.S. EPA); Rule-making Hearing on Numerical Design Guides for Effluents From Light-Water-Cooled Nuclear Power Reactors, AEC Docket RM 50-2, 4/26/72.
3. The New York State Department of Health. Tompkins, E.A.; "Selected Health Statistics 1960-69, For Counties in New York State Having Nuclear Facilities," New York State Dept. of Health, 6/30/70.

4. The Michigan Department of Public Health. A.R. Davis and Bernard Kahn, "A Rationale of Dr. Sternglass' Paper, 'Infant Mortality Changes Near the Big Rock Point Nuclear Power Station, Charlevoix, Michigan,'" Michigan Department of Public Health.
5. The State of Illinois. Public statement by Dr. Franklin Yoder, Director, Illinois State Department of Health, October 22, 1970.
6. All Presidents of the Health Physics Society (holding office up to or at the time of the statement made at the 1971 Health Physics Society Meeting).
7. The American Academy of Pediatrics. A.P. Hull, "More on Radioactive Fallout" - statement by Committee on Environmental Hazards, American Academy of Pediatrics, 4/15/70.

The nature of these criticisms suggest at least two major difficulties that seem to be present in Dr. Sternglass' evaluations:

1. He seems to select the data which supports his hypothesis and fails to adequately consider data which doesn't support his point of view. This method of data handling is not an acceptable scientific approach to problem areas.
2. Others who have evaluated data from the same areas that Dr. Sternglass has studied (to determine if radiation-induced health effects exist) find no evidence for such effects. This failure by many other scientists to find evidence that would support Dr. Sternglass' hypothesis makes his data

less credible in the scientific community.

These questions concerning the scientific credibility of Dr. Sternglass' approach, together with the many statements and reviews of those who have reviewed his findings, all tend to discredit the conclusions which he advocates.

QUESTION # 18-A

Submitted by DR. TOM COCHRAN (Natural Resources Defense Council): We are more than 30 years into the nuclear age, with no permanent solution to the nuclear waste problem. Are there any credible technical or institutional failures that you can envision that would lead you or the Department of Energy at some future time to call for stopping new power reactor construction? What are these?

ANSWER

We believe that the technical and institutional uncertainties associated with nuclear waste do not justify the stopping of new nuclear power reactor construction. However, DOE is increasing its efforts to develop a Federal waste management program. The Department of Energy will monitor the development of information over time, to ascertain if a postulated technical or institutional failure becomes sufficiently credible to require a change in the course of action with regard to nuclear power.

QUESTION # 18-B

DR. COCHRAN: What efforts does the Department of Energy have underway, or plan, to study the nuclear waste disaster in the USSR?

ANSWER

We do not know if there was a "nuclear waste disaster" in the USSR. We are aware that Zhores Medvedev, a Soviet refugee biochemist and geneticist now living in England, has reported

that waste from a shallow burial facility near the town of Blagoveshensk in the Ural Mountains erupted and spread radioactive material over a large area, and that many people were killed or suffered from radiation sickness.

DOE has no information relating to Soviet nuclear installations or activities near the town of Blagoveshensk. It is possible that Medvedev is not certain of the location, although we are aware of similar reports released by the CIA. Accidents in the Soviet Union do not receive extensive publicity and, because of the extreme secrecy surrounding the Soviet military nuclear programs, we would expect little more than rumors of any accident that may have occurred.

In bilateral talks, the Soviets have been very reluctant to discuss details of high-level radioactive waste storage or disposal, except in the most general terms.

Locations have never been specified, nor has there ever been any mention of an accident as described by Medvedev. It appears from the general information provided that the development of waste management techniques in the USSR is at the same stage as it is in the USA.

Given this Soviet reluctance, DOE has no current plans to try to study the purported accident, since such a study would obviously have to depend on a Soviet willingness to provide information.

QUESTION # 19

Submitted by DR. JUDITH JOHNSRUD (Environmental Coalition on Nuclear Power, State College, Pennsylvania): In today's questioning, the Department of Energy panelists have stated that the health effects costs of the coal fuel cycle are worse than those for the nuclear fuel cycle. Has this conclusion considered the testimony of NRC Staff Health Physicist Reginald Gotchy in ASLB Docket 50-320, July 5, 1977, concerning the long-term health effects of radon-222 released from uranium mill tailings? What consideration has been given to Walter Jordan's September 21, 1977 comments also concerning health effects of radon releases from uranium mill tailings?

ANSWER

The studies referred to (studies conducted at the Brookhaven National Laboratory and at the Argonne National Laboratory) do account for radon-222 release from mill tailings. The health effects are calculated on an annual basis in terms of electric production.

With regard to Reginald Gotchy's testimony, we assume that you are referring to comments made about the large number of health effects from mill tailings if one accepts what he considered to be unrealistic assumptions. Since Reginald Gotchy rejected those assumptions and the health effects derived from them as not being meaningful, we do not consider it meaningful to consider his conclusions. Furthermore, Dr. Gotchy is the author of the NRC document, "Health Effects Attributable to Coal and Nuclear Fuel Cycle Alternatives," recently distributed for public comment. The conclusions of this document are identical to those stated by the panel at the December 13, 1977 public briefing (i.e.; that health

effects costs of the coal fuel cycle are up to 100 times worse than those for the nuclear fuel cycle).

Walter Jordan commented that the NRC understated the number of curies released by mining and milling activities. It is our understanding that these numbers are being revised by the NRC. The NRC position on this matter will be reviewed for its implications for health estimate calculations.

QUESTION # 20

Submitted by ERIC PETER RODENHAUSER (Office of Consumer Affairs, Arlington, Virginia): Why not pursue a more vigorous program of conserving present energy sources (i.e.; oil) and have a crash program to develop non-polluting forms of energy (i.e.; solar and wind generation)?

ANSWER

The overall policy of the Department of Energy follows the general direction suggested by the question. Conservation is the cornerstone of national energy policy, as has been pointed out in the earlier answers. The proposed national energy legislation before Congress is heavily weighted towards encouraging additional conservation by energy prices that reflect the cost of replacement fuels, tax credits for improved energy efficiency and for solar installation and regulation and conversion from oil and gas to more plentiful domestic fuels. If the actions proposed in the National Energy Act are carried out and continued along a logical path into the end of this century, the U.S. should be in transition to renewable energy sources early in the Twenty-First Century.

The Federal Government, through cooperative programs in the DOE, Housing and Urban Development (HUD), and the Department of Defense (DOD), is pushing solar energy development consistent with the ability of the research community and the fledgling infrastructure to productively employ the increased funding. We anticipate asking for additional funding in future years.

The Federal program of research, development, and widespread demonstration of improved technology aims at convincing potential users that renewable resources are reliable, economic, and environmentally satisfying. It has its limits. Business and industry must become the suppliers of renewable energy equipment if these sources are to become truly viable energy supplies. That appears unlikely to occur over the near to mid-term, based on what is known about current and projected equipment and fuel costs. Preliminary life-cycle costing estimates indicate renewables may be the least economic option for most energy users, primarily because of the high capital cost for initial installation of facilities. To force massive installation of known uneconomic technology would have energy benefits, but at the expense of overall economic welfare measured in terms of labor, materials, services and energy.

QUESTION # 21

Submitted by MS. BEA CAMP (Consumer News, National Press Building): John Ahearne mentioned that renewable energy forms will probably have more environmental problems than predicted; for instance, solar. What are these problems?

ANSWER

The answer you refer to was a statement that renewable energy mechanisms probably have more environmental problems than are currently predicted, but will most likely have fewer environmental problems than non-renewables. There has been some work attempting to examine possible environmental problems. These are in many areas speculative, since the renewable technologies have not been developed. However, the potential environmental impacts resulting from the development of solar powered energy sources are discussed in a document prepared by DOE's Division of Solar Energy. The document is entitled, "Solar Program Assessment: Environmental Factors" (ERDA 77-47/1-8). In addition, an evaluation of satellite power systems, "Final Report of the ERDA Task Group on Satellite Power Stations" (ERDA 76/148), addresses environmental issues. These should be obtainable from DOE or from the National Technical Information Service (NTIS).

A list of some possible problems associated with renewable energy technologies is presented below.

Heating and Cooling of Buildings

1. Disposal of used working fluids.

Wind

1. Interference with electromagnetic radiations (e.g.; TV).

Biomass

1. NO_x and HC from combustion of biomass.

2. Depletion of soil organic content due to removal of residues.
3. H_2S production from thermochemical (liquifaction and gasification) biomass conversion, in addition to char, ash, oils and other residues.

Photovoltaics

(No problems listed....)

Ocean Thermal Energy Conversion

1. Climatological impacts from OTEC operation and due to sea water temperature gradient change.

Geothermal

1. Subsidence caused by removal of fluids.
2. Seismicity problems due to withdrawal and reinjection of geothermal fluids.

The presentation above is not exhaustive, but should give you some appreciation of the problems. As noted, you can find more detail on solar environmental issues in the Solar Division documents. On geothermal you might want to look at the study, "Imperial Valley Environmental Project: Progress Report," by P.L. Phelps and L.R. Anspaugh (UCRL-50044-76-1), which is an ongoing case study of geothermal development (available from NTIS).

We should note that the social, economic, and institutional issues associated with either renewables or non-renewables

have not been touched on in these comments. These may also be significant.

QUESTION # 22

Submitted by MS. ISABELLE WEBER (The League of Women Voters Education Fund - posed on behalf of MS. LENORE LOEB, League of Women Voters of Missouri): In view of the many competing demands on our limited water supply and greatly accelerating demands envisioned during the development of new energy sources, we must question the huge water demands required by nuclear power plants. Have studies been made to determine if such water demands can be met without impacting on food production and other essential water demands?

ANSWER

Nuclear power plants require water for cooling, as do most other types of electric generating plants, such as fossil-fueled plants. For a 1000-MWe nuclear plant, consumptive cooling water requirements can vary from approximately 18 cubic feet/second (for once-through cooling) to 31 cubic feet/second (for mechanical-draft wet-cooling towers). Nuclear plants require approximately 40-50 percent more cooling water than fossil-fuel plants because of the slightly higher thermal efficiencies of fossil plants, and because approximately 10 percent of the cooling of fossil plants is accomplished by direct discharge to the air via smokestacks. Whichever type of generating system is used to satisfy electrical demand, it is generally expected that, nationwide, consumptive use of water for energy (including not only electricity, but also further development of synthetic fuels from coal and oil shale) will be relatively small compared to non-energy use, such as irrigated agriculture.

Regionally, the relative use of water for energy and non-energy varies considerably. For example, in the general Northeast and Southeast regions, overall energy use has been indicated in some projections to increase from approximately 6-8 percent of total water use in 1975 to approximately 16-20 percent in 2000. On the other hand, in the Missouri River Basin, energy use of water has been similarly projected to increase from about 1 percent to about 4 percent.

Several studies have been conducted (or are ongoing) to examine the overall needs for water and the relative significance of the various uses, as well as the comparison of all needs with total availability. For example, the Water Resources Council is currently concluding work on its 1975 National Assessment that examines all of these issues from a national viewpoint and from a State/regional viewpoint. The Congressional Office of Technology Assessment has underway a survey of energy and non-energy uses of water. The various River Basin Commissions include both energy and non-energy needs in developing their comprehensive river basin plans. The Department of Interior conducted an earlier "Westside Study" with the eleven Western States (including participation by non-Federal interests), and the U.S. Geological Survey has conducted several studies of water use, including studies with particular emphasis on energy use and water needs of nuclear power. The Department of Interior

is also leading an interagency study (as directed by the President's 1977 Environmental Message) of the needs for water for developing the Nation's energy resources, as measured against needs for other uses. The Department of Energy is currently conducting a cooperative study with the Water Resources Council to examine in three key regions of the country (the Ohio, Upper Missouri, and Upper Colorado Basins) the impact and significance of the development of emerging energy technologies against a background of other uses of water resulting from conventional energy generation, plus non-energy uses.

The DOE fully recognizes the importance of water as a national resource for all national goals and its particular importance in those regions where water is already perceived to be a critical resource. All of the Department's programs will carefully consider regional factors and conflicting demands for water in the design and deployment of energy facilities and resource development. From the above and other studies, it is expected that it will be possible to develop an overall view of the ability of the nation's available water supply (surface, ground, fresh and saline) to meet all societal needs. These studies will also determine whether special initiatives may have to be undertaken to conserve or modify uses of water in order to meet overall regional and national goals for future development of all water uses - for energy, agriculture, drinking water, and industrial needs.

QUESTION # 23-A

Submitted by MR. CURT BIREN (Design Alternatives, Inc.): Has the Department of Energy identified the public concern about the United States storing spent fuel from foreign countries? What are the findings?

ANSWER

DOE conducted a public meeting on the Spent Fuel Policy on October 26, 1977 to discuss the policy and respond to questions on its implementation. This meeting did not identify any serious objections to the foreign aspects of the policy. In the future, DOE plans to publish for public comment the Generic Environmental Impact Statements on the domestic and foreign portions of the policy, and also submit legislation to enable DOE to implement the policy. These activities will provide further opportunity for public concerns on storing foreign spent fuel to be addressed.

QUESTION # 23-B

MR. BIREN: Are there any efforts being made toward multinational arrangements for radioactive waste storage or disposal?

ANSWER

We currently have active technical exchange agreements in the field of waste management with Sweden, West Germany, Great Britain and, to a lesser extent, with Japan. Further, as you may know, considerable information is being exchanged with approximately 40 countries in the International Fuel Cycle Evaluation Program currently underway.

The possibility of multi-national arrangements for waste disposal and storage has been discussed on a preliminary basis, but no specific proposals or sites involving U.S. participation are currently under discussion.

President Carter has, of course, proposed a U.S. policy for storage of spent fuel which could include acceptance of some foreign fuel under certain conditions, but no specific arrangements have made to date under this policy. It is expected that Congressional approval would be required prior to any arrangement to accept foreign spent fuel.

QUESTION # 24

Submitted by MR. MAGNHILD A. PETTERSON (International Association of Machinists and Aerospace Workers): Is there support for, and would it be feasible to have, a Federally-sponsored program to convert home water and space heating from oil and gas to solar heating?

ANSWER

The President's National Energy Program proposes a program to encourage the increased use of solar systems in residences. Under the legislation presented to the Congress last April, homeowners installing solar equipment (including wind powered equipment) should be allowed a tax credit of a percentage of the cost to purchase and install a solar device - up to a maximum of \$2,000 credit on an expenditure of \$7,400. The Congressional Conference Committee has tentatively modified this somewhat to provide a maximum credit of \$2,100-\$2,200.

The program has a goal of the use of solar energy in 2 1/2 million American homes by the year 1985.

This concludes the answers to the questions which were read into the official record at the conclusion of the December 13, 1977 public briefing on "The DOE Role in Nuclear Policies and Programs."

The preparation of these answers (by officials of DOE's Office of Energy Research, the Secretary's Office, and the Office of Energy Technology) was coordinated by the Office of Energy Technology. For additional information on this process (identification of officials answering specific questions, etc.), please contact Ms. Valerie B. Donovan, Office of Energy Technology, U.S. Department of Energy, 20 Massachusetts Avenue, N.W., Washington, D.C.