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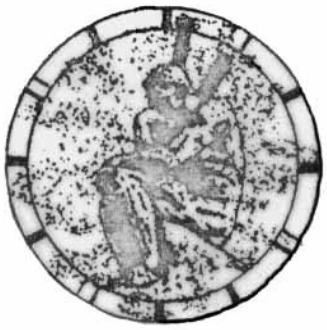

LOS ANGELES CHAPTER !
FEDERATION OF AMERICAN SCIENTISTS

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ON THE PROLIFERATION OF NUCLEAR POWER PLANTS

A Report

by the Executive Board
Los Angeles Chapter,
Federation of American Scientists

This report issued by the Los Angeles Chapter of the Federation of American Scientist is a response to the requests by public interest organizations for our participation in the public debate on the broad policy questions which should have been answered before the planning and construction of the nuclear power plant near Bakersfield, California. It is not to be construed as the official policy statement of the national Federation of American Scientists,

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November, 1974

R e p o r t : ON THE PROLIFERATION OF NUCLEAR POWER PLANTS
by Executive Board, Los Angeles Chapter, Federation of American Scientists

A B S T R A C T

An analysis of the proposed nuclear power plant near Bakersfield is made. It is concluded that there are still too many unanswered questions about the safety and ecological impact of such a plant. The extremely dangerous long term waste disposal problems are completely unsolved. Therefore it is recommended that a moratorium on construction of such plants be enforced until nuclear power technology is significantly improved.

Along with additional research on nuclear power, it is strongly urged that vigorous research be supported on solar, geothermal, wind energy and other alternate energy sources. In this way we will be able to develop systematically the cleanest, most economical and safest energy supply possible for each region of the United States.

In the short term this report recognizes that energy conservation is urgently required. At the same time, the economic health of the society requires growth in the energy supply. Large groups of citizens still do not enjoy adequate energy for even a minimum decent standard of living. In spite of this increasing short term need, it is emphasized that present reserves of fossil fuel, with current technologies of clean burning — such as the fluidized bed burning of coal — can supply the energy needs for at least the next two or three decades. During this period, if implemented completely, active research and development will establish new safe sources of energy sufficient to our future needs.

TABLE OF CONTENTS

R e p o r t : ON THE PROLIFERATION OF NUCLEAR POWER PLANTS
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I. REASON FOR REPORT

The Los Angeles City Council is considering whether to approve a participatory agreement which will permit the Department of Water & Power (DWP) to proceed with plans to build the world's largest nuclear power plant in the San Joaquin Valley near Bakersfield.*

The Los Angeles Chapter of the Federation of American Scientists (LAC-FAS) has been requested by the California Citizen's Action Group for cooperation in their efforts to achieve open public debate on the broad policy questions which should be answered before the planning and/or construction of any additional nuclear power plants.

We have also been asked by Californians for Safe Nuclear Energy to support their, petition campaign to place a state initiative on the ballot. The Attorney-General has prepared the following summary of the proposed initiative:

INITIATIVE MEASURE TO BE SUBMITTED DIRECTLY TO THE ELECTORS

NUCLEAR POWER PLANTS — RESTRICTIONS 0N CONSTRUCTION AND OPERATION. INITIATIVE PROHIBITS CONSTRUCTION OF NUCLEAR POWER PLANTS UNLESS:
(1) AFTER ONE YEAR THE LIABILITY LIMITS IMPOSED BY FEDERAL GOVERNMENTS ARE REMOVED, AND (2) AFTER FIVE YEARS THE LEGISLATURE, BY TWO-THIRD VOTE CONFIRMS EFFECTIVENESS OF SAFETY SYSTEMS AND WASTE DISPOSAL METHODS. IF BOTH CONDITIONS ARE NOT MET WITHIN FIVE YEARS, EXISTING POWER PLANTS SHALL BE DERATED AT 10% PER YEAR FROM ORIGINAL LICENSED CAPACITY. IF LIABILITY LIMITS ARE NOT REMOVED WITHIN ONE YEAR, EXISTING PLANTS SHALL OPERATE AT 60% CAPACITY OR LESS. DOES NOT APPLY TO SMALL SCALE MEDICAL OR EXPERIMENTAL NUCLEAR REACTORS. HOWEVER, IF THE INITIATIVE RESTRICTS THE OPERATION OF EXISTING NUCLEAR POWER PLANTS THERE IS A POTENTIAL FOR SUBSTANTIAL CLAIMS AGAINST THE STATE BY OWNERS OF THE PLANTS.

The proliferation of nuclear power plants should be of concern to all citizens but especially to scientists, who, because of their training, should have a bettor understanding of the danger and problems involved, but also, as scientists and citizens they must be concerned about the energy needs, of both the present and future generations. While the LAC-FAS should and does support the objectives of both the Citizens Action Group and the Californians for Safe Nuclear Energy, that support is qualified.

To raise questions about and to seek legislation to restrict construction and operation of nuclear power plants which have generated, and will generate problems for the foreseeable future, are worthwhile objectives. But this is not enough. Our recent experiences with energy

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* Approval by the City Council means that a minimum of fifteen million dollars of the city's monies will be committed even if final approval to build the plant is not granted by controlling agencies.

shortages, whether real or artificially created, should have taught us that we must also present a positive program which will meet our present and growing energy needs.

II. SAFETY QUESTIONS AND DANGER OF CURRENT NUCLEAR POWER TECHNOLOGY

In 1965 the Los Angeles Chapter, Federation of American Scientists (LAC-FAS) issued a REPORT ON NUCLEAR POWER. The report posed certain questions regarding safety, waste disposal, power needs and resources, economics, conservation and social costs. The report also presented some criticisms of the national nuclear power policy and made some recommendations for change in that policy.

Although nine years have elapsed since that report, few if any significant answers have been given to the questions. The criticisms which were then presented are even more valid today. Nor have any substantive changes been made in the national nuclear policy.

The hazards and problems created by nuclear power production which were pointed out in the LAC-FAS 1965 paper, still exist today — only raised to a higher magnitude. The prediction that the installed nuclear power capacity, which at present is 3×10^4 MW* will rise to 10^6 MW by the year 2000,[1] if fulfilled, may raise the hazards and problems to an unmanageable order unless there are tremendous advances in the "state of the art." And there is, at this time, nothing to indicate that such advances are in the offing.

The economics of nuclear power production necessitates that the uranium fuel elements be reprocessed. Four reprocessing plants have been in operation; three are government-owned and are operating. The fourth, a privately-owned plant at West Valley, NY has been shutdown by the AEC because it has been emitting more than the permissible limits of radioactive wastes and is not expected to reopen until 1979. Two plants are under construction: the Allied Gulf Nuclear Service plant in South Carolina, which is scheduled for start-up in 1977 and the General Electric plant near Chicago. However, GE has disclosed that this plant on which it has already spent six years and sixty four million dollars, will have to be virtually scrapped.[2] If GE does redesign and build the remodeled plant, the earliest it will be ready for start-up is 1980. During this period, from 1972 when the West Valley plant was shut down and only the government-owned plants will be operating, to 1977-1980 when West Valley and the new plants will be operational, a most serious hazard can develop. According to the trade journal Nuclear Industry, a stockpile of about 2,300 tons of unprocessed reactor fuel will accumulate.[3]

About reprocessing, nuclear scientist Sheldon Novick says, "Uranium fuel elements, before they have been placed in a reactor, are nearly harmless. But after undergoing a slow controlled chain reaction in the reactor for several months, the same fuel element

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* A megawatt (MW) = 1 million watts... $3X10^4$ MW = thirty thousand MW; 10^6 MW = 1 million MW.

becomes the most dangerous object, short of the atomic bomb, known to man."[4]

The L. A. Times reported 9 September 1974, "The DWP panel admitted that there is not yet an acceptable solution to the storage of nuclear wastes for long periods."

III. COSTS OF NUCLEAR PLANT CONSTRUCTION

Because the technology of nuclear power plant construction is not very advanced the costs of building plants escalates greatly from the planning to the completion. As an example. Consumers Power in Michigan planned in 1966 a nuclear power plant for $93 million dollars. By the time it had produced its first electricity in 1971 the final cost had run to $l88 million. Unfortunately, over the past year the plant has produced a "mere trickle" of electricity forcing the Utility to purchase $32 million in replacement power.[5]

Because the technology of nuclear power is relatively undeveloped, the nuclear power plants now in operation have produced only in the range of 50% to 60% of their total generating capacity. This is appreciably below the 80% of capacity achieved by coal fueled plants. The reliability problem of nuclear plants has prompted one expert, David Comey, to predict that the public could spend more than $15 billion dollars for nuclear power in the next 15 years but receive very little power in return.[6]

IV. POWER NEEDS IN THE NEAR FUTURE

In 1970 the electrical demand was 1.53×10^{15} KWH.* In 1973 the demand was 1.85×10^{15} KWH, approximately a 21% rise in three years. It is important to note that in that year (1973), despite the energy shortages, the brown-outs, and energy conservation measures, 4.85% more electrical energy was used than in 1972.[7]

A two year study by the Rand Corporation forecast that the annual electrical energy demand will rise to 5.87×10^{15} KWH by the year 2000, an increase of about 400%. This was their minimal estimate, the maximum was 9.56×10^{15} KWH, an increase of about 600% over the 1970 demand.[8] The Federal Power Commission (FPC) projected the electric power demand to be 1.5×10^{15} KWH for I980, 6×10^{15} KWH for 1990.[9]

The statement that we Americans are profligate in our use of energy can well be substantiated. We are not making the most efficient use of our energy resources. A study of efficiencies of heat use in various industrial processes indicated that only 55% was used in processing, 45% went up the exhaust.[10] It has been estimated that l5-40% reductions in energy use can be achieved by redesign or replacement of many of our plants, equipment and other energy using

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* 1.53×10^{15} = 1.53 million billion kilowatt hours. (A kilowatt hour is the standard unit of electrical energy on which your electric bill is based.)

components. But the redesign and replacement of these, from electric light bulbs to high rise office buildings, from washing machines to giant steel foundries, must take time. Even if economic considerations were put aside such redesign and replacement would require more than two decades before any significant reduction of energy use could be realized.

We have developed, perhaps heedlessly, a life style which consumes huge amounts of energy. Our homes were designed with little or no consideration for efficient use of energy for heating or cooling; this was also true of the many appliances we believe necessary for our life style. Nor was efficient use of energy a very important factor in the design of our commercial buildings or in machinery and equipment. Until recently, the prevailing attitude was: energy is plentiful and comparatively cheap.

These homes, appliances, buildings, factories, machinery already exist. They represent an enormous capital investment both in monies and in social labor. An orderly conversion and replacement will require decades. But even if it were possible to replace or convert these energy-wasting homes, appliances, factories, etc., within the next decade, it must be recognized that our high energy use is an accepted aspect of our culture. This being so, although we can achieve much more efficient energy use both by better design and by forgoing many of the energy-using amenities considered necessary today, the probability that a majority of the people are, at this time, ready and willing to accept such a cultural change is remote. To bring about a change in public attitude will require a broad, comprehensive, educational campaign. Even with such a program it would take at least two or three decades to achieve general acceptance of such a cultural change.

Any position that we as scientists take must be based upon the assumption that the energy demand will increase for the near future. The population will have grown even if the 1960-1971 U.S. average growth rate of 1.2% per year[11] were to decline to zero by the end of the century. But more significant are the needs and demands of the 15-20% of the citizens who are denied, because of inadequate income, access to these amenities of life that the majority of citizens have, expect and demand. We therefore anticipate a certain amount of expanding demands from this particular have-not segment of our society.

V. AVAILABLE POWER RESOURCES

While we do support a moratorium on the proliferation of nuclear power plants until there have been substantial advances in the state of the art, and for strict monitoring of existing plants, we must at the same time present feasible alternatives. Time is of the essence. Unless these alternative energy sources can be made available in the immediate future, brown-outs, black-outs, gasoline, heating and petrochemical shortages, either actual or contrived, can be expected. The crises created by these shortages will condition the majority of the people to support the proponents of nuclear power proliferation,

and power plants will be built.

Numerous alternative energy sources have been proposed. Geothermal energy, fuel from wastes, solar energy, photovoltaic cells, magnetohydrodynamic power, wind mills and coal. (Laser fusion and magnetic containment fusion are not considered here since these are still in the theoretical stage.) Of the various alternatives other than coal, geothermal energy has been produced commercially for the generation of electric power. At the Geysers, in Sonoma County, California the Pacific Gas & Electric Co. (PG&E) is producing, from a dry steam field, about 396 MW of electric power and is expanding its plant, which when completed in 1976, will have a total installed capacity of 900 MW.[12]

In Larderello, Italy, geothermal energy (dry steam) has been used for the generating of electric power since 1904. That plant now has a capacity of 380 MW. At Matsukawa, Japan, a dry steam plant which now has a capacity of 20 MW went into operation in 196l. There are hot water or wet steam plants producing electric power in Wairakei and Kawerau, New Zealand; in Otake, Japan; in Pauzhetska and Paratunka, USSR; in Namafajall, Iceland; and a Cerro Prieto, Mexico. However these plants are small and are still plagued by many technical difficulties.[13] In the U.S. proven geothermal sources of hot/wet steam are located in California, Nevada, New Mexico, Oregon and Idaho but none of these is in commercial use.[14]

Although the National Petroleum Council estimates that the U.S. geothermal resources can be developed to supply 1,900 to 3,500 MW of electric power by 1985,[15] and the Hickel Geothermal Research Conference estimated the developable geothermal potential as 132,000 MW by 1984,[16] much more research and development work will have to be done before this source of energy can make a significant contribution to our electric power needs.

Solar energy is being developed in some experimental apartment house water heaters and in some southwest homes. Research on efficient wind generators is progressing. Other alternatives are still in experimental stages. The lead time required for development and large scale production for commercial use of the generating equipment using these alternatives would be too long to allow us to offer these as feasible alternatives to the imminent construction of nuclear plants.

Coal has been the principal fuel for electric power production. However, with the increasing availability of oil and natural gas at costs which were competitive with coal, many existing plants were converted. New plants were designed for oil or gas use as fuel. In 1973 the utilities used for fuel 54% coal, 21% natural gas, 20% oil and 5% nuclear (excludes hydroelectric, geothermal, and waste-power generators).[17] With the increasing shortage of domestic natural gas, the apparent shortage of domestic oil and the increasing costs of imported gas and oil, conversion of the existing coal-using plants has practically stopped.

To meet the increasing demand for electrical energy, obsolete generating plants must be replaced, and additional plants must be built. The utilities argue that dependence upon foreign supplies is

risky and that our domestic supplies of gas and oil must be reserved for gasoline, home heating, industrial processes, petrochemicals and national emergencies. They claim that the nuclear-power plant is the most feasible alternative.

The available statistics belie their claim. John C. McLean, Chairman of Continental Oil Company states that our recoverable fuel reserves are:

> "Sufficient to meet U.S. needs for at least two hundred years at the present rate of consumption."

He cites as potential recoverable reserves: oil for 65 years, gas for 50 years and coal for 300 years.[18] The U.S. Geological Survey supports McLean's statement that we have enough reserves for at least 200 years. Their estimate is: oil reserve — 3 trillion barrels, natural gas 6,000 trillion cubic feet.[19]*

As for coal, the picture is even brighter. Readily recoverable reserves: underground (deep mining) 293 X 10^9 short tons (293 billion); surface (strip mining) 135 X 10^9; total, 428 X 10^9.[20] Based upon the present use of 600 million tons per year and allowing for a 10% per year increased use, (approximately doubling every seven years) the total amount of coal that will be used in the next 25 years would amount to only 13.8% of the known reserve. The U.S. Geological Survey has indicated a possible reserve of 1.5 trillion tons. As the technology improves more of this 1.5 trillion tons will become available.[21]

It is apparent from the data presented, by responsible sources that there is no valid threat of an imminent shortage of fossil fuel necessary for the operation of our electrical generating plants. The brown-outs, the black-outs and the shortages (if such shortages really existed) of 1973 were due not to the lack of resources but to the lack of planning or, even worse, to misdirected planning or both. Despite warning signals that domestic natural gas and oil, with the present methods of extraction, would soon be in short supply, many coal using generating plants have converted in the past three decades to gas and oil use. Neither the FPC nor any other agency of the government had attempted to deter this conversion.

While there is no threat of an imminent shortage of fossil fuel, our present methods of extracting and using these fuels are extremely wasteful. But even with efficient extraction and use, these huge reserves of resources will be exhausted in the not too distant future. Research and development (R&D) of the alternative energy supply sources must be carried on at an ever increasing pace. Adequate federal financing for R&D in these areas must be made available.

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* This does not include the estimated 26 trillion barrels of oil which can be recovered from oil shale with proper technology.

VI. RECOMMENDATIONS

We recommend a two stage program which will obviate the need for the present construction of nuclear power plants with all their attendant hazards and problems.

Stage I: a) Moratorium on current nuclear power plant construction with particular reference to the proposed plant at Bakersfield, California.

b) Immediate establishment under the auspices of the Energy Resources Development Agency (ERDA), of a massive R&D project to produce highly efficient methods of extraction and utilization of coal. Methods should not be causative of damage to the environment. It may be interesting to note here that fiscal budget for 1972-73 allocated $2.2 billion to the AEC, while only $58 million was allocated to the Office of Coal Research (OCR) and $3 million for solar research. The AEC employs 5,800 people, the OCR only 37.[22]

c) The Federal Power Commission (FPC) should direct utilities to reconvert to use of coal, maintaining strict pollution control.

d) Congress should place the responsibility for long range planning for our power needs, including the planning for regional, national and international electric power transmission interties, with the FPC.

e) The present methods of oil and gas extraction produce only about 1/3 of a field's potential. The technology for at least doubling that extraction has been available for some time. With adequate supplies of foreign oil (which generally are controlled by the same companies which produce the U.S. oil), the producers had little incentive to adopt the more efficient technology. Congress should enact the necessary legislation which would compel, by incentive and by sanctions or both, the utilization of technologies which can produce the greatest portion of a field's potential.

Stage II: Congress should provide adequate federal funding for R&D of alternative energy sources (other than nuclear). This project should also to be under the auspices of the ERDA.

Additional power generating facilities are needed. Conventional fossil fuel using generating plants require much less time for planning, approval and construction. The technology to control and prevent damage to the environment by these plants is available. Fuel to provide the energy for these plants is, at this time, a readily available resource.

It is not enough to point out the availability of recoverable resources. The uncontrolled extractions of resources from the earth has

left many scars. Hillsides have been devastated, arable lands have been rendered useless, towns have suffered subsidence, waterways have been contaminated, hideous windrows of mining spoils desecrate the landscapes. The human, ecological, aesthetic and economic damage that has been caused by this uncontrolled extraction is immeasurable. This uncontrolled extraction of our resources must no longer be permitted.

The technology for extracting the resources without creating the havoc is known; it is available. In some states legislation which prohibits the devastation of the land has been on the books for many years. Recently federal legislation has been proposed and probably will be enacted. But legislation will not stop the environmental abuses. An alert and aroused citizenry must demand that legislation with adequate safeguards against despoliation be enacted and enforced. And more to the point, this alert and aroused citizenry must see to it that enforcement include meaningful punishment to violators.

To those who say that the laws against the environmental degradation of our country by the extractors of our resources cannot be enforced, there is only one answer: If we will be strong enough and active enough to prevent the proliferation of nuclear power plants, we can be strong enough and active enough to make sure that the laws against the devastation of our country are enforced.

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R E F E R E N C E S :

(1) Rose, Science, 19 August 1974 p.351

(2) Gillette, Science, 30 August 1974 p.770

(3) ibid.

(4) A Public Report on Nuclear Power Plants, (Environmental Education Group) 1974

(5) Wall Street Journal, October 8, 1974

(6) ibid.

(7) Edison Electric Inst./Business Week, 27 Jul 1974 p.37

(8) Based on Rand Study, Energy & the Future (AAAS 1973) p.142

(9) ibid. p.139

(10) Hemstat in MIT paper, 4 June 1973

(11) World Bank Atlas (Int'l Bank for Reconstruction & Development)

(12) PG&E Weekly, 24 August 1973

(13) Robson, Business Week, 19 April 1974 p.372

(14) Energy of the Future (AAAS, 1973) p.57

(15) ibid.

(16) ibid.

(17) ibid.

(18) The Annals (American Academy of Political & Social Science) Nov. 1973 p.98

(19) Energy Resources, U.S. Geological Survey 1972 - Circular 650

(20) Data - Bureau of Mines (BW 11 May 1974 p.134)

(21) ibid.

(22) Miller, Center Magazine (Center for the Study of Democratic Institutions) Nov/Dec 1973 p.41