The original documents are located in Box C1, folder "Presidential Handwriting, 5/15/1974" of the Presidential Handwriting File at the Gerald R. Ford Presidential Library.

5/15/74

THE WHITE HOUSE

WASHINGTON

JERRY:

Since this is dated May, 1974, should I contact Mildred Leonard's office to see if they wish to have it for their files?

YES_____ NO_____

OTHER____

KYLE

No — Just file it with J's yellow notes

15 May, 1974

Meeting with Ford, Sawhill, Rhodes, Mosher and McCormack

To: Vice President Gerald Ford
From: Congressman Mike McCormack

Regarding: Some suggestions concerning solutions to this nation's energy problems.

The energy crisis has caused a complex mixture of long range problems that will be with us at least for the balance of this century. Resolution of these problems is more important than other challenge facing our society except national defense and maintaining a stable economy.

The United States has never had an energy policy. We have simply assumed that currently available sources of energy (such as oil and natural gas) were inexhaustible and so cheap as to be of little concern.

Our industrial economy and our standard of living are dependent upon a prodigious consumption of oil and gas, but the most reliable predictions indicate that we will have consumed most of these fuels before the end of this century. As these resources decline, we will become dependent for virtually all our energy on coal and nuclear fusion (solar and geothermal energy, hydroelectricity, and exotic energy sources will probably not provide a total of 10% of our energy before the end of this century.)

Today this nation desperately needs a systems approach to an integrated national energy policy, and a single administrative agency to implement the programs to carry this policy into effect.

Today we assume a spectrum of simultaneous programs to solve the energy crisis:

--A crash program of exploration and drilling for oil and gas

--New pipelines, refineries, storage facilities, etc.

--Dramatically increasing the amount of coal mined (or stripped)

--Gasification of coal

--Liquefaction of coal

--Heavy reliance on nuclear energy

--An energy electric grid

--Solar and geothermal energy

--Nuclear fusion

--A massive research, development, and demonstration program

--Energy conservation in transportation, housing, and industry

In assuming these programs, the requirements for . . .

--Fuels (coal, uranium, thorium, etc.)

--Materials (steel, copper, aluminum, helium, etc.

--Money (for research and development and capital costs)

--Manpower (R & D, technical, engineers, labor)

--Water (process, cooling)

--Transportation (railroads, pipelines, transmissions)

--R & D facilities (national labs, non-profit labs, industry, academic)

. . . must be considered for each, and how the requirements for each conflict with the others in 1975, 1980, 1985, 1990, and 2000.

In addition, we must do environmental studies on all energy proposals and an economic analysis of all proposed programs.

Thus, a systems approach to an integrated national energy policy can only be managed by a single agency at the Cabinet level.

A Cabinet level Department of Science, Technology, Energy and Materials could be one such agency.

It would include the present functions and authority of:

--The AEC (except weapons)

--NASA

--National Bureau of Standards

--National Science Foundation

--Office of Coal Research

--Office of Oil and Gas

--Bureau of Mines (energy)

--and perhaps others.

It would have some special statutory relationship to

--Department of Transportation

--Department of Housing and Urban Development

--Environmental Protection Agency

in energy related areas of authority.

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House of Representatives

NUCLEAR ENERGY AND NATIONAL ENERGY POLICY

HON. MIKE McCORMACK
OF WASHINGTON
IN THE HOUSE OF REPRESENTATIVES

Shakespeare had Julius Caesar say "There is a tide in the affairs of men, Which, taken at the flood, leads on to fortune; Omitted, all the voyage of their life is Bound in shallows and in miseries." I believe that such a moment exists at this time in this country, and that the response to it by us all will very substantially influence the fate of this nation for decades to come.

The shortages of gas and other petroleum products experienced by Americans during recent months has finally accomplished what 20 years of insistent warnings of scientists could not do. It has made most Americans aware of the fact that the energy supplies of this nation are not inexhaustible, and that this nation can no longer control the policies of weaker nations to the end that they will deliver their resources to us to our advantage and to their disadvantage. It has made Americans aware of how much we depend on a prodigious consumption of energy for our standard of living.

What may not yet be apparent to the casual observer is that our consumption of energy must continue to increase even if we establish a successful program to conserve, and that we are faced with a frightening spectrum of implications associated with such increased energy consumption, and the conservation programs we must institute. Any concerned citizen may justifiably ask "What are we going to do?" which, translated into a more professional jargon, would read "What is our Energy Policy?"

The sad fact is that this nation has no energy policy at all, and that we, the general public and the government, have acted as if all sources of energy were cheap, inexhaustible and, until recently, non-polluting.

The challenge that we face today is the need to recognize that we must promptly extricate ourselves from the folly of this dream-like attitude of the past, and that we must now develop a systems approach to an integrated national energy policy. If we do create such an energy policy and if we implement the programs to carry it into effect, the people of this country can have both adequate energy and environmental protection, and can attain a state of greatness and affluence that we have not known. If we fail, the inevitable result will be catastrophe.

I would like to discuss a national energy policy so that we may understand just what it is that we are talking about, why it is so important, how it relates to us here in this Western Energy Congress, and to my comments today.

A national energy policy will not be a permanent, inflexible, dogmatic proclamation, but rather a dynamic set of working goals which will be flexible enough to change and evolve as new information becomes available. However, there are some guideposts which I think will be rather lasting, and which provide some valuable perspective for us at this time.

In the first place, we must have a *systems* approach to an *integrated* national energy policy. This is an absolutely essential minimum requirement if we really intend to solve the energy crisis. It must include, along with the administration of *all* energy research, development and demonstration, *all* assessment and management of all fuels, an understanding of the supply and demand for each type of energy and fuel for each region of the country, and managerial determination of the conservation potential, the economic impact and environmental feasibility of any energy-related proposal. *This is basic* to any action we may desire to take with respect to the energy crisis, and it is essential that we establish within the Executive Branch a *single administrative agency* with the authority to *implement* such an energy policy.

It must be based on the best information available. We cannot afford the luxury of basing policies on fantasies (such as assuming that solar or geothermal energy or suppressed carburetor designs will bail us out of our problems) or prejudices (such as antinuclear fanaticism) or hopes (such as the hope that we will keep finding enough natural gas to keep us going).

A national energy policy must provide the optimum conservation practices through every step of everything we do and, in particular, with respect to the conversion, transmission and consumption of energy. It seems obvious to me today that in the short run we should not burn natural gas to produce electricity; in the very long run we should not be burning fossil fuels at all.

A national energy policy must allow for a higher standard of living for most people in this country. This ability to gain a higher standard of living is fundamental to our society, and we must design a national energy policy that will permit it.

A national energy policy should, I believe, provide energy self-sufficiency for this nation—not by 1980 or 1985—this is pure political demagoguery—but as soon as is reasonably possible, and certainly by the year 2000. Still further, and of great importance, we should plan now to export the technology that we will develop to every nation of this earth so that no nation will be dependent upon any other nation for its energy or subject to blackmail for its survival. This is one of the most important contributions this country can make to the world in terms of reducing international tensions and bringing true and lasting peace.

Finally, our national energy policy should provide for an ultimate reliance upon inexhaustible supplies of essentially non-polluting sources of energy.

Now that the Arab oil embargo has been relaxed and we appear to have almost enough gasoline for this coming summer, this nation and its people will need to demonstrate an exceptional degree of determination to develop a national energy policy with realistic emphasis on the long-range aspects of the problem. Of course, the key to success of such an effort is appreciation of the fact that the energy crisis is not a short-range problem, but rather a long-range one. Several years ago some of you heard me discuss the energy crisis as being made up of four crises:

The first involving the need for this country to be able to manage the distribution and secure the availability of fuels and electricity on a short-range basis;

The second involving the inevitable conflict between environmental protection on the one hand and energy conversion, distribution and consumption on the other;

The third relating to the necessity for this country to mitigate or eliminate our dependence upon imported fuels, particularly upon oil from the Arab nations; and

The fourth relating to the need for this nation to provide alternate sources of energy before the year 2000.

During recent months, the first three of these crises were telescoped into a single one which has shaken the country badly. The fact is, however, that the fourth element is most important because this nation has, during the last two years, truly passed from one historical era into another. We have passed from an era of cheap, abundant energy to an era of shortages in fuels, energy and materials which will be with us for several decades. The implications of this transition are, I fear, far more profound than is generally appreciated.

I think it may have a salutary effect on our perspective to recognize that future historians will probably record that during the 20th century, western man discovered and burned up as fuel virtually all of the earth's resources of petroleum and natural gas.

This may be a difficult reality to face, but we must assume that this nation has already consumed more than half of all the petroleum and natural gas we ever have discovered or ever will discover on this continent, or off its shores, and that it will all be gone, insofar as a significant supply of fuel is concerned, by about the year 2000. As our supplies of petroleum and natural gas dwindle toward the end of this century, this nation will become dependent for almost all of its energy on coal and coal products, and on nuclear fission. But even these sources of energy are really only transitional, and as we phase them in we must also make plans for phasing them out in the more distant future, and replacing them with other, still-to-be-developed sources.

Thus we have one generation within

which to develop these new sources of energy, and while we are making this conversion we must make the necessary cultural, societal and economic adjustments that will inevitably result.

There seem to be several traits which surface when individuals or societies are faced with such disturbing realities. The first is to deny that the problem exists. Thus I have been deluged with mail stoutly insisting that there was—and is—no petroleum shortage at all.

The second escape mechanism is to find a scapegoat to kick around as if this would somehow make the problem disappear. Thus we have had the oil companies and the Administration and the Congress blamed for our energy crisis and our shortages. Certainly there is adequate blame for each, but no amount of criticism will correct what is basically a problem of exponential demand growth exceeding essentially linear improvement in supply.

The third reaction is to look for fantasies as solutions. Thus we have had such spokesmen as Ralph Nader making ludicrous statements to the effect that either solar or geothermal energy, if adequately funded, could solve our problems.

But finally, the mature, responsible citizen will seek the truth and try to work out constructive solutions based on facts.

The facts available to us now provide a fairly clear picture of what our course must be for the near future. Our options are severely limited during the next three to five years. We can and must conserve, or be prepared to conserve, enough energy to provide for essential needs in any contingency. We must also, of course, initiate permanent comprehensive conservation programs in everything we do.

We must establish our Federal Energy Administration and support its operations. We must obtain a large library of accurate and detailed information on energy and fuels and related subjects as quickly as possible, get it into computers, and have it available for use. It must be kept up-to-date. We need good luck in our weather and we need good international relations.

During this time we must initiate aggressive programs of exploration and drilling for oil and gas, on-shore and off. We must develop an oil shale program, and assist, as is mutually advantageous to both nations, exploitation of Canadian tar sands. We must build new refineries, new ports, new pipelines and new storage facilities for gas, petroleum and petroleum products. This is our best short-range strategy for trying to keep our energy supplies for our existing industrial and societal infrastructure as close as possible to future demands.

Of course coal is our greatest resource of fossil fuel, and we must rely heavily upon it. However, even a superficial glance should warn us against taking it for granted. We will need an entire, new, modern coal industry with new mines that meet modern health and safety standards and have a minimum impact on the environment. It will be necessary for us to allow coal to be stripped under realistic regulations, but provide for responsible reclamation of the land. It will be necessary to restore our railway system with new road-beds and new rolling stock. It may also be necessary to amend our Clean Air Act to allow for the burning of coal to generate electricity provided that the best de-sulphurization technology is employed. I have perpared legislation, which I believe to be realistic, to accomplish this goal.

We will, of course, come to depend more and more upon coal gasification and liquefaction, but here the absolute necessity for a systems approach to an integrated national energy policy becomes overwhelmingly obvious.

For instance, reliable figures indicate that if we were to attempt to close the presently projected gap between supply and demand for natural gas in 1985 using coal gasification, the capital cost alone for the coal gasification plants would be $200 billion. Such an operation would require 140% of all the coal mined today and the equivalent of about 10% of the flow of the Columbia River at Hanford for process water.

One can quickly grasp the implications of undertaking even one project of this magnitude in terms of coal, water, dollars, steel, manpower, logistics and environmental impact, and how each relates to the other and to those of every other energy-related activity such as coal liquefaction, expanded mining, shifting to smaller cars, nuclear power plant installation, oil shale development, pipeline installation, and providing new housing and mass transit systems. We must make these plans now for this year and next, for 1980 and 1985, and on to 2000.

It may not be apparent yet but I am certain that one of the greatest strokes of good fortune this nation has experienced is to have our nuclear industry as well advanced as we find it today, ready *now* to provide much of the energy this nation will need during the next 50 years.

Nuclear energy is the cleanest significant source of energy available with the least environmental impact of any significant option. If we did not have nuclear energy available to us for the coming decades, the future of this country would indeed be black in more ways than one.

Today there are 44 nuclear power reactors licensed to operate in the United States. They produce about 26,000 megawatts or 6% of this nation's electricity. There are 54 more plants under construction or in final testing. Of these, 14 are expected to go on line in 1974, making a total of 58 plants by the end of the year. 107 more are on order, and by the mid-1980's we can have 205 nuclear power plants on line. By 1980, 140 of these should be operational, producing 21% of our electricity. By the year 2000, approximately 1000 nuclear plants will be on line. Incidentally, present projections assume that in the year 2000 we will be producing a total of 2 billion kilowatts of electricity, as compared to 440 million today, and 60% of the total electricity produced in the year 2000 will be nuclear.

Nuclear electricity is cheaper (8.6 mils/kwh) than electricity from fossil plants (10.3 mils/kwh). Both these figures will, of course, inflate, but I suspect that it is fair to assume that inflation and higher "real" costs will strike harder at new fossil fuels than at nuclear energy.

One problem facing the United States' nuclear energy program is the availability of uranium. Atomic Energy Commission figures indicate that known reserves (up to $15 per pound) total 525,000 tons, compared to a projected U.S. requirement of 38,000 tons per year in 1980 and 154,000 per year by the year 2000. Thus, we have an adequate supply for the next decade—but we will probably encounter problems in the mid-1980's. There are several proposed solutions to this problem, and I have asked the AEC to establish an ongoing review of the total potential inventory of fissionable material on a year-by-year basis for the balance of this century. This would be a significant undertaking in that it would require an appraisal of all known reserves of uranium ore that are yet to be mined, all potential imports and exports, the demand of domestic and foreign nuclear energy industries, the enrichment capacity available in this country and elsewhere in the free world, the impact of the breeder program and the use of thorium as a nuclear fuel in gas cooled fast breeders or molten salt breeder reactors.

Of course, it will be necessary to provide additional uranium enrichment capacity by the early 1980's. Perhaps as many as six new "Oak Ridge-size" plants must be built in the United States by the year 2000. A new enrichment plant would cost $1.5 billion to build. If it were a new gaseous diffusion plant, it would require 2400 megawatts of electricity to operate (the equivalent to the present output of Grand Coulee Dam). If it were a centrifuge plant, it would cost about the same, but would require only 240 megawatts of power. A third technique involving the use of lasers for isotopic separation may be developed. If it were successful, it would be less expensive, both in capital and in power requirements. It would also be more efficient.

One of the major frustrations associated with nuclear energy today is the 8 to 10 year lead time involved in getting a plant on line. It should be possible to substantially reduce this time without sacrificing any environmental or safety requirements. France and Japan, for instance, require only 5 to 6 years. During recent weeks, the Joint Committee on Atomic Energy has been holding a series of hearings on nuclear power plant licensing and siting, considering legislation which I have sponsored and legislation which has been sponsored by the Administration. These two approaches are compatible, and hearings which start immediately after the Easter recess may lead us to some new comprehensive bill, including the features of each, as well as other suggestions that have been made during hearings. In the legislation I have introduced, I propose a much greater involvement by the individual states in the selection of acceptable sites for nuclear power plants. The AEC has suggested several additional approaches, including standardized plant designs, pre-selection of sites, and advanced consideration of some administrative and legal procedures associated with construction permits.

One can scarcely overemphasize the significance of reducing the lead time for getting nuclear power plants on line. I mentioned earlier that there are 161 plants under construction, in final testing or on order. It would require 5 million barrels of oil per day to produce the same amount of electricity that these plants will put on line. At $10 per barrel, this is equivalent to $18 billion in one year. It is easy to appreciate the beneficial impact nuclear power will have on our trade deficit, as well as the colossal amount of fossil fuels which we will save for other purposes.

Today the nuclear energy program is on track and essentially on schedule, but there is much to do. We must have a liquid metal fast breeder reactor demonstration plant on line by the early 1980's, and we must follow it by a gas cooled fast reactor demonstration plant. In addition, we should continue research related to a possible molten salt fast reactor. The LMFBR will require extensive research and development in advanced fuels such as carbides or nitrides to replace the present oxide fuels. Work on the thorium-232-uranium-233 fuel cycle for the GCFR and MSFR is necessary. Advanced fuels, alternate claddings, and fabrication and reprocessing facilities will require massive research and development, costing large amounts of money and consuming many years. All these programs should be started at once, and I am pleased that they are being carried forward under the leadership of Dr. Dixy Lee Ray, chairman of the AEC, and Tom Nemzek, director of the Division of Reactor Research and Development.

During recent years, a small group of antinuclear zealots, including a few technically qualified individuals, have mounted a concerted anti-nuclear campaign, and promoted the concept that this nation should terminate its nuclear program. Over the years, the more extreme anti-nuclear charges, such as exploding power plants and high incidence of cancer and infant mortality in the vicinity of nuclear reactors, have been discredited. In recent hearings before the Joint Committee on Atomic Energy, individuals and spokesmen for some of these groups concentrated their attacks on three main points—the reliability of the reactor vessels, cooling systems, and containment systems; the safe handling of nuclear wastes; and the possibility of the theft of nuclear materials for the fabrication of weapons or for the threat of radioactive contamination of populated areas.

It may be appropriate for us to consider as best we can the rational aspects of these charges, and to try to put them into perspective. The nuclear industry, just as any other, has some hazardous aspects, and will undoubtedly have accidents causing property damage, injuries and deaths. It is crucial, however, to ask how likely these accidents are and how this risk compares to that associated with other energy industries. Further, we must distinguish between the financial risk to the industry, the personal risk to the employees of that industry and the potential risk to the public at large.

Recent studies by Dr. Norman Rasmussen of M.I.T. indicate that the probability of a loss of coolant and a simultaneous failure of the emergency core cooling system resulting in a core meltdown is from 1 in 1 million to 1 in 10 million per reactor year. Accordingly, with 1000 reactors on the line in the year 2000, the probability of such an incident would be 1 in 1000 to 1 in 10,000 per year. These are long odds, but even a meltdown doesn't guarantee the escape of fission products from a nuclear power plant. All that is guaranteed by a meltdown is a severe financial loss and a potential for harm to individuals. To minimize the possibility of such harm, reactors are built with other engineering safeguards, such as fission product suppression systems and the containment vessel itself. The simultaneous failure of these systems at the moment of a meltdown is, of course, far more remote than the meltdown itself. In addition, the extreme accidents that are frequently postulated by nuclear critics assume weather conditions that will somehow trap extremely hot gases on the surface of the ground, and convey them in a contained cloud to a nearby community that has failed to evacuate. While it is essential that every conceivable accident be guarded against and every reasonable precaution taken, there is a point of absurdity beyond which the rational public should not be expected to go. I believe that these hypothetical extreme accidents lie beyond that point.

Having worked for 20 years at Hanford, I am acutely aware of the extreme safety measures that the Atomic Energy Commission enforces. These have paid off in fewer mandays lost per million man-hours worked (43) than in hydroelectric plants (149) or in all fossil fuel plants (1710). In addition, no radiation injuries or deaths have resulted from operation of licensed nuclear power plants in the United States, and no member of the public has received a radiation exposure in excess of prescribed standards due to the operation of any nuclear power plant in this country.

Assuming 1,000 nuclear power reactors on line in the year 2000, the average person in the United States will receive 102 millirem of radiation per year from natural background, 73 millirem per year from medical X-rays and therapeutic radiation, but only 0.425 millirem per year from the operation of all nuclear plants and their supporting activities.

Dr. Ralph Lapp estimates that of the 2 million cumulative cancer deaths in the United States between now and the year 2000, about 314,000 will be radiation-induced. Of those 314,000, Lapp estimates that 200,000 will come from natural background radiation; 100,000 from medical X-rays; about 7,000 from jet airplane travel; about 7,000 from weapons fallout and 90 from nuclear power plants.

Today, we have 54,000 deaths a year and nearly 2.5 million serious injuries from automobile accidents in the United States. More than 12,000 persons burn to death; more than half of them are children. Overdoses of aspirin and aspirin compounds cause more than 200 deaths per year, 1,000 persons die from electrical shock. About 160 are killed by lightning. About 3,000 choke to death on food. Not a single person has been injured or killed from any nuclear power plant, or supporting activity.

It is probable that some qualified person could make a nuclear weapon if the essential materials came into his possession. Certainly we must take every precaution to protect against any theft of material from any nuclear plant or other facility. The AEC has long-established security programs, and these have recently been strengthened because of international terrorist activity, and because GAO criticism of the AEC. I think the tradeoffs involved indicate that we must live with the risk of some attempt by someone to seal nuclear materials. I think this is an acceptable risk, particularly because there seem to be so many thousands of ways to make serious mischief in so many easier ways than attempting to steal enough of the correct raw materials to fabricate a nuclear weapon. There are literally billions of shipments of hazardous materials in this country every year. Many of these materials, such as highly flammable liquids and organic poisons, are shipped in tank car lots through every city in the country without anyone being particularly aware of where they are, let alone providing any protection from them. If one is objective, and disenthralls himself from anti-nuclear fanaticism, he must see the very remote possibility of theft of nuclear materials as an acceptable risk to assume to enjoy benefits of nuclear energy.

Most nuclear critics, when talking of handling radioactive wastes, either point to the leaks at Hanford (which come from the military program and have nothing to do with commercial power plants) or complain about the fact that there is no specific permanent waste management program yet announced by the Atomic Energy Commission.

Certainly the storage and management of radioactive wastes is a legacy that we must leave to the future as a price for our having entered the age of nuclear fission. However, this can be approached in the same sound manner which we have used in handling radioactive materials for the last 30 years. Millions of gallons of liquids and thousands of tons of solids containing billions of curies of activity have been handled in an exemplary way, with virtually no harm to anyone. Using the techniques that have been developed during recent years, the safe, permanent storage of radioactive materials is actually a simple matter of good engineering and good management.

I believe that in the near future, the AEC will announce plans for long-range storage of highly concentrated radioactive wastes. One technique which seems attractive to me involves solidifying the wastes from reprocessed fuels immediately after separation, and encapsulating them in cannisters. Ten cannisters, 1 foot in diameter and 10 feet long, holding about 6 cubic feet each, will contain the solidified wastes produced each year by a 1000-megawatt power plant. These cannisters can be enclosed in individual concrete shields, and simply placed on the surface of the ground inside some restricted area such as the Hanford reservation. It would require less than 2 square miles to store all of the high-level wastes that will be generated by the nuclear energy program between now and the year 2000.

Incidentally, while there have been leaks at Hanford, it has been understood that until the solidification programs of these liquid wastes are completed, some leaks would occur from the underground tanks. The radioactive materials that have escaped from the tanks are trapped far under the surface of the ground, and far above the water table, held immobile in a dry, sandy clay. When I cross-examined Dr. Harry Kendall, spokesman for the Union of Concerned Scientists, he admitted in a formal hearing before the Joint Committee on Atomic Energy that the material that had leaked from the tanks at Hanford does not and never would constitute a threat to any person, or to the environment, unless dug up by some human being.

In summary, then, the safety record of the Atomic Energy Commission is unequalled. No person has been harmed by any radiation from a licensed nuclear power plant. Although accidents are possible, the probability of a serious accident threatening any human being is so small that society can easily afford to live with this risk, particularly in view of the remarkable benefits derived from nuclear energy.

Beyond nuclear fission lie three sources of energy which will be of great importance in our future. All three are inexhaustible and, compared to coal or nuclear fission, they are essentially non-polluting.

The first is solar energy. The House of Representatives recently passed the Solar Heating and Cooling Demonstration Act of 1974, which I authored and which would provide for a $50 million, five-year program to demonstrate the commercial feasibility of using solar energy to heat and air-condition residences and other buildings. It is my hope that the Senate will pass this legislation in the near future. However, I think it is important to keep the short-term potential of solar energy clearly in perspective. It would require a stupendous effort to provide solar heating and cooling in 5% of the buildings in the United States by the year 1990, yet this would represent only 1% of the total energy consumption of this country. Clearly, then, solar energy will have no impact at all in relieving our current energy shortages.

Still, we must pursue this approach for its long-term potential; more than $50 million will be authorized for Fiscal 1975 for solar research and development, in addition to the heating and cooling demonstration that I have mentioned. The technology required for generating electricity from solar energy, either directly or indirectly, is still in the initial developmental stages and it is not likely to become economically competitive until sometime after 1990. We must push ahead to reach this goal before the year 2000, but we must not mislead ourselves about the short-range solar potential.

The same general perspective is also true for geothermal energy. Immediately after this Easter recess, my Subcommittee on Energy will mark up a new bill providing for a comprehensive geothermal energy demonstration program. Our goal is to have from 6 to 10 demonstration plants on line by 1980. They would generate from 1 to 10 megawatts of electricity each, using the various undeveloped types of geothermal energy such as dry hot rock formations and geopressured water. Here again, prudence must govern our optimism. Even with a crash program, it is highly unlikely that this could be deriving 1% of its total energy from geothermal sources before 1990.

The third new source of energy is, of course, nuclear fusion, and here indeed may lie the fulfillment of mankind's dreams—an unlimited source of clean, cheap energy available to all.

As many of you are aware, I have been the activist/advocate in Congress for increased financial support for the fusion program. The past two years have been the most productive in the history of controlled thermonuclear research, and certainly we are now operating on a new plateau—one which we have dreamed of and sought for 20 years. Now, for the first time, we are in a position to move forward with a much more aggressive research and development program; and now we can, with considerable confidence, predict success.

In July of last year, the AEC announced that it will move more rapidly than was previously thought realistic to a "scientific feasibility" demonstration of a deuterium-tritium fusion reaction. This decision, which I support enthusiastically, may save 4 to 5 years in developing fusion power.

I am happy to report that Congress and the Administration seem to reflect my confiedence in the potential of this program. Total funding for magnetic confinement and laser fusion have increased from $52.5 million in Fiscal 1972 to what I expect will be $177.1 million for Fiscal 1975. Within this total, the funding for magnetic confinement studies will increase from $57 million in the current fiscal year to what I expect will be $111.3 million for Fiscal 75. This is particularly gratifying to me, because I have obtained significant increases in this program in both years.

I believe that we can have a commercially feasible fusion electric demonstration plant on line by the mid-1990's. This will require massive support, starting now, for materials research and development and for engineering studies. If this program is successful, we may be able to look forward to providing unlimited quantities of clean, cheap energy forever, not only for this country, but for all mankind.

Implicit in this potential is the prospect of using large blocks of cheap energy for mining from the sea or from low-grade ores that have not so far been feasible to exploit and thus freeing the international community from the threats and tensions that accompany shortages of energy and critical materials. In addition, we may look forward, during the first third of the 21st Century, to a policy of phasing out all of our fossil and fission-powered conversion systems, and operating from that time forward on clean, inexhaustible sources of energy.

And so to summarize:

As our supplies of petroleum and natural gas decline, this nation will, toward the end of this century, depend primarily upon coal, coal products, and nuclear fission for virtually all of its energy.

The hazards associated with the development of nuclear fission are real and must be taken seriously, but the sound safety practices and management techniques of the Atomic Energy Commission can continue to be employed to maintain the outstanding safety record we have established, and allow us to benefit from the tremendous potential of nuclear fission.

In the long run, this nation can be self-sufficient in energy, ultimately depending upon inexhaustible supplies of essentially non-polluting forms of energy such as solar, geothermal and nuclear fusion.

This nation faces a serious, long-range energy crisis which demands that we immediately establish a systems approach to an integrated national energy policy. Failure to do so will inevitably result in catastrophe.

However, if the people of this nation exhibit the common sense, resiliency and dedication with which we have faced previous crisis, we can, by the turn of the century, enter a new era, wherein nuclear fusion will provide an unlimited supply of cheap, clean energy for all of the people of this country and the rest of the world for all time.