OUTSIDE CRITIQUES

To gain a broader concensus than is achievable by physical panel participation alone, OTA contacted a group of organizations with a request that appropriate personnel review and critique the ERDA-48 volumes I and 11. The list of organizations as shown in Table 1 was chosen to represent both a spectrum of interests and a variety of expertise in the broad subject area, and to complement those capabilities presented on the working panels.

Of those contacted, the organizations marked by asterisk were able to participate. Their contributions follow in alphabetical order by organization, without OTA comment.

TABLE 1
Organizations Contacted for Review of ERDA-48, Volumes I and II

*American Gas Association
1515 Wilson Boulevard
Arlington, Virginia 22209

American Petroleum Institute
1801 K Street, NW.
Washington, D.C. 20006

*American Public Power Assoc.
2500 Virginia Avenue, N.W.
Washington, D.C. 20037

Babcock & Wilcox
Post Office Box 1260
Lynchburg, Virginia 24505

*Building and Construction Trades Dept.
AFL-CIO
815 16th Street, N.W.
Washington, D.C. 20006

Coal Research Bureau
University o! West Virginia
Morgan town. West Virginia 26505

Coal Research Program
Garrett Research & Development Co.
1855 Cassion Road
La Verne, California 91750

(Combustion Engineering, Inc.
1000 Prospect Hill Road
Windsor, Connecticut 06095

*Consumer Federation of America
1012 14th Street, N.W.
Washington, D.C. 20004

*Edison Electric Institute
90 Park Avenue
New York, New York 10016

*Environmental Defense Fund
1525 18th Street, N.W.
Washington, D.C. 20036

Environmental Quality Laboratory
California Institute of Technology
Pasadena, California 91109

Geological Society of America
3300 Penrose Place
Boulder. Colorado 80302

Institute for Government Research
University of Arizona
Tucson, Arizona 85721

*Institute of Gas Technology
3423 S. State Street
Chicago, Illinois 60616

Lake Powell Research Project
Dept. of Planetary & Space Sciences
University of California
Los Angeles, California 90024

*National Association of Electric Companies
1140 Connecticut Avenue, N.W.
Suite 1010
Washington, D.C. 20036

National Gas Association
1130 17th Street, N.W.
Washington, D.C. 20036

Scientists' Institute for Public Information
30 East 68th Street
New York, New York 10021

*Sierra Club
Mills Tower
San Francisco, California 94104

United Mine Workers
900 15th Street, N.W.
Washington, D.C. 20005

United Nations Association of the USA
345 E 46th Street
New York, New York 10003

Union of Concerned Scientists
P. C). box 289
MIT Branch Station
Cambridge, Massachusetts 02139

AGA American Gas Association

1515 Wilson Boulevard , Arlington. Va 22209
Telephone (703) 5242000

F. Donald Hart
President

July 21, 1975

Mr. **Emilio Q.** Daddario
Director
Office of Technology Assessment
Congress of the United States
Washington, D. C. 20510

Dear Mr. Daddario:

The American Gas Association, representing over 300 natural gas pipeline and utility companies which serves the public with one-third of its energy needs, appreciates that it was offered the opportunity to review and comment on the first National Energy Plan developed by ERDA. Volumes I and II are very comprehensive documents which reflect the major effort required for their complication.

In view of the thorough treatment given electric and nuclear-electric in Volume I, the Plan, and the draft of Volume II, Program Implementation, we were extremely disappointed that a major energy source like natural gas, upon which this country depends so heavily, has essentially been written off in the long-term. Certainly, enhanced recovery of oil and gas, conversion of coal and oil shale to oil and gas, conversion of waste materials to oil and gas, improving efficiencies in the residential, commercial, and industrial areas, and the use of the fuel cell and solar heating and cooling will provide natural gas and synthetic natural gas for the near and mid-term and extend gaseous fuels into the long-term.

There are two major opportunities to develop gaseous fuels which could easily provide all of the gaseous fuel requirements in the long term and offer a choice of fuels to the American people. In addition to offering a fuel choice,

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these developments would prevent the wasting of billions of dollars in capital equipment now in place as well as saving the tremendous quantity of energy that would be required to provide other equipment for its replacement.

The first of these opportunities is the production of methane from marine and terrestrial biomass. This can be accomplished by the production of seaweeds, trees, and grasses (which are the most efficient solar converters known) , harvesting and bioconversion of these raw materials to methane. The feasibility of these processes has already been proven. Engineering details must be worked out and proven on the pilot and demonstration plant scales. With the proper effort, this can be accomplished by 1990.

The second major opportunity for gaseous fuel is the hydrogen energy system. Hydrogen can have a major impact as a special purpose fuel, which could lead to a base load energy form in the future. Research is needed in the large scale production (both electrolytic and thermochemical) transmission, storage, distribution and utilization of hydrogen. ERDA should play a major role in this development.

The American Gas Association and its member companies stand ready to cooperate with and assist ERDA in developing and implementing this Energy Plan which is so vital to the well being of this country.

Sincerely,

F. Donald Hart

FDH/sls ,

REVIEW OF

A National Plan for Energy Research, Development and Demonstration

GENERAL COMMENTS

Volume I, The Plan, and the draft of Volume II, Program Implementation, are comprehensive documents which form a good basis for critical review. At the outset, the major criticism and problem with the over–all plan is that it **clearly focuses long term wise on electric and nuclear-electric as the only source of energy. This is contradictory to the statement on Page one of the Summary, which states "To overcome this (the energy) problem and to achieve our National policy goals, the Nation must have the flexibility of a broad range of energy choices."**

Natural gas and synthetic natural gas are addressed in the near and mid-term priorities, but not comprehensively and clearly not to the extent that electric and nuclear are considered. The production of methane from biomass and hydrogen from water by electrolysis have both been proven feasible. A well–planned, high priority research program could demonstrate both of these technologies in the mid-term and insure all of our gaseous fuel needs for the long-term. Hydrogen is a near perfect fuel which can have a major impact as a special purpose fuel and, in the future, it has the possibility of becoming a base load energy commodity. The Plan should address hydrogen as a separate major subject with the title, "A Hydrogen Energy System." This hydrogen system would include production, storage, transmission, distribution and utilization. We certainly hope that the first revision of the Plan will place natural gas, gas from coal and oil shale, methane from marine and terrestrial biomass and hydrogen from seawater in the proper perspective. The heavy dependence of this Nation on natural gas (provides one-third of all the energy used, over one–half of all industrial energy, and is over 40% of all energy produced in this country) demands that it be placed on the highest priority in all categories.

The Government has done little, if any, research in gaseous fuels (except gas from coal) , particularly in the **transmission, distribution and utilization areas. The draft of Volume II of the Plan attempts to address these subjects,** but it **is obvious that little is known about the problems,**

research needs, and technical approach. The gas industry would welcome support from ERDA, either separately or cooperatively, in solving these problems. We would also be pleased to discuss the overall situation and to provide recommendations for revision of the Plan and its Implementation.

The American Gas Association and/or its member companies are currently working cooperatively with ERDA on high–Btu gas from coal, hydrogen from coal, methane from marine biomass, enhanced gas recovery, and clean boiler fuel. These research areas need expanding and accelerating. Additional research areas for cooperative research between the gas industry and ERDA include, but are not limited to, gas from oil shale; methane from terrestrial biomass; hydrogen from seawater by both electrolysis and thermochemistry; storage, transmission and distribution of gas; improved efficiencies of residential and commercial appliances; improved efficiency of industrial processes; the fuel cell; solar heat and cool; waste heat utilization, etc.

The following are specific comments on Volumes I and II in the order of their presentation.

Volume I
SUMMARY

1. **Figure 2, Page S-2, shows the Remaining Recoverable Projected Domestic Natural Gas Production to be 750 TCF after 1974. The U. S. Geological Survey referred to in the first sentence on Page S–2, states the following:**

237 **TCF Proved**
202 TCF Inferred
Range 322 – 655 TCF Undiscovered Recoverable Resources
761 -1094 TCF Total Range

If the mean of the Undiscovered Recoverable Resources is calculated, then the above figures **become:**

237 **TCF Proved**
686 TCF **Mean of Undiscovered + Inferred**
923 TCF **Remaining Recoverable After 1974**

The report should use the **Total** Range **761 - 1094 TCF or the Mean 923 TCF instead of 750 TCF.**

If the **Mean is used, then the figures in Figure 2, Page s-2, become:**

Old	**New**
750 TCF	**923 TCF**
250 TCF	250 **TCF**
1000 TCF	**1173 TCF**

2. In Figure **3, Page S-3, shows the Available Energy in 10^{15}Btu) for Gas to be 1030 quads. This is based on the 1000 TCF shown in Figure 2, Page** S-2. **If the new Mean of 1173 is used instead of 1000, then 1030 quads in Figure 3 becomes 1208 quads.**

3. On Page s-4 under "ALL THE NATIONAL ENERGY TECHNOLOGY **GOALS MUST BE PURSUED TOGETHER. CONCENTRATION ON ONLY ONE OR A FEW TECHNOLOGICAL AVENUES IS NOT LIKELY TO SOLVE THE ENERGY PROBLEM" a number of strategies are advanced with primary national emphasis in three areas.**

We agree that the first primary interest should be reduction of energy waste and inefficiencies.

We agree that the second primary interest should be on the production of synthetic gas from coal and oil shale.

We do not agree that the third should be shifting from gas and petroleum to electricity. We believe that from the Gas Industry point of view the third emphasis should be on the production of methane from marine and land biomass and on the production of hydrogen from seawater by both electrolysis and thermochemical means. The gas industry and its customers have billions of dollars invested in capital plant equipment which must not be wasted. In order to provide the gas industry's customers and the nation with energy at the lowest possible cost demands the development of the inexhaustible resources of methane from biomass and hydrogen from seawater. Therefore, Scenario II **on Page S–4 should read, synthetics from coal, oil shale, and biomass consistent with Table 4-3 on Page IV 5, and Scenario III on Page S–5 should be methane from biomass, hydrogen from water, and** Improved **electrification and Figure 5, Page 3–5 should be changed to be consistent with above.**

4. **On Page S–6, for the long-term (past 2000), the total emphasis is on nuclear and electricity. The obvious technologies which should be pursued vigorously and which could be demonstrated in the 1985-1990** period, become commercial **1990-2000 and supply huge quantities of energy beyond 2000 are methane produced from both marine and land biomass and hydrogen produced from seawater by electrolysis and/or thermochemical process using nuclear or solar heat. These should also be stated along with the solar electric approach in the "inexhaustible" resource technologies to be given high priority in the fourth item under major changes on Page s-7.**

5. **Near term efficiency (conservation) technologies in Table 3 should include the Fuel Cell.**

6. **On Page S-7, Table 5 should include the following:**

   1. **Materials Research - (Materials (both metals and ceramics) testing, evaluation, data accumulation, and alloy development is urgently needed for construction of coal gasification and liquefaction plants.)**

   2. **Component Development - (Many components required in commercial scale coal conversion plants have never been designed, built and tested in the very large sizes required.)**

7. **Page** S-8, **Implementation of the National Plan, states that, "As a given technology approaches commercialization, the role of the private sector will be paramount" and "Play the major role (financially and technically) in large demonstration and near-commercial projects." Certain segments of industry, such as a regulated industry, cannot raise the required funds or** assume the financial risks in the high-risk demonstration and near-commercial plants. The Federal Government must play the lead role and **assume the financial risks to demonstrate and prove to industry and the financial community that the very large, high temperature, high pressure systems for the conversion of coal to synthetic natural gas can be built and will operate as designed and produce synthetic gas, interchangeable with natural gas, on a consistent, reliable basis.**

8. **Figure** 2-2, Page II-2, **Remaining Recoverable After 1974 should be changed from 750 TCF to 923 TCF and from 1000 TCF to 1173 TCF consistent with 1. above.**

9. **Table 2-1, Page II-3, Resource Natural Gas, to be consistent with 1. above, change 750 TCF to 923 TCF and 775 quads to 950 quads.**

10. **Figure 2-3, Page II-4, change 1030 quads of gas to 1208 quads consistent with 2. above.**

11. **On Page IV-1, change Scenario III to read, methane from biomass, hydrogen from water, and improved electrification, consistent with 3. above.**

12. **Scenario III, should read methane from biomass, hydrogen from water, and improved electrification consistent with 3. above.**

13. **Figure 5-1, Page** v-2, and Figures **5-2 and 5-3, Page V-3, Figure 5-4, Page V-4, and Figure 5-5, Page v-5, should be changed consistent with 3. above. Also, the text in Chapter V does not include importance of methane from biomass and hydrogen from seawater.**

14. **Text on Page VI-1, under important near-term areas for conservation should include the fuel cell.**

15. **Page VI-2, Table 6-1, Goal VI, should include the fuel cell.**

16. Page VI–2, Table 6–1, Goal V, Hydrogen in Energy Systems, R, D&D status, should read Lab instead of study. The American Gas Association and others are actively engaged in laboratory investigations of thermochemical cycles for the production of hydrogen, and others are actively engaged in improving electrolytic decomposition of water.

17. Table 6-2, Page VI–3, should be changed consistent with 4. above. Also, text concerning biomass and hydrogen, last paragraph under Developing Other Important Technologies, Page VI-3, should be moved to Page VI–2, Inexhaustible Energy Sources. The production, harvesting and bio–conversion of marine biomass to methane is being actively pursued in both laboratory and deep ocean experiments by the American Gas Association and ERDA. Hydrogen status as in 16. above.

18. Table 6-3, Page VI-4, should include Materials Research and Component Development consistent with 6. above.

19. Page VII-1, Rationale for a Federal Role in R, D&D, should appropriately include the statement that the huge amounts of funds required and the high-risks involved in the development and demonstration of these new technologies involved go far beyond what industry has ever conducted on its own or is capable of doing now and demands major Federal Government support to solve the energy crisis.

20. Page 20, The Private Sector Role, should be changed consistent with 7. above.

21. Page VIII-2, Oil Shale. Limiting oil shale research to In-Situ is not consistent with the major changes described on Page S-7, "Acceleration of commercial capability to extract gaseous and liquid fuels from coal and shale." The development, demonstration, and commercialization of the Hydrogasification of Oil Shale to Oil and Gas can be initiated and completed much more rapidly than In-Situ.

22. Gaseous and Liquid Fuels from Coal. The objective and approach is not consistent with the two–pronged effort described under "Acceleration of Commercial Capability to Extract Gaseous and Liquid Fuels from Coal and Shale," i.e., "Existing technology must be implemented as soon as possible to gain needed experience with large scale synthetic fuel production." Existing commercial coal gasification technology requires design modifications which must be tested and demonstrated in this country on American Coals. This is the

fastest way of obtaining commercial quantities of synthetic gas from coal.

23. **Chapter VIII – Summary of Federal Program Implementation does not, and should, include the production of hydrogen by electrolytic or thermochemical process using nuclear or solar heat. This is a major technology which is not addressed in the Plan and is not consistent with, "... the Nation must have the flexibility of a broad range of energy choices."**

Volume II

The following comments are addressed to the Items indicated and are in the order of presentation in Volume II.

Advanced Research and Supporting Technology

A research program on testing and evaluation of metals and ceramics is underway. This program should be expanded as rapidly as possible. Special alloy development programs should be initiated as soon as possible.

Second generation commercial coal gasification plants requiring large size, high pressure, high temperature components cannot be built today because these components do not exist. A program must begin immediately to design, build, and test such components.

Demonstration Plants

A goal of one high-Btu gas demonstration plant is insufficient and shortsighted. Every effort should be made to demonstrate on a commercial-size scale all processes that are competitive and successful on the pilot plant scale.

The demonstration plant schedule is far too long based on the critical need for supplemental gas. **If the** preliminary design step were eliminated and an all-out effort made in detail design and construction, the **10-11 year schedule could be cut to 6-7 years. If internal procedures within ERDA were changed, the time required for proposal evaluation and contracting could be cut from 1-2 years to 3 months.**

Competitive proposal procedures is not the optimum proper technique to make this country energy independent in the fastest possible time. Major Government funding of acceptable technical proposals would greatly speed up the process.

Enhanced Oil and Gas Recovery

We **are pleased that recognition has been given to stimulation of tight natural gas formations, however, greatly increased levels of expenditures are entirely in order, in view of the natural gas shortage. The Benonian shale forma-**

tion covering bare sections of Appalachia contain reserves surpassing present proven U. S. reserves, however, stimulation techniques must be developed and demonstrated to produce this gas. ERDA support is particularly important as the preponderance of drilling activity in that region is conducted by small companies with limited technology and financial resources. In view of the cost, chance of success, total potential, and time required for commercial adaptation, this is one of the most attractive alternatives available to ERDA.

Coal Gasification

Pipeline Gas

An excellent program which should continue to receive the highest priority. The technological problems are greater than shown in the report. The C F Braun & Co, Technical Evaluation Contractor for the Joint ERDA/A.G.A. Coal Gasification Pilot Plant Research Program issued a report entitled, "Mechanical Development Recommendations for Commercial Scale Coal Gasification Plants" on October 15, 1973 which recommends research required to insure the availability of components and processes for commercial scale coal gasification plants. We recommend that ERDA review and implement this report.

Low Btu Gas

The low Btu gas program appears to be limited to less than 200 Btu/cubic foot for boiler feed. One very large segment requiring tremendous quantities of gas is the lndustrial market which requires gas in the 300-500 Btu/CF range. This subject should be addressed as a separate and distinct problem.

In-Situ Gasification

We recommend that ERDA fund the Lawrence Livermore Laboratory in-situ coal gasification process to determine the technical and economic feasibility of the process and to demonstrate it on a commercial scale if successful. This process can produce pipeline quality gas which is so urgently needed.

Oil Shale

Limiting oil shale research in the plan to In-Situ is

not consistent with the major changes described on Page 3-7 in the plan Summary, "Acceleration of commercial capability to extract gaseous and liquid fuels from coal and shale." Above ground retorting needs research. The development, demonstration, and commercialization of the Hydrogasification of Oil Shale to Oil and Gas can be completed within the near term. In-Situ, if ever successful, will require many years.

Fuels From Biomass

The marine biomass, which is the most efficient solar converter, can proceed at least as rapidly, if not faster, than terrestrial biomass with the proper support from ERDA. A 7-acre experimental farm just off San Clemente Island 60 miles west of San Diego has already proven that giant California kelp can be transplanted, grown, and reproduced on an anchored structure made of polypropylene rope at a depth of 40 feet in 350 feet of water. In addition, juvenile kelp has been successfully grown in the laboratory in water obtained from 1000 feet in the deep ocean. The California kelp is harvested commercially by specially designed ships, such as the Kelco Co. in San Diego. The kelp will produce methane naturally when out of water, and methane has been successfully produced in the laboratory from this kelp. With proper ERDA support, this process can be engineered through the pilot and demonstration phases very rapidly. Given appropriate attention and priority, we believe that the marine farm concept can fulfill all of our gaseous energy requirements in the future.

Solar Heating and Cooling

Since low cost, high reliability and long life solar components do not exist, the major emphasis should be placed on their development in the shortest period of time instead of demonstration of components which will not fulfill the need.

Technology Utilization and Information Dissemination

One of the problems associated with information dissem-ination which was not mentioned is inherently associated with the development of hardware by potential solar energy-related

equipment suppliers. Proprietary positions will be sought which will delay dissemination of new information. Elimination of the proprietary positions will slow the development of hardware.

Conservation in Buildings and Consumer Products

Objectives

Under near term to 1985, a 20% reduction in energy consumption in existing buildings is the goal, and a 30% reduction in new buildings. There is no base structure defined which is to be modified for the consumption reduction. One might assume that the base case is the "state–of-the-art" building envelope.

A major effort has been made by ASHRAE in development of Standard 90. If this Standard is implemented by legislative action, the 30% reduction in energy consumption might be demonstrated daily. This amplifies the need for a typical base case. The magnitude of the technological challenge is not apparent in the objectives due to rapidly changing building practices.

Community Systems

Problems

The first technological problem listed is the development of more efficient components, subsystems, and total systems which utilize fuels other than natural gas and fuel oil. While this may represent specific fuel preservation, it might not necessarily promote energy conservation.

Consumer Products

The American Gas Association has been conducting research in improving the efficiencies of all types of residential and commercial appliances for many years. We would appreciate the opportunity to discuss this entire subject with ERDA personnel and assist by providing material for preparation of the next Plan and cooperate in the Plan's implementation.

Energy Storage

For some mysterious reason under Wind Energy Conversion, the plan suggests electrolyzing water to produce hydrogen for

on-site fertilizer manufacturing. In this Energy Storage section, the plan is to develop hydride and other hydrogen storage devices. In another section a Hydrogen Energy System is mentioned but not defined and implemented.

Hydrogen is a near perfect fuel which can have a major impact as a special purpose fuel and in the future it has the possibility of becoming a base load energy commodity. The first major problem is the economical production of hydrogen on a large scale. Two methods for this production, electrolysis and thermochemical, have been proposed. Hydrogen production by these technologies could utilize either nuclear or solar heat or electricity. Both should be vigorously pursued. The plan does not address this problem. Further, the plan does not consider a hydrogen energy system of the future involving production, transmission, storage, distribution, and utilization. This should be a major section in the next plan.

Industrial Energy Efficiency

The American Gas Association has been making studies and performing experimental projects on a commercial scale for several years on improving industrial process efficiencies. We would welcome the cooperative support of ERDA. We urge cooperative implementation of projects in the next Plan.

Building and Construction Trades Department

AMERICAN FEDERATION OF LABOR — CONGRESS OF INDUSTRIAL ORGANIZATIONS

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Action AC

Info EQD
DVD

August 12, 1975

Rec'd 8/20

Prepare for of reply
for sig of

Action #

Suspense

Mr. Emilio Q. Daddario
Director
Off ice of Technology Assessment
u. S. Congress
Washington, D. C. 20510

Dear Mr. Daddario:

In response to your invitation of June 23, I would like to take this opportunity to convey the views of the Building and Construction Trades Department, AFL-CIO regarding ERDA' s National Plan for Energy Research, Development and Demonstrate ion.

The Building Trades Department, representing 17 affiliated international unions and 3 1/2 million workers, has taken a vital interest in energy-related matters. The energy crisis is not only a crisis for our members in their roles as consumers, but it is also a crisis for them as workers. It is for this reason that the Building Trades is pleased to have this opportunity to offer its comments on ERDA's comprehensive assessment of this country's energy situation.

From the standpoint of the Building Trades, ERDA's mixed strategy of necessary options is a realistic and practical evaluation of our worsening energy situation. We have long been on record in support of increasing our energy supplies, particularly through the increased utilization of coal and nuclear energy, while at the same time conserving our energy resources. ERDA's national plan presents a balanced strategy encompassing this approach.

At the suggestion of your office, the Building Trades would like to briefly comment on one of several potential constraints of implementation identified in your report, namely, manpower.

It is true that the proportion of construction labor presently employed for the erection of energy-related facilities is a small fraction of the total work force. It is also true that over the next decade this proportion will rise only slightly. Nevertheless, we must insure against manpower difficulties arising in the course of providing badly needed energy-supply facilities.

As stated in ERDA's report, reliance upon natural market forces to balance the demand and supply of labor is generally a

safe strategy. We can count among our 17 affiliated internationals some of this country's best manpower training programs. This factor, coupled with "the dynamic character and mobility of the labor force . . . [A]nd the lead time anticipated by the Plan" should minimize large-scale problems.

However, it is conceivable that regional and local labor force imbalances might develop. The labor requirements for energy facilities are rapidly escalating. Our estimates now show that each 1000 megawatt nuclear plant alone requires a peak construction site work force of 2,000 to 3,000 workers. Because of the large component of skilled labor required of these projects, certain areas of the country might have labor shortfalls.

The trend towards energy parks and more isolated sites in power plant siting will only compound these difficulties.

We view these shortages as unnecessary. With the proper planning and forecasting, the industry and the building trades in particular, would be more than able to supply any manpower needs. We would like to suggest that the possibility be explored of developing regional information systems on impending construction. Knowledge of a region's construction schedule would enable local unions to gauge their apprenticeship programs to expected demand. We don't want to see our unions involved in training programs created in the wake of energy hysteria which are unnecessary and superfluous.

The chief obstacle to compiling such a system will be the fact that manpower demand in a region will not simply be a function of upcoming energy projects; it will be a function of all construction. Any information system will have to take account of the region's entire construction schedule.

Finally, the Building Trades Department suggests that implementation of any activities designed to meet projected manpower requirements include close consultation with the Building Trades. ERDA's description of its manpower development program makes no mention of the allied building trades. Yet, it is these trades in conjunction with contractors and private sector employers who have spearheaded our industry's various training programs. We regard this as a serious omission.

In closing, the Building Trades Department wishes to commend ERDA on its National Plan. Hopefully, the Plan is truly a blueprint for our future energy well-being.

With best wishes, I am

Sincerely,

Robert A. Georgine
President

RAG/lr

energy policy task force

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LEE C. WHITE, CHAIRMAN ELLEN BERMAN DIRECTOR

Action JV

Info EOB
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July 22, 1975

Rec'd 7/24

Preparation of reply for sig of

Action #

Suspense

Mr. Emilio Q. Daddario
Director
Office of Technology Assessment
Senate Annex, 119 D Street, NE
Washington, D. C. 20510

Dear Mr. Daddario:

1 have had a chance to review briefly the recent Energy Research and Development Administration report, and have some comments that I hope will be helpful. Although it is obviously an ambitious effort, it does not adequately encompass several important issues. Recognizing the inherent difficulties in developing a comprehensive and positive energy program, Congress authorized ERDA to survey the country's needs and problems. The recently released report details many of the numerous difficulties which lie ahead. The stated solutions, however, merely reinforce our deepest concerns without necessarily providing a direction or, for that matter, much hope.

Reflecting the residual influence of the old Atomic Energy Commission, ERDA emphasizes nuclear reactors and describes high hopes for fast-breeder reactors. However, the same pages containing these aspirations bear disclaimers that reactors are terribly intricate and cannot possibly be completed until the next century. Nevertheless, the money recommended for atomic research is astronomically larger than the amount designated for solar energy research, perhaps the most available, safest way to solve our energy problems. There is nothing necessarily wrong with this, but one gets the uncomfortable feeling that we are not pursuing alternatives at a lusty enough level.

In addition, "environmental restraints" on the potentially hazardous nuclear energy development are only mentioned in oblique, muted terms. Although our national security and environmental health might be at stake as this research develops, ERDA did not find it necessary to outline precautions. It is nearly inconceivable that the authors of the ERDA report would believe any new energy research should go forward without due concern for necessary precautions and environmental safeguards.

consumer federation of america

Perhaps such oversights--if they are oversights--could be prevented if consumer-oriented non-governmental advisors were added to ERDA advisory committees. These programs affect us all, and there should be a corresponding broad representation in the advice received by ERDA. And after research is started--nuclear and otherwise--progress reports should be presented to Congress and to a citizen-oversight committee on a regular basis. No such reporting mechanism is detailed in the ERDA report, although it is of considerable importance.

The authors of the ERDA report have only discussed the use of waste materials in terms of environmental control. In fact, the actual conversion of waste material, including everyday garbage, may provide a valuable energy resource. This omission may be another indication of the authors' bias towards centering energy and energy-related research around nuclear development.

The ERDA report explains that the development of new resources will be shared by both the public and private sectors. However, there is no explanation of the turnover from the government to industry or for the sharing of original costs. There is no explanation of who will do original research. No mention is found in the report's pages of the need for competition in the research and development aspects of new energy resources and equipment. Obviously, such questions must be answered before any plans for development can be taken seriously.

The task before us is not easy. The establishment of ERDA and its efforts to map out our future energy needs and programs are basically encouraging. We hope, however, that some of the above suggestions will be helpful.

Thank you for the opportunity to comment.

Sincerely,

Lee C. White

NATIONAL ASSOCIATION OF ELECTRIC COMPANIES
SUITE 1010, 1140 CONNECTICUT AVENUE, N W
WASHINGTON. D. C. 20036

DAVID R TOLL
MANAGING DIRECTOR
AND
GENERAL COUNSEL

2021223.3460

July **22, 1975**

Mr. Emllio Q. Daddario
Director
Office of Technology Assessment
Washington, D.C. 20510

Dear Mr. Daddario:

Thank you for your letter of June 23, addressed to Mr. Guy Nichols, Chairman of this Association.

We appreciate your invitation to critique the two volumes relating to ERDA's National Plan for Energy Research, Development and Demonstration.

To present a composite commentary from investor-owned utilities, we have prepared our comments in collaboration with the Edison Electric Institute in New York City. Their critique does include our comments and should be received by you shortly.

Sincerely,

w" **David R. Toll**

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LD
Rec'd 7/24
Preparation of reply
for sig of
Action #
Suspense

EDISON ELECTRIC INSTITUTE
90 PARK AVENUE • NEW YORK 10016 • (212) 573-8700

July 24, 1975

Action JV
Info EQD
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Rec'd 7/28
Preparation of reply
for sig of
Action #
Suspense

Mr Emilio Q Daddario
Director, Office of Technology Assessment
Congress of the United States
Washington, D C 20510

Dear Mr Daddario

Thank you for your June 23, 1975 letter which provided the Edison Electric Institute with the opportunity to submit comments to the Office of Technology Assessment on ERDA's Energy Research, Development & Demonstration plans and programs. As the principal association of the nation's investor-owned electric utility companies, EEI is vitally concerned with steps taken by the Federal government to advance the technology that will insure an adequate supply of energy for the United States in the years ahead.

We note that the objective of the review that OTA will submit to the House Committee on Science and Technology, the Senate Committee on Interior and Insular Affairs and the Joint Committee on Atomic Energy is to "identify and discuss those questions concerning the programs presented by ERDA that are critical for Congressional attention because they represent unresolved, controversial, or overlooked areas." Our analysis of the two ERDA documents has been from this point of view. We find that while the overall ERDA outline is, for the most part, complete and comprehensive, in certain critical respects relating to the science of generating, transmitting and distributing electricity, it is unbalanced, out-of-focus and inadequate. EEI welcomes the opportunity to have its views on these crucial weaknesses included in the OTA review that will be called to the attention of key legislative bodies.

EEI commends ERDA for its comprehensive analysis of the country's energy situation and outlook that has resulted in the "National Plan for Energy Research, Development & Demonstration: Creating Energy Choices for the Future." The significance of this undertaking is even more noteworthy in view of the fact that it has been formulated in the absence of a strong, coherent national energy policy. In lieu of such basic policy, we endorse the soundness of the five "national policy goals" used as a focus for the ERDA program.

We also support ERDA's intention of insuring that its national energy RD&D plan is kept responsive to changing needs and conditions. This would be done by periodic up-dating of the initial plan. We take this occasion to suggest that through the Electric Power Research Institute an electric utility industry advisory group of high technical management level representatives be organized to work with ERDA on a continuing basis. Similar groups from other industries may also be of assistance. Without strong and active industry involvement, technology assessments and planning guides will tend to be out of touch with reality.

EEI does not agree with the general tone of ERDA's Volume I in one important respect. While recognizing the country's need for Liquid Metal Fast Breeder Reactor (LMFBR) technology to permit the use of an essentially inexhaustible resource, ERDA appears to de-emphasize the priority assigned to the development of this concept. Chapter VI of Volume I classifies the LMFBR concept along with solar-electric generation and controlled nuclear fusion as technologies whose potential contribution to the nation's energy supply will occur in the year 2000 and beyond. The prospect for the LMFBR is underestimated. ERDA's Experimental Breeder Reactor II has logged more than ten years of successful operation, and breeder reactor technology is clearly established.

As the Edison Electric Institute has pointed out repeatedly before Congressional committees and other government bodies, there is no single energy related research effort that holds greater promise for insuring adequate reliable electricity supply for the American public than the breeder reactor program. The importance the electric utility industry attaches to development of the breeder is reflected in its commitment to contribute nearly $260 million to the Clinch River Breeder Reactor demonstration plant project. This is the largest contribution to a single R&D project ever made by the industry. Solar-electric and fusion research should be accelerated to the extent that funding can be used effectively. It would be a serious mistake, however, to do this by slowing down development of the LMFBR and delaying the date at which this option becomes available.

Another specific comment relates to the method selected by ERDA in Volume I to yield its conclusion that to meet the country's needs, research effort must be directed at a combination of technologies rather than toward a specific area. This conclusion is reached by selecting six contrasting national energy "strategies" or "scenarios" -- some of which are assumed to have an "unrealistically high degree of success." By analyzing the net imports of oil and gas required by each of these scenarios to the year 2000 in this "paper and pencil experiment," the "Combination of all Technologies" scenario is found to be superior.

Although the rationale for the selection of this methodology is not entirely clear, the ERDA conclusion that technology should be attacked on all promising fronts is reasonable. EEI takes exception, however, to Scenario III which is the "Intensive Electrification" case. Scenario III examines how "the total energy picture would be affected by an intensive shift to electrification, with (1) maximum use of all sources to generate electric power and (2) maximum reliance on electricity for end-uses." With certain assumptions included, although basic data are lacking, the results of this scenario are shown to be less desirable in terms of net imports of oil and gas in the year 2000 than do all other cases with the exception of the "No New Initiatives" scenario. To suggest that it is undesirable to move toward greater electrification, based on indigenous fuel reserves, is inconsistent with achievement of the country's energy goals.

Not only is the scenario method of analysis open to question, its implied and stated conclusions relative to the future role of electricity in the country's energy picture is unwarranted. In a conservation oriented and environmentally conscious society, electricity will be substituted increasingly for end-use energy purposes. Expanded electric power grids will improve the efficiency of our energy transportation system.

A final comment is concerned with the discussion in Chapter VII of Volume I dealing with the responsibility of industry in achieving national RD&D goals. The recent organization of the Electric Power Research Institute stands as evidence of the electric utility industry's recognition of the important part it has to play in this government-industry cooperative effort. Investor-owned electric utility companies will continue to meet this vital responsibility. The industry agrees with ERDA that the "private sector" should "Interact strongly with the Federal government in developing the economic, technical, safety, and environmental aspects of the National Plan for Energy RD&D." EEI points out, however, that while on occasion, as stated in the ERDA Volume I, industry should "Play the major role (financially and technically) in large demonstration and near-commercial projects," there are instances when the cost of a technically advanced demonstration plant will extend beyond the ability of an industry. In these instances, such as the Clinch River Breeder Reactor plant, the Federal government appropriately should provide financial assistance that will make the R&D results available to assist in meeting the needs of the public.

Sincerely yours

W Donham Crawford
President

cc: Messrs S L Sibley
F W Lewis
Chauncey Starr

ENVIRONMENTAL
DEFENSE
FUND

162 OLD TOWN ROAD, EAST SETAUKET, N.Y. 11 733/516 751-5191

July 17, 1975

Mr. Patrick Gaganidze
Congress of the United States
Office of Technology Assessment
Washington, D. C. 20510

Dear Mr. Gaganidze:

Enclosed is a copy of my critique of the ERDA National Plan. I trust it will be of assistance to you, your fellow staff members and the Congress. Please feel free to call me should you have any questions regarding my comments.

Thank you very much for permitting us the opportunity to comment on ERDA's activities. I am

Very truly yours,

Ernst R. Habicht, Jr., Ph.D.
Staff Scientist and Director
EDF Energy Program

Enclosure

July 17, 1975

Comments of Ernst R. Habicht, Jr.
Staff Scientist and Director, EDF Encrgy Program
Environmental Defense Fund, Inc.
162 Old Town Road
East Setauket, Ncw York 11733

To: The Office of Scicnce Technology, U.S. Congress

Re: ERDA 48; A National Plan For Energy Research, Devclopment and Dcmonstration*:

GENERAL OBSERVATIONS

Since the research and development activities of today are likely to provide the basis for commercial technologies some twenty to thirty years from now, one needs to make a number of educated guesses regarding plausible scenarios for U.S. and world energy markets. Of no less importance is that, with rare exceptions, the individuals who devise and advise the creation of such documents as the National Plan (see also AEC Chairman Ray's Report to President Nixon in December of 1973) arc uniformly imbued with the spirit of past technological advances and, despite recent strong evidence to the contrary, are still possessed of an expectation of ever-lower energy costs, at least in the long run. .

Thus it is not surprising that the National Plan appears as if it had been written prior to the late 1960's by the AEC for the Joint Committee on Atomic Energy.

Familiarity with the electrical utility sectors in the United States leads one to several conclusions:

1. Even absent fuel price increases, electricity supply has encountered absolute diseconomics of scale in generation which began to become perceptible in the mid to late 1960's;

2. Continued investment in central electric generation technology is becoming increasingly unfavorable with respect to the altemative of investments in partially electricity-dependent, integrated technologies at or near the site of end-use; and

* Hereinafter referred to as the "National Plan."

3. From the perspective of the economist, the consumer or the envirommentalist, the way electricity is priced has become increasingly irrational in recent years.

From this set of perceptions regarding electricity supply, I conclude that the Natioal Plan is most deficient in that it is moot On recent abrupt departures from past experience and ignores the impact of institutional change within society on the technology required in future years. Thus the National Plan focuses most heavily on large centralized fuel processing and energy conversion facilities that accord most closely with an extrapolation of today's energy technologies. Present and growing countervailing trends in the U, S. energy economy render such an emphasis on centralized supply and conversion technology misdirected in some instances and counterproductive in others. An incomplete list of such countervailing trends follows:

1. Over 50% of the energy in the U.S. economy is directly regulated at the state level as to price. Under far more pressure by consumers than ERDA, state regulators are becoming increasingly sensitive to the advice of economists most particularly with respect to the wisdom of employing marginal cost pricing for electricity. This will stimulate decentralized storage, integrated electric/solar space conditioning, and, in some instances, integrated elctric/fossil fuel systems.

2. Present federal and state tax law is written in accord with the perception that energy costs will fall overtime. Also, buttressed by freight rates and numerous other regulatory policies, the tax laws discriminate strongly in favor of primary materials in the U. S. economy as opposed to recycled materials. It is reasonable to expect that there will be an increascd need for superior recycling technologies including those directcd towards the manufacturing of goods in such a way that the composite materials may be more easily returned to material flows in the economy.

3. Our high agricultural productivity depends upon centralized inputs of large amounts of energy in the form of fuel, fertilizer, pesticides, food processing and transport, Little if anything in the pronouncements of the USDA in recent years would lead one to believe that there is any concern about the energy intensity of agriculture in the U.S. economy. Indeed, the overwhelming majority of federally-funded agricultural research is directed towards increasing the centralization of agricultural processes with concomitantly increased energy intensity of production. Sustained high agricultural yield, together with rcduced energy intensity in our agricultural economy would seem to be a laudable research, development and demonstration goal. Given the present structure and goals of the USDA, one should not be optimistic about conducting solar or other energy R, D & D within or in collaboration with that agency.

4. At present, the most critical energy sector in the U.S. economy is natural gas. Great emphasis is placed on increasing gas supplies through coal gasification. Present exceptionally expensive commercial endeavors directed towards this end (and all the ERDA studies with which I am familiar), have neglected an attractive alternative to be taken over the next five years. This involves the production of low heat content gas which, pursuant to modification of present large "gas-fired boilers, would be "swapped" for that substantial portion of natural gas now committed to the production of process steam and electricity. Customers who are being curtailed are also an attractive near-term target for this technology especially if they would normally switch to oil firing. To explain this in greater detail I am attaching the comments of the Environmental Defense Fund on the Draft Environmental Impact Statements for both the El Paso and the WESCO coal gasification projects. The reader is a1s. rcfcrrcd to the El Paso case before the Fcdcra1 Power Commission (Docket No. CP 73-131).

TIMING AND WORLD ENERGY RESERVES

While assuming that it is a laudable goal to become largely or entirely free of imported energy resources, the National Plan seemingly neglects arguments against such a policy and contains no useful discussion regarding the transition years during which, under any possible scenario, we will continue to be dependent upon imported oil and to a lesser extent, imported natural gas. Quite clearly, any rational U.S. energy program need consider the merits and costs of an oil storage system; indeed, Congress has already authorized a meaningful step towards such security. A research, development and demonstration program should be directed towards the speedy testing and implementation of some of the concepts for oil storage that have been advanced thus far. (See, for example, The Oil Security System by Daniel H. Newlon and Norman V. Brekner, Lexington Books, Lexington, Massachusetts, 1975.)

Since the world oil market has become an evermore important determinant of the U.S. energy market, it seems foolish for ERDA to posit a research and development program without any discussion of what is going on in the rest of the world. We are presently in the midst of a growing world oil glut. Many astute observers of international oil markets are convinced that the OPEC cartel will soon begin to lose strength and oil prices will fall sharply. One plausible scenario for the future is declining world energy prices in the near term and increasing prices after another ten to fifteen years -- when the world's oil production and reserve data look like those of the U. S. today. This indeed compounds the dilemma of policy makers here in the United Stales. But, since credibility with the general public can only be viewed as a virtue (and this seems especially so today), this scenario should be more amply discussed.

Many of the actions wc would take in a "crash program" directed towards self sufficiency would lead this country to greater energy intensity in the short run (via direct inefficiencies in energy use and the adverse near term]mt-energy consequences of rapidly changing conversion and end use technology). Continued reliance on imported fuels over the next ten years or so is desirablaeif we take adequate steps to protect

ourselves against disruptions in supply. The more time that can be bought through energy conversion and efficiency improvemcnts, the better. But it is really the long run expectation that looms over the substantial bulk of the ERDA National Plan since the payoff from new energy supply research, development and demonstration does not really be@ to have much effect until 1995 or so. At our present level of knowledge about world oil reserves, this turns out to be the period when wc can reasonably expect the cost of oil to be relatively high and the price to be on a definite upward trend. By that time, assuming our efforts have been successful over the preceding 20 years, we will be in an excellent position to market technologies to other nations. This might be compared to our present dependence on German coal gasification technology that was brought into commercial.ization during the second World War.

While specific programs pertaining to energy supplied from both old conventional and new exotic sources is discussed on a sector by sector basis below, some of the present emphasis of the National Plan is commendable and in accord with the scenario laid out immediately above. I agree wholeheartedly with the concept that the most fruitful area of energy R & D in the relatively near term is to improve the efficiency of energy use everywhere in the U.S. economy from the point of extraction to the point of end USC. Towards such ends, the endeavors of social scientists should be emphasized heavily. Since future energy technologies (to be developed and demonstrated by the year 2000) can be reasonably expected to be more expensive than today's technologies, the continued endeavors of such research programs over the life of ERDA seem highly justified.

At every stage of ERDA efforts, unbiased and economically disinterested technical review deserves a high priority. Attached is the testimony of EDF witness Dr. Robert J. Budnitz in Application No. 54279 before the California Public Utilities Commission. Dr.. Budnitz places considerable emphasis on the need for public scrutiny of R & D budgets, (in this case, that of the Pacific Gas and Electric Company by the public and independent agencics. Dr. Budnitz also speaks strongly to the need for research on the general question of energy demands -- a subject touched upon in the preceeding paragraph above.

ENERGY SUPPLY SECTORS

1. Nuclear Fission. This reviewer strongly supports the position of the Natural Resources Defense Council and affiliated parties in their opposition to speedy implementation of the liquid metal fast breeder reactor program. The work of Dr. Thomas Cochran at NRDC and formerly at Resources for the Future is definitive in providing irrefutable economic and technical criticism of the ERDA breeder program. Energy R & D ought to focus most heavily on implementation of technologies whose end results afford a minimum array of irreversible consequences and intertemporal inequities. For this reason, if for no other, "bypassing the breeder" is a laudable goal. While this priority may be less indicated in the future as *a* result of significant technological change, the ERDA budget is badly skewed towards a program that offers speedy implementation of a technology whose consequences are profound in terms of uncertainties, risks, unknowns, intertemporal inequities and irreversibilities. The decision rules employed by the NRC and ERDA deserve the closest possible scrutiny and criticism. To this end and by way of specific example, I am attaching a copy of a paper by Professor Paul L. Joskow entitled "Approving Nuclear Power Plants: Scientific Decision Making or Administrative Charade?" (The Bell Journal of Economics and Management Science, Vol. 5, No. 1, Spring 1974, at page 320).

2. coal. I am concerned about heavy emphasis on centralized federal research in the domains of coal mining, handling, cleaning and conversion technology. The coal industry has a sorry record for research and development over its long history in the United States -- to be contrasted sharply with the joint government-industry endeavors that have been encouraged in Englnd and Germany. With the possible exception of the Consolidation Coal Company, no significant amount of innovation has come forth from the domestic coal industry. In order to get new technologies that are more bcnign to the coal miner, the coal environment and the coal consume, the industry itself is going to have to undertake and participate intimately in all phases of research, development and demonstration. The attitudes of coal managers, mining engineers and miners themselves are going to have to change if this industry is ever to lift itself abovc the past tradition of boom and bust with no thought for the future and a fondness for the past.

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A national severance tax on coal directed towards R & D to revert only to those mining firms who actively engage in R & D seems to be a warranted institutional prod in the right direction. This should accompany a tough surface mine reclamation statute that is also directed towards abating the externalities associated with deep mining. Such a statute would, once and for all, relieve the coal industry of an enormous barrier of uncertainty associated with future mining development. Entry into the industry 'should be encouraged through a progam of integrated federal leasing policy, business loan policy and federal agency contract purchases of coal.

3. Oil and Gas. The petroleum industry substantially retrenched its energy research and development efforts starting in the latter part of the 1960's. Laboratories were closed, consolidated or dedicated to more routine purposes and skilled personnel were transferred out of research endeavors, retired early or fired. By having ERDA involve itself in activities that would normally be undertaken by the industry itself, we have a hefty increase in taxpayers subsidy of petroleum exploration, production and consumption. This is particularly so in view of the very low domestic tax rate that is effectively applied to the major petroleum producers.

The only seeming justification for government involvement in enhanced gas and oil recovery is institutional. For example, individual oil reservoirs behave quite differently under varying secondary and tertiary recovery approaches. Thus ERDA may be prompted to be involved in such experimentation so as to speed the transfer of technology from the oil fields of one company to those of a second company and thus avoid anti-trust complications. This may well duplicate information exchanged in joint ventures beyond the continental boundaries of the United States. Regardless of whether or not such information exchange takes place between individual fires, ERDA emphasis on this particular set of endeavors seems to be one more nail in the coffin of the idea that we have a competitive oil industry here in the United States.

4. Solar. While considerable work needs to be performed to make direct solar space cooling technology dependably competitive, solar space heating technology is now being implemented by the private sector and production technologies for solar collectors are presently available for mass production. The principal barriers to

implementing solar water and space heating technology would seem to be institutional in nature. Questions of financing (life cycle costing) and constructing (in a depressed, fragmented and under-capjtalizccl construction industry) seem to be of prime importance. Some of 13 RDA's "demonstration projects" manage to be counterproductive in that the relatively slow-to-move financial and construction industries may continue to wait for "the last word" from federally financed demonstration developments. The entire ERDA solar space conditioning budget might be more favorably applied to the removal of institutional and lcgal constraints at the federal, state and local level. A combination of small business loans to contractors, federal housing financing incentives and even tax incentives might provide the necessary push and pull to achieve more rapid commercialization.

Virtually all of the solar electric dollars seem to be directed towards central utility concepts. A large portion of the costs of solar elcctric technologies are in the physical apparatus required for the collection of the sun's energy. This is essentially a "two-dimensional" technology and may not properly be expected to admit of great on-site economies of scale with increasing deployment. Of course, substantial technological change is needed to render any of the proposed solar electric technologies competitively viable.

It would seem that more attention might be paid to future establishment of small scale solar electric technologies intended for the customers side of the meter where the diseconomies of scale of small storage units is offset by reduced transmission and distribution requirements. As noted earlier with respect to conventional electricity investment today, there is the greatest promise for small scale technologies. This would include the load management and pricing reforms discussed earlier as well as the promise of dispersed technologies such as fuel cells -- which can be sited quite close to modcst demand centers thus avoiding transmission cost-s.

5. Conservation. Most of the goals in this gcncral category are certainly laudable but will probably be achieved quite speedily through normal market forces and good flow of information. A principal government role ought to be the wide promulgation of developments concerning encrgy conservation so that managers, engineers, the press and hence consumers can take cffective action all thc more quickly.

There is little sense of priority in each of the separate conservation categories and thus the ERDA program is made all the more fuzzy. Some of the proposed research is worded in such a way as to be directly counterproductive to the avowed goals of the program. For example, the statement regardeing institutional problems concerning air transport which reads: "Federal regulations on safety, noise and emissions need to be reexamined to reflect strengthened fuel conservation policy. " (Vol. 2 at p. 79) is almost certainly a direct reflection of the DOT, CAB, FAA and State Department position in favor of the Frcnch/British SST. As such, it could not be more counterproductive with respect to energy conservation. In this same section of institutional problems associated with air transport, no mention is made of attempting to directly increase load factors or to minimize problems that ensue from the control of airline regulation by the industry itself.

In such "institutional problem" areas ERDA is stepping on sensitive political ground. If we really wanted to improve transportation efficiency, we would pay close attention to the advice of economists who advocate that user charges reflecting total marginal social costs be imposed upon each transportation mode. Thus, commuter traffic would begin to pay a formidable price for using crowded highways. There would begin to be meaningful user charges for trucks which more accurately reflected the maintenance requirements occasioned by their use of highways. Barges would, for the first time, begin to pay a user charge. The conventional wisdom of the ICC would wither and with its disappearance would return the health of the railways. Such a list is nearly endless.

The point to remember here is that ERDA may, by virtue of its working solely within the existing framework, perpetuate and compound inefficiencies and idiocies that presently obtain. If it is to involve itself in institutional problems, then let such involvement be wholehearted. Such a step proved impossible to the AEC whose failure in this area led to tjr formation of the NRC and ERDA. This implies the need for continued funding of institutionally directed R and D activities by other agencies such as the National Scicnce Foundation.

6. Manpower Training. Where possible, programs should be initiated to provide reeducation of unemployed and under-employed technical personnel. At a fairly high level, the Miami University Medical School Program in Florida, directed towards re-education of scientists in a considerably accelerated M. D. program, stands as a good example. The field of mining engineering would certainly benefit by an infusion of such new talent.

THE ERDA APPROACH TO R & D

It would be nice; to imagine an agency of five or six thousand people directed towards research and development avoiding the past mistakes of the AEC. This may be difficult since ERDA is so heavily dominated by personnel who have been transferred from the AEC. Serious questions need to be raised rcgarding the decision making apparatus and speed of action within the agency regarding new policy and technologies.

Every effort must be made to pare down the number of level.s of decision making within the agency. ERDA must pay attention to ideas as opposed to "proposals" so that the agency gets behind innovative thinking at an early stage and avoids outright intellectual dishonesty. Nothing is worse than the consequences of establisling just another federal granting "old boy" network wherein new fresh talent is effectively shut out of timely funding. Yet there is no inclination that a fresh approach has been made.

Stale corporate proposals placed before ERDA seem to be funded with regularity. Some of these comprise efforts that would be normally undertaken by the industry in question absent any federal funding whatsoever. Some redundancy is evident. individuals and small groups with good ideas are heard to complain that they have difficulty talking to anyone who can make a decision at the agency. There seem to be too many layers of review wiithin ERDA and action seemingly takes forever. Only the large entrenched powerful interests in the U.S. economy can long withstand such an approach to R & D funding. Small enterprises and entreprenual ventures wither away and good academic research by bright young investigators simply never is performed. This is another argument for funding of energy research and development by other smaller federal agencies such as NSF as well as for sweeping review of ERDA policy by disinterested experts.

Whether or not ERDA is merely to be the handmaiden of entrenched industrial ventures (and the foe of new industrial interests), the question of how it is funded ought to be addressed directly and soon. Every dollar of the taxpayers money that goes into ERDA represents a transfer of taxpayer dollars into the consuming cnergy sector. Thus we are subsidizing energy consumption out of general tax revenues. As ERDA and similar agencies grow, this problem will become more severe. The history of the AEC is rife with examples of such subsidies and it is of no use to repeat the litany of criticism here. Instead, the reader is *referred to the* Book of Prophets: *Chapter* 26, Verse 11.

IGT

INSTITUTE OF GAS TECHNOLOGY •3424 SOUTH STATE STREET •I IT CENTER •CHICAGO, ILLINOIS 60616

July 21, 1975

Mr. Emilio Q. Daddario
Director, Office of Technology
Assessment
Washington, D.C. 20510

Dear Mr. Daddario:

The Institute of Gas Technology appreciates the opportunity to review the "National Plan for Energy Research, Development and Demonstration" developed by ERDA. We hope the appended comments can be of help to you.

As one of the nation's major energy research organizations working both for the government and industry, we believe that this is a document of major importance. It should receive constructive inputs from all sectors of the nation.

To this end Dr. Derek Gregory, the IGT staff and I have given the document a very serious review. We hope to be able to serve a similar role in the future.

Very truly yours,

Jack Huebler

Jack Huebler
Senior Vice President

JH/klf

Action JV
Info EQD w/o enc.
DVD
ED
Rec'd 7/21
Preparation of reply for sig of
Action #
Suspense

REVIEW OF "A NATIONAL PLAN FOR ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION"

Overall Comments

The document is comprehensive and intelligently put together. There is an excellent summary from which one can extract national policy goals, national energy technology goals and priorities for developing technologiess. Some qualifying statements about the present shortcomings of the plan itself are given near the end of Vol. 1. A concisely expressed statement of the National Energy Plan placed at or near the beginning might be helpful.

The report has a heavy bias towards nuclear energy and electric power. This is not so much in the recommendations but in the examples that are drawn, the scenarios chosen and the more detailed discussion of particular technologies. We would hope that forthcoming revisions could amend this weakness. The report was probably put together primarily from people with an AEC background, and their previous environment shows through in the way they express themselves. It is especially disturbing to find the emphasis on the opinion that the inexhaustible energy sources, breeder, fusion, and solar electric, could only be used to produce electricity, and therefore there was a need for the development of electrification techniques. This opinion is expressed 4 or 5 times throughout the report. In the same vein, while one of the inexhaustible sources is "solar electric other non -electric uses of solar energy, including biomass and solar heating and cooling, are dealt with under separate headings and not in the context of development of inexhaustible energy sources. There is an unfortunate division of the solar energy option in the report which tends to emphasize the solar - electric route as the only one that can provide ultimate long-term benefits.

There is considerable discussion of the resources of gas, petroleum and uranium, but remarkably little discussion of the resource of coal and of oil shale. Coal and oil shale technology are properly ranked among the highest priority of supply, but the coal and shale resources are lacking in terms of how long will they last at the projected rates of extraction.

We find the coal gasification time table to be too long. It can be materially shortened by proper emphasis. Similarly, we believe that marine biomass should be put into an equal time frame with terrestrial biomass.

The remarks on environmental protection seem to indicate that that is more important than the supply of energy. While protection of the environment is very important, we believe that the case of the environmentalists has been over stated. Emission levels have been set at unreasonably low levels without adequate proof of the need. We agree to the need expressed in the plan for research on the establishment of these levels. We would also suggest work toward establishing the amount of the overall energy dissipation which occurs in reaching the emission levels and work to minimize this use of energy.

While energy resource assessment is included in the Plan, we feel it should be given a much higher priority than is indicated.

The summary (page 5 -8) calls for industry to "Play the major role (financially and technically) in large demonstration and near -commercial projects" and to "Commercialize the technology It is very doubtful that industry has the resources to bring the required gigantic revolution in energy supply to reality in the short time required. Much more government support will be required than is presently planned.

In order that the stated objective to "Shorten the time for transition to new fuel forms . . . " may be accomplished, a drastically speeded up contracting procedure is required.

The plan uses the scenario technique of technological forecasting. Five energy scenarios are postulated, and the report makes it quite clear that none of these scenarios is expected to represent a case which is likely to occur. They are "what if" exercises. The only scenario which is stated to provide an acceptable level of imports by the year 2000 is the one in which all possible technology options have been exercised. While we believe this conclusion is valid, "the case is not really proven.

There is only one scenario in which a specific technology is omitted or constrained, and this is the one in which nuclear development is not allowed to continue. Clearly, under these circumstances an unacceptable situation arises. There are no scenarios in which other energy technology options are withheld. It would also be important to assume partial successes at faster or slower rates.

The organization of Vol. 2 could be improved. Topics in several cases appear to be out of order and/or separated; for example, the separation of storage technology from solar technology. In discussion of solar energy, little emphasis is given to the need for storage systems, and energy storage development is treated at a different priority level to that of solar energy, and is discussed in a completely different context. Energy storage is ranked at a fairly low priority because it is included in "Technologies Supporting Intensive Electrification, "while solar-electric generation is ranked with the highest priority technologies because it is considered an inexhaustible source for the long term.

Discussion of Specific Technologies in Order of Presentation

Direct Combustion

Plan is limited to fluidized bed combustion. Is stack gas cleaning completely developed or is there some other reason it is left out? There are many other potential applications of direct combustion which deserve attention.

Demonstration Plants

It is our understanding that the pipeline gas demonstration plant projects will be selected from competitive bids in response to an RFP. It is unlikely, at present, that various gas distribution and transmission companies located in different states will be able to present combined bids although their ultimate objective is common. 'It may be necessary for ERDA to find a way to bring the various state, local and industry interests together to minimize the cost and enhance the strength and probable success of the effort.

" The time schedule on pipeline gas can be materially shortened if a proper effort is made.

Enhanced Oil and Gas Recovery

This is a vital program and deserves the emphasis it is receiving.

Pipeline Gas

This is a very important program. The means of bringing gas to the market place economically and safety is in existance. This is not true of an expanded electric supply. Industry is being badly hurt by curtailments. ' Gas can directly decrease the need to import oil.

The presentation is good and the time table seems obtainable. Plans for third generation processes and second generation process improvements in support of the demonstration program should be included.

Oil Shale

The plan only refers to in-situ recovery technology. Aboveground retorting needs research and the production of pipeline gas presents a great developmental opportunity.

Fuels From Biomass

The delay of the marine program relative to terrestrial biomass seems unfounded. We see no reason that it cannot proceed, at least as rapidly as the terrestrial. Both are of vital importance.

Solar Heating and Cooling

This is a very important opportunity for near, mid- and long -term energy supply. We feel that although some direct commercial applications are immediately possible, a great deal of R, D&D is needed. A thorough investigation is required of where solar" augmentation can be applied to industrial processes.

Geothermal

The program objectives, as classified by time periods, are reasonable.

The exploration and assessment efforts described under Strategy (1) are insufficiently comprehensive. The Government should ensure that an appropriate level of effort is applied to advanced geophysical exploration sciences and technologies. For example, we understand that the U. S. S. R. is already using an MHD magnetic pulse generator for geophysical hydrocarbon exploration, and it seems reasonable to question whether this or comparably imaginative techniques might be applicable to geothermal exploration. Even though the credibility of geothermal r es our c e adequacy of some types of resources must be more fully established (a need that we ourselves do not regard as generally pressing), a need also exists for effective and economic means to find and delineate geothermal reserves of the various types.

The intended extent of activity directed toward active volcanic energy utilization, as compared with some of the other approaches, is not clear. Although it does not deserve top priority at this time, we favor the prosecution of an aggressive, positive approach extending quickly well beyond "a" test facility, presumably one with rather narrow capabilities. Many concepts suggest themselves as worthy of serious consideration at an early date. More ambitious conceptual approaches, such as, perhaps, the use of terrenes, should not be kept on the shelf too long.

Conservation in Buildings and Consumer Products

Development and demonstration of conservation technology and of institutional changes to aid the utilization of solar energy in new and existing commercial and office buildings for heating and cooling should be promoted in the near term (-1985) for the following reasons:

1. Initial results from U. S. Government funded studies (e. g. , G. S. A. , ERDA re: Dubin-Mindell-Bloome Assoc. New York) have shown both technical feasibility of significant energy reduction by retrofit or new design and cost effectiveness.

2. Adequate technology for additional energy reduction by utilization of solar energy has been demonstrated abroad (Australia) for certain commercial buildings.

3. Problems of implementation by private sector due to lack of awareness, institutional barriers, and cost of collectors, can be overcome by a continuous and vigorous government supply of such R, D&D activities enhanced by broad educational initiatives, in cooperation with other

organizations (such as AIA, ASHRAE, SPE, etc.), tax incentives or low cost Federa1 loan inducements to use solar energy alone or as hybrid technology with conventional approaches and support of research to advance mass production technology of solar collectors at reasonable cost.

-Development of cost effective methods of retrofit of existing installations of space and domestic water heating to recover combustion heat lost in the flue is begging the problem. The barrier is safety associated with the need for proper draft and potential premature deterioration of heat exchanger from attendant water condensation in the flue. A more cost effective and safe approach would be to increase by retrofit approaches the seasonal efficiency of utilization of space and water heaters by such means as to reduce the burner -off time losses of conditioned air. While such approaches are known (flue dampers, proper sizing, modulating burners), there is need to establish the magnitude of their potential for energy conservation in order to demonstrate cost effectiveness to the homeowner.

Electric Conversion Efficiency

The program is vitally needed but the approach is weakly stated and incomplete. Improving the energy conversion efficiency should occupy the highest government priority sine e it is *one* of our best m cans of conservation-making existing fuel reserves (both fossil and fission) las t longer.

The strategy discussed seems to consider superficially the severe materials problems and limitations encountered by some advanced energy conversion systems. The Electric Conversion Alternative Study (ECAS) is mentioned. This program represents a good start in the direction of asses sing advanced systems. However, care should be used in interpreting

the preliminary results which have just been received. Thus far, the study has been biased toward base load plants and has not considered materials limitations. As a result of the base load bias, systems such as fuel cells which operate best as peakers or in a dispersed fashion (in the electrical distribution system) have not been considered equitably. This bias should be recognized and proper attention should be given to fuel cells. Fuel cells are not Carnot cycle limited and, therefore, show the best potential for achieving the stated 55% efficiency when combined with a gasification plant.

Electric Power Transmission

The approach is sound. No mention is made of the problem of addressing transmission over longer distances than are now typical. Distribution system improvements are included in the Objectives, but are omitted from the Implementation Program. Cryogenic systems are limited to very high capacity lines. The role of large capacity lines and their reliability problems must be addressed in an overall systems study before large coremitments to cryogenic system technology can be justified.

Power transfer requirements will inevitably increase and make improve. ments in Transmission Technologiess both de sir able and imperative. Until order -of -magnitude improvements are made in the Transmission modes, however, it must be recognized that physical laws probably impose a rather tight ceiling on how much present performance can be improved before" rapidly diminishing returns are felt. Such barriers can not be realistically overcome by shifting development costs from rate -payers to tax-payers.

The Federal Role should fall largely in this scientific field with emphasis on the potentia1 conservation of all r es our c es (land, aesthetics, public health and safety, etc.) rather than primarily materials resources. As an example, " the NBS should continue or expand its research on cryogenic and superconducting materials, but the electric utilities and their suppliers should translate the findings into transmission line technologies and should be allowed adequate service rates to do so. Then if the approach is deficient, the system will be economically self-correcting as high electric rates provide an umbrella for competing energy transportation technologiess.

The Federal R&D agencies have much to offer and their potential contributions are too valuable to be unnecessarily diluted by hardware programs.

Electric Transport

The program is much needed and the general approach is good. However, some omissions occur in the objectives and in the information plan. Objectives to produce prototype automobiles with 60, 100, and 200 mile ranges can be met today, and do not need research, if this is all that is needed. These objectives must include a reasonable vehicle weight target, capital cost target, and operating cost (batter y replacement cost) target if they are to be meaningful. These additional qualifiers on goals should be clearly stated as they are vitally important to formulation of a research plan.

The "problems" do not place enough emphasis on the development of low cost charging systems, provision of electric distribution capability for recharging a large-electric vehicle population, development of inexpensive and reliable vehicle control systems and cost reductions on electric motors and drives. These aspects are also missing from the implementation plan.

The general comments on implementation makes the implicit assumption that electric vehicles will have an overall favorable impact on the national energy and economic situation. Some overall systems analysis and a corn. parison with the alternative nonelectric, nonfossil fuel vehicle should be made. This is missing both here and in the “Transportation Efficiency” program.

There is an overlap of effort in the Stirling engine program discussed in this program plan and also in the "Transportation Efficiency" plan. Some definite procedure for coordination of these two efforts is required.

Many of the technologies discussed in the electric -rail transport section are already in use in other countries. The plan quite correctly emphasizes a study of existing foreign train systems. The study should also encompass a review of research in progress by foreign laboratories aimed at electric rail traction. It is to be hoped that the reference to "third rail” electrification also implies overhead catenary electrification, which is the more usual way of supplying power to modern rail systems.

Energy Storage

The program is needed, and is well presented, but with some omissions, overlaps, and conflicts.

The near term objective of providing for **6%** of **delivered electricity to come from storage by 1985 must be critically retie wed in the light of potential availability of relatively low-cost off-peak power. Recent studies (IGT) have shown that within a 10-year time frame, only small amounts of** off-peak nuclear or coal based power will be a available for storage: most of the peaking generating capacity is oil-burning and gas turbine equipment not suited for coupling to storage systems. The need for energy storage will develop in

the future as a) the storage technology becomes available and thus changes the base-load construction priorities, and b) as more nuclear and solar plants are commissioned.

There is a serious overlap and duplication of "storage in vehicle propulsion systems" with the separate program on ''Electric Transport. '' This must be resolved and duplication in the overall plan must be eliminated.

The objectives specifically identify the development of electromagnetic storage systems for a long term, while flywheel, compressed air, underground purged hydro and thermal storage, all discussed in the strategy and implementation plans, are not specifically mentioned in the objectives. There seems to be no reason why electromagnetic receives special recognition.

There is some concern that the hydrogen storage objective includes "transmission and utilization systems as a substitute for petroleum and natural gas fuels." This work is much needed and justified, but the words here imply a far greater impact than merely an energy 6 to rage concept. The plan should state whether a broad hydrogen energy program is proposed here, and how the interrelations will be made with other hydrogen projects included in other program areas (converter reactors, solar energy, transportation efficiency, for example) will be made.

There is a possible overlap and duplication of effort in the Energy Storage in Buildings plan with the separate program on Conservation in Buildings and Consumer Products. Heat pump development, for example, occurs in both places .

Industrial Energy Efficiency

This important area has been the subject studies by A. G. A. and several gas companies at IGT for the past several years. The program has been very **successful but could profit from financial support by ERDA.**

F

Transportation Efficiency

An excellently laid out program. More comprehensive and logical than most of the others.

Highway vehicle problems do not include development of engine systems **to** operate on alternative" nonpetroleum fuels (methanol and hydrogen, f or example), while these are emphasized in the implementation plan.

There are many mentions of the application of hydrogen to vehicle and **train systems. Most emphasis is on the storage aspect. There is an omission of work on problems of delivery of hydrogen to the refuelling stations , its storage there,** and the safety aspects of refuelling operations. There is some **concern that the emphasis on hydrogen in this program is not backed up by** adequate emphasis elsewhere in the plan on hydrogen production, transmission, and distribution technology. Specific mention of hydrogen as an aircraft fuel is not made, while its light weight makes it specially advantageous in this application.

Studies of hydrogen transmission in pipelines must be coordinated with the hydrogen program in the "Energy Storage" plan, and there must be a parallel comparison to the alternative of electric power transmission.

The program repeatedly stresses noncryogenic onboard hydrogen storage. This implies that cryogenic storage has either been ruled out or does not need R&D. Neither assumption is justified, but whichever has been assumed should **be stated.**

A 50% reduction in use of petroleum for pipeline transportation is called for, presumably by switching to electric compressor stations. This, it seems to me, might add more cost and create more problems than its worth. (In many cases, it would represent a waste of energy.)

Fusion

The Tokamak-type fusion reactor development program appears to be structured in a logical sequence. Success is reasonably assured, but we assign a low factor of confidence in schedules being met. We are satisfied to see the program continue as planned without being comfortable in any assumption that it can be depended on to fill major energy needs by 2020. This is not a criticism of the program or its personnel but simply an assessment of the prospects of the technological development progress as we see it.

By contrast, we see laser fusion as an unproven technology that might make a significant contribution to closing the energy gap even before Tokamak and its relatives become consequential. We recommend that laser fusion development be very aggressively pursued in the energy program on the assumption that it is feasible even though this is unproven. Its failure to match our wishes would be no more disgraceful than a failure of other concepts on technological, economic, safety, or other grounds. The need for a deliberate approach to CTR development has been documented to our satisfaction; the need for a restrained approach to laser fusion has not.

Breeder Reactors

We support the near -term objective as stated, and include the FFTF, the CRBR, the PCTF, and possibly some other major facilities within this frame - work.

The mid-term objective is loosely constructed, as we believe its should be at this time. Unnecessary Federal commitments to LMFBR commercialization, as distinct from technological development, should be held in abeyance while alternatives are being aggressively evaluated. Intensive efforts should be applied to the preparation and continuous updating of realistic, integrated, energy development schedules and programs to avoid waiting too long to initiate commercialization, but the possibility of superior concepts and technologiess arising (as the y have in past years under comparatively weak incentives) should not be ignored.

We support four of the five statements of the Federal Role , but take sharp exception to the first of these five statements. ERDAs assistance on safety R&D should not be conceived as "directed toward allaying the publics . concerns" but, rather, toward ensuring safety. Public relations are important, but they should be cultivated by PR people outside ERDA. If ERDA proceeds with the stated concept of its primary (or even ancilliary) Federal Role, it is headed for oblivion and the country's important nuclear energy program will be even further emasculated. Please obliterate such words and concepts!

We believe it is not yet time, and 1978 may be too soon, for a commitment to construction of a near-commercial LMFBR (NCBR) as a follow -on to the CRBR. Before endorsing such a commitment, we would want to see a comprehensive energy development budget showing its impact.

We support the limited attentions to the GCFR, LWBR, and MSBR activities as outlined.

Converter Reactors

The near -term objectives stated are appropriate national goals but we feel that the time has come for the electric utilities to collect further needed LWR

development funds from rate -payers rather than tax-payers. We sympathize with their financial problems but thes e are now lessening due largely to regulator y actions and further improvement could be rapid without further subsidy. Similarly, LWR plant and equipment manufacturers are beginning to show profits on the LWR segment of their businesses, with a strong market demand on the horizon. The Federal Role should not be one of solving electric utility operational problems and thereby encouraging further deficiencies in conventional plant designs and practices. ERDA's role should be one of s s simulating industry-utility efforts and monitoring their progress while eliminating any unnecessary governmental obstacles to progress.

We do favor Federal support (including financial support) of mid-term and longer -term objectives. It is our impression that industry is capable of developing the HTGR direct cycle power plant largely with its own resources, but we encourage ERDA to assist in the back-end fuel cycle work. that needs close coordination with other reactors fuel-cycle provisions. The availability of private funding for development of gas turbine prototypes will certainly be heavily influenced by the more positive Federal attitude toward the HTGR, including its fuel cycle.

We particularly encourage early, aggressive efforts to develop the VHTR reactor and related systems suitable for application to industrial chemical processing, including conversions of organic and/or inorganic materials to essential, non -electric energy forms. Systems work will be costly, but it should include the early study and demonstration of the coupling of the VHTR cool and loop to several important industrial heat absorbing processes. It is not clear that this essential activity has been assigned a suitably high priority.

Attention should also be given to adaptation of the HTGR for the purpose of H_2 or synthetic fuel manufacture. Analysis of industrial applications of process heat other than in H_2 or Synfuel should be included. Iron and steel and cement and stone industries in particular should be investigated.

Use of process heat is not included in the "Problems" or **"Implementation"** program. One particular additional problem is that of coupling the HTGR coolant loop with industrial heat-consuming processes, and adapting the reactor to accept the return of coolant still at a high temperature.

Use of process heat for thermochemical hydrogen production, for coupling to coal and oil processing technologies, to iron and steel production, is already under examination at ERDA and should be continued.

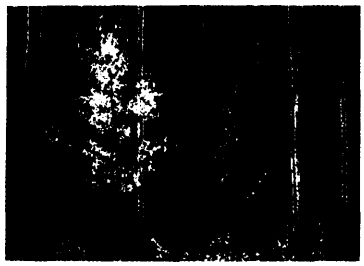
We have frequently been dismayed by the complete disregard for process **heat demands as a factor in the analysis of uranium adequacy.** We **regard nucles energy as an indispensable major source of o-ii and gas energy replace - ment that can be used most efficiently and effective 1 y if it does not first go through a conversion to electricity. This observation should be weighed carefully throughout** ERDAts nuclear and non-nuclear en erg y development planning.

The whole program effort is too heavily emphasizing the production of electricity, and not **the** use **of nuclear energy in other (thermal) forms.**

Hydrogen

The technology of hydrogen in energy systems receives mention in the context of storage and energy transmission. Because it is still at the study status, and has a long term of impact, and presumably because it has no net energy supply impact in the long run, it received the lowest ranking in national priority. In the Glossary section, hydrogen energy is defined as

including non-electrolytic methods of hydrogen production and methods for its storage and transport. Specific mention of the electrolysis process, and of the utilization of hydrogen, is not made. In discussion of the need for increases in the capacity of energy transportation systems, rail movement of coal and pipeline movement to fluid fuels and slurries is discus seal, but no mention is made of the increasing needs to move either electricity or for hydrogen transmission option. In none of the 5 scenarios, and particularly in the combination of all technologies (scenario 5), does hydrogen transmission or any form of bulk energy storage appear (neither does fuel cell or any other form of decentralized conversion appear in the scenarios, although the use of hydrogen energy, bulk electric storage systems, and fuel cell generation are discussed in the plan as developable technology options).



SIERRA CLUB Mills Tower, San Francisco 94104

Sierra Club Research

July 16, 1975

Jon Veigel
Congress of the U.S.
Office of Technology Assessment
Washington, D.C. 20510

Dear Mr. Veigel:

I have carefully read the two volume ERDA decision document: "A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future." The document reflects a major conceptual improvement over earlier work, such as "project Independence.'! The presentation of supply alternatives allows a clearer public understanding of exactly what the federal government plans to accomplish in the next few years. It is a straightforward presentation of technological options.

I would **most strongly recommend that the application of funds for research, development and demonstration also consider social and economic issues. This ERDA report/plan focuses too strongly on supply questions** and fails to follow through on the recognized realization that energy is not unlimited and that prices will be high. Future analysis should treat a broader range of social choices which can achieve improvements in the quality of life. Research, development and demonstration might also be spent on social. demonstrations such as lifestyle changes in addition to energy conservation research which treats technological improvements.

The **documents suggest that** federal energy policy is based on a series of goals necessary to achieve less dependence on imports, but the report fails to explain the following:

1) How much these drastic supply goals will cost America - what are the implications of domestic dependence?

2) **How environmental impacts are to** be **treated.**

3) Under what conditions a supply goal will be reduced or expanded.

4) What changes in the distribution of wealth and political power are likely under each supply scenario.

5) The anti-trust implications or the rate of timing of the plans.

6) How public access will be incorporated into the ERDA plans, particularly in choices of technological implementation.

7) What the corporate contribution to this research will be - who will capture the profit from the output.

I am particularly concerned over the presentation of the time tables contained in Volume 2. The process for making these plans and the conditions which would lead to a sequence modification are not specified. I would think that the public interest would be well served by a description of explicit conditions which would lead to the abandonment of a technology and the flexibility of choice which is contained in the plan. For example, if nuclear plants were to prove unacceptable ten years from now, how would America phase out the existing stock? One wonders what the economic distinction is of dependence on foreign oil over which we have little control and dependence on a questionable technology which becomes so dominant that a phase out is impractical. Energy independence should be analyzed in the context of social protection from unexpected events of all sorts. One even might wonder whether the oil import uncertainty is as major a policy concern as the technological failure potential. As a start, an analyses might show the national consequences of a loss of expected energy supply for each source of the technologies in this ERDA document for each yearinthe planning process. Thus, the energy policy which chooses the source and timing of energy exploitation would implicitly consider the uncertainty of availability. In this sense, the cost of a reduction in the use of energy would be analogous to an insurance premium paid to avoid the potential high cost of a drastic, rapid curtailment of energy use.

Underlying all my comnents is a concern that the proposals for R,D,&D will not be responsive to economic, social and environmental factors. If reseach is pursuedto obtain a supply goal and the goal is achieved, we are not automatically assured that resources will be used efficiently or that federal funds have not been wasted.

Again, I would like to congratulate the authors on a much improved decision document. The problem is to now convince the government that the supply strategy is not an ultimate solution to the energy problem and to expand the scope of future federal research to include social options.

I am interested in cooperating directly, and in greater detail, in the early stages of future ERDA decision plans. Please consider the advantages of professional resource economics input from research organizations such as Sierra Club Research.

Sincerely,

Stephen O. Andersen
Resources Economist

SOA/cLG

cc: Sid lbglewer

AMERICAN PUBLIC POWER ASSOCIATION

2600 VIRGINIA AVENUE NW WASHINGTON DC 20037 • 202/333-9200

July 24, 1975

Emilio Q. Daddario
Director
Office of Technology Assessment
Congress of the United States
Washington, D.C. 20510

Dear Mr. Daddario:

I appreciate the opportunity for the American Public Power Association to comment on the Energy Research and Development Administration's National Plan For Energy Research Development and Demonstration. We hope that the Office of Technological Assessment and Congress will find our comments useful in analyzing ERDA's study.

APPA represents more than 1,400 local public power systems in 48 States, Puerto Rico, the Virgin Islands and Guam. More than 30 million people receive their power from local public power systems in towns ranging in size from Reynolds, Nebraska with 60 meters to the City of Los Angeles with over 1,000,000 meters. Local public power systems have a generating capacity of about 40,000 megawatts.

Local public power systems seek to provide adequate and reliable electric service at reasonable price and in an environmentally acceptable manner. Since national energy research and development will certainly be a factor in the ability of these systems to obtain their goal, APPA has commented to ERDA on **both the national energy research and development plan and the Solar Energy Research Institute. Copies of both comments are enclosed and referenced.**

GENERAL COMMENTS

In my April 29 letter to Dr. LeGassie, I listed criteria on which to base energy systems priorities. **Many of these** criteria appear in Chapter X of Volume I of A National Plan **For Res**earch, Development & Demonstration as unresolved issues.

Net Energy: ERDA should have considered net energy in formulating a national energy plan for **R&D. Net energy is a yardstick with which to measure the energy output for a given energy input, and it provides one measure of the relative attractiveness of competing energy systems.**

cost: While **ERDA claims to have considered costs in forming their national plan, there are no cost figures in either Volumes I or II of the National Plan. It seems to me that**

you must know "what you are getting for how much" before you can allocate resources wisely.

End Use: A high priority should be placed on a sustained effort to develop the technology to convert consumer products and industrial processes from gas and oil to methanol and electricity.

Regional Analysis: In our comments to ERDA, APPA recommended a regional approach to the development of a national plan. This approach would highlight the regional nature of most energy technologies, identify resource rich areas, and point out the unique environmental problems associated with each region. With this additional information, one could optimize the energy-mix for each region and determine whether a given region is likely to be energy rich or poor, in terms of meeting its energy needs. This information would indicate the amount and type of energy to be transferred from one region of the country to another.

Water: APPA believes that the ERDA comments on water resources in Chapter IX of Volume I of the National Plan would not have been made if a regional analysis had been made. ERDA's comments average out regional water shortages by speaking of the problem on a national basis. Along these same lines, there is a critical need to develop non-water consumptive technologies for electrical generation.

Another area of concern is what we view as the lack of sufficient input by the user of the energy system to be developed. It is essential that users, regulators and other local governmental officials understand and plan for the energy systems being developed. The user should be involved in the planning, design and specifications of these energy systems. Advisory committees composed of these groups should be formed for each major technology to insure that user needs are met. The Federal government should retain control of all Federally-funded research, development and demonstration projects with advisory committees to appraise and advise on each program from beginning to end.

INDIVIDUAL TECHNOLOGIES

Solar: While APPA believes that ERDA has outlined a reasonable solar energy policy, we are disturbed by the comment in the draft document that the Solar Energy Research Institute mandated by Congress will be run by a contractor (see our enclosed letter to Dr. Teem).

Fuel Cells: This is a technology barely mentioned in the ERDA National Plan, and yet it represents a technology in which private industry has spent over $100 million over the past 8 years. The technology is non-polluting at point of use and may be operated on fuels such as methane, methanol, natural gas, and hydrogen and oxygen. It can be used for direct electrical generation on its own or for energy storage with solar technologies. Its demonstration would be rather inexpensive and near-term when compared with other energy systems.

Fusion: ERDA offers no alternative to its development of the Tokamak. ERDA's fusion effort should be a balanced effort with energy programs in both electron beam and laser fusion.

Although there is much we like in ERDA's National Plan, we believe that the formulation of such a plan should incorporate the items discussed in our "General Comments". As far as the individual technologies are concerned, the problems that we raise with solar, fuel cells and fusion can be readily corrected. These comments are not an attempt to judge ERDA's overall effort, but to point out considerations that would improve their initial effort.

Sincerely,

Alex Radin

AR/dt
Encl.

AMERICAN PUBLIC POWER ASSOCIATION

2600 VIRGINIA AVENUE NW WASHINGTON DC 20037 • 2021333-9200

April 29, 1975

Mr. Roger W. A. LeGassie
Assistant Administrator for
Planning and Analysis
United States Energy Research
& Development Administration
Washington, D. C. 20545

Dear Mr. LeGassie:

I appreciate the opportunity which you have afforded the American Public Power Association to contribute to ERDA's formulation of a national energy research and development plan.

APPA represents 1,400 local public power systems in 48 states, Puerto Rico, the Virgin Islands and Guam. More than 30 million people receive their power from local public power systems in towns ranging in size from Reynolds, Nebraska with 60 meters to the City of Los Angeles with over 1,100,000 meters. Approximately 80% of APPA member systems do not generate electricity but purchase power from other utilities. APPA member utilities provide 10% of the nation *s electricity with a generating capacity of 39,508 megawatts.

Local Public Power systems seek to provide adequate and reliable electric service at reasonable price and in an environmentally acceptable manner. National energy research and development will certainly be a factor in the ability of these systems to obtain their goal.

We believe that the decision-making process (criteria) on energy R&D should first assess the impact of various energy technologies on the efficient use of resources, the environment, the public health and safety, the national interest, and the utility industry. Based on these studies, judgments should be made as to the acceptability of each of the energy technologies. For those technologies judged unacceptable, projections should be made as to how the energy technology could be made acceptable. Estimates should also be made as to when new energy technologies will be available for commercial operation for various levels of R&D effort. Then, for a given date, those energy technologies which are available and acceptable would be optimized in terms of:

1. the ability of the technology to meet projected electrical demand;
2. health and safety considerations;
3. environmental considerations;
4. resource availability and net energy consumption; and
5. the cost of developing, producing, and using the technology.

These studies should be done on a regional basis to provide an opportunity to introduce as much diversity as possible into the energy mix. The optimization variables should be regional in character where possible. A final national model should be developed from a composite of the regional studies. Using this composite model as a starting point, comparisons should be made between (a) the ***use*** of relatively inexpensive generation in one region with transmission to another region and (b) the use of more expensive generation within a region as given in the region al model.

Environment. The factors considered in making this determination should include cost, environmental impact, transportation, resource displacement (the transport of water in a slurry pipeline from a water deficient region to a water rich area), and overall energy efficiency. Since both providing electricity and preserving the environment are in our opinion desirable goals, decisions should be made as to what constitutes a tolerable level of environmental impact. While sources of electrical generation which minimize environmental impact should be developed, for the next generation they will not provide adequate electrical energy. Therefore, trade-offs between energy and the environment must be made. Trade-offs must be based on the best available technical information, and made on the basis of balancing of costs and benefits and consideration of the attitudes of the people affected by the decision.

National Interest. If the "oil crisis" taught us anything, it showed us the importance of developing a balanced energy policy which minimizes our dependence on foreign resources or on a single fuel. It also pointed out the need for more efficient production and use of energy as well as the need to assess all energy and environmental control technologies on the basis of net energy.

Health and Safety. The projected health impact for present and future generations of the technologies being developed **and their fuel cycles** should **be assessed. This assessment, coupled with the prevailing public attitudes towards what constitutes acceptable risk, should** provide the basis for decisionmaking on health. Energy systems should be designed for maximum reasonable safety during construction, operation, and maintenance. The energy fuel cycles should also be designed for maximum reasonable safety.

User Criteria. The development of energy technology should always be clearly focused on the end-use of the technology. New energy systems should be designed with an eye toward compatibility with existing utility systems. The program to develop the new technology should aim at keeping capital and operating costs of commercial equipment low while insuring that vendors can provide sufficient quantities of new equipment replacement parts and fuel to obtain the quickest possible

application of the technology. The energy system should be efficient, reliable, durable, and easy to repair. Designs should be standardized and construction modular where possible.

ERDA

For ERDA to effectively deal with the intricate problems for which it was created, it must define its goals so that if those goals are met the problems which led to its formation would be solved. A clearly defined approach to meeting these goals should be developed and followed, along with the philosophical underpinning for this policy. The policy would represent the administratively most efficient means of applying the "principle of least action", which is reaching the desired goal in the shortest period of time, with the greatest possible economies of effort and resources. To keep ERDA vital, periodic review of its goals, **policies, and philosophy should be made to examine the agency's successes and failures plus changes in the overall energy situation. Every five years or so, the agency should reassess its studies on the optimum mix of energy systems. This reassessment should reflect technological advances and developmental failures, shifts in public attitudes toward the various technologies or the criteria used in decision-making, and new information on the impact of various technologies on the criteria used in decision-making. On the basis of this information, five year program plans should be developed.**

To assure user acceptability and equipment availability, ERDA should work closely with all segments of the utility industry and probable vendors as well as with ERDA contractors. But it is imperative that close cooperation with these groups not lead to monopolies on either the technologies developed or the fuels used.

Allocations of Resources

TWO ways of looking at the projects to which ERDA will be devoting its efforts are: (a) the nature of the work performed and (b) the time-frame in which technologies will be brought to commercial operation. The kinds of activities that ERDA labs and ERDA contractors will be involved in appear to be basic research mission-oriented R&D, and proof-of-concept experiments. A reasonable allocation of resources might be 15% for basic research, 45% for mission-oriented R&D, and 40% for proof-of-concept demonstrations. Another way of looking at this is to provide 15% of the available funding for projects likely to be brought to commercial operation in 25 years or more, 45% for projects commercially available in less than 10 years. There will obviously be a great **deal of Overlap between long term projects and** basic research as there will between near term projects and proof-of-concept demonstrations, but by simultaneously meeting both sets of requirements, balance will be assured. It should be noted that long term basic research will provide a needed pool of manpower to draw upon during the development phase.

PROJECTS OF APPA MEMBER INTEREST

Presented below are some projects of special interest to APPA members and and indication of APPA's concern about these projects.

Fossil Fuels

Gasification. Coal gasification offers an opportunity to use a relatively clean fuel, when compared to coal, for generating electricity. The price for this clean-up is higher cost for the fuel, solid waste products from the cleaning process, and increased water consumption. The loss of efficiency due to the gasification process means increasing either strip or deep mining to povide the same amount of energy. Gasification should be compared with other ways of obtaining the same results in order to determine the extent of its future use. Many of these same arguments apply to oil shale liquefaction.

MHD. MHD appears to be an effective method of increasing the energy efficiency of coal burning steam electric generating plants. The Soviets are reportedly testing a 75 MW power plant with an MHD generator using natural gas. Studies indicate that the nitrogen oxides can be controlled by using a fuel-rich mixture. . Sulfur oxides would react with the alkali seed material to form compounds recovered by the electrostatic precipitators. For economic reasons the alkali metals must be recovered and a by-product of that is control of sulfur. With a steam turbine as the second stage of power production, the discharge of waste heat into the cooling water would be well below that of any existing steam power plant. If a gas turbine is used for the second stage, the need for cooling water is removed. Unfortunately, to reach the required temperatures for MHD, auxiliary heating or an oxygen enriched atmosphere is required.

Nuclear Power

Breeder Reactor. The breeder reactor may become an important element in our methods of electrical generation over the next half-century. A balanced approach to the breeder, as one of three or four major forms of electrical generation, would be to fund the high-temperature gas-cooled reactor and the light-water breeder as well as the LMFBR. In addition, some of the reliability and safety questions raised about the LWR are magnified in the breeder case. The nuclear waste-disposal problem must also continue to be studied.

Renewable Resources

The whole range of solar technologies hold the promise of meeting a significant portion of the nation's energy needs over the next forty years. In certain regions of the country, it may become a major method for generating electricity. The Pacific Northwest, is heavily dependent upon hydro power, which currently provides about 14% of the nation's electricity. While the development of new hydro sites cannot keep pace with projected electrical demand, many previously marginal sites could be developed, existing sites could be redeveloped for increased capacity, and bulb-type turbines should be developed for use both in hydro projects and possible tidal installations. On a net energy basis no method of electrical generation is as favorable as hydro.

The development of first generation solar heating and cooling seems well along, and an evaluation of the integration of this technology into the utility industry is deserving of study. The economic use photovoltaic cells, solar thermo-electric, ocean thermal, and wind turbines is regional in nature.

Development and use of solar technologies over the next 25 years could allow them **to take their place along side hydro as a major factor in electrical** tion **during the first quarter of the next century.**

Except for ocean thermal, an efficient and widely applicable energy storage system is required to make solar systems viable. While pumped-storage and batteries will probably be commonly used, a fuel cell using a fuel such as hydrogen may prove to be the best form of energy storage.

Geothermal energy is an efficient method of generating electricity'.' Its application will be limited unless new ways of tapping geothermal fields are perfected and the environmental problems associated with using geothermal energy are solved.

Fusion

APPA supports the development of both laser fusion and magnetic containment. The laser approach appears to be the only one that offers many of our members the possibility of actually operating such generation. Large fusion generation plants would probably be jointly owned by all segments of the industry. Concepts such as the KMS approach to produce methane with laser fusion should be studied to determine whether or not it has advantages over direct electrical generation with fusion. A pressing need in this area seems to be the development of an efficient high energy laser.

Fuel Cells

In addition to being an effective way to store energy for solar systems, fuel cells promise inexpensive and reliable energy. They should be easy to install and are modular so that fuel cells can be sized to meet the needs of almost all utilities. There appears to be little environmental effect associated with generating electricity with fuel cells. A unique approach to using fuel cells is being studied by the City of Seattle. The fuel used in the cell would be obtained from converting the methane, from pyrolysis of solid waste, to methanol which is used in the cell.

Congress mandated that ERDA decide their energy priorities on the basis of:

1. power related **values of energy sources;**
2. **preservation of material resources;**
3. **reduction of pollutants; and**
4. **export market potential (including reducing imports).**

I believe the projects and evaluation scheme I have outlined meets those requirements in a rational way.

Sincerely,

Alex Radin

AE:mls

June 17, 1975

Dr. John M. Team
Deputy Assistant Administrator
for Solar, Geothermal and
Advanced Energy Systems
Energy Research and Development Administration
1707 H Street, N. W.
Washington, D. C.

Dear Dr. Teem:

These comments on the role of the Solar Energy Research Institute mandated by the Solar Energy Research, Development and Demonstration Act of 1974 are a response to an ERDA request for views published in the June 3, 1975 Federal Register.

The American Public Power Association is a national service organization representing more than 1,400 local publicly owned *electric utilities in* 48 states, Guam, the Virgin Islands, American Samoa and Puerto Rico. Because our membership is interested in providing adequate amounts of reasonable priced, reliable electricity in an environmentally acceptable manner, APPA has a substantial interest in the development of economical solar energy systems to generate electricity or to supplement electric@. With a membership as geographically diverse as ours, APPA is interested in most forms of solar energy utilization.

we believe the role of the Institute should be to facilitate the utilization of solar energy, and that the Institute should be organizationally separated from other ERDA solar activities. The Institute should focus on R&D on those system components which are unique to solar energy. Related work in fields such as material science should be contracted to other agencies or research organizations. The Institute should have test facilities at appropriate sites for testing all fores of solar energy, and should be the national lab for solar energy.

System analysis activities of the Institute should include the development of Conceptual designs for solar systems which are tible with off the shelf non-solar components. The Institute should evaluate overall system performance and establish system, component and material standards for solar systems. 1t should also develop designs which are responsive to the concerns of an economic group within the Institute.

An economic group should be concerned with all aspects of marketing solar equipment, developing a strong solar energy industry, and resting solar components and systems.

A communications division in the Institute should compile data in and provide information from a solar energy bank, as we11 as function as a public information office.

I hope that you find these comments useful.

Sincerely,

Alex Radin

~ j b k