The original documents are located in Box 13, folder "Energy Independence Authority (4)" of the James M. Cannon Files at the Gerald R. Ford Presidential Library.

MEMORANDUM

Jim Cannon

OFFICE OF THE VICE PRESIDENT
WASHINGTON

June 10, 1975

MEMORANDUM FOR: THE VICE PRESIDENT

FROM: DICK ALLISON

SUBJECT: Review Group Ideas from Today's Domestic Council Meeting

Here are Review Group ideas which emerged from today's Domestic Council meeting and from our conversations in the car afterwards:

1. "Finite":

   - To determine the extent to which our natural resources really are finite;

   - The probable conclusion will be that, with three or four exceptions, there are no effective limits to what our resources can yield, given the application of science and technology;

   - This could be the subject of a major speech by the President;

   - Alan Greenspan, the Interior Department, and John Quarles of EPA are all interested and should be involved.

2. Quality of life and of the human environment:

   - The interrelationship of energy, raw materials, and industrial development.

3. The interrelationship of government and free enterprise.

4. Overall transportation policy.

5. New core industries:

   - What will be the new industrial sources of full employment (in place of the automobile and housing industries):

     *Energy

     *Raw materials

     *Transportation

     *Urban development

     *Food production

6. The role of planning in a free economy.

THE WHITE HOUSE

WASHINGTON

August 28, 1975

MEMO FOR JIM CANNON

FROM: MIKE DUVAL

I have doubts about this paper, but you have every right to expect total candor from me -- so here it is.

In terms of quality, I'm a bit embarrassed. I just got into this very complex subject yesterday. I'm sending the memo to you now because you're on deadline, but it doesn't meet my standards.

THE WHITE HOUSE

WASHINGTON

August 28, 1975

MEMORANDUM FOR JIM CANNON

FROM: MIKE DUVAL

SUBJECT: ENERGY FINANCING

I read a draft of the "Energy Resources Finance Corporation Act of 1975". My personal recommendation to you is that the President and Vice President not pursue the ERFCO idea any further.

My conclusions can be summarized as follows:

- There is no need for a Federal financing capability to stimulate energy capital development at anywhere near the level of $16 billion a year for seven years over the level of capital investment which will occur anyway. ERFCO will not significantly assist the Nation in achieving "energy independence" as defined by the President in his State of the Union Address.

- To the extent ERFCO doesn't stimulate additional investment then, philosophically, it must honestly be described as socializing a major segment of the U.S. energy industry. It is diametrically counter to the President's stated energy and economic principles and there is no compelling reason for this abrupt shift.

- Viewed a year from now, the proposal contains far more political negatives than pluses.

- There is an alternative which will permit the President and Vice President to achieve the basic political and substantive benefits of ERFCO without all the problems.

The following is a brief discussion of the above conclusions. I did not have an opportunity to sit in the meetings and discussions of the ERFCO proposal, and thus my analysis may very well be incomplete and perhaps some of the objections I raise have already been answered. Also, I am very conscious of the fact

that a Duval should not be criticizing a Rockefeller financing proposal but, nevertheless, I believe strongly that ERFCO is fundamentally wrong economically and politically.

ERFCO. Stripped of all the rhetoric, ERFCO simply is a transfer of a very significant portion of the decision-making power over capital investment in energy-related projects from the private sector to government. This is not unique. Already the government controls anywhere from 25-50% of the approximately $200 billion in net funds currently raised in the U.S. capital market. What is unique is that the decision-making is vested, not in the President or Executive agencies or the Congress, but rather, in a flexible board of directors.

Implicit in this proposal is the notion that the constraint on achieving our energy objectives involves the investment decision-making process, not other difficulties. I happen to think this assumption is incorrect. If the constraint to achieving energy independence were financial, then a finance-oriented decision mechanism makes sense. If not, the marketplace and the President are in a better position to make these judgments.

The following are some background facts which I think should be kept in mind as the ERFCO proposal is evaluated:

- The Nation can achieve independence as defined by the President, by 1985, by taking the conservation and supply steps outlined in the State of the Union Address. This goal is still achievable (even without Congressional acceptance of the President's total plan) if Congress does not override the President's veto of the oil price control law, if some reasonable compromises are worked out on the energy/environment issues, and if OPEC cooperates by keeping the price up. The important thing to note here is that capital needs for energy development, even without ERFCO, are likely to be within the historical band, i.e., 23% of total business fixed investment.

- One can argue that ERFCO will increase the percentage of total capital investment that goes to energy development. (This argument is probably fallacious because, of the $16 billion a year which ERFCO would generate, only a tiny fraction will probably be additive to what would be spent by the private sector anyway.) The danger in arguing that government should stimulate more energy investment than would otherwise occur, obviously concerns the danger of the government allocating credit.

ERFCO will "manage" about 5 percent of total business fixed investment and 20 to 45 percent of the annual energy investment.

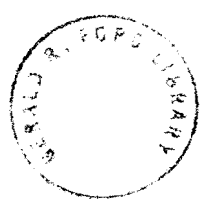
- An inevitable result of drawing capital funds away from one sector into another, is that the sectors which are not favored tend to become financially weak and soon become candidates for direct Federal aid. Since experience tells us (particularly Great Britain) that once the government gets into the business of subsidizing a given sector, it never gets out, this process simply adds to the number of businesses that are recipient of government support.

- As I read the ERFCO proposal, a significant amount of the financial support will be in the form of ten-year loans. Under one analysis, these loans would only provide a ten basis point advantage over the rates of AAA private firms. If this is true, there is no doubt that these loans will be of little assistance in meeting nuclear and synthetic fuel goals.

- In assessing the impact of ERFCO in reducing our reliance on imported oil, one must compare the net difference in savings between a comprehensive energy program with ERFCO to a comprehensive energy program without it. I haven't seen any numbers which would indicate there would be any savings at all, much less the 7 million barrels per day that has been suggested.

- It is likely that ERFCO will not stimulate the economy (for other monetary and fiscal policy reasons, as well as political reality -- the stimulant will come from a tax cut, if anything) nor will it result in increased savings. Accordingly, there really is no macroeconomic benefit from ERFCO. Thus its utility must be measured in terms of achieving energy goals.

- I certainly recognize that there are national security and foreign relation objectives which need to be achieved and for which the private marketplace (so it is argued) will not incur a near-term cost because there is no profit motive. However, the President resolved this issue in his State of the Union Address when he pointed out that we would have to incur a near-term cost for our long-term security, and that there were only two choices available to us: direct government controls, e.g., rationing, or reliance on the marketplace, e.g., taxes with rebates to consumers. The President's tax proposals



and currently decontrol, will accomplish our security objectives and yet maintain the integrity of the marketplace system. The problem with ERFCO is that it destroys the integirty of the marketplace by socializing such a large chunk of our annual capital investment decisions. It should also be noted that most observers would rate the strength of OPEC to control oil supplies and prices as being the heart of our security problem. In all likelihood, OPEC's strength as a cartel will decline beginning in 1979 or 1980. This is precisely the period when ERFCO would become effective. Thus, I don't think ERFCO as a solution matches the time frame of the national security problem.

The Need. There is no doubt that additional government action is necessary to achieve our energy objectives in an economic, foreign policy and national security sense.

It's important, however, to recognize that the constraint to achieving the energy goals laid down in the President's State of the Union Address are not as much financial as they are regulatory, manpower, materials, technology and knowledge, marketplace uncertainty (because of the cartel) and others.

The great danger with a "finance oriented" board of directors making decisions on energy investment, is that they will draw financial support away from other worthwhile research projects which might have a better chance of success. Since our R&D capability in the energy area (independent of financial consideration) is limited (in terms of availability of scientists, etc.) mistakes on where to put our research dollars could be disastrous. The recent ERDA National R&D Report points out how difficult it is to determine where the investment should be, and the last thing we want are financially oriented government people making these decisions. I fail to see how the ERFCO board would better qualify in this area than the President and the Executive departments and agencies.

The following are specific energy problems which must be solved by government before we can hope to achieve the goals of Project Independence.

- Protection against cartel pricing policies designed to undercut the domestic alternative fuels market.
- Support for synthetic fuel development.
- Support for high-risk development such as the nuclear area.
- Support for energy projects involving extremely large financial support.

- Assistance for utilities.

- Authority to override governmental constraints for energy projects.

While ERFCO, as conceived (but certainly not as will be enacted by Congress), may permit us to resolve these problems, it does so at an unacceptable price and in an overkill fashion.

Philosophical Problems. The most critical domestic problem facing the Nation today, in my opinion, is the growing intrusion by the Federal government into the free marketplace and over the lives of individuals. Today, only two States in the Union -- California and New York -- have a population which exceeds the total number of government employees. Government spending today is a third of Gross National Product and will exceed 55% by the end of this century if we simply continue existing government programs.

To take a quantum jump forward into increasing government controls over the marketplace, is the last thing I would expect a Republican President to do, unless there was overriding and clear evidence that no other alternative is available. The obvious counter to this argument is that ERFCO simply is a way of streamlining existing government control and it supplants current government interference with a more efficient mechanism. This simply isn't the case, however, because ERFCO represents substantial increase in government control over the free marketplace.

There must be a clearer indication of why specific energy objectives cannot be accomplished without this intrusion. I have been unable to construct such an analysis myself, and if it exists, I certainly am unaware of it.

Political Considerations. ERFCO has some very attractive political pluses, principally because it is an imaginative and bold idea which might initially be sold as an example of strong leadership. The problem is that, like most highly complex ideas, it will be looked at very carefully over time and must stand up on its merits. For the above reasons, I believe that the substance of ERFCO will not withstand close scrutiny, will be attacked philosophically by the conservatives, and will ultimately fall on its face. To the extent that it is successful in withstanding attack and therefore can be perceived as an example of innovative thinking and leadership, I doubt that the President will get the credit.

Obviously, this kind of a high visibility proposal must be viewed from the perspective of a year from now. By that time,

it will be picked over, and the substantive flaws (to the extent they exist) will be fully exposed. Furthermore, it will have gone through a year of the legislative mill and this, of course, presents the greatest danger. The following are the possible scenarios which ERFCO may follow over the next year:

- It if it substantively weak (as many internal Executive Branch studies indicate -- all of which will undoubtedly be leaked) then this is likely to be tagged the same way as McGovern's $1,500 per person proposal.

- If Congress does not enact ERFCO (because of bickering among the Democrats who will try to load it up, or because of conservative opposition) then this will be billed as a major Presidential defeat because of the advance publicity given the proposal. It is one thing for various pieces of the President's State of the Union Message not to get enacted because there is no visible target which the Press can point to as having gone down in flames, but we don't have this cushion with ERFCO.

- Congress could load ERFCO up and send it to the President for signature, thereby raising the problem of a veto and the extraordinary embarrassing position that it would put the President in. One of the key benefits of ERFCO is the fact that it provides a mechanism for speedy decisions concerning energy investment. This is generally accomplished by limiting Congressional control and avoiding existing governmental roadblocks, such as environmental roadblocks. As you know, the President targeted in on this problem specifically in his Energy Independence Act proposal. Congress has refused to go along with this, and I can't imagine that they would be willing to do so in the context of ERFCO. Therefore, what you're likely to get is an ERFCO without the override capability, with Federal exploration and development authority, possibly with Davis-Bacon type provisions, and who knows what else included.

To sum this thing up politically, I think it's fair to say that the risks are very substantial and the benefits, to the extent they exist, are not likely to be very helpful for the President.

The Alternative. Unfortunately, because of the leaks concerning ERFCO (which do not help the President or the Vice President) it will be very difficult to work out an alternative compromise. The stories have all carried the $110 billion figure, and thus anything that comes in under that, even though it might have excellent substantive provisions, is likely to be dismissed as a watered down compromise.

If an alternative is to be seriously considered, we're going to have to start doing some spade work in the Press to counter the damage that has occurred thus far. (I assume that the leaks to date have come from anti-ERFCO forces, and that should be an indication of what will happen if the proposal goes forward in terms of in-house critiques that have already been completed.)

I would propose a mechanism which is designed to strip away government constraints which are preventing speedy energy decisions in a manner which will impose minimum costs on the economy, either in terms of tax burden or increased prices. In short, a red tape expediter which imposes minimum costs on the economy.

I suggest that the existing (and statutory) Energy Resources Council be used as the vehicle to implement specific, national energy objectives. The new law could create an Executive Committee consisting of the Secretaries of Treasury, Interior and Commerce and Administrators of ERDA and FEA. This group would act as a board of directors to:

- override government restraints on energy development projects.

- approve limited and specifically identified financial assistance for energy projects, e.g., synthetic fuel and nuclear development. [This function would be similar to ERFCO but limited in scope and existing Executive agencies would be utilized.]

- protect U.S. private energy investment against foreign cartel pricing actions by using a variety of powers such as import tariffs and quotas. Actions under this section would have to be implemented by Presidential Proclamation.

THE WHITE HOUSE

WASHINGTON

EFPC

THURSDAY, June 26, 1975

MEMORANDUM FOR : JIM CANNON
JIM CAVANAUGH

FROM : DICK ALLISON

SUBJECT: Energy Finance Options Paper
for the President - Friday

Last night, on the way in from Butler, the Vice President urged me to make sure of the following:

- That the options presented to the President in the paper planned for tomorrow include both

  1. The original proposal which is currently being staffed and is due into Connors' office by close of business today, where the capitalization is $10 billion and the borrowing authority $100 billion, as well as

  2. What he and I understand to be the latest Zarb/Morton version of the Energy Finance Corporation, capitalized at $5 billion dollars.

ERFCO
Charter

PROPOSAL FOR A PROGRAM PLAN CETEP*

FOR THE

ENERGY RESOURCES FINANCE CORPORATION

BUREAU OF DOMESTIC COMMERCE
DOMESTIC & INTERNATIONAL BUSINESS
ADMINISTRATION

SEPTEMBER 17, 1975

*CETEP - COMMERCIALIZATION OF EXISTING TECHNOLOGIES FOR ENERGY PRODUCTION

I. Purpose of Report

Consideration is in process to establish the Energy Research Finance Corporation (ERFCO). The corporation will have authority to make loans, guarantee loans and provide financing and economic assistance for the development of domestic sources of energy.

This proposal defines a specific charter for ERFCO and points out where impacts can be most significant in developing new sources of domestic energy rapidly.

Consequently, the program designated CETEP (Commercialization of Existing Technology for Energy Production) is proposed.

In this program concept, the following programs currently existing or under development in ERDA would not be eligible for ERFCO loans until certified by ERDA for production.

- Coal gasification (a near term possibility).
- Solar energy.
- Oil from shale.
- Pyrolysis.
- Electrolysis (eco-energy)
- Molecular (requires high temperature and pressure).

Four areas of domestic energy resources that are commercially operational and could be considered for ERFCO loans are as follows:

- Conversion of oil and gas powered generating plants to coal.
- Processing of municipal waste to generate power and recover materials in coal and oil fired biiler.
- Development of geothermal energy.
- Acceleration of nuclear energy development.

CETEP would also provide an appropriate mechanism for transfer of technology from ERDA developments and Pilot Plant operation to the commercial sector.

The sizes of the proposed programs are based on previous studies. The number of power generating plants that can be converted to coal burning was developed by the FEA. The number of municipal waste processing plants is based on serving 62% of the population of the United States. The number of geothermal plants was developed from the geothermal study prepared for Project Independence as were the number of nuclear plants proposed.

The majority of estimates on investment, energy production and jobs generated were obtained from sources listed in Section V. Refinement of these estimates through an extensive study would produce some changes but these should not be extensive. The labor estimates were coordinated with the Department of Labor.

EXECUTIVE SUMMARY

CETEP PROGRAMS

° This program is designed to

1) promote the accelerated use of coal for oil and gas in electrical generating facilities.

2) promote the accelerated development and production of energy from nuclear power, geothermal energy and municipal wastes.

° As a consequence of action to promote the use of these sources the following economic benefits occur:

1) additional direct employment totaling 68,800 new jobs will result by the end of the fifth year, with an equivalent number of jobs being generated by the "ripple effect."

2) completion of these new facilities will result in the production of energy equivalent to 2 million barrels of oil per day.

EXECUTIVE SUMMARY

CETEP PROGRAMS

	Conversion of Oil & Gas Power Plants to Coal	Solid Waste Processing for Energy	Geothermal Power Plants	Nuclear Power Plants
Total Loan Commitment in Millions	$1,800	$6,300	$940	$35,000
Equivalent Annual Energy Production Upon Completion (Millions of Barrels of Equivalent)	110	90	128	400
Cumulative New Work Over 15 Years (1,000 Man-Years)*	102	370	42	650
Loan Dollars for Each Man-Year of Work Generated	$18,000	$17,000	$22,400	$54,000

*Department of Labor aggregate data indicates that these figures would double for "ripple effect."

Number of Persons Employed At The End of Each of
The First Five Years of CETEP.

No. of persons employed at the end of the:	Coal Conversion	Municipal Waste	Geothermal	Nuclear	Total CETEP
1st. Year	1,000	11,300	200	1,000	13,500
2nd. Year	2,000	18,100	500	4,000	24,600
3rd. Year	3,000	20,900	700	6,000	30,600
4th. Year	6,000	21,200	1,100	16,000	44,300
5th. Year	8,500	22,700	1,600	37,000	68,800

II. Description of CETEP Programs

A. Conversion of Power Plants to Coal

In 1973, about 45 percent of the installed capacity used either oil or gas to generate electricity. The FEA has indicated that some 54 plants with 105 generating units totalling 14,452 megawatts of capacity can be converted to the burning of coal.

It is estimated that all of these plants can be converted to burning coal in a four year period and that loans or guarantees would provide significant incentive to make the conversions. This program represents a quick way to obtain conservation of gas and oil.

In addition to conserving oil and gas, new jobs are provided on a permanent basis to operate the plants and to mine and transport coal. These are additional jobs that are generated because coal burning plants require operating and maintenance personnel for handling coal, disposal of fly ash and for operating and maintaining air pollution control equipment.

B. Municipal Waste Processing

Resource recovery is concerned with the disposal of municipal solid waste and has come to be viewed as an alternative to the conventional disposal of waste. This alternative has resulted from environmental considerations and in part from resource scarcity, and is a potential energy source. For the most part, it is a mechanized process that separates ferrous metal, aluminum, glass, paper and combustibles. The

combustible components are used to generate energy in electrical generating plants, converting the energy into steam or in pyrolysis plants, where the components are converted to oil or gas.

The availability of this energy source has the same geographical distribution as the population of the United States. Building plants near population centers would reduce transportation costs of solid waste and transmission costs of power.

A resource recovery system consisting of 226 plants could be built within ten years serving 62 percent of the population in 150 metropolitan areas and process 58 percent of municipal solid waste.

In addition to producing energy, solving much of the solid waste disposal problem and providing jobs, the system could after full development, recover annually 7.5 million tons of ferrous scrap; 5 million tons of aluminum; 6.4 million tons of glass; and 5.5 million tons of paper. The total value of the product is $1.1 billion annually, including the energy produced.

C. Geothermal Energy

There are two geothermal facilities currently operational in the United States, a dry steam plant generating 490 MWe at the Geysers in California, and a small facility in the Imperial Valley. There are only a few other sources of natural dry steam. Other types that have potential are hot brine, hot dry rocks, and deep normal-gradient formations.

Although plants of the dry steam type and the hot brine type are commercially exploitable, a program in which a large number of plants are started simultaneously in the next year or two is not feasible. The present state of knowledge concerning the geographic location and extent of geothermal sources is limited. Consequently, the generating capacity is as of yet uncertain. Geothermal exploration on a massive scale requires development of an industry infrastructure to obtain rigs, train crews, and develop large scale generating techniques, peculiar to geothermal processes. This phase precedes planning and construction of plants.

Based on these considerations, a program in which four new plants of 200 MWe each are on line at the end of six years and 84 new plants are on line at the end of fifteen years is analyzed in this paper.

It is our opinion that this development is not likely to take place unless there is a new institutional mechanism for making or guaranteeing loans since the risks associated with geothermal exploration are high. Exploration, although similar to those in oil exploration and production does not provide the banking industry with adequate experience on which to base credit decisions.

D. Nuclear Energy

The first commercially operated nuclear plant was placed on line in 1957 and was 90 megawatts electrical (MWe) capacity. In the past 15 years larger nuclear units have

been placed in service and are producing an increasing proportion of domestic power demand. As of 1972, over 110 nuclear plants were operational, under construction, or under order. Nuclear power reactors are currently supplying three percent of the domestic power supply.

The factors most likely to delay the commercial installation of nuclear power are 1) environmental constraints; 2) siting problems, 3) nuclear waste disposal, 4) skilled labor availability, 5) fuel availability and cost. Nuclear power plants are typically capital intensive, require long construction and institutional delays in obtaining operating permits, and involve very long pay-back periods.

For these reasons, a program of loans and loan guarantees would expedite bringing nuclear plants on line.

While capital investment required to build capacity comparable to energy now provided by coal, gas or oil by 1990 (for purposes of comparison, 12 million barrels of oil per day equivalent) would require $350 billion in investment, a smaller program which could be part of the total nuclear program could benefit from ERFCO.

Accordingly, the program chosen for analysis consists of fifty plants of 1100 MWe capacity each to be built by 1990.

III. Summary of Program Results

A. Conversion of Power Plants to Coal

- 54 plants, consisting of 105 generating units, with a total of 14,452 megawatts can be converted to coal.

- This will annually substitute 32 million tons of coal for oil and gas, an equivalent of 110 million barrels of oil. Cumulative oil savings over fifteen years from start will be 1400 million barrels of oil.

- $1.8 billion in investments will be required to make the conversions over a four-year period.

- 8,000 man years 1/ will be required over four years to build new equipment, make plant conversions, and build railroad cars and barges.

- 3,500 additional jobs will be generated to operate the plants.

- 6,000 jobs will be generated to mine and transport coal. This is 5,000 more than those needed for gas and oil distribution.

- These new labor requirements amount to 102,000 man-years over a fifteen-year period.

- $18,000 of investment is needed for each man-year of work generated.

B. Municipal Waste Processing

- 226 plants covering 62 percent of the population of the U.S. and processing 57.6 percent of municipal solid waste can be built in ten years.

- 90 million barrels of oil equivalent annually in fuels and energy will be produced when the recovery system is in place. Over a fifteen-year period, cumulative energy production will be the equivalent of 930 million barrels of oil.

- $6.3 billion in investment is required over ten years.

1/ The Bureau of Labor Statistics estimates that for each job that is created directly in industry, the overall impact of the ripple effect throughout the economy results in the creation of about one additional job. Therefore, the total number of jobs created is approximately double the number of direct jobs estimated for each activity in this paper.

- 106,000 man-years are required over ten years for construction of plants.

- 51,000 man-years of labor are required over ten years to build equipment.

- Generate 25,600 permanent jobs when all plants are on line.

- These requirements in labor total to 370,000 man-years over fifteen years.

- $17,000 of investment generate one man-year of labor.

- After full installment, the plants will produce materials, fuels, and energy valued at $1 billion annually.

- System will appreciably reduce land-use requirements for waste disposal.

C. Geothermal Energy

- Construction of 84 geothermal power plants, 200 MWe each can be in operation by the year 1990.

- Energy produced would be the equivalent of 128 million barrels of oil annually when all plants are in place. Cumulative energy production over the fifteen-year period is 600 million barrels of oil.

- 940 million in investment is required over the fifteen-year period.

- 32,800 man-years of labor would be required to construct plants and manufacture equipment.

- 1,900 jobs would be created in operating and maintaining the plants and gathering fields when all plants are on line.

- Total labor requirements over fifteen years are 42,000 man-years.

- $22,400 investment is required for each man-year of work generated.

D. Nuclear Energy

- 50 nuclear plants of 1,100 MWe each can be built over fifteen years.

- Energy produced would be the equivalent of 400 million barrels of oil annually. Over the fifteen-year period, cumulative energy production is equivalent to 850 million barrels of oil.

- 400,000 man-years of labor would be required to construct plants and manufacture equipment.

- Total man-years of labor over fifteen years would be 650,000 man-years.

- $54,000 of investment is needed for each man-year of work generated.

IV. Comparison of Proposed Programs 2/

A. Energy Output

Conversion of power plants from burning oil and gas to burning coal yields earliest results, reaching a level of 110 million barrels of oil equivalent annually in four years and yielding a cumulative savings of 1,400 million barrels of oil equivalent in fifteen years.

Energy from solid waste is obtained by the third year, building to a maximum of 90 million barrels of oil equivalent in ten years. Cumulative production is 930 million barrels of oil equivalent in fifteen years.

Geothermal energy will be produced in small amounts after five years building rapidly to 130 million barrels of oil equivalent annually at the end of ten years. Cumulative production in fifteen years is 600 million barrels of oil equivalent.

Additional nuclear energy will first be produced eleven years after program initiation but will build rapidly since all plants will be completed after fifteen years. After completion, yearly production of energy will be 400 million barrels of oil equivalent annually and cumulative energy produced over the fifteen year period will be 850 million barrels of oil equivalent in fifteen years.

2/ Figures 1 thru 4 at the end of this section illustrates the manner in which labor, investment and energy output build up over fifteen years for the programs chosen for analysis.

B. Labor Requirements

Conversion of power plants will require 500 man-years in the first year, climbing to 3,500 man-years in the fourth year. From the fifth year onward, 8,500 man-years per year will be required for a cumulative total of 102,000 man-years in fifteen years.

Labor requirements for solid waste processing will begin to rise sharply after two years. The delay is caused by the need for coordinated planning by industry and municipal governments. After two years, a level of around 7,000 man-years per year for construction and operation is reached and maintained throughout the fifteen-year period. Cumulative employment over fifteen years is 350,000 man-years.

Labor requirements for geothermal energy production rise slowly reaching a level of about 1,800 man-years per year after five years and 2,500 man-years per year after ten years. Cumulative employment over fifteen years is 25,000 man-years.

Labor requirements for additional nuclear energy will be insignificant in the first three years due to the requirement for licensing and environmental impact analysis. After the first three years, labor requirements will build uniformly through the fifteen year period. The average level will be 43,000 man-years per year.

C. Investment Schedules

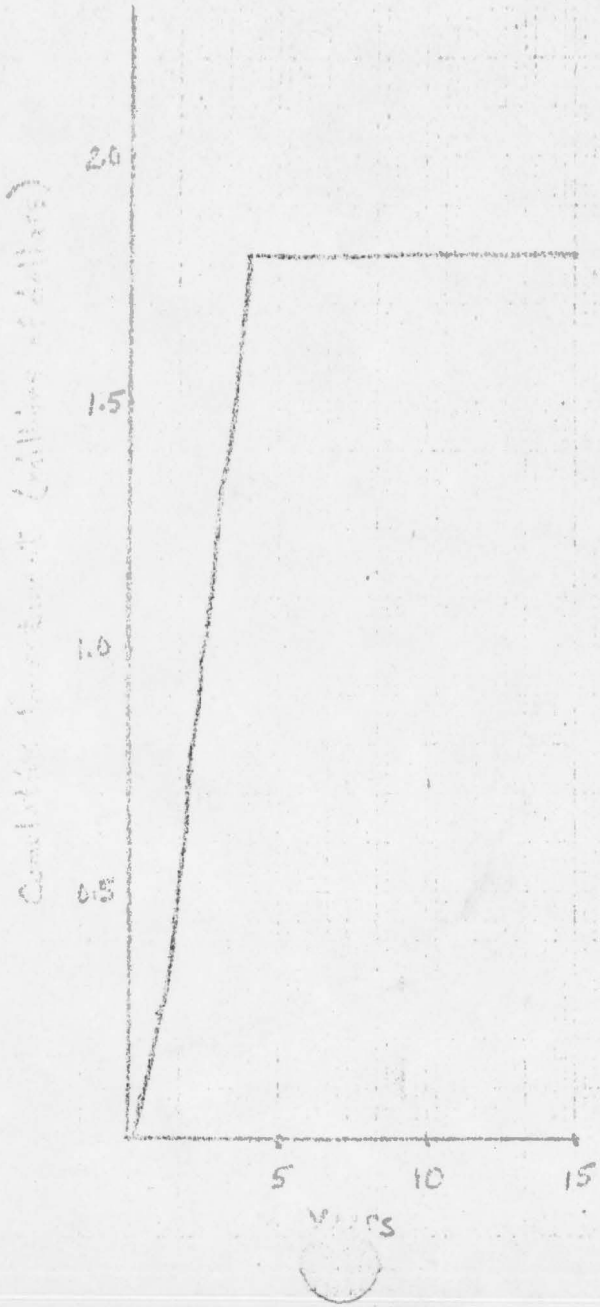
Investment for coal conversion and for municipal waste processing will achieve significant levels in the first two years. In the case of conversion, all of the investment can be made in four years and all of the investments in municipal waste processing can be made in ten years.

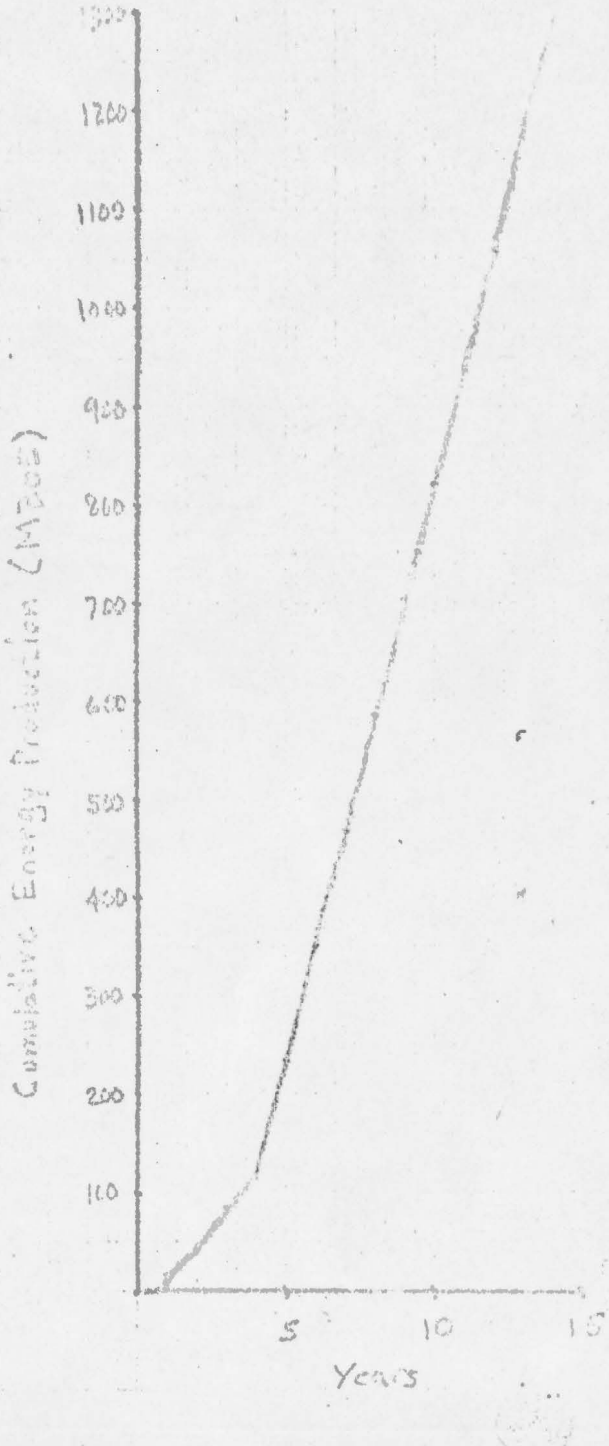
Investment for geothermal energy production cannot proceed as quickly. Of the total investment of $940 million, less than $150 million is expended by the end of the first five years.

Investment in nuclear energy will be relatively insignificant in the first three years but will build uniformly and rapidly. At the end of five years cumulative investment will be $3 billion accumulating to $35 billion at the end of fifteen years.

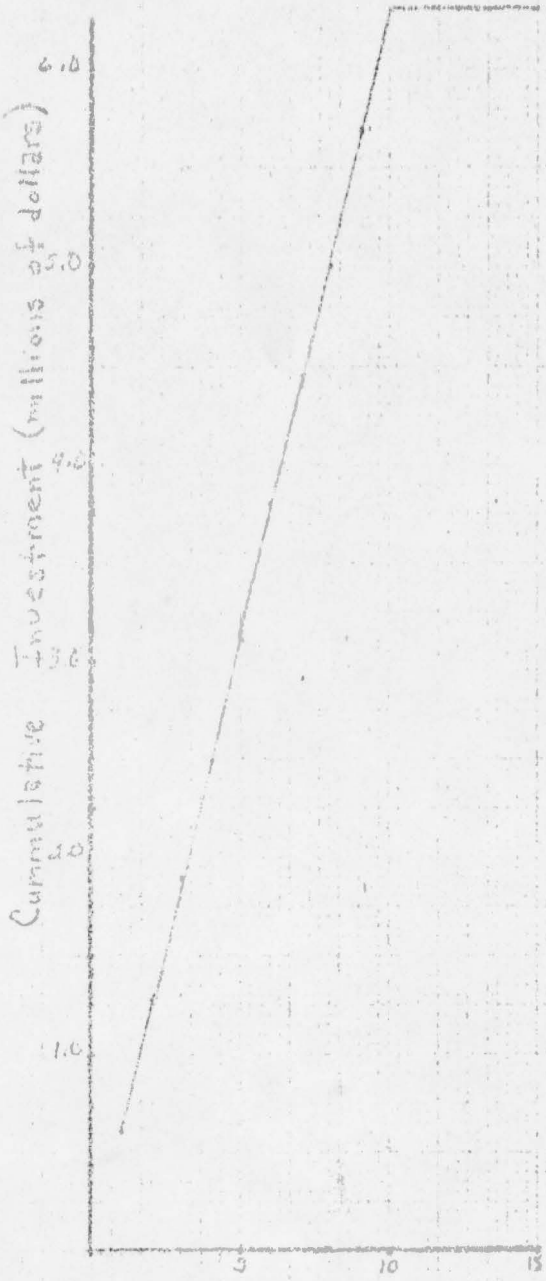
Figure 1.

Conversion of Oil & Gas Fired Power Plants to Coal





Extracting Fuels and Energy From Solid Waste



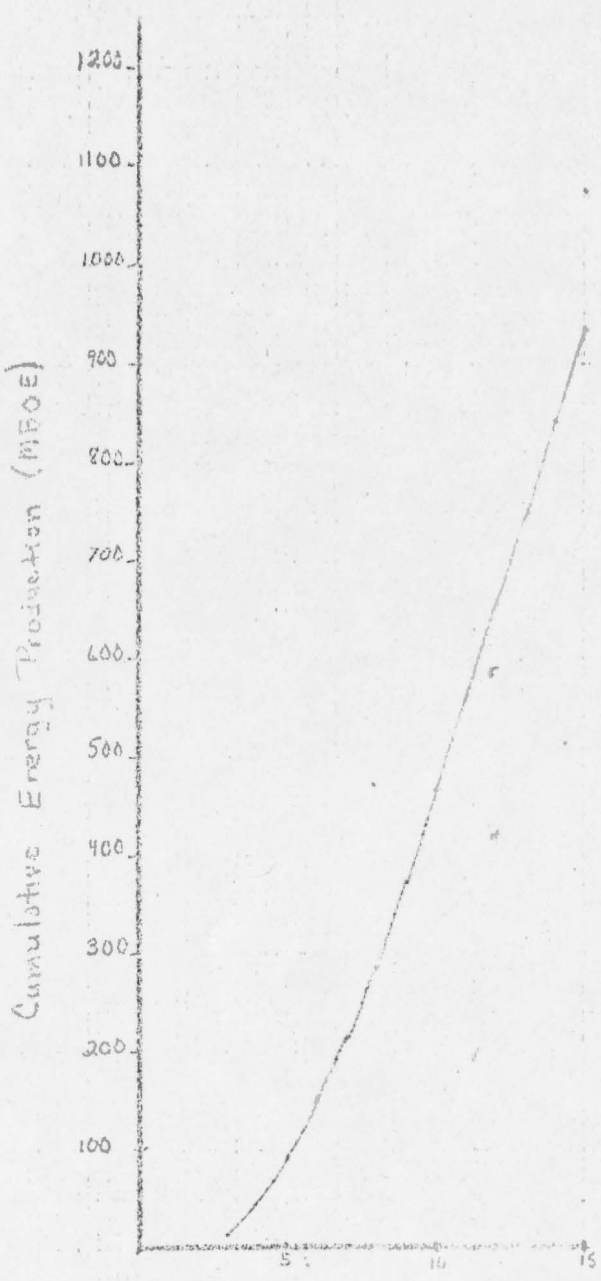
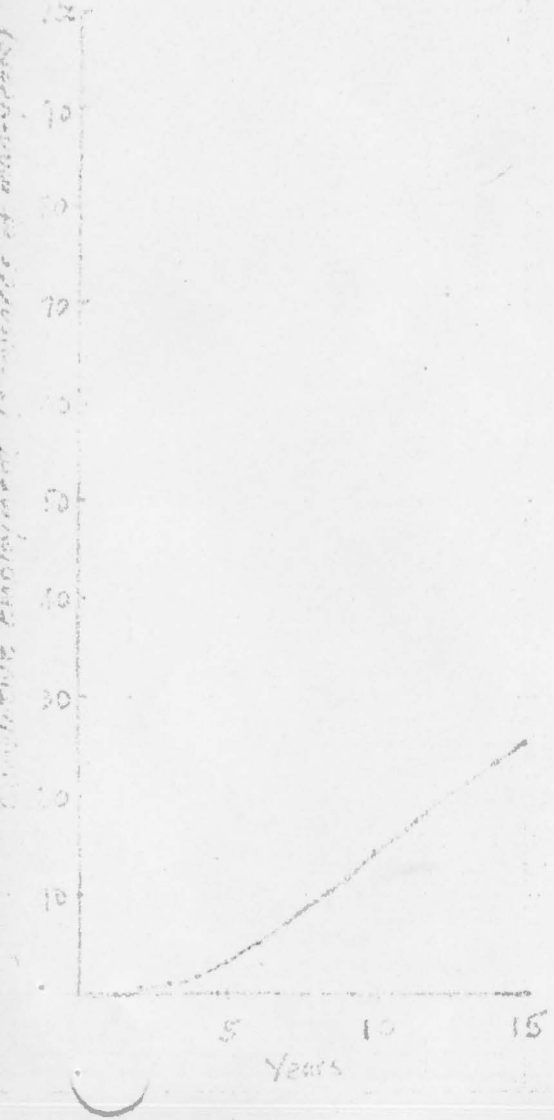
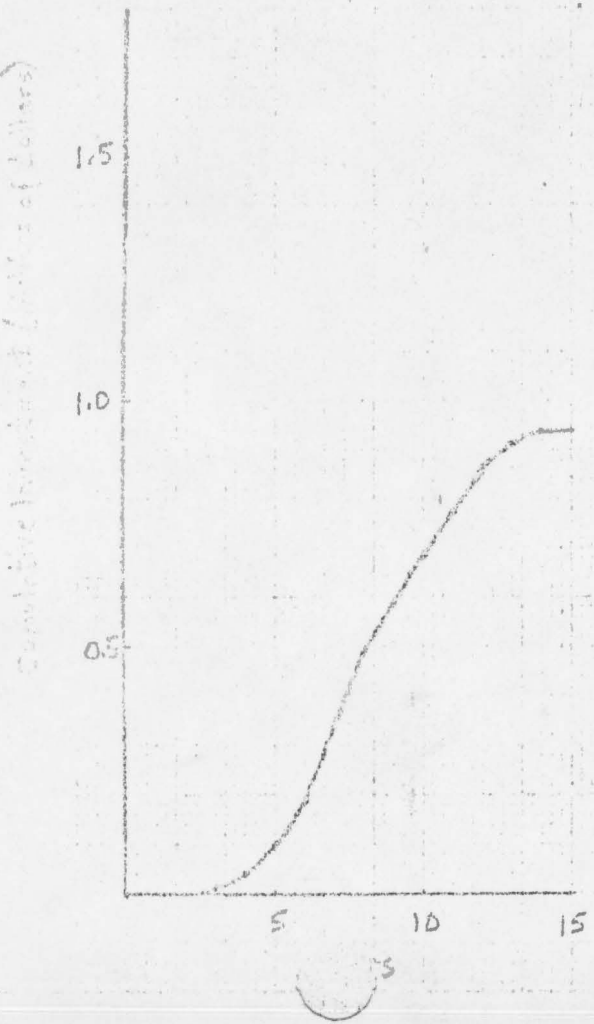


Figure 3.
Geothermal Power Plants





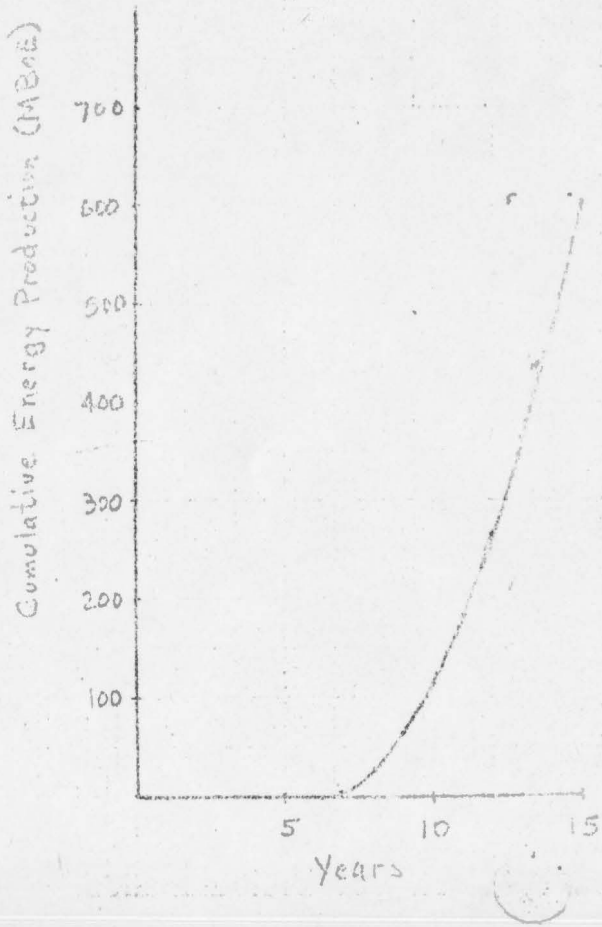
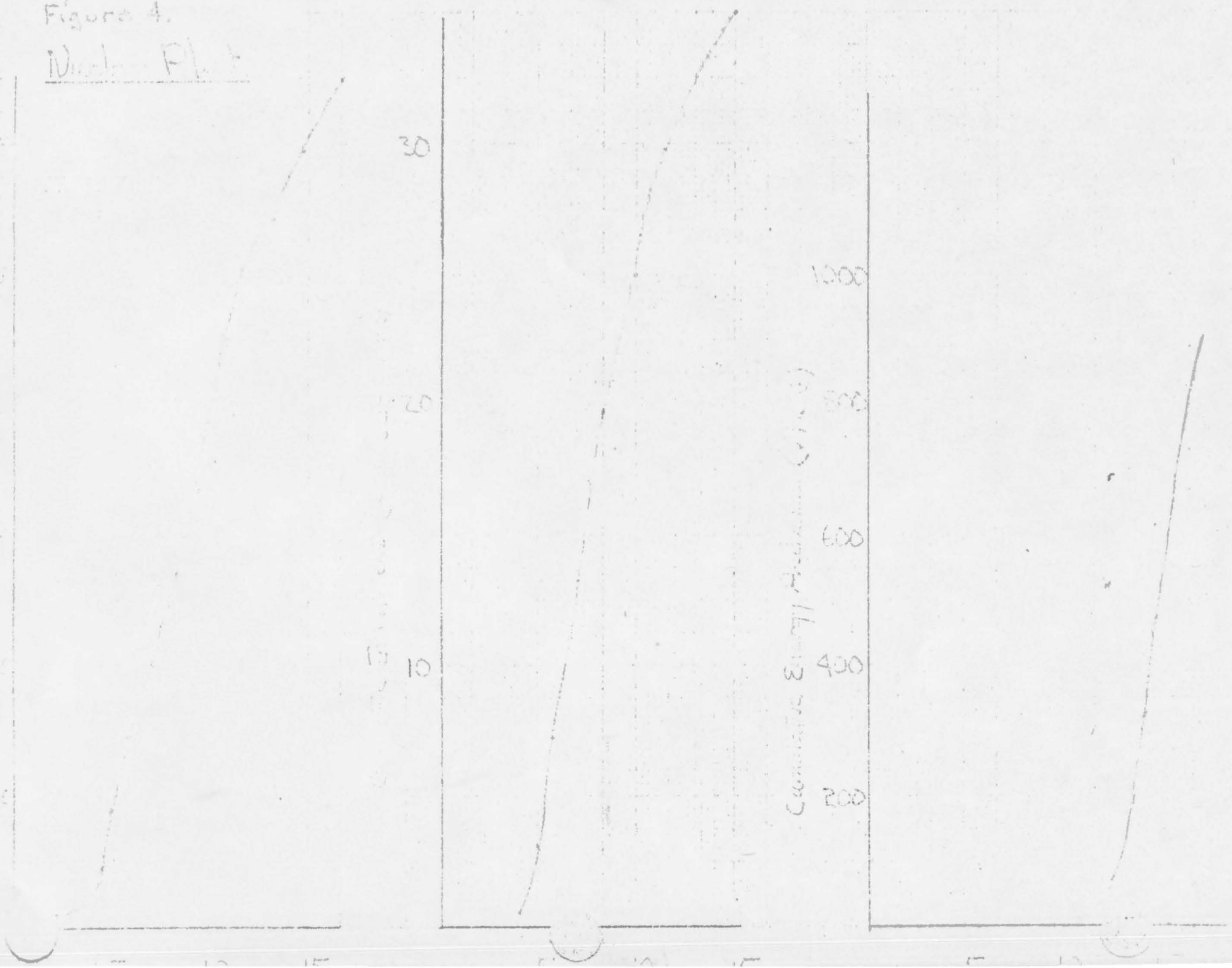


Figure 4.

Nuclear Plant



A. Conversion of Power Plants to Coal Methodology

The primary methodology employed to arrive at the values presented was through the use of engineering estimates made by the Bureau of Domestic Commerce staff. Investment was estimated at $125 per kilowatt of capacity. This conversion capacity data were obtained from FEA. Estimates of manpower requirements for the coal sector were obtained through personal communication with the firm of Peat, Marwick and Mitchell, the consulting firm which performed earlier energy studies.

Estimates of the rate of plant conversion are based on the assumption that all plants converted to coal will burn high sulfur coal and thus require stack-gas SO_2 scrubbers. SOCTAP data and projections for vendor availability and utility off-line site availability (restrained by reserve generating capacity requirements) were basic factors in estimating the conversion schedules. SOCTAP scrubber installation projections were modified by several assumptions for the mandatory oil to coal conversion plants: 2) mandatory conversions would be given some priority over projected scrubber installations on existing coal fired units, both for scrubber availability and planned off-line site availability; b) apparent and expected rate at which EPA approves individual oil/coal conversion cases, and; c) the assumption that EPA eventually approves all O.F.U. oil/gas burning prohibitions. The volume of conversions in the 1976-78 period is restrained by the

above considerations; 1979 conversions are the remainder, with the potential in that year for additional conversions over the 14,500 MW assumed to be under prohibition order during the period.

Bibliography

The sources used were:

FEA Factsheet dated May 9, 1975.

This factsheet provided capacity ratings for each plant selected for early conversion.

Personal communication with Peat, Marwick and Mitchell, Inc.

This conversation provided data for the coal sector.

Report of Sulfur Oxide Control Technology Assessment Panel - 1973.

B. Waste Methodology

Utilizing the Franklin Associates report entitled "A Cost/Benefit Analysis of Resource Recovery in the Major Metropolitan Areas," ratios of operating employees per plant, construction employees per plant, and average tonnage per plant were derived by the BDC staff. A ratio of .9 barrel of oil per ton of waste was assumed to allow energy savings per year to be calculated. Investment was prorated over a ten year period to obtain an average fixed investment per plant. A ratio of value of shipments per employee was used to determine the associated employment to produce the materials and equipment installed in the CETEP facilities.

A construction schedule of two years prior to a plant becomes operational was assumed. One half of the 226 recovery facilities was estimated to be on line by the fifth year, the first one beginning operation by the third year. Employment of operating personnel is first scheduled in the third year also. All construction and manufacture of equipment was assumed to be completed by the end of the ninth year.

Bibliography

Potential for Resource Recovery In the United States --A Cost Benefit Analyses of Resource Recovery in the Major Metropolican Areas.

Prepared for Aluminum Company of America by William E. Franklin, Franklin Associates Ltd. Prarie Village, Kansas, May 1975 (revised)

Industry Profile. U. S. Department of Commerce

C. Geothermal Methodology

Exploitation of geothermal sources of energy will provide some electric power within the next decade. This is due in part to less severe environmental restrictions than are applicable to other sources. The example investment schedule used for this report provides a payoff period starting in 1982, increasing in output until 1990. Employment within the sector will increase as soon as investment begins, with additional labor support required in manufacturing and geothermal prospecting sectors.

Total investment for the program outlined will be $940 million, with a half of the requirement used by 1983. Cumulative employment to 1990 will be 25 thousand man-years, including permanent employees as well as construction and indirect manpower inputs from other sectors.

Bibliography

Assessment of Construction Equipment Availability, Energy Requirement, and Construction Industry Capacity to Support Project Independence Contract TT-A-412-75-011, FEA February 1975.

Bowen, Richard G., and Edward H. Groh, "Geothermal-Earth's Primordial Energy," TEchnology Review, Vol. 74, number 1, October/November 1971.

National Geothermal Energy Program -

A Report to the Federal Energy Administration by the Geothermal Energy Task Force, July 25, 1979.

(3) Exploring Energy Choices, Energy Policy Project of the Ford Foundation, 1974.

(4) Survey of Nuclear Power Supply Prospects, Hittman, Associates, Inc., February 1972 for Environmental Protection Agency, Contract No. EHSD 71-43.

D. Nuclear Methodology

The construction and financing of nuclear power plants is differentiated from other power sources due to long time lags which must be considered within the investment period before the plant can be brought on line. The example investment schedule takes these considerations into account, allowing a three-year lag in initial investment expenditures, and a nine-year construction and testing period for plant completion after initial expenditures.

Total labor inputs include an allowance for labor expended in manufactured goods installed in power plants. Some permanent labor is involved early in the period in fuel exploration and processing, but larger labor inputs occur later in the period as generating plants come on line.

Due to the inherently long construction period, cumulative power supplied during the period will be low. Most of the energy output from the investment will occur in the subsequent period 1990-2020.

Bibliography

(1) Assessment of Construction Equipment Availability, Energy Requirements, and Construction Industry Capacity to Support Project Independence Contract No. 14-01-0001-1664, Tetra-Tech., Inc. for FEA, February 1975.

(2) United States Energy through the Year 2000, U.S. Department of the Interior, December 1972.