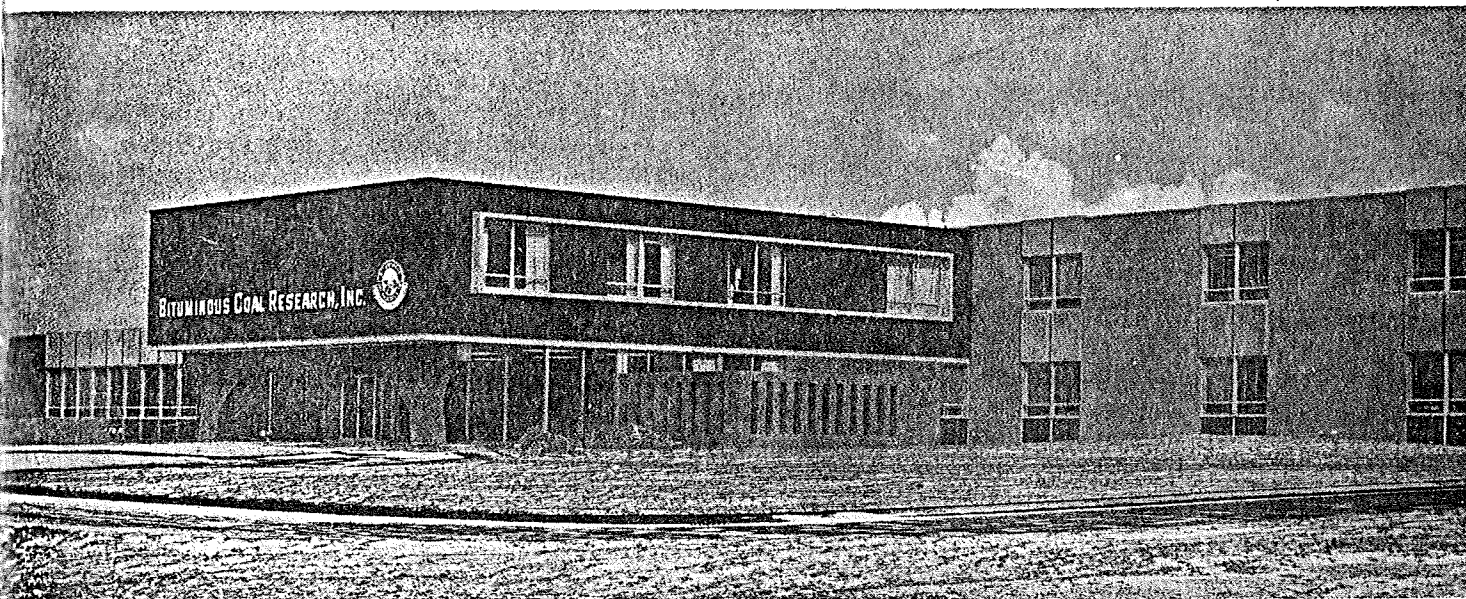


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Engineering Manpower & Energy Needs—4



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Federal Policies Have an Impact

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Government policies that affect energy supply and demand may have unexpected and disastrous consequences for the energy supply situation.

In government parlance the country has been in a serious energy crisis for more than a year. Knowledgeable people in the petroleum industry have been talking of the long term problems of petroleum and natural gas supply for nearly ten years, but the facts came home to the American people and their government with the 1973-1974 embargo on petroleum from the Middle East. Actually the problems had started in 1972-1973

because of shifts from coal to natural gas for power generation in the Northeastern part of the country. These shifts were generated by EPA regulations resulting from the Federal Air Pollution Act.

It seems to me that the events which have taken place over the last three years in energy supplies illustrates one very important fact; governmental policies with impact on energy supply and demand may have unexpected and disastrous consequences on the energy supply situation. This is particularly true where such policies dictate rapid changes in energy use that are not in the economic interests of those affected.

Government policies that encourage wasteful uses of a particular form of energy are singularly counterproductive. The control of natural gas prices at the wellhead at very low prices en-

couraged use of this clean, convenient form of energy for the most pedestrian purposes. This policy led to substitution of natural gas for other forms of energy because of the unrealistically low price for this fuel. At the same time, the low prices virtually stopped exploration and drilling for new sources of natural gas since the return on a gas well scarcely paid for drilling and development costs. When wellhead price controls were initiated in the mid 50's, the industry was drilling nearly 60,000 wells/yr. looking for crude oil and natural gas. By 1970, some 15 years later, the number of wells drilled annually had dropped below 30,000. It has been obvious for some time that natural gas has much more valuable end uses than those dictated by the controlled price of gas. Currently, intra-state gas prices in Texas are nearly four times the controlled interstate price. The natural gas industry can only be brought to economic reality by discontinuing federal controls to permit market forces to establish reasonable economic uses for this energy and raw material source.

Likewise federal policies and regulations that promote use of some forms of energy or discriminate against other forms for various social reasons may cause substantial disruptions in energy supply and demand. Currently, it seems reasonable that the nation needs to shift from crude oil and natural gas to coal as our major fossil fuel. A casual study of existing and proposed policy regulations, particularly in environmental and land use controls, lead one to the conclusion that the federal government is doing what it can to stop the shift to coal. It is interesting to note that in Texas, where there is a relatively free market situation and 40% of the nation's oil and gas, there is currently a rapid shift from natural gas and fuel oil to lignite as a major source of energy for electric power production.

Federal policies cause uncertainty

One of the major disturbing factors in the entire energy picture today is the uncertainty with regard to future federal policies for the energy industry. It is going to be difficult to get the necessary investments in capital and technological development that our problems seem to warrant without firm long-term policies. Risks will not be taken as long as it seems probable that changes in federal policies may substantially increase the risks or reduce the potential economic gains.

It would seem that a reasonable initial program for the country would be a strong program of exploration and drilling for petroleum energy. Our studies at Texas A&M indicate that crude oil and natural gas reserves can be correlated only with footage of holes drilled. If we want to improve the supply of petroleum it seems evident that a sub-

stantial drilling program is warranted. It is interesting to note that, in contrast with the major petroleum companies, many wild-cat operators are extremely optimistic that new finds will occur in the continental United States. For manpower the program requires geologists, geophysicists, petroleum engineers and drilling crews. All of these skills are in fairly short supply because of the drop in drilling rates in this country previously discussed. Most of the shortage could probably be made up by shifting scientists and engineers from related disciplines and using crash training programs to give them the special knowledge required. Chemical engineers are needed for design and control of process plants.

The second phase of a national energy program may quite properly be the development of the nation's coal resources. Such development must include not only direct use of coal, but also its conversion to usable gas and liquid fuel. Our chemical engineering faculty has been studying the use of methanol derived from coal as a substitute for gasoline. It is our opinion that coal research and development must be a substantial part of any viable energy program, particularly for solutions of our near future problems. Major technical manpower needs for the coal research and development program include mining engineers, extractive metallurgists, civil engineers, mechanical engineers, chemical engineers, chemists, physicists, and materials handling experts. With the exception of mining engineers, these specialists are not in short supply and are not expected to be so during the next ten years. Here again special education and training will be required to provide any highly specialized training needed. When the probable effort needed in coal research and development is compared to the space effort there seems little need for pessimism.

The shift will be to nuclear power

A substantial shift to nuclear energy for power generation is indicated by our current fossil fuel energy problems. Most of the technology for power generation by the fission process is available along with a substantial pool of engineering and scientific manpower trained by the federal government and housed in government laboratories. The creation of the Energy Research and Development Administration should shift this manpower pool to civil problems. Our difficulties in this area are twofold. First, our experts are in government and have limited knowledge and experience in the private sector so that a reorientation process will be required. Secondly, many of our nation's people have developed almost a morbid fear of nuclear fission, controlled or uncontrolled, and government has reacted accordingly. If nuclear power is to be

developed there is a need for a substantial education program for the general public. My investigation of our peaceful nuclear program has uncovered the loss of only two lives in a period of over 25 years. Nuclear energy use certainly has a good track record that can be emphasized to the public.

In our longer range energy program there must be new sources of energy and new liquid fuels. The greatest potential seems to lie in solar energy, the nuclear fusion process, geothermal energy, and energy from biological (agricultural) processes. Solar energy which is under fairly intensive study at present, has both great potential and great problems. Its greatest initial potential seems to be in use for heating and cooling homes and office buildings.

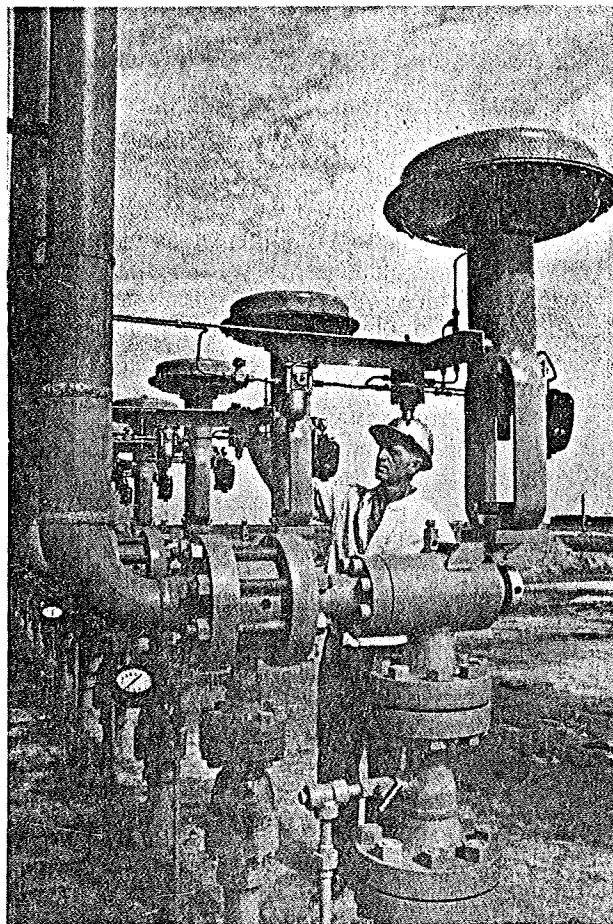
The nuclear fusion process has the potential for cheap, plentiful energy from fuel available in the oceans. Again, most of the knowhow in the fusion process is in government laboratories, although a rather substantial program supported by the private electric power industry is under way at The Univ. of Texas. The difficulties ahead are great. Our present state of technology does not generate much optimism.

Geothermal energy in large quantities is available in the heat stored in the earth's core. The quantity of energy available through a decrease of only 2°C. in the mass of the earth is fantastic. Use of this energy is dependent on man's ability to drill to greater depths than is possible now, and on suitable down hole heat transfer mechanisms. Current schemes to utilize natural hot waters at reasonable depths are feasible with existing technology, but the energy available from this source is limited.

A potential in biological processes

The use of biological and agricultural processes as sources of gas and liquid fuels has been under study for years, but not through a coordinated, long-range program. Isolated projects have yielded useful results, for example, gas from sewage disposal operations and treatment of feed lot wastes. Various alcohols can be produced from agricultural raw materials and energy in agricultural wastes may be recovered through burning. The potential of biological processes to provide for man's energy needs in addition to food should have more serious consideration. The potential of these processes may depend on our willingness to limit population.

All research and development required for these long-range energy sources requires the same technical manpower as for our existing technologies. Discoveries in all of these areas will depend on the basic scientists: chemists, physicists, and biologists. Implementation will continue to be the



Coal research and development must be a substantial part of any viable energy program, particularly in the near future.

task of the engineers, agriculturalists, and entrepreneur. Our existing educational systems are designed to provide all of these technical specialties and the young men and women of this country are certainly capable of meeting the challenges. The nation needs only to insure that they have the opportunities to educate themselves and participate in the process.



Benson