THE IMPACT OF ENERGY DEVELOPMENT ON WATER RESOURCES

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When I accepted the invitation to speak to this group on the occasion of its Twenty-fifth Annual Conference, I asked myself, "What can I say to these people that is new, exciting, or different? I am sure they have already heard many arguments about water quality and quantity for energy development. They must have debated over whether we will even have enough water in the West for continued development."

What I have chosen to discuss with you today, while not likely to bring you to the edge of your seats, is very definitely an issue of importance to this nation and to the state of New Mexico: the President's synthetic fuels program, and its relation to water usage and the New Mexico resource base.

The major elements of my talk today are five:

1. A brief overview of the President's proposed synfuels program.
2. A quick look at the potential for synfuels in New Mexico due to our extensive coal reserves, with some cautions added.
3. A focus on the water thirstiness of synfuels production.
4. Some very interesting and frustrating results of a survey on attitudes toward water use.

5. An attempt to put the significance of future synfuels and other energy efforts into some perspective, while gracefully admitting how many questions we do not have answers to.

The President's Synfuels Program

In July of last year, the President announced his synfuels program. He expects that by 1990 the United States will produce the equivalent of 2.5 million barrels of oil a day from synthetic fuels including coal liquefaction, coal gasification, oil shale, biomass, and unconventional gas.

Along with this major announcement, the President submitted to Congress proposals to develop an energy mobilization board to "fast track" these and other "priority energy projects" and an energy security corporation to fund, to the tune of $80 billion, synthetic fuel development and production. These two proposals are presently undergoing that wonderful art of compromise in House-Senate conferences. One major action taken there was to cut the funding to $20 billion.

Even though the Administration's synfuels proposal has yet to make it through the legislative process, it is worthwhile to take a brief look at the magnitude of the program as envisioned by the Administration.

The first two figures I am about to show will give you a feel for that magnitude and for the wide variance in production goals for synfuels.

Figure 1. President Carter's Synfuels Program -- Three Scenarios

The three bars on the left represent total projected U.S. synfuels production in 1985, assuming three different program levels. These scenarios were provided in testimony before the Senate subcommittee on Synthetic Fuels in September 1979.

Case I: Represents a low level of production related to a good commercialized test program, equivalent to less than 100,000 barrels of oil per day.

Case II: The middle bar represents an accelerated engineering program with removal of impediments.

Case III: The solid colored bar represents an all-out crash program, equivalent to roughly 250,000 barrels of oil per day.

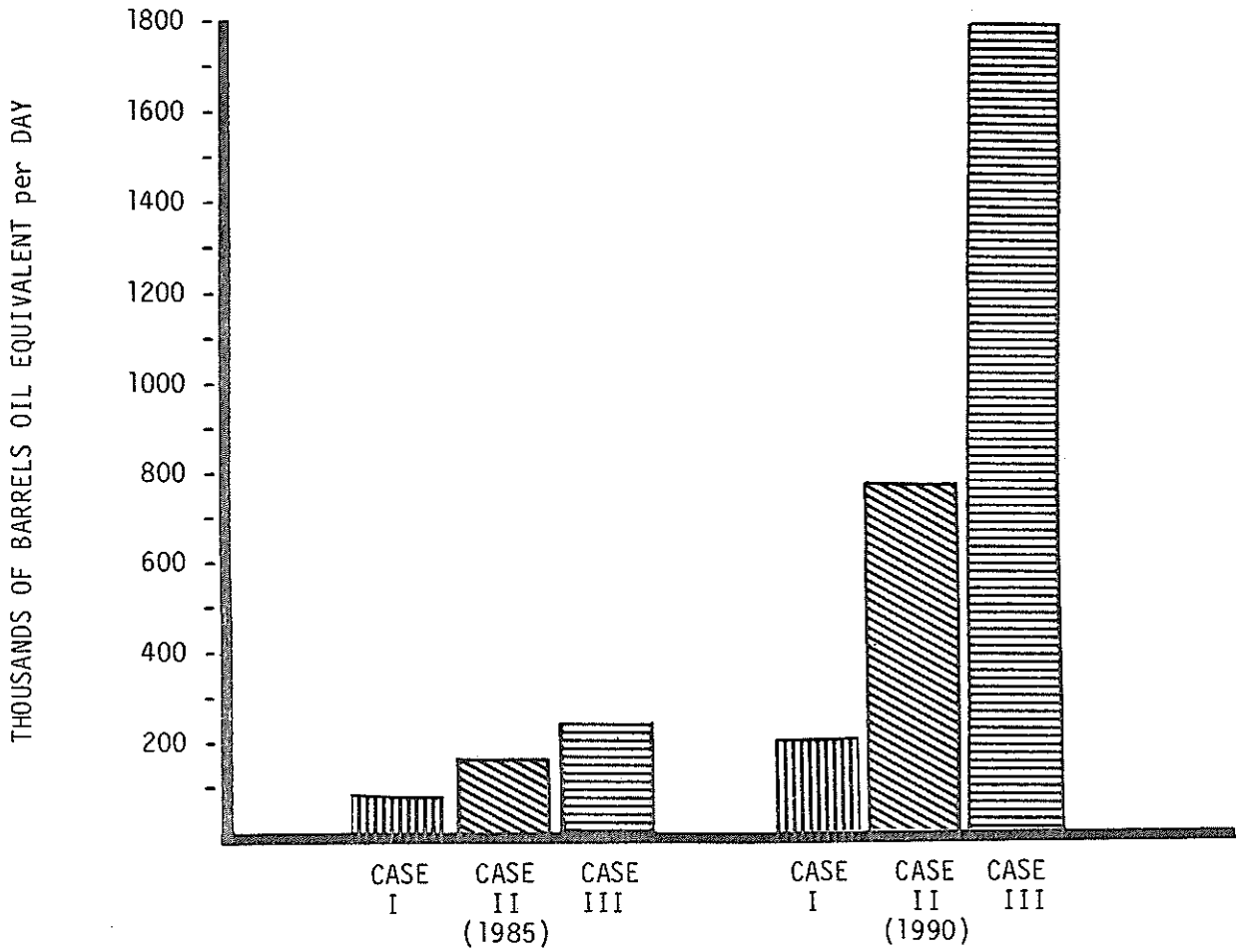
Now look at the three bars on the right which show anticipated growth of production under the low-, medium-, and high-effort scenarios by the year 1990. Obviously, the spread of production between the three scenarios has widened considerably.

Case I: At low level there is a doubling of production in a five-year period.

Case III: At high level there is a seven-fold increase in a five-year period to a production equivalent to nearly 1,800,000 barrels of oil per day.

Such tremendous increases would make corresponding claims on the materials used in the production of synthetic fuels -- the great variation in these potential claims is quite remarkable.

FIGURE 1. PRESIDENT CARTER'S SYNFUELS PROGRAM
Production Goals Under Three Scenarios



Case I: A good commercialized test program

Case II: An accelerated engineering program with removal of impediments

Case III: An all-out "crash program"

Source: Testimony before Senate Subcommittee on Synthetic Fuels, Sepetember 5-6, 1979

Figure 2. President Carter's Program -- Synfuels in 1990

So far I have spoken of total synfuels production. But what are the most important types of synfuels in the program envisioned by the President's proposal?

This second figure, based on information from the Western Interstate Energy Board, shows the relative magnitude of production by 1990 of the various synfuels.

The first thing to note is that this is a diversified synfuels program with production from coal, oil shale, biomass, and unconventional sources.

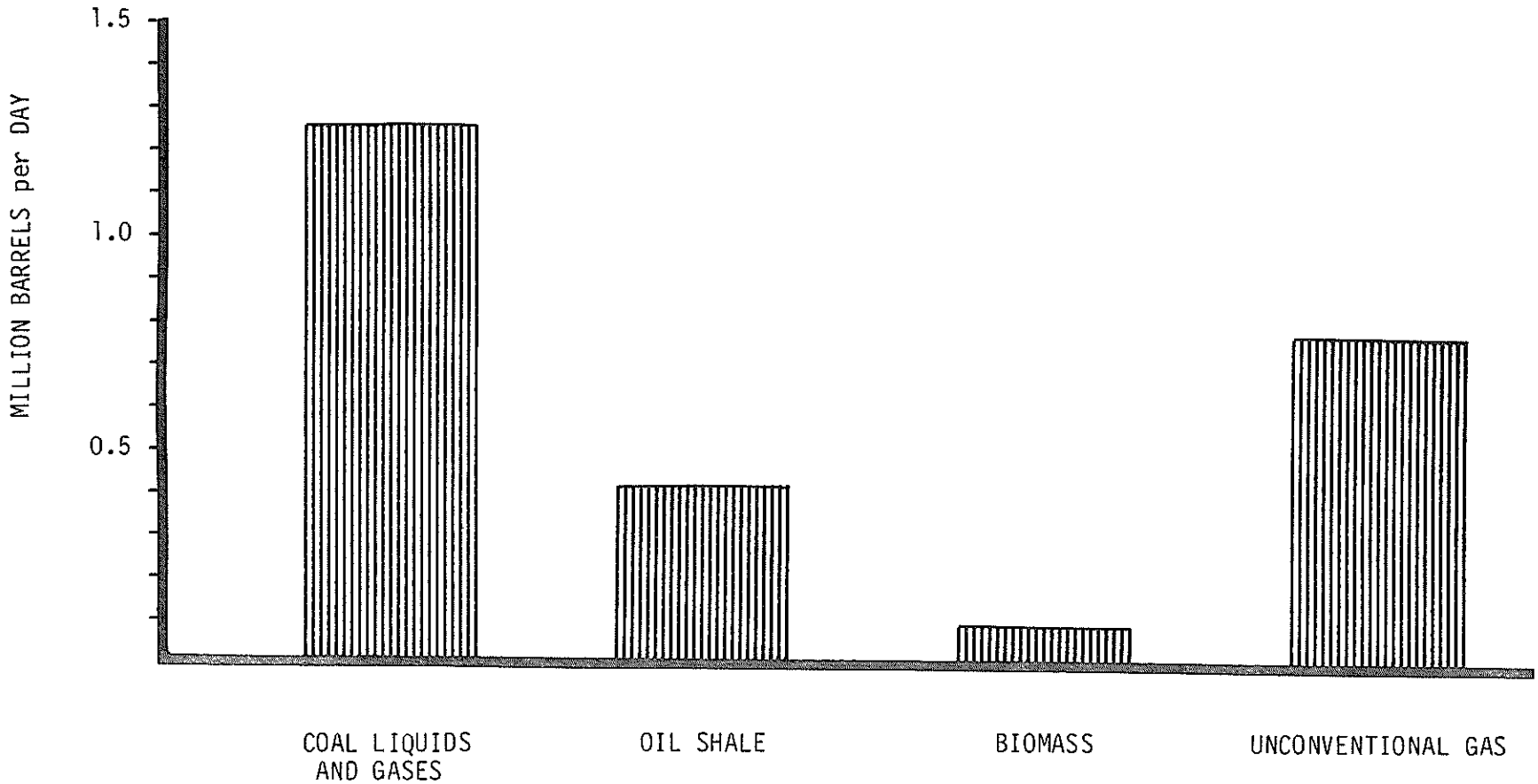
The real story told by this figure, however, is that almost one-half of the total production goal is expected to come from coal in both liquids and gasses.

Now, where does this brief picture of this proposed Federal program for future energy development leave New Mexico? It leaves us, initially, with the obvious fact that there will be a need to develop new energy resources for the Nation. As you all know, historically, New Mexico has always played a major role in energy resource production to help meet the nation's energy needs. Present statistics for the state show that we are fourth in the nation in total gas production and reserves, seventh in crude oil production and reserves, eleventh in coal reserves, and fourteenth in coal production. We rank among the top twelve states in reserves of every major energy category.

Remembering how important coal-based synfuels are proposed to be, let's take a look at the next figure.

FIGURE 2. PRESIDENT CARTER'S PROGRAM

SYNFUELS PRODUCTION BY 1990 - ALL SOURCES NATIONWIDE



Source: Western Interstate Energy Board

Figure 3. Proved Reserves of Fossil Fuels in New Mexico

Of New Mexico's fossil fuel supply, more than three-quarters is coal; and coal is the resource which is projected to provide one-half of the President's synfuel production goal.

If synfuels really do become a significant part of our nation's energy future, New Mexico's extensive coal resources may well play a significant role in that development. There are a lot of ifs in our energy future, especially as it relates to synfuels.

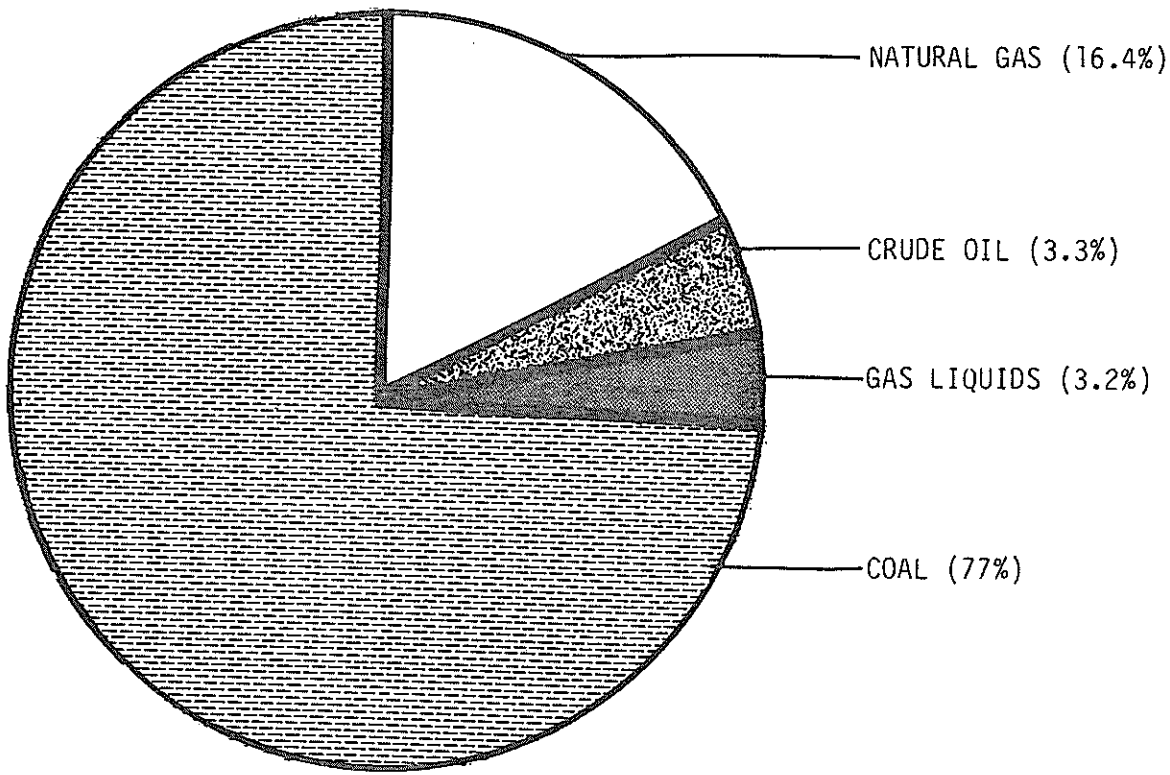
Careful thought must be given to international developments, the supply of other energy resources, and more specifically for our New Mexico future, the quantity and quality of coal available in other states. One must look closely at national energy-demand trends, and be prepared for the shocks of changing policies in Washington, D.C. In looking at past and present policy decisions with regard to energy, one's crystal ball threatens to go from cloudy to a complete blackout.

Let me just give you one brief example of the confusion of energy policy-makers, which will also serve to connect synfuels to a resource which most interests this audience -- water.

When the President's coal commission, in two lengthy reports supporting the replacement of two million barrels of oil per day by 1990 with various coal technologies and coal conversion processes, does not even devote one sentence to the water usage involved in such a major switch in resource usage, it makes my job and your work twice as hard when we try to look at the future.

FIGURE 3. PROVED RESERVES OF FOSSIL FUELS IN NEW MEXICO

(ECONOMICALLY RECOVERABLE WITH EXISTING TECHNOLOGY)



Source: EMD Bureau of Geology, 1979

I believe my next figure will amply demonstrate the important consideration which must be given to water in an attempt to discuss the feasibility of synfuels production in New Mexico.

Figure 4. Water Consumption to Produce one Quad of Energy -- Traditional Sources vs. Synfuels

This figure is based on information from the EPRI -- Lawrence Livermore report, dated August 1979.

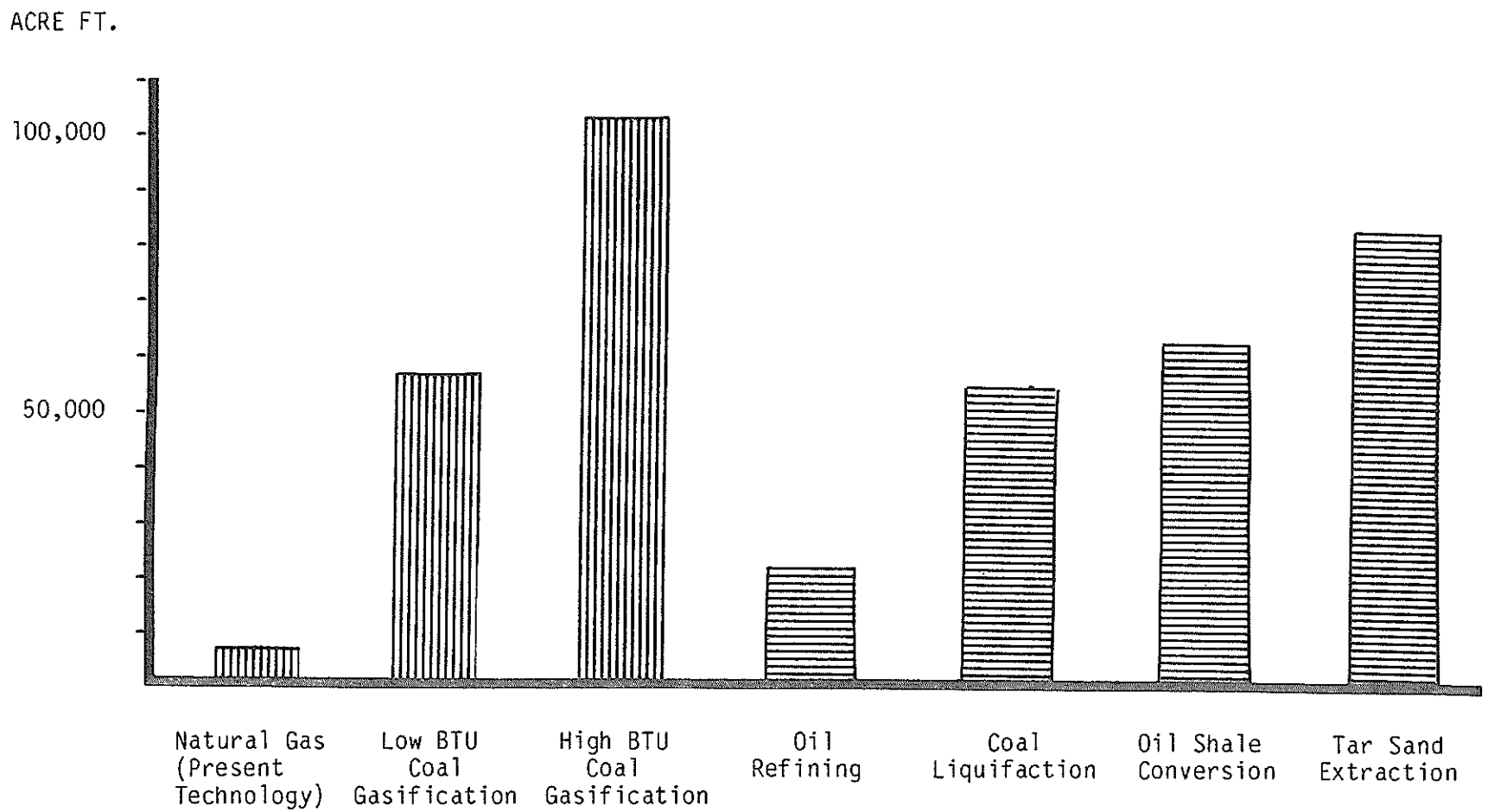
The three bars on the left show relative water consumption in the production on one quad (10^{15} BTU) of energy in gaseous form:

1. Natural gas by present technology is the lowest bar.
2. The second bar shows that in the area of low-BTU synthetic gas production each unit of energy requires seven times as much water as current production methods.
3. The third bar shows that production of high-BTU gas requires almost 15 times as much water.

The four bars on the right show relative water consumption in the production of energy in various liquids.

1. The lowest of those four bars shows water consumed in traditional oil refining.
2. The next bar shows that in the area of synthetic liquids, any coal liquids produced in New Mexico will require more than double the present water use per unit of energy.
3. The next bar relates to oil shale conversion.

FIGURE 4. WATER CONSUMPTION TO PRODUCE 1 QUAD ($1X10^{15}$ BTU)



Source: EPRI-Lawrence Livermore Report
August, 1979

4. The last bar illustrates that any production from New Mexico tar sands will require more than three and one-half (3 1/2) times as much water per unit of energy as does current oil refining.

As you can see from this figure, these new technologies will require greater amounts of water than the main technologies they will be replacing, that is, oil and gas production and refining. Of course, there will be substantial variation in the amounts of water required within each technology. For example, with the new coal technologies, water use will vary depending on the moisture content of the coal and the types of cooling techniques applied.

What does the future hold for energy development and its impact on water resources? I cannot honestly predict that future for you. But one thing I do feel certain of: to the extent that synfuels are produced in that future, they will tend to require significantly more water than do current, traditional energy sources.

The President's program for development of synthetic fuels is not the final word for our energy future. It is a best guess at this time and is definitely subject to change. But, as the figures indicated, whatever the "real future" in energy development holds for our nation, New Mexico will be expected to provide significant amounts of these energy resources.

Now let's look at the public's attitude toward the future as it relates to water and energy.

Attitudes Toward Water Use

A group at the University of Arizona recently completed a very interesting survey of public and state legislators' attitudes regarding water and its applications (survey conducted in 1979 by Professor Helen Ingram, et al., University of Arizona, in conjunction with Resources for the Future). They conducted their study in the Four Corners region where agriculture is presently the predominant consumer of available water resources, but where energy resources and energy development also play a major and growing role in the total social and economic structure. The results of this survey are quite interesting, and I would like to share some of the statistics on New Mexico with you.

While a clear majority of those surveyed agreed with the seriousness of the issue of air and water pollution, 58% also supported spending more money on energy research and development, and 34.3% agreed to spend at least the same levels as we are at present. Over half of all those surveyed disagreed with policies which would allow more pollution to insure plentiful supplies of energy, and over 70% also disagreed with allowing further damage to water supplies and the environment for energy production used outside the state. At the same time, 33% of those surveyed agreed with increasing future water allocations for energy production, and 50% agreed with keeping it at the same level as the present.

The most interesting results from the survey centered around the statistics on future water allocations. The following statistics

represent the percent of persons responding in favor of having more, or the same amount, of water dedicated in the future for various uses. For New Mexico, the following results were obtained:

Electrical Energy Production	83.1%
(We should note here that electrical energy production consumes more water than even the new coal technologies.)	
Irrigated Agriculture	94.6%
Industry and Manufacturing	79.3%
Municipal and Residential	88.0%
Water-Based Recreation	60.2%
American Indians	75.3%

Ladies and gentlemen, it is obvious that we cannot expect to devote significantly more water or the same amount of water to each of these uses in the future. Public opinion and proposals out of Washington for high water-use energy development must confront our western state reality: water is a coveted, valuable resource!

Now let's put synfuels and the President's program in perspective. We do have to take synfuels seriously with regard to our energy future -- such development can make a contribution. But, let's keep it in perspective. For example, right now current U.S. supplies, in quads, are as follows (1 quad equals 172 million barrels of oil or 60 million tons of coal):

Natural Gas	20 quads
Domestic Oil	19 quads
Imported Oil	18 quads
Coal	14 quads
Hydro and Geothermal	4 quads
Thermal/Nuclear	4 quads
Other (Solar, Renewable, Synfuels)	1 quad
	80 quads

In our figures, we showed you the Case I, II, and III synfuels estimates for the next fifteen years. Estimates have also been made

on the ultimate contribution of synfuels in these cases -- from one quad in Case I, to six in Case II, up to ten in Case III. I think this is another good example demonstrating that synfuels cannot be the total solution to our energy problems or anything near that. That is why it would be misleading to cover only the Administration's synfuels program, show you the estimates of production and water usage, and simply leave our energy future at that.

However, whatever the major emphasis of this nation's energy program, the main thrust which we must base our work on is the fact that we must try to attain a more balanced system of energy resources and a more balanced system for water usage. We cannot, as the survey participants seemingly desired, devote the same or greater amounts of water to all sectors of society. We cannot devote all our time and efforts to developing water-consumptive synthetic fuels. We cannot ignore the other possibilities of our future, such as the influence of market forces on fuel costs and energy conservation efforts.

Sooner or later, some very hard choices will have to be made. I wish I could tell you right here and now just what those choices will be and how much impact on water resources they will have. But, as I indicated earlier, my crystal ball is cloudy. However, this does not mean we should hang our heads in despair over the future. A lot can be done by the members of the New Mexico Water Resources Research Institute and all of you present at this conference.

I think your agenda for this conference reflects what has been done already, what we are doing today, and raises some of the issues for the future. Technological improvements by you folks will be of vast importance.

The work we do now and the decisions we make now for the future will be critical to the well-being of our state. It is my belief that in New Mexico we have an opportunity to manage our resources effectively so that at least in this state we attain a balanced system for resource development.

In the meantime, our department and other state agencies, our mining industry and utilities, our research institutes, and the federal government, all of us have a lot of work to do in seeking some answers.