

ADDRESS TO THE ENERGY RESOURCE CONFERENCE
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Mr. Chairman and delegates to the Energy Resource Conference of the University of Kentucky. I would like to extend my appreciation for this opportunity to address this meeting on a subject of mutual interest, the energy situation in the United States. The views that I will present here today will be my own and not necessarily reflect official federal power commission policy, although there is no substantial divergence.

It is no secret that this nation is facing a serious energy shortage and that the shortage of natural gas is the most immediate and acute aspect of the overall shortage. The Federal Power Commission and other federal agencies are encouraging the gas industry's efforts to improve the supply situation, but hope for future relief of the supply-demand imbalance must also come from efforts by the consumers of natural gas to improve the efficiency of their energy utilization.

The nation's proved natural gas reserve inventory for the lower 48 states has been shrinking for the past four years. Major pipeline companies and distributors in all parts of the country have been refusing requests for gas for many new customers. This is a new situation - the end of natural gas industry growth uninhibited by supply considerations. In recent years a new major factor has emerged which contributes to the supply-demand imbalance - a strong demand for natural gas as a substitute for sulphur laden oil and coal as a part of the national clean air effort.

During the long period of uninterrupted gas growth there was one important, but little noticed, statistic: Production of natural gas was increasing at a much faster pace than additions were being made to reserves.

As a result, the ratio of reserves to production slid from 32.6 in 1946 to 11.3 by year-end 1971. In 1968, for the first time in our history, reserve additions in the lower 48 states fell short of production. This short-fall increased from 7.3 trillion cubic feet in 1968 to 12.3 in 1969, 10.7 in 1970, and 12.5 trillion cubic feet in 1971. Currently, proved reserves in the lower 48 states have dropped from 289.3 trillion cubic feet in 1967 to 247.4 in 1971, and these reserves are committed to existing customers.

There has been a steady decline in drilling for both oil and gas since the mid 1950's. But this reduced drilling effort has been only a part of the problem. In addition, there has been a noticeable drop in gas reserve additions per foot drilled.

While it is difficult to relate drilling statistics to the search for new gas re-

serves, we do know that the decline in gas reserves in recent years has been paralleled by a decline in crude oil reserves. Furthermore, we must recognize that the level of the exploration effort is responsive to many factors other than the ceiling prices which the Federal Power Commission allows on natural gas produced from domestic wells. These other factors include the availability of promising drilling prospects; improvement of technology for exploration and development; tax policies; import policies for crude oil and refined products; the relative attractiveness of investment in foreign exploration as compared with domestic exploration; leasing policies for public domain lands, etc.

Whatever conclusions are reached about drilling statistics, the Federal Power Commission is taking action in every regulatory area to foster and encourage higher levels of exploration for gas to be dedicated to the interstate market.

Clearly, a sensitive, dynamic, and informed regulatory atmosphere is one of the prerequisites to the optimum development of our domestic gas resources at reasonable prices to the consumer. Toward this end, the FPC, after receiving Congressional appropriations, instituted a national gas survey in January 1971. Some of the issues which will be investigated and evaluated under the survey are: Supply-demand price relationships; price structures and interfuel competition; supplemental sources of gas supply; environmental considerations; future capital requirements; and an independent survey and analysis of the nation's current proved natural gas reserves by the Federal Power Commission Staff.

On August 3, 1972, the Federal Power Commission issued Order 455 - a statement of policy relating to optional procedure for certificating new producer sales of natural gas. The purpose of this order was to stimulate and accelerate domestic exploration and development of the nation's natural gas reserves. The procedure would permit producers to file for certification of new gas sales at rates above established area rate ceilings provided: That the contract is dated after April 6, 1972; that all contracted parties agree to the procedures; that the purchaser is an interstate pipeline company; that the seller has discharged or will discharge all obligations prescribed by prior FPC Orders; and that the acreage has not been previously dedicated to the Interstate market. By accepting authorization under these procedures the producer would waive the right to seek future price increases under the contract, other than fixed escalations which were approved by the commission, and would waive all rights to contingent price increases for flowing gas which the seller produces in the same pricing area.

Some of the other regulatory actions regarding domestic natural gas supply which the FPC has taken recently include:

--- A nation-wide investigation to review existing producer rates and determine whether higher rates should be allowed for future supplies of natural gas dedicated to the interstate market;

--- Review and completion of area rate proceedings in important gas producing areas;

--- Change of small independent producers price regulation by means of blanket certification;

--- Nation-wide investigation of the reliability of natural gas service;

--- Establishment of producer rates by rulemaking procedures;

--- Establishment of accounting rules for advance payments to producers by pipelines to stimulate further exploration and development and to increase pipeline responsibility for gas supply.

This in part covers the actions of the Federal Power Commission and its staff to relieve the current gas shortage, but what about the future?

The most recent estimate of natural gas needs developed by the future requirements committee will help to put into perspective the magnitude of the National requirements for natural gas. The Committee estimated that annual requirements for gas in the United States will increase from 26.1 trillion cubic feet in 1970 to almost double that amount -- 50.1 trillion cubic feet by 1990. If those gas demands are met, the FPC Staff estimates that about 843 trillion cubic feet of supply would be required between 1970 and 1990. This is almost equal to the potential gas supply estimate of 851 trillion cubic feet of undiscovered potential reserves in the lower 48 states. I think that by now everybody has come to the conclusion that the national demand for natural gas cannot be met with domestic production in the lower 48 states alone, so where do we turn?

For the immediate future, imports of pipeline gas from Canada will be the main source of gas supply in addition to domestic production. Since 1964 net imports from Canada have averaged about 2.7 percent of annual U.S. natural gas consumption and have been increasing steadily, but even by 1980 imports from Canada will only meet about 4.4 percent of United States gas requirements in that year.

What about Alaskan gas? The potential gas committee has indicated that 327 trillion cubic feet of United States gas potential,

about 28 percent, is located in Alaska. Much of this potential is on the north slope where the Prudhoe Bay area has estimated proved reserves of 26 trillion cubic feet in 1970. Most of north slope gas reserves are associated with or dissolved in oil, and its availability will depend on production of the related oil reserves. There are three separate proposals in the development stage for a natural gas pipeline from the north slope through Canada to the United States. One of these - the northwest project study group - plans for deliveries of north slope gas to U.S. markets by mid-1978. Even under the most optimistic conditions by 1980 deliveries are projected to be only 0.7 trillion cubic feet and 2.3 trillion cubic feet in 1990.

The nation must increasingly turn to supplemental sources within the next 5 to 10 years. Our policies with respect to the development of supplemental sources of gas should be two-pronged: First, these sources should be ready when the need arises; second, these supplemental sources should not interfere with the fullest possible development and utilization of our conventional supply of natural gas.

Let's take a look at the primary supplemental gas sources: First, liquefied natural gas; second, pipeline-quality synthetic gas from coal, oil shale and liquid hydrocarbon feedstocks; and third, nuclear stimulation of tight natural gas reservoirs.

Liquefied Natural Gas

The importation of liquefied natural gas to provide supplemental supply for the near-term future looms ever larger in importance. LNG has been imported on a short-term basis from overseas and from Canada. However, the greatest potential impact on supply is expected to come from the larger base-load marine import projects. The first of these, which was recently approved by the FPC, is the proposal of El Paso natural gas company to deliver up to 390 billion cubic feet per year from Algeria to the East Coast. To put this project in proper perspective, total deliveries over the life of the contract will be approximately 9.8 trillion cubic feet which is just about what our annual addition to natural gas reserves have been running in recent years.

Several announcements proposing base load imports of LNG to the contiguous United States from Venezuela, Nigeria, Trinidad, Algeria and the North Sea have been made. These are areas of the world which have natural gas reserves in excess of local requirements, but it must be realized that there are many buyers besides the United States in the International market for LNG. Deliveries are scheduled to start during the 1975-1978 period and should all of these projects reach fruition as proposed they would amount to only 2 trillion cubic feet per year by 1980 or about 5.8 percent of the projected demand in that year.

Synthetic Gas

The current gas shortage has led to plans for producing synthetic gas from light hydrocarbon feedstocks, particularly naphtha. This process can provide supplemental gas supplies for meeting short-term needs, since plant construction requires only two years. Most of the plants are expected to utilize imported feedstocks, since most domestic naphtha is used for gasoline. Current supplies of imported naphtha are limited to surplus production at foreign refineries and it would appear that the real potential for SNG production lies with converting imported crude oil to SNG. A commercial process for direct conversion of crude oil is not yet available but several energy refineries utilizing imported crude have been proposed in which the lighter fractions would be converted to substitute natural gas with residual liquid fuels and other products also being produced. The office of emergency preparedness is currently reviewing the economic and national security implications of importing liquid hydrocarbons for production of SNG.

For the longer term future, we must look for the development of commercial processes for the conversion of coal and oil shale to pipeline quality gas. It has been estimated that this country's recoverable coal reserves represent the energy equivalent of almost 20,000 trillion cubic feet of gas. This is about an 885-year supply at 1970 rates of gas consumption. Obviously, not all of these recoverable coal reserves will be earmarked for the production of pipeline-quality gas. U.S. coal reserves are more than adequate as a long range supplemental source of gas and no other source is more reliable from a standpoint of national security. The Department of Interior and the American Gas Association announced an agreement last August on a coal gasification research program calling for \$296 million to be spent over the next eight years. Moreover, several pipeline companies have announced plans for commercial scale coal gasification projects.

The United States possesses the largest single hydrocarbon deposit in the world in vast oil shale deposits of Western Colorado and Utah, for the most part on Federal lands. While these have been primarily considered as the source of liquid petroleum products, synthetic gas can be produced from oil shale.

Nuclear Stimulation

Nuclear explosive stimulation of tight gas reservoirs estimated to contain a total of more than 320 trillion cubic feet of natural gas offers a potential effective and economic means of increasing the nation's gas reserves. However, the technology is still in the developmental stage and it appears that the R & D program will, at best, require several years.

It is apparent from the foregoing discussion that in order to satisfy the rate of growth in demand for natural gas it will be necessary to achieve annual reserve addi-

tions never before experienced, augmented by the optimum development of supplemental gas supplies.

The cost of gas from newly discovered reserves and from supplementary sources will be substantially higher than the current cost of gas from conventional domestic sources. The price of natural gas delivered to New York City is about 50 cents per MCF, as compared to 68 to 85 cents for large volumes of liquefied natural gas delivered by cryogenic tanker from Algeria. The cost of synthetic gas from coal will probably be about 85 cents per MCF once some processes now in the developmental stage achieve commercial application. All of the projects for substitute gas from liquid hydrocarbons that have been filed with the Federal Power Commission have tailgate price estimates of over \$1.00 per MCF.

Most of the large, shallow, easy-to-find natural gas deposits of the lower 48 states have already been found and are either exhausted or being depleted at the present time. By contrast, most of the potential gas reserves awaiting discovery are estimated to be at great depths (more than 15,000 feet), or on the offshore outer continental shelf--all areas of difficult and costly exploration and production and, in large part, areas involving costly transportation to the major markets. Most of the prospective cost trends for future gas supplies are pointed sharply upward.

Basic attitudes toward energy must change. During most of the nation's history ample supplies of low cost energy--particularly wood, coal, oil, gas or the derivative energy form, electricity, were taken for granted. Energy costs have been so low in the past that in most applications they could be disregarded for all practical purposes. As a result there has been waste in both the production and use of energy.

Natural gas is not the only fuel with problems in providing adequate and reliable service. Some sections of the United States again experienced electric power supply shortage this past summer, according to reports filed with the Federal Power Commission by the nation's electric utilities. Delays in availability of planned new facilities will lessen the amounts of installed generating capacity planned earlier to provide adequate and reliable service. Much of the nation, particularly east of the Mississippi River, is affected by the delays. Analysis by the FPC staff of the utilities' reports indicates that for three of the six national power survey regions the generating capacity reserve margins are somewhat better than for the corresponding period of 1971. For the remaining three they are lower. While reserve margin alone cannot be considered to be a complete indicator of a system's reliability, it can, in conjunction with a comprehensive knowledge and understanding of other related system characteristics, represent a helpful measurement if used with discretion in analyzing system capability to meet demands.

The Federal Power Commission's recent natural power survey report, culminating an intensive 6-year study, lays out a long-range guide for efficient development of the nation's electric power industry through the year 1990.

The report forecasts that the nation's electric energy requirements will nearly quadruple by 1990 with installed generating capacity increasing from 340,000 megawatts at the end of 1970 to 1,260,000 megawatts at the end of 1990. It is expected that there will be a dramatic growth in nuclear power during the next two decades.

In the face of these forecasts, many people are calling for curtailment of power growth in the interests of environmental protection, apparently without appreciation as to how fundamental electricity has become to the human environment and how importantly it affects the nation's economy as well as its quality of life.

To a very considerable extent, the nation's industry and commerce literally run on electricity, and a close relationship exists between adequacy of electric supply and the economic health of the nation at large.

Deterioration of the quality of electric service would degrade our national life. It is one thing to take electricity for granted, but quite a different thing to take for granted that it will always continue to be available.

Positive steps must be taken promptly to avoid recurrent and spreading power shortages. It calls for action to remedy conditions which are slowing orderly development of essential power supplies.

It is already too late to avoid further difficulties. Power facilities cannot be built overnight and it will take time to correct present inadequacies. While the pattern varies, the outlook for the years immediately ahead is largely fixed by the momentum of past events.

The report also foresees higher electricity prices as a result of cost pressures from ever more rigorous environmental protection criteria; increased demand pressures on fossil fuel costs; and general inflationary effects. These cost pressures can only be partially offset by technological advances.

Utilities have a large base of embedded capital investment which dilutes the immediate effect of inflated investment in new facilities. Also, because of time lags and rate adjustment procedures, the unusually severe cost increases which utilities experienced in the last few years are just beginning to translate into rate increases. Thus, the full and inevitable impact still remains to be felt by the consumer.

There is a positive as well as negative side to the present electric power situation, with the technology of power continuing to show remarkable vitality as evidenced by a great deal of industry accomplishment in recent years. The Electric Industry's health is basically sound, although menaced in some areas by current and increasing delays in new capacity additions. It will take the best coordinated efforts of industry, government and the public to prevent this potential threat from proving real.

But even with the best government stewardship, the best industry management, the most enlightened public attitudes, and continued excellent technological progress, the current trend of upward rate adjustments is expected to continue for several years. This is partly because of the momentum of underlying economic forces. But it is also partly because of changing social values which are causing society to move in the direction of reckoning the full and true environmental overhead cost associated with a given product -- and including it in the price charged for it.

The final imperatives, therefore, are for the nation to condition itself to regard energy as a more highly valued commodity and to recognize that our best efforts will be required to keep rate increases and industry performance in reasonable bounds in the years ahead.

The old assumptions and practices concerning energy are being challenged today and the energy industry as we have known it will never be the same. The search for new energy applications and technologies will continue, of course, but the scientists, architects and design engineers of the future will be called upon to satisfy the need for clean energy fuels and to develop much more efficient and sophisticated applications of smaller amounts of higher cost fuels.