PIRINC

Telephone: (212) 867-0052

Petroleum Industry Research Foundation, Inc.

122 EAST 42nd STREET

New York, N. Y. 10168

U.S. NATURAL GAS POLICY AND OUTLOOK FOR GAS IMPORTS

A Paper delivered by

John H. Lichtblau, President

at the

International Seminar on
Natural Gas and Economic Development

Cairo, Egypt

February 26, 1982

The U.S. gas market is almost completely self-sufficient. Yet, it is still of considerable potential interest to the international gas trade. For it is a market of such magnitude that even a small gap between domestic supply and demand could provide a substantial outlet for foreign gas. On the other hand, if this gap does not develop or is met by supplementary gas supplies other than imports, this too should interest the international gas trade, since it would forestall illusory expectations about a market that may not develop.

I would like to discuss the outlook for U.S. gas import requirements against the background of the new natural gas economics and politics that have emerged since passage of the Natural Gas Policy Act (NGPA) in November 1978.

Let me start with a few facts. In 1981 the U.S. consumed about 20 trillion cubic feet (Tcf)* of natural gas and produced almost that much. This made it by far the largest consumer and producer of this fuel, accounting for almost two-fifths of available world gas supplies.

When it comes to reserves, however, the U.S. gas position is much less strong. Proved reserves of just under 200 Tcf at the end of 1981 accounted for only 7% of world reserves. Furthermore, if we exclude northern Alaskan reserves whose commercial development is quite uncertain for the foreseeable future, U.S.

---

*a cubic foot of gas equals about 1,000 Btu's.

proved gas reserves have declined every year since 1968 and now equal less than 9 years of the current annual production level. Ten years ago the U.S. reserve/production ratio was still 11.5 years, with a production level significantly larger than last year's. It is this growing discrepancy between the production level and the underlying reserve base which has given rise to the assumption that the U.S. will have to draw on substantial supplementary gas sources, including imports, if gas is to maintain its 26-27% share in U.S. energy consumption.

In part, this assumption is of course correct. But the decline in U.S. gas reserves over the last 13 years is by no means entirely due to a naturally depleting resource base. To a large extent it reflects decades of legislation and regulations which created disincentives for exploratory drilling.

Gas pricing policy has undergone basic changes in the last three years. Under the NGPA the average U.S. gas price is rising much faster than the inflation rate and all new gas (mostly gas from reservoirs not produced before April 1977) will probably be decontrolled by January 1, 1985, when this becomes permissible. Thus, the incentive for drilling gas wells will progressively increase over the next several years under existing legislation.

We have seen the impact of price incentives on domestic crude oil drilling in 1980 and 1981, following price decontrol of newly found oil in mid-1979 and all domestic oil in January 1981. The

effect of the removal of these constraints together with the sharply rising world oil price in 1979/80 caused the number of oil wells drilled to increase by 39% in 1980 and 40% in 1981, to record heights in both years. Meanwhile, gas wells increased by only about 7% in each of these years. As we move beyond 1982 we can expect a somewhat similar upsurge in gas drilling and for somewhat similar reasons.

The higher drilling rate will most probably slow down the decline in natural gas reserves, since the economically recoverable potential gas resource base is estimated to be a multiple of current proved reserves. Optimistically, the higher drilling rate might even stabilize the existing reserve level. It is unlikely, however, that it will bring about a sustained increase in U.S. gas reserves during the 1980's. The reason is that the gas producing industry must run fast to stay in place. The bulk of the currently flowing gas comes from fields discovered before 1970 whose flow is rapidly declining. Hence, without an accelerated drilling effort during the 1980's we would see a sharp drop in U.S. gas reserves and production in the second half of the 1980's.

It is difficult to forecast the actual level of U.S. natural gas production by 1990, given the opposing forces of substantially higher price incentives and the rapid depletion of most flowing wells. But our guess would be that the positive will not fully offset the negative so that by 1990 conventional domestic gas supplies

(assuming no gas from northern Alaska) are likely to be 1.5-2.5 Tcf below last year's available production of somewhat over 20 Tcf.

Now let us look at the demand side. We know that from 1974 through 1977 U.S. gas demand was supply-limited--that is, if more gas had been available it would have been used, probably backing out oil. Since 1978 demand has stabilized within about 1.5 percent in either direction of 20 Tcf. In the last two years,available supplies have been perceptibly larger than actual demand so that some production had to be shut in. Current shut-in production appears to be in excess of 1 Tcf. In the trade this is referred to as the "gas bubble," suggesting that it is a temporary phenomenon.

The occurrence of the gas bubble gives an insight into the factors influencing the U.S. gas market. It has been caused by a combination of market forces, supply expectations and regulatory-legislative market intervention, all working in the same direction.

Market forces have reduced gas requirements both structurally and temporarily, the first because of price-induced energy conservation across the board, the second because of the general stagnation of the U.S. economy in the last two years.

Supply expectations in the second half of the 1970's were influenced by the sharp decline in domestic gas reserves and production in the 1973-76 period. It was believed this trend would continue, causing consumers to reduce their dependency on

gas. However, contrary to these expectations, the decline in domestic gas supplies has reversed itself on a modest scale since 1979, partly as a result of the NGPA.

Government intervention accelerated the move away from gas by requiring or encouraging a reduction in the use of gas as an electric power generating fuel. This policy reflected the government's belief that dwindling gas supplies had to be reserved for use in priority markets.

The confluence of these various moves to reduce demand in the face of slightly increasing supplies has forced some domestic gas production to be shut-in. The most important and least reversible of these moves to reduce demand has been conservation. It is noteworthy that consumers should practice this conservation with a fuel whose price has been, in general, significantly below that of its principal competitors--fuel oil and heating oil. The reason is that natural gas prices have risen enormously from their earlier very low levels. Thus, the average 1981 well-head price of natural gas, about $1.85 per thousand cubic feet (Mcf), represents a 760% increase over the average 1973 price, or nearly five times the underlying U.S. inflation rate during this period. Gas prices to consumers also rose by multiples of the inflation rate.

Hence, consumers looking at their rapidly rising gas bills have a strong incentive to conserve this fuel despite its low price relative to oil products. There is considerable evidence that they are conserving, in factories, homes and commercial

establishments. This is a major reason that domestic natural gas demand is no longer supply-limited. Prior to 1980 most forecasts had assumed that it would remain supply-limited throughout the current decade.

The energy conservation process in gas demand is by no means completed, since the price of gas is likely to continue to rise substantially faster than the U.S. inflation rate until it reaches its market clearing level. A recent study by the U.S. Department of Energy (DOE) projects a doubling in the real (constant) average annual wellhead price of natural gas between 1981 and 1985 under NGPA. Thus, the real price of gas will continue to soar during this period while that of oil will in all likelihood move at least slightly in the opposite direction. This means that switching from oil to gas will become less attractive than in the past, while gas conservation will become more attractive.

Of course, simultaneous with this downward pressure on demand there are also continuing upward pressures. For instance, with about 40% of all new U.S. homes being gas heated, the eventual recovery in U.S. housing construction will positively influence demand. Similarly, most of the industries which use gas for industrial and process heating have an underlying secular production growth trend which affects their longer term energy requirements. Between now and 1985, we expect these opposing trends to approximately offset each other so that unconstrained

demand for natural gas will show very little change from last year's level of about 20 Tcf.

As pointed out, U.S. natural gas prices will rise in real terms during this period but will remain below the market clearing level. By 1985 gas prices are likely to approximate that level, either under existing legislation or under alternate legislation, proposed by various industry groups, which would phase out all gas price controls over the next several years.

Now let us define the term "market clearing" price, as it applies to U.S. natural gas. We believe it is the point at which the price of natural gas is at approximate Btu parity with residual fuel oil delivered to industrial and electric power plants in the Gulf Coast region. This price is then netted back to the wellhead (by deducting transportation cost) to establish the market clearing wellhead price.

One reason for determining the market clearing price in this manner is that the industrial and power plant market, which accounts for over 60% of total U.S. gas consumption, represents the only real swing market between oil and gas, since many users are in a position to switch back and forth between these two fuels at relatively short notice.

Of course, this calculated parity at the user level could theoretically result in different gas wellhead prices for different geographic regions, partly because of variations in gas transportation cost and partly because of regional differences in the

required quality (sulfur content) of residual fuel oil. We believe the pertinent point of reference is the Gulf Coast where gas has the minimum transportation cost and residual fuel oil quality is not significantly restricted.

In order to determine when parity between oil and gas, as we have defined it, will be reached we must make some price assumptions. For natural gas the DOE has recently projected an average U.S. wellhead price of $3.62/Mcf (in constant 1980 dollars) for 1985 under continuation of existing NGPA legislation.* In nominal 1985 dollars this price is likely to amount to around $5/Mcf.

For future residual fuel oil prices we must unfortunately make our own forecast which requires guessing at the future price of OPEC crude oil. Historically, such forecasts have hardly ever been correct. However, unless we do make assumptions about future oil prices we can say nothing about gas prices, since the former will affect the latter.

We believe that the official OPEC marker crude price will remain at its current nominal price level through 1983 and will then rise approximately in line with inflation in 1984 and 1985. This would yield a 1985 crude price (F.O.B.) of $39-$40/Bbl in nominal dollars ($28-29 in 1981 dollars). Based on analysis we have done, U.S. Gulf Coast residual fuel oil prices at that time will be around 80 percent of the delivered cost of the OPEC marker crude. This equates to an approximate U.S. Gulf Coast wellhead

*Department of Energy, Energy Information Admin., Current Status of the Natural Gas Market, Dec. 1981, p. 51.

price for natural gas of $5/Mcf. Thus, if our oil price assumptions and the DOE's gas price projections are both correct, oil/gas price parity will be reached by 1985.

How will U.S. gas demand fare from then on? As we have seen, conventional domestic gas supplies in the 1986-90 period are expected to be 17.5-18.5 Tcf. There is no doubt that this volume of gas will find a ready market. Any growth in demand above this level would depend on the cost and availability of supplemental gas supplies. This is of course where imports come in. In fact, from now through 1990 imports will account for nearly all supplementary U.S. gas supplies.

Where will these imports come from? The answer is, primarily from Canada and Mexico by pipeline. In 1981 we imported 762 billion cubic feet (Bcf) of Canadian gas by pipeline. This was about 4% less than in the previous year which in turn, was 25% below the peak level of about 1 Tcf in 1979. The reason for the decline was not unavailability of Canadian supplies but lack of market demand in the U.S. In fact the volume of Canadian gas authorized for export to the U.S. last year amounted to about 1.6 Tcf, or more than twice the actual export level. The principal factor in the export deterioration is the Canadian gas border price of $4.94/Mcf which is substantially above the average U.S price. It is tied to a formula based largely on the F.O.B. cost of Canadian oil imports. Under the formula the current price could be about $1.00/Mcf higher but the Canadian government has waived the increase to prevent further erosion in the export volume.

Canada has a substantial volume of shut-in gas production. This has greatly reduced the incentive for exploration activities in western Canada. Furthermore, Canada's master plan to bring western gas to its eastern provinces, backing out imported oil, is likely to be affected by the discovery of gas off Nova Scotia, marketing of liquefied Arctic gas by tanker transport and large oil deposits (with associated gas) off Newfoundland. Under these circumstances, Canada can be expected to become once again more export-oriented in its gas policy. An available gas export volume to the U.S. of about 2 Tcf sometime after 1985 does not therefore seem unreasonable. The cost to the U.S. would probably be substantially lower than that of other supplementary gas sources such as new synthetic gas, gas from northern Alaska or, as we shall see, liquefied natural gas (LNG) from almost any source.

Another ready source for incremental gas imports is Mexico which last year supplied the U.S. with 110 Bcf. This volume will probably soon be doubled and could possibly be tripled within a few years, according to estimates by PEMEX officials and others. The country's proved and probable gas reserves are certainly large enough to permit such a level of exports. It should be recalled in this connection that in 1977 PEMEX signed a letter of intent with a U.S. gas pipeline consortium to deliver up to 700 Bcf annually. Final agreement was blocked by U.S. government objection to the border price of $2.60/Mcf demanded by PEMEX at

the time. The current Mexican price tracks the Canadian price of $4.94.

Canada and Mexico, together with the small volume of existing and planned domestic synthetic gas production, could probably supply the U.S. with some 2.5 Tcf of supplementary gas in the latter 1980's. This would enable the U.S. to maintain its current annual domestic demand of 20 Tcf, or do slightly better, until at least 1990. Any additional supplementary gas supplies (except for relatively small volumes of incremental seasonal peak requirements) could enter the U.S. oil/gas competitive market during this period only at prices approximately in line with the delivered cost of heavy fuel oil at the U.S. Gulf Coast. In other words, LNG, whose transportation costs from Eastern Hemisphere locations to the U.S. plus regasification and storage cost may be the equivalent of $14-19/Bbl of crude oil, must compete here primarily with an oil product which usually sells significantly below the cost of the crude from which it is made. Given the present pricing philosophy of major LNG exporters, the U.S. market would therefore not seem to be attractive for any new Eastern Hemisphere LNG projects. For the Trunkline project, regasified delivered cost of LNG from Algeria, the nearest Eastern Hemisphere supply source, has been quoted in the trade press at $7.38/Mcf which is vastly above the cost of fuel oil or Canadian or Mexican pipeline gas. (Deliveries for this project have not yet begun, however.) Some pipelines can pay this price, just as they can pay similar or even higher prices for some new domestic

gas, because they can average it with other categories of gas which are kept artificially low priced under existing legislation. Under NGPA some gas is to remain under price control as long as it continues to flow and thus will provide a continuing cushion for rolling in the cost of higher priced gas. However, this "old" gas production is of course irreversibly declining so that the cushion is becoming progressively smaller. Hence, new LNG import projects, which require substantial capital investments and can only become operative in the late 1980's, will have virtually no benefit from the domestic price cushion. Furthermore, it is quite possible that before that time new legislation will end all wellhead price controls on natural gas. In that case the cushion will disappear instantly.

One final point: If some incremental LNG supplies are required in the 1980's the U.S. will first look to such nearby sources as Trinidad for shipments to the East Coast and the Cook Inlet in southern Alaska for shipments to California. In both these places LNG projects for shipments to the U.S. are under active consideration. Given the progressive increase with distance in the transportation cost of LNG, shipments from these locations are likely to be more competitive than those from Africa or Indonesia. For the same reason Europe and Japan will continue to provide more economic LNG markets for African or Asian exporters than the U.S. East or West Coast.

Let me conclude with two caveats. We have assumed that the real price of oil will not rise significantly during the remainder of the 1980's. If this assumption is wrong and we see another sharp real price increase, Eastern Hemisphere LNG exporters might become competitive in the U.S. and still earn an acceptable profit because of the higher parity price for their product. I consider the odds for such a price scenario fairly low for the 1980's but by no means zero. If it did occur the evolving problem for exporters would not be competition with other fuels but the shrinking markets for both oil and gas.

My second caveat is that our analysis only covers the period through 1990. In the following decade U.S. demand for supplemental gas supplies can be expected to increase further. It remains to be seen whether LNG imports from the Eastern Hemisphere will then be able to play a part in providing these supplies.