THE GAS SUPPLIES OF THE UNITED STATES--PRESENT AND FUTURE

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INTRODUCTION

The growth of natural gas service in the United States between 1945 and 1970 must rank as one of the great success stories of American business and technology. During this period the number of miles of utility gas mains carrying natural gas increased from 218,000 miles to 906,925 miles, and a $17 billion high-pressure gas transmission pipeline network was extended into all of the lower 48 states. Natural gas consumption increased at an annual average rate of about 6.5 percent and moved from a position where it supplied 13 percent of the Nation's total energy consumption in 1945 to the point where it provided about 33 percent of the total energy consumed in 1970.

The Nation's gas reserves are distributed among 25,000-30,000 gas fields (shaded areas of Figure 1) which in many instances are geographically remote from the gas consuming areas. The pipeline system which connects the consuming areas with their respective areas of supply can, in a general way, be characterized by a number of national "pipeline corridors." For instance the interstate gas consumed in the New England, Great Lakes, Appalachian, and Southeastern regions (proportional to the width of the arrows in Figure 1) originates chiefly in the South Louisiana, Texas Gulf Coast, and Hugoton-Anadarko (Oklahoma Panhandle region) gas supply areas. In addition to these domestic supplies, the United States is also a net importer of gas from Canada and Mexico. Although net imports during 1970 amounted to only about 3.5 percent of national consumption, imports are an important contribution to the gas supply of some areas.

The requirements for gas are expected to increase significantly during the 1971-1990 period, not only because of the growth in total energy requirements but because of the clean nature of this fuel and its premium value from a pollution control standpoint. Unfortunately the deliverable supply of natural gas, which presents the fewest pollution problems of all the Nation's present primary energy sources, will be inadequate to meet all of the demand for it.

1/ The views expressed herein are those of the author and do not necessarily reflect the views of the Federal Power Commission or of individual Commissioners.

The American gas consumer has only recently begun to be affected by the developing imbalance between the supply of this environmentally superior fuel and the burgeoning demand for it. The emerging shortage of gas is evidenced by major pipeline companies and distributors in many parts of the country being forced to curtail service to some existing customers and to refuse requests for additional gas service from many new customers and from present large industrial customers. Present and projected trends in the supply and demand for gas in the United States indicate that the national supply deficit which has recently developed will continue throughout the 1972-1990 period.

DEMAND

Until recently gas requirements (demand) of the United States were equivalent to gas consumption, because gas supplies were abundantly available as new markets for gas were developed. In retrospect then, demand for gas was approximately equal to domestic net production plus net pipeline imports. Prospectively, however, under conditions of insufficient gas supply, consumption will be less than demand.

While numerous projections of the future demand for gas have been made, the most recent projection of future gas requirements developed by the Future Requirements Committee has been adapted in this analysis as the yardstick against which anticipated gas supply will be measured. On this basis the annual demand for gas in the lower 48 states is projected to grow from 22.6 trillion cubic feet in 1970 to 46.4 trillion cubic feet in 1990 (Figure 2). The growth of demand to this level reflects an anticipated average annual compound growth rate of about 3.7 percent during the 1970-1990 period compared to a historical average annual compound growth rate of over six percent for the 1950-1970 period.

HISTORICAL RESERVE AND PRODUCTION TRENDS

The historical domestic supply position of the United States, as reported by the American Gas Association, is illustrated in Table I and Figure 3. These data exclude Alaskan resources because they are not presently available to the markets of the lower 48 states.

Prior to 1968 the annual net additions to reserves exceeded the annual production of gas, resulting in a surplus of gas found over the amount of gas consumed. In 1968, for the first time, production exceeded reserve additions by 7.3 trillion cubic feet. This historic reversal was followed by excesses of production over reserve additions of 12.3, 10.7, and 12.5 trillion cubic feet in 1969, 1970, and 1971, respectively. Because reserve additions in the past 4 years have been considerably below the historical

level and because production has been increasing, the year-end inventory of proved reserves has been reduced from its historical high of 289.3 trillion cubic feet in 1967 to a current level of 247.4 trillion cubic feet.

A distinct change in the rate of production occurred during 1971 when production increased only 0.1 trillion cubic feet. Although this change results from many factors, including the fact that the 1971-72 winter was unseasonably mild in many parts of the country, it may also indicate that the Nation's peak productive capacity is being approached. As will be discussed later, this peak has been projected to occur beginning about 1973.

One commonly used indicator of the Nation's gas supply posture is the reserve to production (R/P) ratio. The R/P ratio is a measure of the remaining years of proved reserves at the current level of production. Although the R/P ratio does not consider many of the physical limitations which govern the rate of gas withdrawal, it is useful as an indicator of gas supply. The R/P ratio has declined steadily from 26.8 in 1950 to 11.3 in 1971. Considered by itself, the historical decline in the R/P ratio was not a major source of concern because it was believed by some that, ideally, the R/P ratio would stabilize at a point sufficient to enable the quantities of gas demanded to be met without the development of excessive reserves. A decline below the ideal level, however, results in deliverability problems, i.e. reserves are insufficient to deliver the peak quantities of gas needed.

The findings (reserve additions) to production (F/P) ratio is another indicator which is sometimes useful when talking about gas supply. While reserve additions have fluctuated about an average value, production has been increasing, causing the F/P ratio to decline from about 2 in the early 1950's to 0.4 in 1971, indicating that gas reserves are now being consumed faster than they are being renewed (Figure 4).

FUTURE DOMESTIC GAS SUPPLY

Any analysis of future domestic supply necessarily involves an estimate of the level of future reserve additions. A recent analysis of natural gas supply and demand relationships by the Federal Power Commission (FPC) Staff reached several conclusions with respect to the future annual reserve additions depicted in Figure 5. First, an increase from the present level of annual reserve additions to the average national finding level of the past ten years (17 trillion cubic feet annually) is consistent with factors such as estimates of the undiscovered potential gas remaining and recent regulatory actions which have increased the wellhead price of gas in several important supply areas. Second, it is unlikely that annual reserve additions will increase to a sustained level higher than the average of the past 10 years.

Finally, it is improbable that findings will increase immediately to the 17 trillion cubic feet level from the 1970 level of 11.1 trillion cubic feet. Accordingly, for the purpose of projection, it is assumed that annual reserve additions will increase by approximately one trillion cubic feet per year from the 1970 level of about 11 trillion until additions reach 17 trillion cubic feet per year in 1976. Reserve additions are subsequently projected at 17 trillion cubic feet per year during the period 1977 through 1990.

Cumulative reserve additions under this anticipated schedule would amount to 325 trillion cubic feet from 1971 through 1990. This rate of reserve additions is compatible with current independent estimates of potential gas supply by the Potential Gas Committee (PGC) and the United States Geological Survey (USGS). Under this schedule of annual reserve additions, cumulative additions through 1990 would represent the development of about 38 percent and 21 percent, respectively, of gas supply in the lower 48 states as estimated by PGC and USGS.

Average reserve additions for the five year period 1971 through 1975 would be 14 trillion cubic feet per year which was also the average experienced during the period from 1966 through 1970. Reserve additions for 1971 were projected by the Federal Power Commission Staff to be about 12 trillion cubic feet (Tcf). In 1971, reported additions amounted to only 9.4 Tcf. Some reserves resulting from drilling on acreage leased in the December, 1970 Federal lease sale in offshore South Louisiana were not included, however, because data was insufficient to properly estimate the amount of proved reserves.

Estimates by the FPC Staff have been made of the future annual production levels which could be supported by these projected additions to reserves. The period from 1971 through 1975 was focused on by employing the projected national additions to reserves in an area-by-area analysis of the major producing areas of the country. Each area was examined by evaluating past drilling trends, reserve finding rates and production history as well as the potential of the area for sustained contributions to national supply. Two things were established through this analysis: (1) our national reserve additions schedule through 1975 was reconciled with individual supply area considerations and (2) we were able to approximate the national production rate which could be anticipated by summing the area-by-area estimates of production capability.

The dynamics of the relationship between gas supply, demand, and production can result in changing inter-area relationships with the passage of time. For this reason production projections based on an area-by-area approach do not have much validity

beyond five years. Beyond that time span, estimates of the production available from a given reserve base are probably best made on a national basis.

A commonly used method of approximating the productive capacity of a body of reserves is to assume that a minimum reserve to production ratio (usually 10) is required to provide for adequate delivery rates. This rule of thumb approach does not consider the sometimes rather wide variations experienced with actual gas reservoirs. In an attempt to make an improved approximation of future long-term gas deliverability, the FPC Staff developed a method to estimate the national production capability for each year by the computerized application of a "national availability curve." This curve was synthesized from FPC Form 15 deliverability data from more than 900 individual sources of supply which comprised more than 88 percent of the interstate and 62 percent of the national reserves in 1968. This method is superior to an R/P limit approach because it is derived from deliverability data which considers actual reservoir production characteristics.

The production projection for 1971 through 1990 (Figure 6) was derived from presently proved reserves plus anticipated reserve additions as scheduled by the methods described above and was computed using the "national availability curve." Annual gas production has increased exponentially in the past. In the 1971-1990 time interval, however, it is projected to peak at about 24.8 trillion cubic feet, around 1973-1974, and thereafter decline and stabilize at a somewhat lower level in the 1980's. Because demand is projected to grow while domestic supply is projected to stabilize within the time frame considered, a gas supply shortfall will develop. This supply deficit is projected to increase annually and reach 28.6 trillion cubic feet by 1990 (Table II).

Future supply and demand will not develop exactly as depicted in the above projections because precision is not possible in such a projection. Both demand and domestic production are susceptible to considerable deviation from the levels projected. In terms of sensitivity to error, it is obvious that the projection of domestic production is very susceptible because of its dependence upon the level of future reserve additions. Even if much more optimistic levels of reserve additions (and hence productive capacity) are assumed, however, increasing demand cannot be satisfied. Figure 7 illustrates a comparison of demand and three different levels of productive capacity should annual reserve additions exceed 17 trillion cubic feet per year. Reserve additions of 20, 25, and 30 trillion cubic feet are programed for every year beginning with 1971. Even under the best of these conditions, a substantial supply gap develops in the mid-1970's and worsens over the time span considered.

SUPPLEMENTAL GAS SUPPLIES

When considered against the backdrop of a projected indigenous supply deficiency, the importance of the future role to be played by supplemental sources of gas is obvious. Pipeline imports of gas from Canada and Mexico constitute the only substantive source of supplemental gas presently available. However, significant supplemental supplies of gas are expected to become available from several other sources in the future as development of the associated technologies and/or required systems proceeds. These major new supplemental sources are liquefied natural gas imports (LNG), gas from coal, and gas from Alaska (Table III). A positive contribution to gas supply will also be made by reformer gas derived from liquid hydrocarbons (SNG). However, the quantification of meaningful long range projections with respect to this source is not practicable at this time.

Pipeline Imports

During 1970 net imports of natural gas to the United States from Canada and Mexico amounted to 794.5 billion cubic feet. Of this amount, net imports from Mexico were only 26.7 billion cubic feet. There appears to be little reason to expect any substantial increase in imports from Mexico chiefly because of Mexico's relatively small undiscovered gas potential. There are prospects for increased overland imports of gas from Canada, however, which depend in large measure upon the timely development of gas reserves in excess of those required to satisfy Canada's future internal requirements.

In April 1969 the Canadian Petroleum Association estimated the ultimate potential raw recoverable natural gas reserves of Canada to be 720.9 trillion cubic feet (at 14.73 psia and 60°F.). If the total raw recoverable gas discovered through 1970 is subtracted from this value, a remaining undiscovered potential of 634.8 trillion cubic feet of raw gas is derived. Much of this undiscovered potential is attributed to Canada's frontier areas comprised of Northern Canada, the Arctic Islands, the MacKenzie Delta, Hudson Bay, and the continental shelf areas off the Atlantic, Pacific, and Arctic coasts. An important factor relative to Canada's natural gas potential is the interrelationship between the possible development of the potential in the MacKenzie Delta and Arctic Islands areas and the effect that this would have in unlocking the proven and potential gas resources of Alaska. The successful development of Canada's MacKenzie Delta and Arctic Islands resources would greatly enhance current proposals to move gas from Alaska and Northern Canada to Canadian and United States markets.

Several significant gas discoveries have already been made in the frontier areas. Because of these discoveries, a future level of annual reserve additions greater than historical rates can reasonably be used to estimate the future gas surpluses which the Canadians may be able to make available for export. Annual reserve additions in Canada's traditional supply areas averaged 4 trillion cubic feet from 1966 to 1970. On the basis of the potential of the frontier areas, however, future annual average additions may be estimated to be 6.5 trillion cubic feet. Use of this finding level in conjunction with Canada's projected requirements and scheduled exports under existing licenses would result in an increase in the annually exportable volumes of 0.8 trillion cubic feet in 1970 to 1.9 trillion cubic feet by 1990 (Table III).

Liquefied Natural Gas

Many regions of the world have extensive volumes of developed natural gas reserves but have limited internal markets. These resources in conjunction with advancing technologies in the liquefaction, handling, and transportation of liquefied natural gas (LNG) have kindled an intense interest in the delivery of liquefied natural gas volumes to the energy hungry centers of the world.

At present the Federal Power Commission has authorized only one long-term marine import of LNG into the United States. Several other proposals for the long-term import of base load LNG have been filed with the Federal Power Commission, however, and a number of other prospective projects have been widely discussed in the trade press. These filed and prospective LNG projects are an indication of the future availability of long-term LNG imports to the contiguous United States. While the estimated operational dates for these projects may be based on reasonable assumptions or on the most current expectations, other more difficult factors to evaluate such as the length of time required for the necessary governmental authorizations and the construction time necessary to build the extensive facilities required make it unlikely that actual LNG imports will precisely follow current schedules and expectations. Current analyses of these projects indicate that the import of significant LNG volumes into the United States (0.3 trillion cubic feet) can first be expected in 1975 and that these imports will increase to about 2.0 trillion cubic feet annually by 1980 (Table III). In the longer term future, the degree of precision in any forecast is even less clear, but numerous companies have indicated that certain additional projects are under "active consideration" or "investigation". On this basis the growth rates expected in the 1975-1980 period should continue into the decade of the 80's, thus yielding a projected LNG availability of about 4 trillion cubic feet annually by 1990.

Gas From Coal

Progress toward the development of improved processes to produce high - B.t.u. synthetic pipeline quality gas from coal can currently be seen on several fronts. Two large-scale coal gasification pilot plants are currently in operation or under construction and plans to build two others have been firmed up. The pilot plant in operation is located near Chicago, Illinois, and employs the HYGAS process developed by the Institute of Gas Technology. A plant using the Consolidation Coal Company CO_2 Acceptor process is nearing completion at Rapid City, South Dakota. The Department of the Interior has awarded a contract to Bituminous Coal Research to build and operate a pilot plant based on their BI-GAS process near Homer City, Pennsylvania, and construction on a fourth pilot plant, intended to study the Bureau of Mines' SYNTHANE process, is scheduled to begin in September of 1972 in suburban Pittsburgh, Pennsylvania. The research and development work associated with these new coal gasification processes is not expected to be completed prior to the late 1970's.

In addition, two other major efforts have been announced to develop coal gasification facilities in northwestern New Mexico. These proposed plants would be based on an extension of the Lurgi technology which has been used in Europe for many years. The first is a project proposed by El Paso Natural Gas Company, and the second is a proposal by a consortium composed of Pacific Lighting Service Company, Texas Eastern Transmission Corporation, and Utah International Inc. Each of these projects calls for the construction of one or more gasification plants capable of producing about 250 million cubic feet per day each and would utilize some of the extensive coal reserves of the area.

The first few commercial coal gasification plants will probably be based on Lurgi technology, and the first of perhaps several Lurgi type facilities could be producing synthetic gas in commercial quantities by 1976. By 1980 the newer gasification processes will likely have been fully demonstrated which will permit the significant expansion and development of a coal gasification industry in the period beyond 1980. Several factors will bear heavily upon the rate of growth which can be attained by this new industry. Among these are the availability of substantial tonnages of coal for conversion, the tremendous capital expenditures which will be required for gasification plants and the supporting mining facilities, and the problems associated with locating the mine-plant complexes in areas able to provide the necessary uncommitted coal reserves as well as the required process water.

With these factors in mind the availability of pipeline quality gas from coal may be projected to rise from about 0.1

trillion cubic feet in 1976 to 0.3 trillion cubic feet annually by 1980 with these volumes most likely entirely attributable to Lurgi type plants. Gas available from added facilities based on the newer process technologies currently under development is projected to bring the total annual volumes of gas available from coal gasification to about 1.4 and 3.3 trillion cubic feet, respectively, in years 1985 and 1990.

Gas From Alaska

The year-end 1971 proved reserves of natural gas in Alaska were 31.4 trillion cubic feet. Of this amount about 26 trillion cubic feet are attributable to the Prudhoe Bay area of the North Slope. It is widely known, however, that because the North Slope gas reserves are chiefly associated-dissolved volumes related to the North Slope oil reserves, this gas can become available to market only as provision for the production of the oil is provided. Any projection of the availability of North Slope gas to the markets of the lower 48 states is therefore heavily dependent on the availability and timing of a transport capability for both the oil and the gas.

A great deal of planning, research, engineering and other preliminary work with respect to a Trans-Alaska oil pipeline has already been completed. However, considerable delays in the initiation of construction of the proposed pipeline have been encountered chiefly as a result of the environmental implications of the project. For the purpose of this projection, further delays are assumed to be minimal and oil production from the North Slope is assumed to begin in 1976.

Three major proposals have been advanced which would provide large diameter pipeline transportation for North Slope gas as well as that gas which may become available in Canada's Northwest frontier areas. The Gas Arctic Systems group has proposed a 1550 mile system which would connect the Prudhoe Bay area with an extension of Alberta Gas Trunk Line's existing system in Alberta, Canada. This system could make gas available to U.S. Westcoast and Midwest markets through pipeline interconnections with existing pipeline systems. Sponsors of the Mountain Pacific Project have proposed the construction of a system passing from the North Slope area through the Fort Liard region of the Northwest Territories and then southward through British Columbia to the international border where it would connect with a newly proposed U.S. carrier and serve Pacific coast markets as far south as Los Angeles. A third proposal, advanced by the Northwest Project Study Group, would provide a 2,500 mile line extending from Prudhoe Bay to the Canadian-U.S. international boundary near Emerson, Manitoba. Whichever line is ultimately built will likely be capable of moving approximately three billion cubic feet of gas daily when fully powered.

The projection of the availability of Alaskan gas (Table III) is based on the assumption that a gas pipeline system traversing Canada will be completed for initial service in late 1976 or in 1977. Although the timing of current plans to provide for the pipeline movement of North Slope oil and gas is subject to considerable conjecture, a projection of 0.7 trillion cubic feet of Alaskan gas in 1980 is reasonable. Alaskan natural gas production and transmission capability should expand to 1.3 and 2.3 trillion cubic feet annually by 1985 and 1990, respectively. These projections exclude those Canadian volumes which may be transported in the same pipeline system; all Canadian gas has been included with the projection of Canadian imports.

CONCLUSIONS

Our projection of the United States' gas supply-demand balance through 1990 is summarized in Table IV and Figure 8. The availability of gas from all sources is expected to fall increasingly behind demand. An annual unsatisfied demand for gas of about 9 trillion cubic feet by 1980 will increase to about 17 trillion cubic feet by 1990. Domestic production of natural gas is projected to peak in the mid-1970's and fall slowly thereafter, placing an increasingly heavy future reliance on imports and other supplemental gas supplies. While this outlook may appear to be pessimistic, it is not predicated on a pattern of failure. The future prospects for domestic reserve additions, pipeline and LNG imports, Alaskan gas, and synthetic gas from coal have been carefully analyzed and a reasonably successful program of development and implementation for each has been assumed. The purpose of these projections has been to approximate the likely national supply-demand balance over the period considered and to establish some idea of the probable supply-demand posture which the Nation can expect. If these projections portray the future course of events with any degree of accuracy, it is obvious that solutions to the Nation's gas supply problem or a significant modification of the anticipated supply-demand balance will not be simple or swift.

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Table I

UNITED STATES NATURAL GAS SUPPLY EXCLUDING ALASKA
1950-1971
(Volumes in Tcf)

Year	Net Production (1)	Reserve Additions (2)	Year-End Reserves (3)	R/P Ratio (3)/(1) (4)	F/P Ratio (2)/(1) (5)
1950	6.9	12.0	184.6	26.8	1.7
1951	7.9	16.0	192.8	24.4	2.0
1952	8.6	14.3	198.6	23.1	1.7
1953	9.2	20.3	210.3	22.9	2.2
1954	9.4	9.6	210.6	22.4	1.0
1955	10.1	21.9	222.5	22.0	2.2
1956	10.9	24.7	236.5	21.7	2.3
1957	11.4	20.0	245.2	21.5	1.8
1958	11.4	18.9	252.8	22.2	1.7
1959	12.4	20.6	261.2	21.1	1.7
1960	13.0	13.8	262.2	20.2	1.1
1961	13.4	16.4	265.4	19.8	1.2
1962	13.6	18.8	270.6	19.9	1.4
1963	14.5	18.1	274.5	18.9	1.2
1964	15.3	20.1	279.4	18.3	1.3
1965	16.3	21.2	284.5	17.5	1.3
1966	17.5	19.2	286.4	16.4	1.1
1967	18.4	21.1	289.3	15.7	1.1
1968	19.3	12.0	282.1	14.6	0.6
1969	20.6	8.3	269.9	13.1	0.4
1970	21.8	11.1	259.6	11.9	0.5
1971	21.9	9.4	247.4	11.3	0.4

Source: American Gas Association

Table II

UNITED STATES DOMESTIC SUPPLY AND DEMAND
1972-1990
(Volumes in Tcf)

Year	Demand	Production	Domestic Supply Deficit
1972	26.1	23.8	2.3
1973	27.7	24.7	3.0
1974	28.8	24.8	4.0
1975	29.8	24.7	5.1
1980	34.5	20.4	14.1
1985	39.8	18.5	21.3
1990	46.4	17.8	28.6

Table III

SUPPLEMENTAL SUPPLIES OF NATURAL GAS
Projected 1971-1990
(Volumes in Tcf)

Year	Pipeline Imports	LNG Imports	Gas From Coal	Alaskan Gas	Annual Total
1970	0.8	*	-	-	0.8
1971	0.9	*	-	-	0.9
1972	1.0	*	-	-	1.0
1973	1.1	*	-	-	1.1
1974	1.1	*	-	-	1.1
1975	1.2	0.3	-	-	1.5
1980	1.6	2.0	0.3	0.7	4.6
1985	1.9	3.0	1.4	1.3	7.6
1990	1.9	4.0	3.3	2.3	11.5
Total	31.1	38.0	17.3	20.6	107.0

*Small Volumes

Table IV
UNITED STATES GAS SUPPLY-DEMAND BALANCE
Actual 1966-1970; Projected 1971-1990
(All Volumes in Trillions of Cubic Feet @ 14.73 Psia and 60° Fahrenheit)

Year	Annual Demand 1/	Net Pipeline Imports	LNG Imports	Gas From Coal	Gas From Alaska	Gas From Liquid Hydrocarbons	Domestic Production	Annual Consumption	Unsatisfied Demand	Reserve Additions	Year-end Reserves	R/P Ratio
1966	17.9	0.4	-	-	-	-	17.5	17.9	0.0	19.2	286.4	16.4
1967	18.8	0.5	-	-	-	-	18.4	18.8	0.0	21.1	289.3	15.8
1968	19.9	0.6	*	-	-	-	19.3	19.9	0.0	12.0	282.1	14.6
1969	21.3	0.7	*	-	-	-	20.6	21.3	0.0	8.3	269.9	13.1
1970	22.6	0.8	*	-	-	-	21.8	22.6	0.0	11.1	259.6	11.9
1971	24.6	0.9	*	-	-	-	22.8	23.7	0.9	12.0	248.8	10.9
1972	26.1	1.0	*	-	-	**	23.8	24.8	1.3	13.0	238.0	10.0
1973	27.7	1.1	*	-	-	**	24.7	25.8	1.9	14.0	227.3	9.2
1974	28.8	1.1	*	-	-	**	24.8	25.9	2.9	15.0	217.4	8.8
1975	29.8	1.2	0.3	-	-	**	24.7	26.2	3.6	16.0	208.7	8.4
1980	34.5	1.6	2.0	0.3	0.7	**	20.4	25.0	9.5	17.0	186.1	9.1
1985	39.8	1.9	3.0	1.4	1.3	**	18.5	26.1	13.7	17.0	175.4	9.5
1990	46.4	1.9	4.0	3.3	2.3	**	17.8	29.3	17.1	17.0	170.4	9.6
1971-1990 Totals	707.6	31.1	38.0	17.3	20.6	**	414.2	521.2	186.4	325.0	-	-

* Very small volumes
** Insufficient data for quantitative projection: unsatisfied demand will be reduced by the amount of SNG actually produced.
1/ Contiguous 48 states.

1970 INTERSTATE NATURAL GAS MOVEMENTS

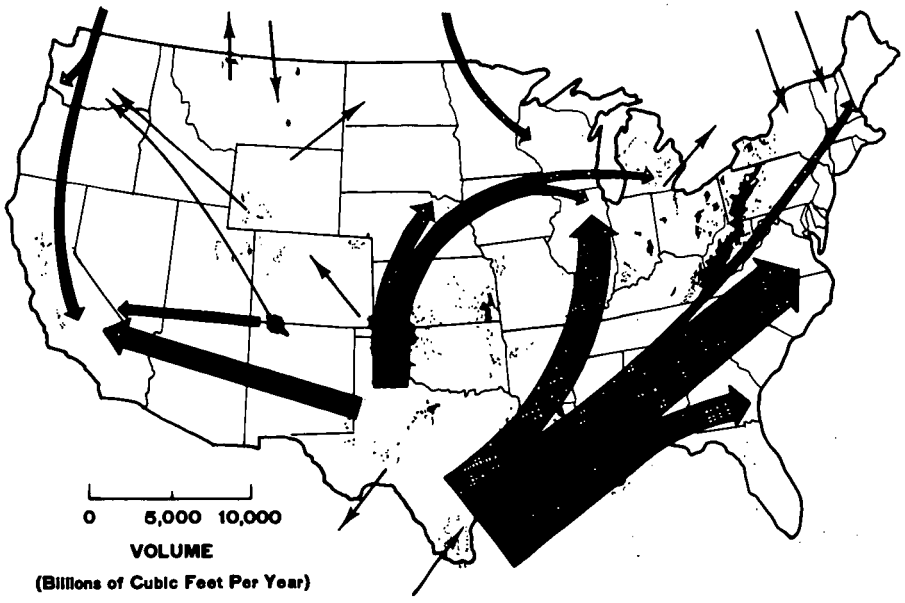


Figure 1

DEMAND FOR NATURAL GAS

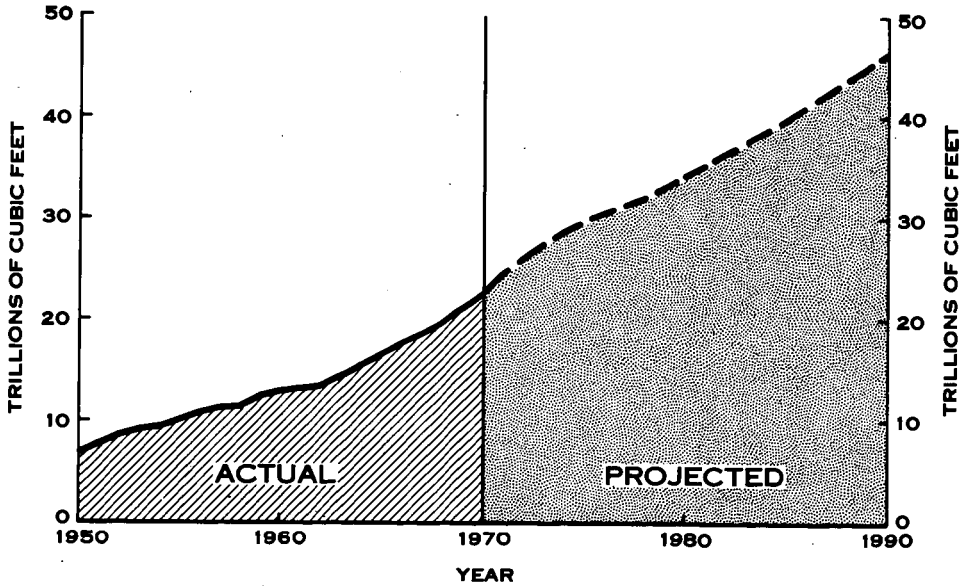
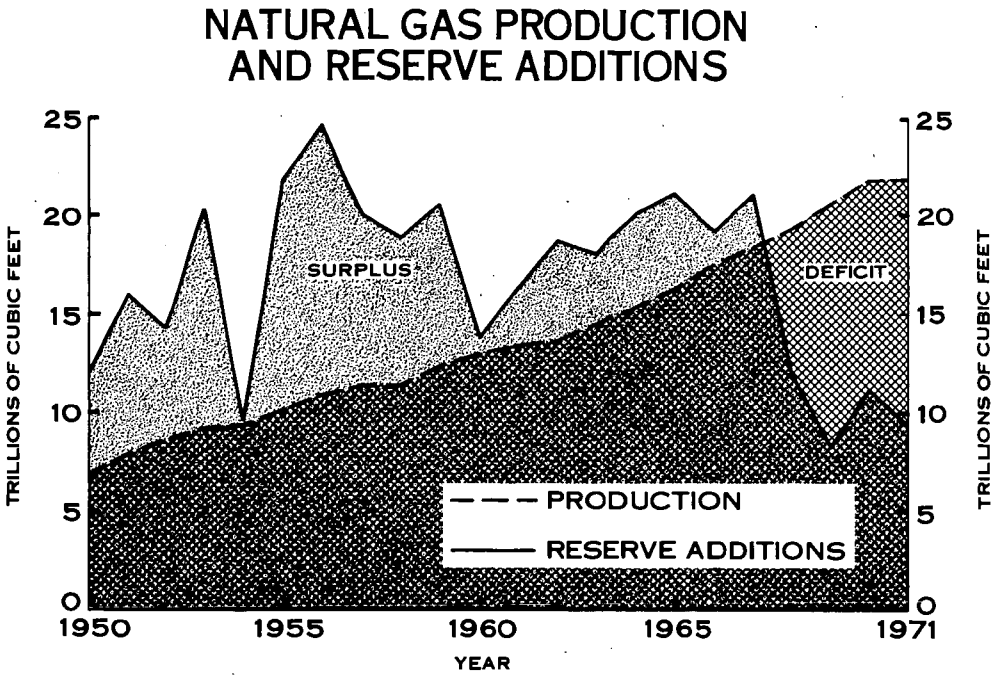


Figure 2



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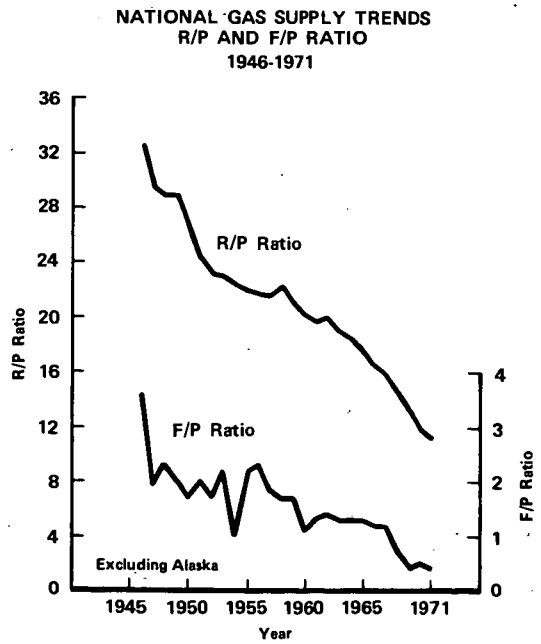

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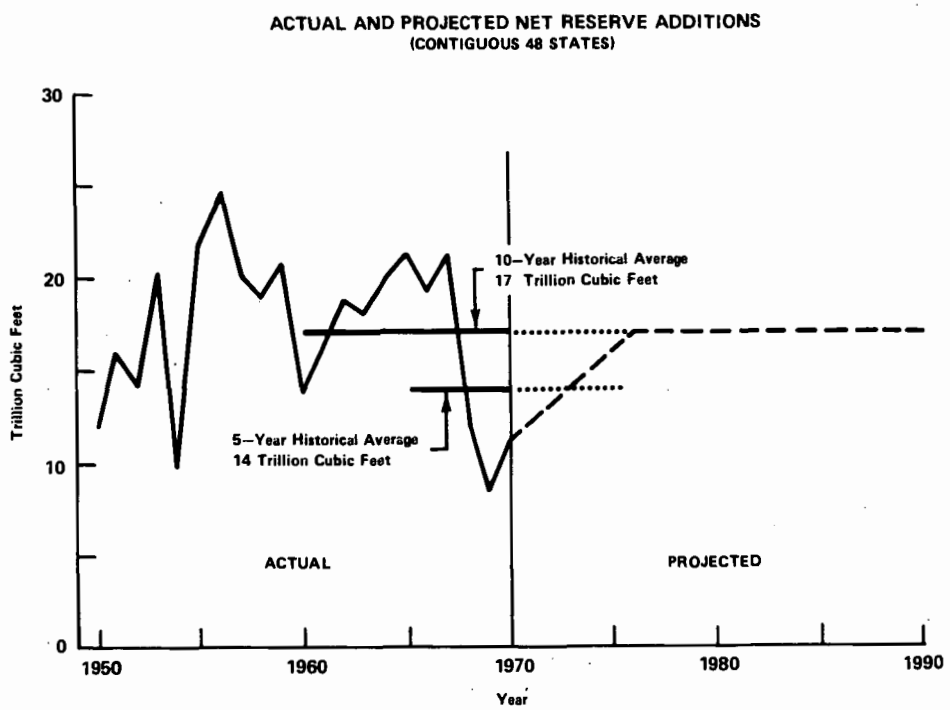
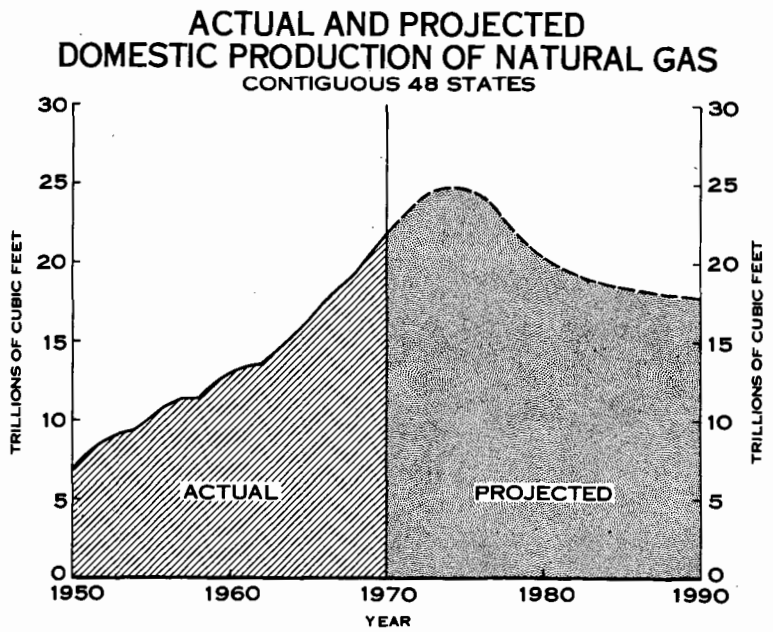


Figure 5



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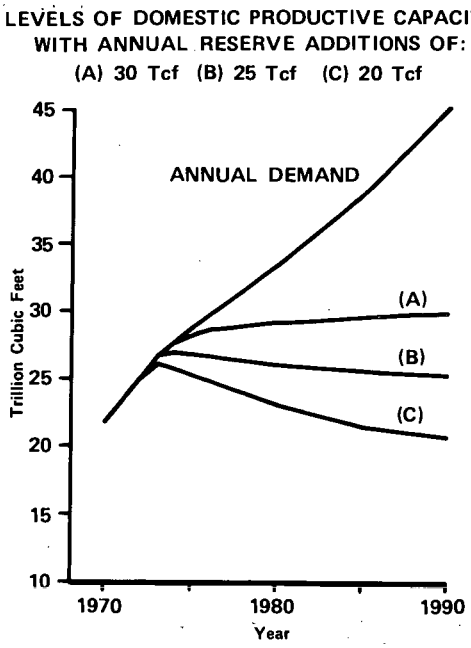

Figure 7

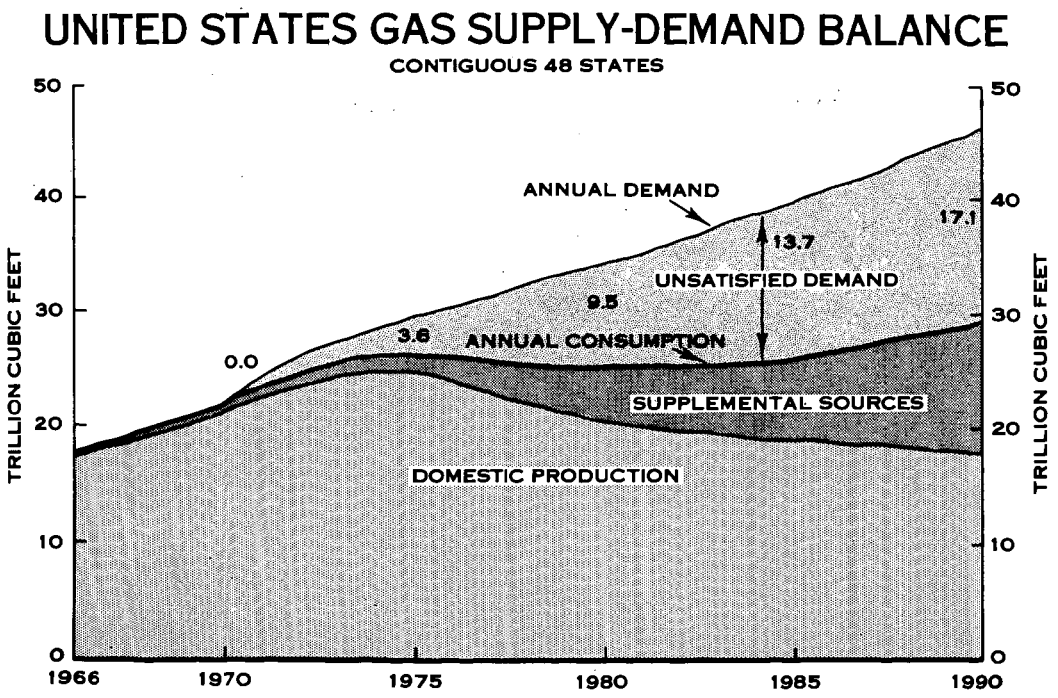

Figure 8