The original documents are located in Box 13, folder "Natural Gas Shortage (1)" of the Robert T. Hartmann Files at the Gerald R. Ford Presidential Library.

THE NATURAL GAS SHORTAGE:

A PRELIMINARY REPORT

AUGUST, 1975

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EXECUTIVE SUMMARY

THE SHORTAGE

- The natural gas shortage has been growing rapidly.
  - ° In 1970, curtailments were 0.1 Tcf or less than 1 percent of consumption. Last year curtailments were up to 2.0 Tcf or 10% of total demand.
  - ° For 1975 they are forecast to increase by 45% to 2.9 Tcf (about 15 percent of demand).
- The shortage is most severe in the winter.
  - ° This winter curtailments will be 1.3 Tcf, up from 1.0 Tcf last winter. This lower than expected increase is due to the lag in demand growth as the economy begins its upswing.
  - ° A very cold winter (once every 10 years) would raise the shortage to about 1.45 Tcf.
- Even with natural gas deregulation, which is the greatest potential policy solution, shortages can be expected to grow in each succeeding winter for several years and could approach 1.9 Tcf in the 1976/77 heating season.

ECONOMIC IMPACT THIS WINTER

- Because of the economic slowdown and much higher prices, no shortage and possibly a surplus exists in the intrastate markets, primarily Louisiana, Texas, and Oklahoma.
- Economic impacts last winter were very scattered and not significant nationwide. This was due to:
  - ° Alternate fuels were available and many gas consumers switched to propane and oil.
  - ° The economic slowdown and mild weather reduced demand.
  - ° Conservation programs were implemented in some local areas.
  - ° Some emergency natural gas deliveries were allowed under existing FPC authorities.

- To the extent there were economic impacts, they were localized mainly in eastern and midwestern states.

- This coming winter the shortage will increase by about 0.3 Tcf and this increment is probably the most accurate measure of economic impact.

- This shortage is likely to be focused in about 10-15 states including the mid-Atlantic coast (from New York to South Carolina), and others such as Ohio, West Virginia, Pennsylvania, and Kentucky.

  ° The potential economic impact is concentrated in these states because the particular pipelines in these areas are the most short of supply and because of a higher concentration of industrial use in some of these areas.

  ° Local communities within these states are likely to feel an even greater impact where a factory, which is a major employer, may be forced to shut down or reduce output.

- The economic impact could be magnified many fold by a concurrent Arab embargo, as alternate fuels would be unavailable.

NEXT STEPS

- The President will announce his decisions on policy actions to mitigate the shortage within the next few weeks.

- FEA has made available to the States its preliminary assessment of the natural gas shortage. In about a month, the FEA will produce and make available the first results from its more sophisticated and continuing data and forecasting systems before the start of the heating season. These systems will assess the size of the shortage for each major distributor of gas in the country, each end user's alternate fuel capability and will forecast the shortage regionally based upon economic and weather conditions.

TAB 1

TAB 1

THE NATURAL GAS SHORTAGE:

A PRELIMINARY REPORT

AUGUST, 1975

FEDERAL ENERGY ADMINISTRATION
OFFICE OF POLICY & ANALYSIS

THE NATURAL GAS SHORTAGE

Introduction

In May, President Ford directed the Energy Resources Council to assess the magnitude and possible impacts of this winter's natural gas shortage and to recommend policy actions to deal with the shortage.

This report, coordinated by the FEA, is a preliminary assessment of the natural gas problem and its impacts. Final policy recommendations will be issued shortly and a complete monitoring, forecasting, and data system will be operational before the start of the heating season.

Natural Gas Trends

The natural gas shortage has been growing at a rapid rate in recent years. Demand for natural gas has steadily increased because of its clean-burning properties, low-cost, and until recently, accessibility. After World War II, the availability of abundant supplies of natural gas -- most of it found in the search for oil -- and improved quality of pipe for high-pressure, long-distance delivery enabled the gas utility industry to expand rapidly and widely. Marketed gas production increased from four trillion cubic feet (Tcf), in 1946, to eight Tcf by 1952 and continued to grow at a 6.5 percent average annual rate in the 1950's and 1960's (see Figure 1 for natural gas trends).

Natural gas production peaked in 1973 at 22.5 Tcf and declined significantly for the first time in 1974 to 21.2 Tcf, a decline of almost 6 percent. Last year's production decline is equivalent to over 230 million barrels of crude oil. Reserve additions failed to equal or exceed production for the seventh straight year and gas reserves in the lower 48 states are now at their lowest level since 1952. The only major reserve additions in recent years has been the Alaskan reserves of 26 Tcf added in 1970 (see Figure 2 for reserve and production trends).

The U.S. natural gas system is composed of producers, interstate and intrastate pipelines, distributors, and end-users (see Figure 3). Interstate pipelines supply about two-thirds of the approximately 20 trillion cubic feet (Tcf) consumed annually in the U.S. Domestic production is concentrated in six states (Texas, Louisiana, Oklahoma, California, New Mexico, and Kansas), with most of this production in Texas and Louisiana. Consequently, most of the intrastate pipelines are found in these states.

Growth in U.S. Natural Gas Consumption 1920 - 1974

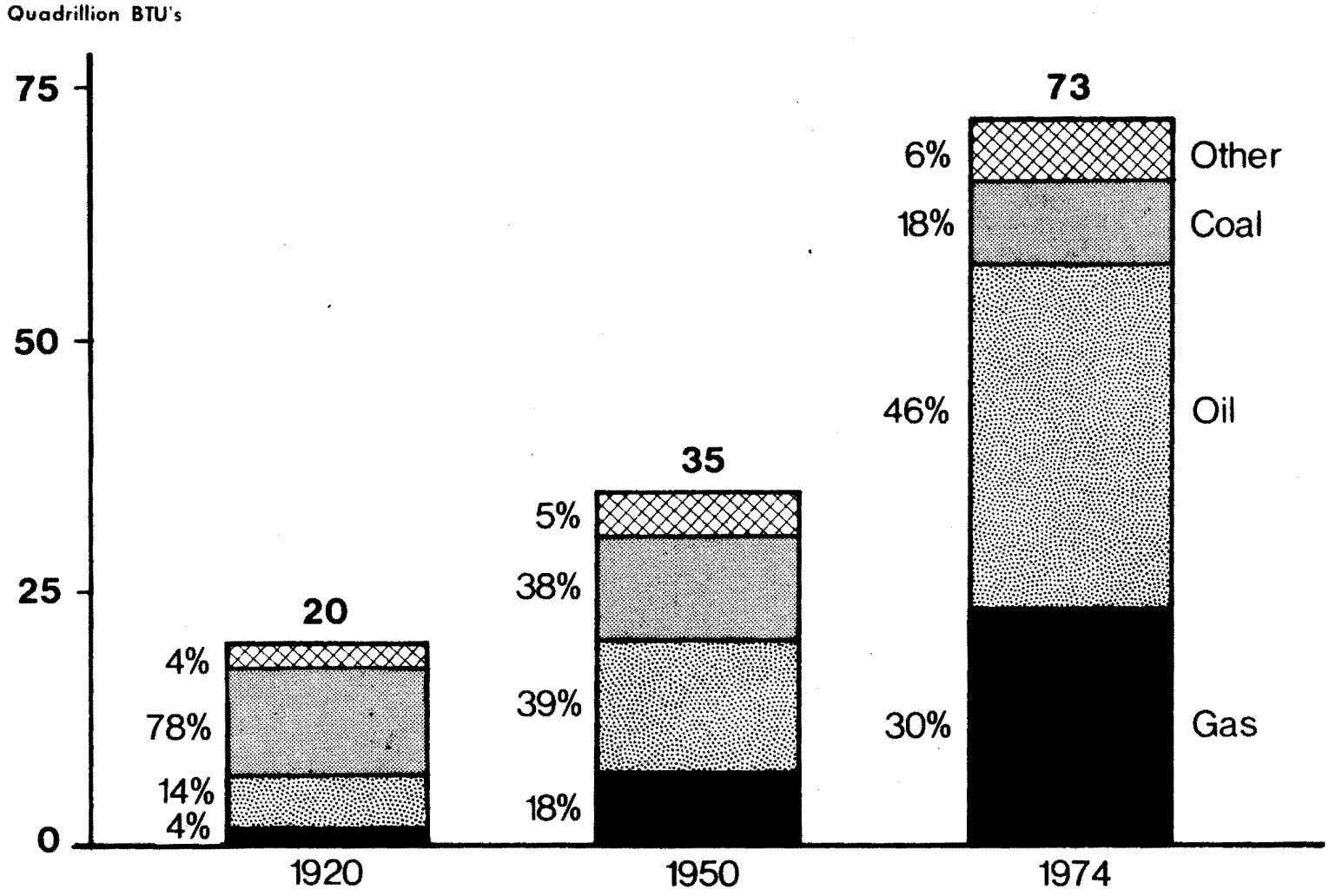


FIGURE 1

U.S. Natural Gas Reserves (Excluding Alaska)

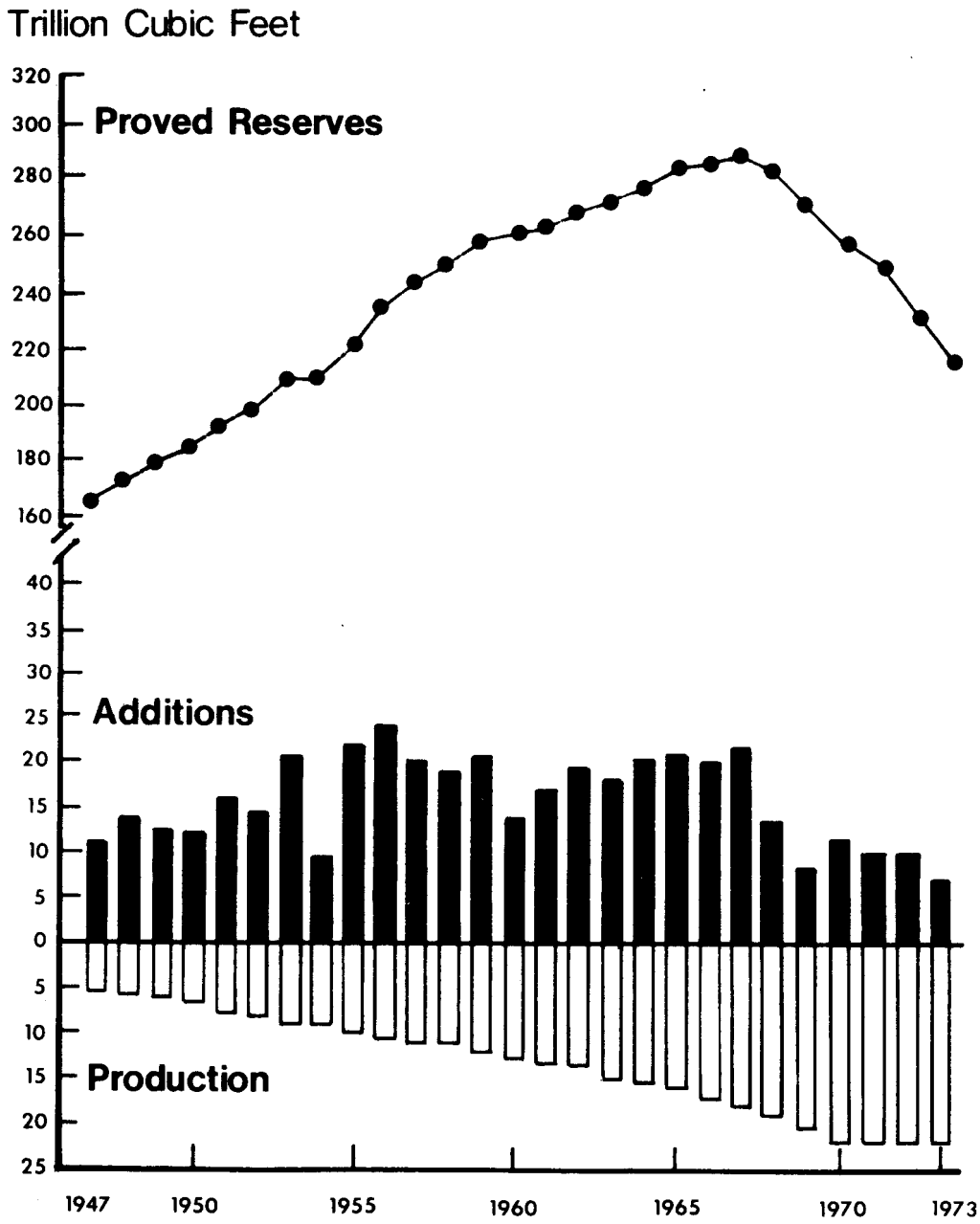


FIGURE 2

Overview — U.S. Natural Gas System [Bcf]

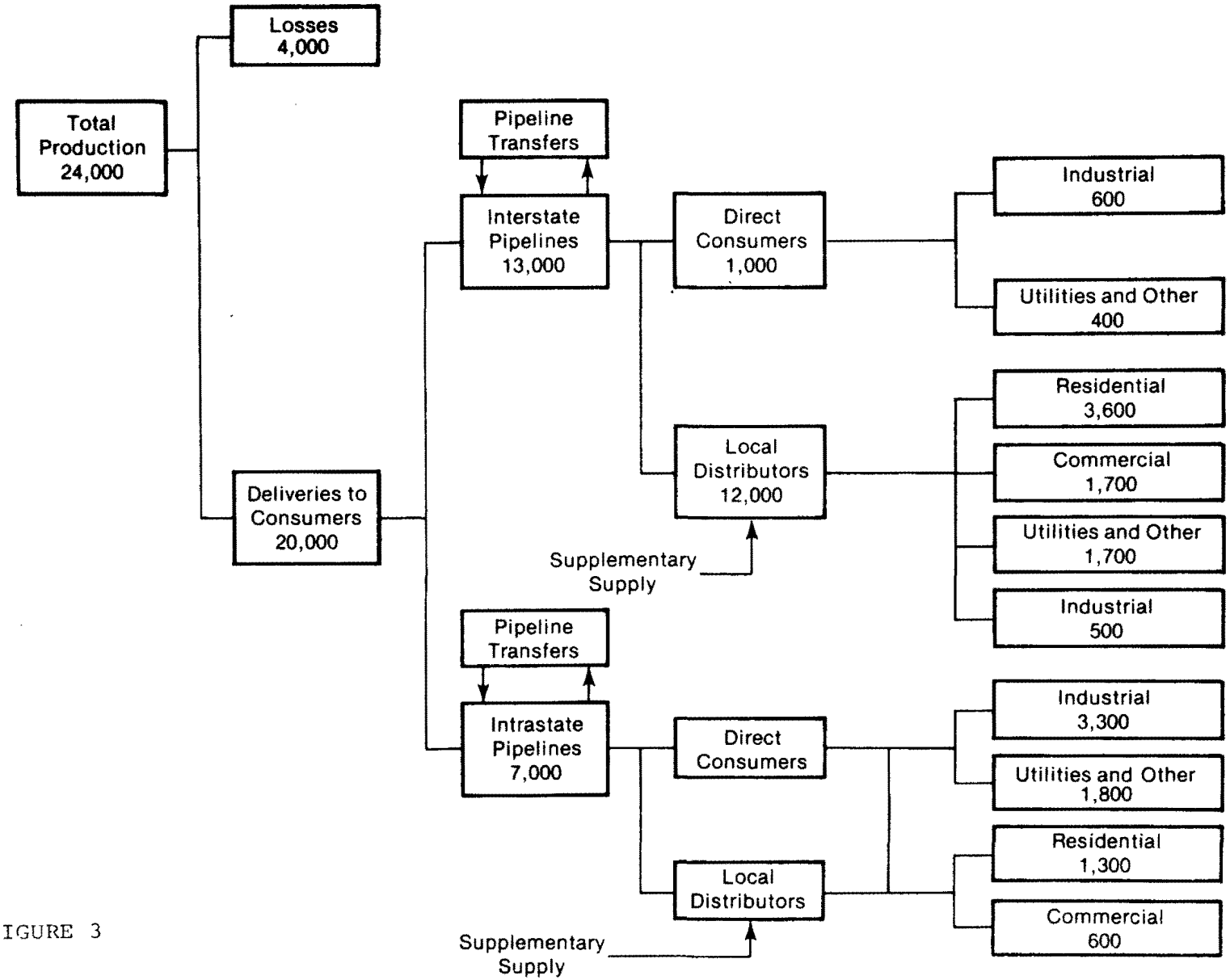


FIGURE 3

Natural gas now represents about one-third of the total energy consumed by the Nation and almost one-half of the non-transportation uses -- an amount twice that supplied by either oil or coal. It is consumed by over 40 million residences, 3.4 million commercial establishments, and over 200,000 industrial users.

Natural gas is predominantly consumed by industry, as indicated below:

residential use	24.5%
commercial use	11.6%
industrial use	46.2%
electric power	16.5%
other	1.2%

Most of the residential use of natural gas is for space heating (over 70 percent) and water heaters (about 20 percent). The largest industrial gas users are chemical and allied products (about 24 percent), petroleum and coal products (16 percent), and primary metal industries (about 13 percent). Almost 40 percent (about 3.5 Tcf) of the industrial gas use is as a boiler fuel in the chemical, petroleum, food, and paper industries. Gas consumption plays an important role as a feedstock and process fuel in the manufacture of ammonia, fertilizer, and methanol.

The greatest percentage of natural gas use occurs in the West South Central census region (Texas, Louisiana, Oklahoma, and Arkansas), which consumes over 30 percent of the natural gas used and which also accounts for more than 50 percent of gas used in electric utilities. The smallest use of natural gas occurs in New England, which uses less than 2 percent of the gas. Boiler fuel gas use remains over 1/3 of the gas market and is substantial in the West South Central and Mountain States where intrastate gas is more plentiful. (See Figure 4 for the distribution of natural gas consumption in each region.)

Regional Distribution of Natural Gas Consumption, 1974

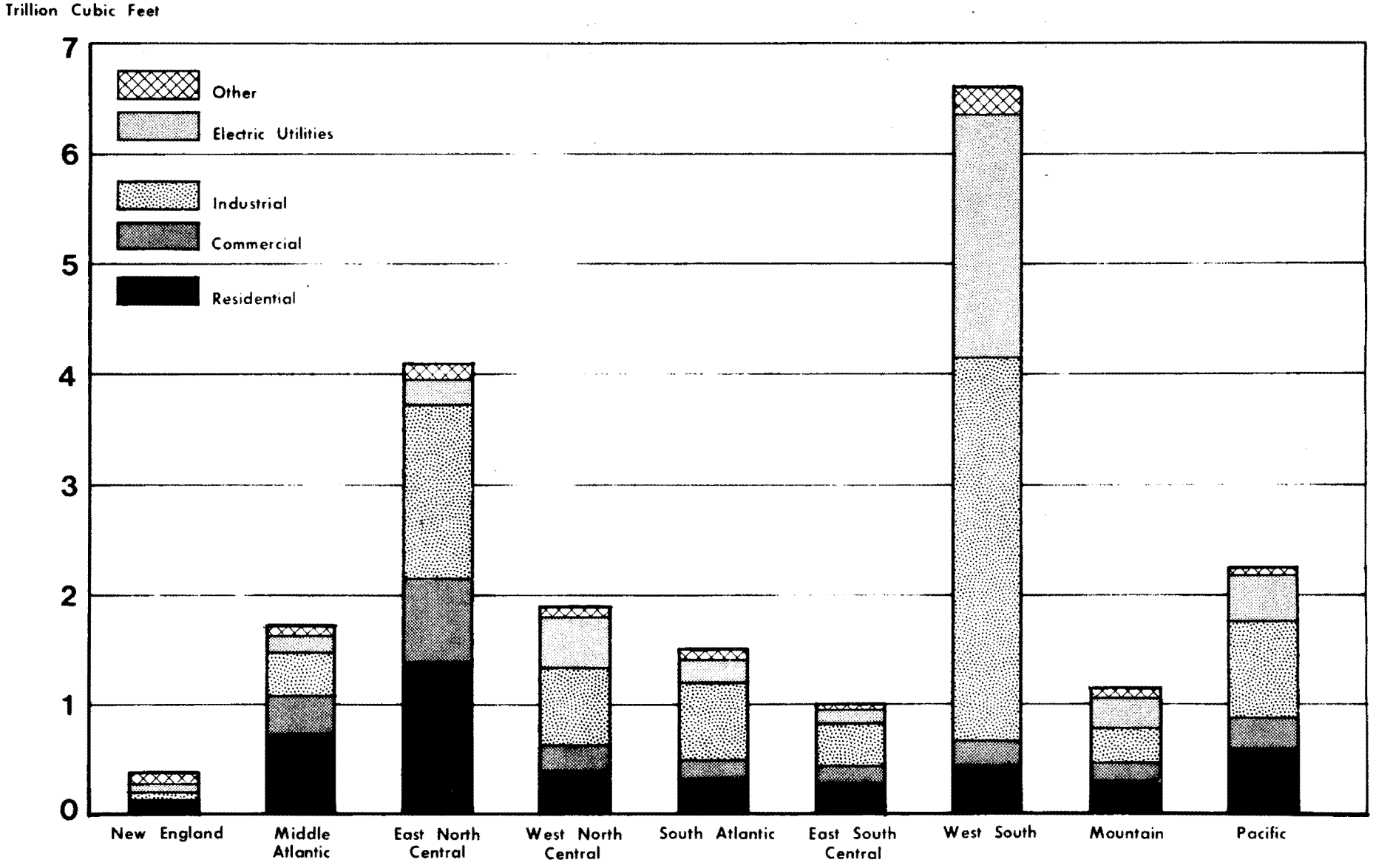


FIGURE 4

The Growing Shortage

In the 1970's, the demand for gas has exceeded its supply. Many gas distribution companies have found it necessary to deny gas service to new customers and to curtail some customers. Additionally, the Federal Power Commission has set priorities on gas use (see Table 1 for priority list). The highest priority users -- residential and small commercial customers and industrial use for plant protection, feedstock, and process needs -- are the last to be curtailed in times of shortage.

Curtailments (generally defined as requirements less deliveries) grew from 0.1 trillion cubic feet (Tcf) in the 1970/71 season (April-March) to 2.0 Tcf in 1974/75, as shown below:

TABLE 2
CURTAILMENT TRENDS

Year (April-March)	Annual Firm 1/ Curtailments (Tcf)	Heating Season (Nov.-Mar.) Curtailments (Tcf)
1970/71	0.1	0.1
1971/72	0.5	0.2
1972/73	1.1	0.5
1973/74	1.6	0.6
1974/75	2.0	1.0
1975/76 (expected)	2.9	1.3
1976/77 (forecast)	4.0	about 1.9

1/ Pipeline to pipeline curtailments not included in 1974-1976 data.

While firm natural gas requirements of 9.0 Tcf are projected for the winter heating season (November 1975 to March 1976), the firm curtailments of 1.3 Tcf exceed last year's curtailments during the same period by 30%. Corresponding figures for the year (April - March) indicate curtailments of 2.9 Tcf, which is 45 percent worse than last year.

For many years, interstate and intrastate gas sold at about the same price. Within the last ten years, intrastate prices have increased more quickly than the regulated interstate prices and this has led to a change in the share of the market held by interstate and intrastate distributors (market share has shifted about 5 percent since 1970). Since the intrastate gas can be sold at higher prices, more exploration has been occurring in the intrastate area. In fact, in the last five years over 90 percent of the reserve additions have been in the intrastate area; whereas in the preceding five years only one-third of reserve additions were intrastate (see Figure 5).

TABLE 1

Federal Power Commission
Natural Gas Curtailment Priorities

1. Residential, small commercial (less than 50 MCF on a peak day) .

2. Large commercial requirements (50 MCF or more on a peak day), firm industrial requirements for plant protection, feedstock and process needs, and pipeline customer storage injection requirements.

3. All industrial requirements not specified in 2, 4, 5, 6, 7, 8, or 9.

4-5. Firm industrial requirements for boiler fuel use where alternate fuel capabilities can meet such requirements.

6-9. Interruptible requirements where alternate fuel capabilities can meet such requirements.

Average Annual Net Reserve Additions to Interstate and Intrastate Pipelines

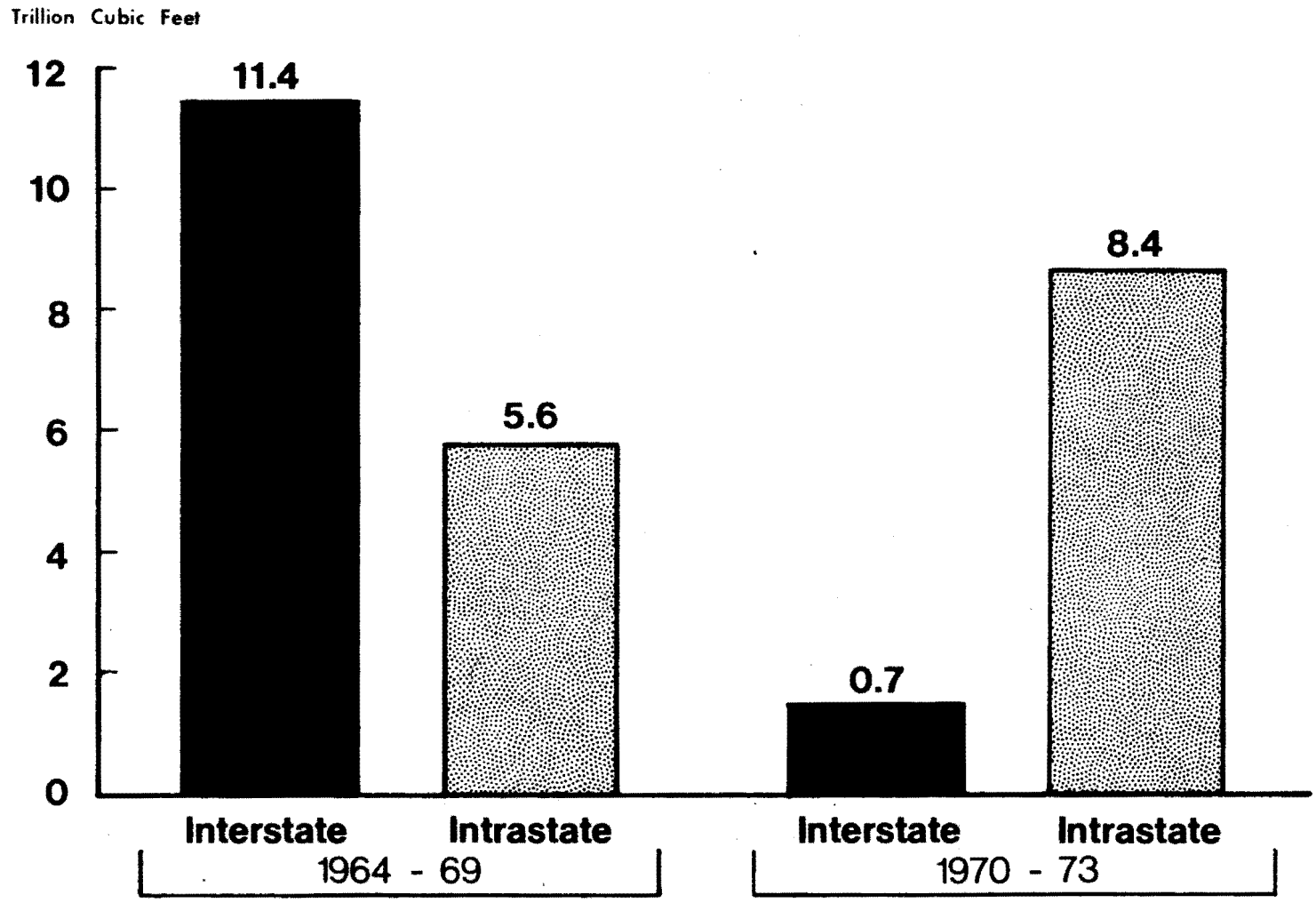


FIGURE 5

Pipelines are not only linked to specific fields, but are linked to specific distribution areas as well. Of the 48 interstate pipeline companies reporting, five major interstate pipelines represent nearly 80% of the volume of projected curtailments and less than half the total requirements. These pipelines are: Columbia Gas Transmission Corp.; El Paso Natural Gas Co.; Texas Eastern Transmission Co.; United Gas Pipeline Co.; and Transcontinental Gas Pipeline Corp. As indicated in Table 3, each of these pipelines projects curtailments to exceed firm requirements by more than 20 percent; but others such as Consolidated Gas Supply, Michigan-Wisconsin Pipeline, and Natural Gas Pipeline have very small curtailments. The map shown in Figure 6 indicates that a few key pipelines experiencing substantial curtailments serve the most affected states.

Thus, natural gas shortages are distributed unevenly. Within one region or state, some areas may have adequate supplies while other areas are being severely curtailed, because the shortage depends upon a particular pipeline's supply situation.

While natural gas deregulation is a major remedy for the problem, shortages are expected to grow in each succeeding winter for the next several years, although at a much slower rate than without deregulation.

Last year's shortage was also felt in the intrastate market and curtailments were experienced in several producing states (e.g., Louisiana). In the last year, however, the increase in intrastate prices, economic slowdown, reduced refinery runs (many refineries use natural gas as fuel) and conservation have relieved the intrastate shortage and probably resulted in a temporary surplus.

While curtailments are normally used to measure the shortage, the most appropriate and consistent measure of the problem we face this year is the reduction in deliveries this year over last, plus any increase in demand. Curtailments, which are generally requirements less delivery, are defined differently by different pipelines and thus there may not be a uniform description of the problem within the same state. Deliveries are expected to decline this winter by about 350 billion cubic feet (Bcf), but demand is also expected to decline. Even assuming a normal winter the economic recovery will not be rapid enough to increase natural gas demand over last winter. With a normal winter, demand will be about 125 Bcf less than last winter; with a cold winter, it will be about level. Thus, the incremental shortage in this heating season over last year will be between 225-375 Bcf.

TABLE 3

Firm Requirements and Deficiencies for Ten Largest Interstate Pipelines

	'75 – '76 Projected			'74 – '75 Actual
	Firm Requirements [Bcf]	Deficiency	Percent Deficient	Percent Deficient
Columbia	849	235	28	21
United	710	320	45	39
El Paso	606	148	24	17
Tenneco	592	70	12	14
Natural Gas Pipeline	527	0	0	0
Michigan-Wisconsin	505	17	3	0
Transco	497	180	36	26
Texas Eastern	501	117	23	20
Consolidated	432	19	4	3
Panhandle Eastern	361	86	24	16

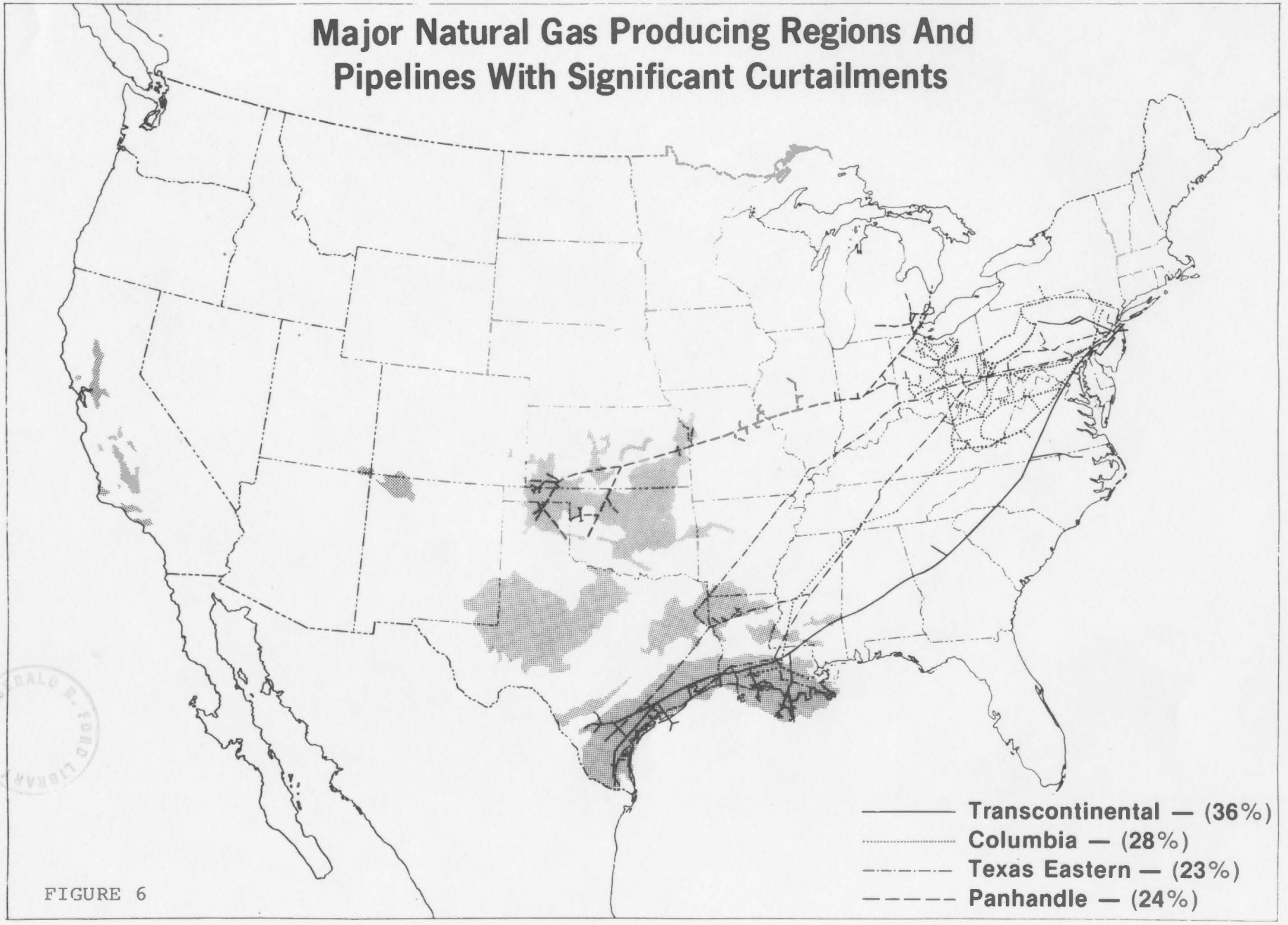


FIGURE 6

Economic Impact

Last year, very little unemployment and few plant shutdowns occurred as a result of natural gas unavailability. Most plant closings occurred because of the recession and many shutdowns were avoided by availability of alternate fuels (propane, butane, distillate or residual oil), emergency diversion of natural gas, mild weather or conservation. There were scattered examples of plant closings during the heating season in Virginia, North Carolina, New Jersey and other states, but in general, almost everybody was able to squeak through.

This year's economic impact of natural gas curtailments will depend upon several major factors: the heating demand by residential and commercial customers which is a function of the temperature; the extent to which industrial activity for natural gas has recovered from the economic downturn; the ability of industry to use alternate fuels and remain competitive despite higher energy costs; the availability and cost of alternate fuels; and the extent of the supply deficits.

The areas likely to experience the greatest economic impact this winter are the mid-Atlantic states stretching from southern New York to South Carolina and several midwestern states, such as Ohio, West Virginia, and Kentucky. Others such as Missouri and Iowa could have spot shortage problems and California, which used over 1.5 Tcf last year could also experience some impacts.

In North Carolina, which is probably the most severely impacted state and is served primarily by the heavily curtailed Transcontinental Pipeline Co. (Transco), it is estimated that about 96 percent of total industrial demand will not be met. Almost 20 percent of these firms have no capability to convert to alternate fuels and others cannot afford to do so. The textile, chemical, and glass industries are particularly large users of natural gas and need gas to maintain the quality of their products. In New Jersey, which is also heavily curtailed by Transco, the northern part of the state is relatively free of curtailments, while southern New Jersey's chemical industries may be affected. Ohio's industrial curtailments could reach 60 percent, but most impacts will be experienced by smaller stone, clay, and glass industries in the central part of the state. Even in states that are not as short of gas, such as Indiana, a utility serving 50 small towns each with only one industry may have to shut down one-third of these plants. In New York, the Southern part of the State will experience considerably reduced deliveries, while the Northern and Western areas will see increased or level deliveries (see Figure 7).

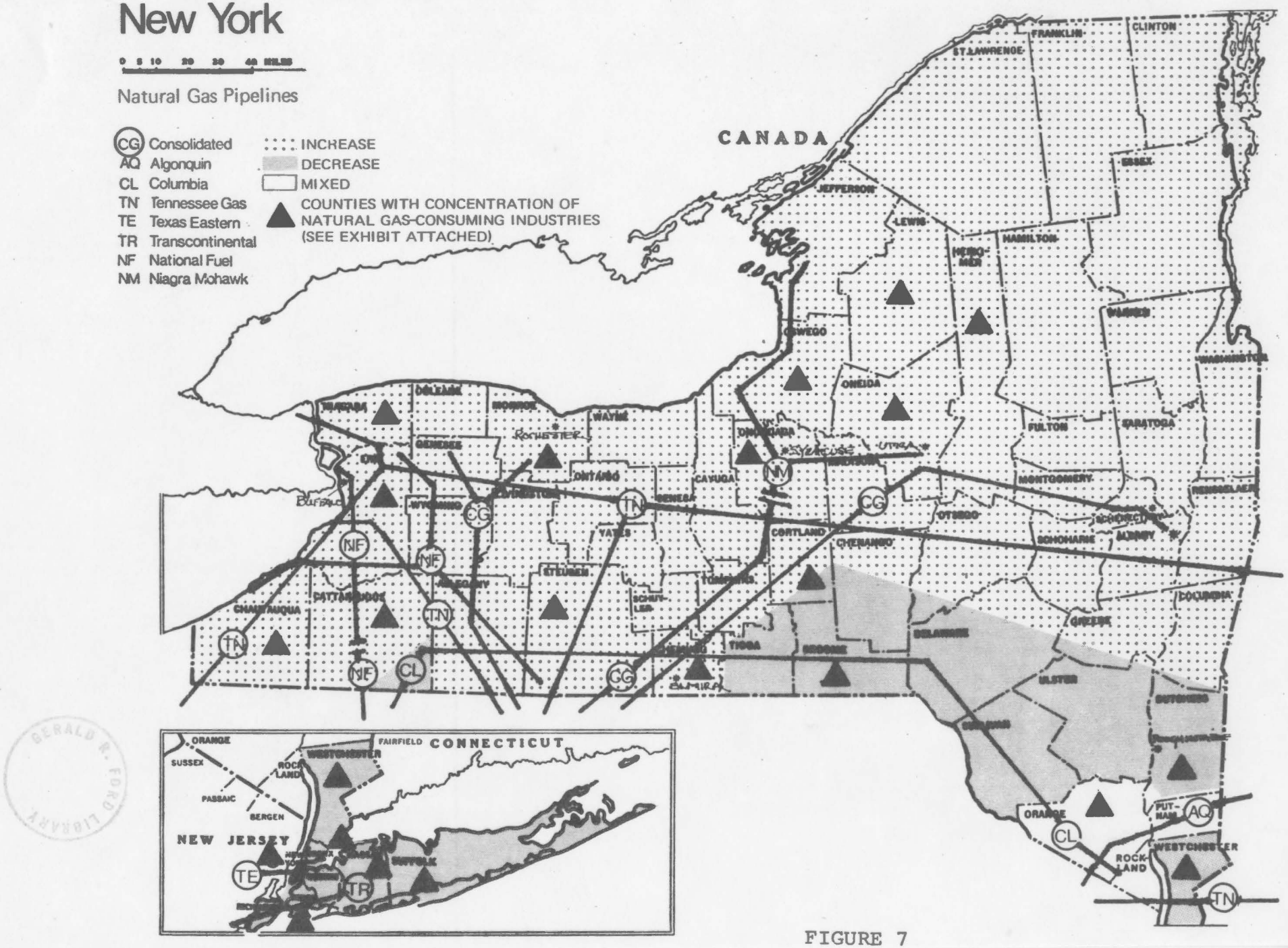

New York
0 5 10 20 30 40 MILES
Natural Gas Pipelines
CG Consolidated
AQ Algonquin
CL Columbia
TN Tennessee Gas
TE Texas Eastern
TR Transcontinental
NF National Fuel
NM Niagra Mohawk
INCREASE
DECREASE
MIXED
COUNTIES WITH CONCENTRATION OF NATURAL GAS-CONSUMING INDUSTRIES (SEE EXHIBIT ATTACHED)
CANADA
CONNECTICUT
NEW JERSEY
ORANGE
SUSSEX
PASSAIC
BERGEN
ROCKLAND
WESTCHESTER
FAIRFIELD
SUFFOLK
JEFFERSON
LEWIS
HERKIMER
HAMILTON
ESSEX
FRANKLIN
CLINTON
ST. LAWRENCE
OSWEGO
ONEIDA
FULTON
SARATOGA
WARREN
WASHINGTON
MONTGOMERY
SCHOHARIE
OTSEGO
CHENANGO
CORTLAND
DELAWARE
COLUMBIA
GREENE
ULSTER
DUTCHESS
PUTNAM
ROCHESTER
BUFFALO
NIAGARA
ORLEANS
GENESEE
WYOMING
LIVINGSTON
ONTARIO
WAYNE
MONROE
YATES
SENECA
CAYUGA
SCHUYLER
STEUBEN
ALLEGANY
CHAUTAUQUA
CATTARAUGUS
TIOGA
CHEMUNG
ELMIRA
TOMPKINS

FIGURE 7

In some communities the impacts could be especially severe. In Danville, Virginia last year, concerted action by local government officials, industry, and residential gas users avoided the shutdown of four major manufacturing plants (Dan River Textiles, Corning Glass Works, Goodyear Tire and Rubber's largest truck and airplane tire facility, and U.S. Gypsum) employing over 10,000 of the area's 50,000 residents. A massive public education media campaign and conversions to alternate fuels by a local hospital saved almost 15 percent of the city's heating requirements in about half the winter.

Since residential and commercial users receive first priority under Federal Power Commission guidelines, natural gas curtailments generally affect industry most. In particular, industries which cannot switch to alternate fuels or are not prepared to switch (such as chemicals, motor vehicle parts, textiles, fertilizer, and glass) may experience considerable impacts. Even when alternate fuels are available, their use will increase costs and will put some companies at a competitive disadvantage with companies in other states that are not experiencing curtailments.

To evaluate the impact for each state, FEA examined the data supplied to the FPC by the major pipelines to determine their levels of shortage and to ascertain the specific areas to which they delivered gas. As indicated in Table 4, the reductions in deliveries are concentrated in about 14 states. In some of these states, the reduction in deliveries will be more than half the 1973 industrial gas consumption. Also, in some states, about one-third of industrial employment is in industries that use natural gas. Nevertheless, it should be recognized that availability of alternate fuels can substantially reduce the unemployment effects, but the accompanying higher priced fuel may result in economic problems. (See Tab 2 for a more detailed discussion of each of these states. A map showing the pipelines serving these states and counties where gas deliveries will increase or decrease is also attached.)

Next Steps

In the next several weeks, there will be the following key milestones:

- Within a few weeks, the President will announce his recommended administrative and legislative program to mitigate this year's shortage.

TABLE 4

Economic Impact in Most Affected States

State	Projected Reduction As % of 1974/75 Deliveries	Reduction As % of 1973 Industrial Gas-Consumption	State Employment In Gas Using Industry	
			As % of Total Employment	In Thousands
New Jersey	8%	41%	32%	717
Maryland	19	60	20	202
Virginia	20	50	9	116
North Carolina	29	41	33	552
South Carolina	12	20	29	227
Pennsylvania	8	17	23	854
Ohio	9	22	29	996
New York	(1)	(3)	21	1,249
Kentucky	4	11	28	196
West Virginia	16	26	19	77
Delaware	16	33	7	11
Missouri	10	31	18	249
Iowa	5	11	14	101
California	4	10	18	972

[ ] Indicates an increase

- By about the end of September, the permanent data and forecasting systems developed by FEA will be completed and operational. The data system will be updated quarterly and will contain a survey of over 1600 distributors and hundreds of thousands of end users of natural gas and will analyze the shortage and the ability to use alternate fuels. (See Tab 3 for a more detailed description of the data system.) The forecasting system will forecast quarterly natural gas supply and demand on a state by state basis and will be sensitive to changes in weather and economic activity.

TAB 2

CALIFORNIA

Situation at a Glance, Major Suppliers[1]

Supplier	Natural Gas Deliveries 1974-75 Volume (Bcf)	Projected Change 1975-76 From 1974-75 (percent)
El Paso Natural Gas	962	-8
Pacific Gas Transmission	347	4
Transwestern	202	0
Total Interstate Pipelines	1,511	-4

Natural Gas Consumption by Sector, 1974[2]

Sector	Billion Cubic Feet	Percent of Total
Residential	580	33
Commercial	220	13
Industrial	642	37
Utilities	293	17
Other	9	--
Total	1,744	100

Estimated Gas Consumption and Employment in Major Gas Consuming Industry Groups[3]

Industry	Percent of Total Industrial Gas Use (percent)	Employment (000)	Percent of Total State Employment (percent)
Petroleum	30	17.2	0.3
Stone, Clay, & Glass	19	48.8	0.9
Food	15	137.0	2.6

[1] Source: FEA Report, prepared by Resources Planning Associates dated 7/2/75.

[2] Source: U.S. Bureau of Mines, Mineral Industry Surveys, Natural Gas Production and Consumption, 1974 (preliminary)

[3] Source: Gas Use: USDC, Bureau of the Census, Census of Manufactures, 1972
Employment: USDC, Bureau of the Census, County Business Patterns, 1972.

Supply Situation

California consumed 1744 Bcf of gas in 1974 and is expected to have about 4 percent less in 1975-76. Three interstate pipelines supplied 1,511 Bcf in 1974-75. The remainder is made up from California's domestic gas production which was about 450 Bcf in 1973 but has probably declined somewhat since then. El Paso Natural Gas feeds to California utilities which serve both Southern California and the Bay Area. Transwestern Gas is mainly fed into southern California. Pacific Gas and Electric imports Canadian gas through its Pacific Gas Transmission line for use in the Bay Area and northern California.

Industrial Impacts

Traditionally, California energy demand has come from oil and gas. For many years gas was a very cheap by-product of abundant California oil production. As a result, the state depends heavily on natural gas including the utility sector. In 1973, utilities consumed 455 Bcf; preliminary figures for 1974 show a large decrease, but a substantial 293 Bcf was still consumed in the utility sector.

The distribution of demand by sectors in California is notable for its particularly large component of electrical utility demand -- 23 percent in 1973 and 17 percent in 1974. Residential/commercial demand consumes 43 percent of the state's gas, and industry consumes 33 percent. The steep decline in utility use of gas consumption between 1973 and 1974 will leave a smaller cushion for other users to draw on in the future.

Of all industrial gas consumption, about 65 percent is utilized by the petroleum, food, and stone, clay, and glass groups. The food industry is the most labor intensive major gas consuming industrial group in California, accounting for 2.6 percent of total state employment. Petroleum and the stone, clay and glass group combine to another 1.2 percent of employment.

The California Energy Commission is now in the process of making an end-use survey of gas consumed. The office does not believe that California differs in any significant way from the ordinary pattern. The bulk of industrial gas consumed in California goes for various kinds of process, boiler, and space heating and only a relatively small percentage is assumed to be for petrochemical feedstocks for which no technical substitute exists.

Alternate Capability

The large component of gas-fired electrical generation in the state, accounting for 455 Bcf in 1973, probably provided a substantial cushion of alterable demand from which gas service was maintained to industries in the past year. However, as noted above, 1974 utility gas use was only 293 Bcf, a rate of reduction which would substantially end utility gas use shortly. Twenty-seven percent of all fuel used in large combustors in the Pacific region was identified in a recent survey as natural gas. Data on the conversion capability of these combustors is not available, but it is quite probable that substantial alternate capability exists. There is a problem in California, however, because the only technically feasible alternate fuel for small and medium sized users is the petroleum distillate group. California has not historically used any significant volume of coal. California uses large quantities of domestically produced residual oil but unlike the East Coast, it has not imported large quantities. Therefore, the whole alternate fuel load must be made up almost entirely by distillates.

The problem is further compounded because the extensive agricultural sector consumes large volumes of distillates for burning smudge pots to protect crops during unseasonably cold weather. Thus just at the time when interruptible gas customers are cut off and need to turn to distillate substitutes, the agricultural sector also comes in with a huge demand.

The California Energy Commission estimates that industrial and commercial distillate users have an average four day reserve fuel supply and the petroleum industry has not much more.

The past three winters have been unseasonably warm in California. If there is unseasonably cold weather this winter, there could be a more difficult situation for California. There would probably not be nearly enough distillate to maintain industrial production even though the industrial users have alternate fuel burning capability.

***NOTE:** On this map increases and decreases have been shown ONLY for interstate deliveries, and that approximately 20% of California's deliveries are intrastate.

Situation at a Glance, Major Suppliers

Supplier	Natural Gas Deliveries 1974-75 Volume (Bcf)	Projected Change 1975-76 From 1974-75 (percent)
Transco	20	16
Total Interstate Pipelines	20	16

Natural Gas Consumption by Sector, 1974

Sector	Billion Cubic Feet	Percent of Total
Residential	7	36
Commercial	3	16
Industrial	9	44
Utilities	1	4
Other		
Total	20	100

Estimated Gas Consumption and Employment in Major Gas Consuming Industry Groups

Industry	Percent of Total Industrial Gas Use (percent)	Employment (000)	Percent of Total State Employment (percent)
Chemicals	(n.a.)	7.9	4.6
Primary Metals	11	2.1	1.2

Supply Situation

The State of Delaware is supplied all of its natural gas by the Transcontinental Pipeline Corporation (Transco). Transco supplies Delmarva Power and Light Co. and the Eastern Shore Natural Gas Company, which in turn supplies Cheaspeake Utilities. The end-users supplied by Delmarva are largely residential, while Chesapeake Utilities' customers are mainly industrial users.

In 1973, Delaware was delivered 22.9 Bcf of natural gas. Of this, 12.3 Bcf, or approximately 53% of total gas deliveries was consumed in the industrial/utility sector. Transco is currently projecting curtailment levels of 43.5% in the upcoming heating season.

Industrial Impact

Last winter Delaware experienced curtailments of 7.8 Bcf, or 28% total requirements without any significant industrial shut-downs resulting directly from the shortages. However, because of the economic slump and nationally slack demand, two major automobile assembly plants, General Motors and Chrysler, as well as several smaller companies were forced to shut down. Had these plants been able to remain in operation, it is highly unlikely that the state could have endured these shortages without some shut-down due to a lack of fuel. This winter, with the economic recovery coupled with increased curtailments of natural gas, there is potential for a greater disruption of Delaware's industrial sector due to natural gas shortages. In the extreme cases, 41% curtailments might mean that all interruptible and 20% of firm contracts would be unfulfilled during the year's winter season. Alternate fuel capabilities will mitigate the impact, although the cost of utilizing such alternate fuels could be significant.

Alternate Fuel Capability

Delaware's economy relies heavily on several gas-consuming industries. The largest employing industry in the state (4.6% of total employment) is the chemical industry, specifically the DuPont and Stauffer Companies. The chemical industry has limited capabilities for switching to alternate fuels; natural gas is required both as a

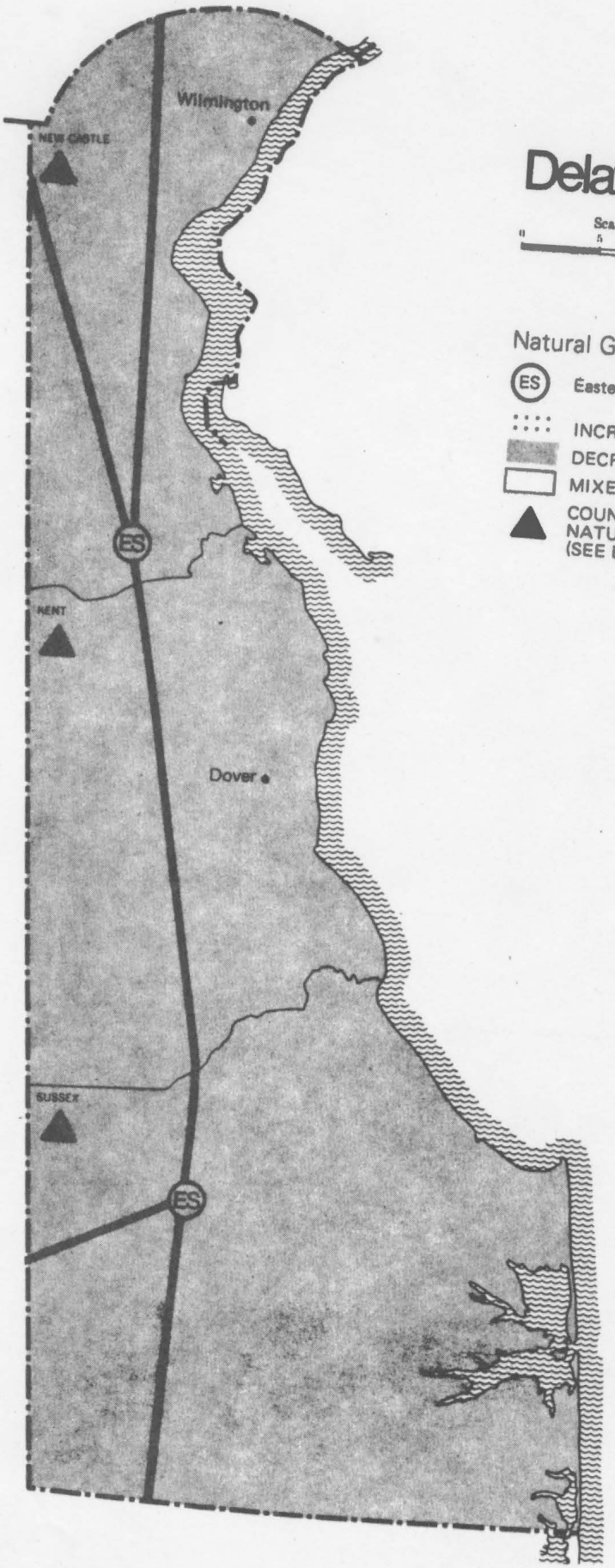
feedstock, and for its unique heat and flame characteristics which pre-dispose it to use in chemical production.

A second major gas-consuming industry in Delaware is the primary metals industry, which accounts for 1.2% of total state employment. It may be possible to utilize alternate fuels for up to 21% of this industry's total gas requirements, although this would entail significant cost increases.

The two auto assembly plants must use a gaseous fuel for paint drying, but may be able to switch to propane. Propane, however, may be in short supply during the 1975-76 heating season.

State Programs

For three consecutive years, the Department of Public Safety has been soliciting conversions to alternate fuels among industrial end-users. In 1971, new residential sales of natural gas were banned, and the state is conducting an aggressive public education program. In addition, Delmarva has proposed a new curtailment schedule to the FPC, based on pro-rata sharing, to help alleviate the potential impact of the projected natural gas shortages.



Delaware

Scale of Miles
0 5 10 15

Natural Gas Pipelines

ES Eastern Shore

INCREASE

DECREASE

MIXED

COUNTIES WITH CONCENTRATION OF NATURAL GAS-CONSUMING INDUSTRIES (SEE EXHIBIT ATTACHED)

Situation at a Glance, Major Suppliers

Supplier	Natural Gas Deliveries 1974-75 Volume (Bcf)	Projected Change 1975-76 From 1974-75 (percent)
Northern Natural Gas	166	-9
Michigan-Wisconsin P/L	32	-7
Nat. Gas P/L of America	87	+3
Total Interstate Pipelines	285	-5

Natural Gas Consumption by Sector, 1974

Sector	Billion Cubic Feet	Percent of Total
Residential	89	26
Commercial	51	15
Industrial	142	42
Utilities	59	17
Other	0	0
Total	341	100

Estimated Gas Consumption and Employment in Major Gas Consuming Industry Groups

Industry	Percent of Total Industrial Gas Use (percent)	Employment (000)	Percent of Total State Employment (percent)
Food	26	49.8	7.5
Machinery	8	42.5	6.4

Supply Situation

Although Iowa's firm natural gas users may face some curtailment of their fuel supplies most of the reduction in gas supply will be offset by further reduction of gas to interruptible industrial and electric generation gas users. The 1975-76 natural gas deliveries will be 5 percent less than the amount delivered in 1974-75, when 22.5 Bcf of gas were curtailed (over 7 percent of total gas requirements).

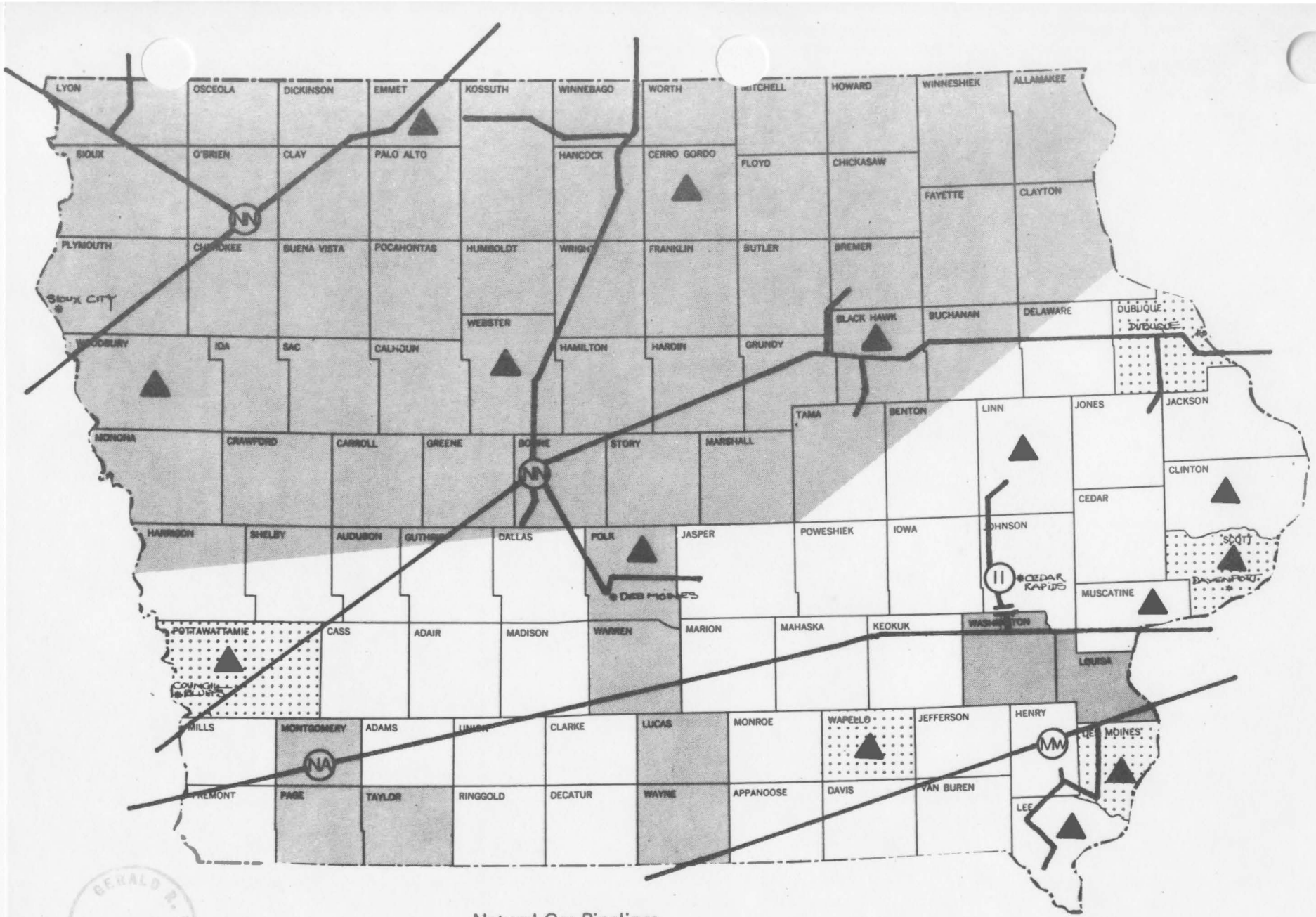
Only because Michigan-Wisconsin Pipeline received FPC approval to implement a pro-rata instead of an end-use curtailment system will large interruptible gas users in southern Iowa have any gas at all after January 1, 1976.

Industrial Impact

The 14 Bcf gas shortfall for Iowa will result in a shortfall of more than 10 percent for industrial and electric utility customers. This shortfall will largely be absorbed by the state's gas-fired utilities, and industrial impacts will likely be very small. In the industrial sector, the two major consumers are the food (26%) and machinery (8%) industries. These two industries are also the two largest employers in the industrial sector. The food industry employs 49,788 workers or 7.5 percent of total state employment, and 42,501 workers or 6.4 percent are employed in machinery industry.

Alternate Capability

The alternate fuel capability for Iowa's gas-fired electrical capacity is substantial. Also, the principal industries affected are believed to have a substantial alternate fuel capability. In sum, the problem this winter, in Iowa is not expected to be substantially greater than last winter, unless there is prolonged adverse weather.



Natural Gas Pipelines

Iowa

Scale of Miles

0 10 20 30 40

(11) Iowa–Illinois Gas & Electric
NA Natural Gas Pipeline of America
NN Northern Natural Gas
Mw Michigan–Wisconsin Pipeline

INCREASE
DECREASE
MIXED
▲ COUNTIES WITH CONCENTRATION OF NATURAL GAS-CONSUMING INDUSTRIES (SEE EXHIBIT ATTACHED)

Situation at a Glance, Major Suppliers

Supplier	Natural Gas Deliveries 1974-75 Volume (Bcf)	Projected Change 1975-76 From 1974-75 (percent)
Columbia Gas	53	-15
Tennessee Gas	8	19
Texas Eastern	2	-33
Texas Gas Trans.	128	- 1
Total Interstate Pipelines	191	- 4

Natural Gas Consumption by Sector, 1974

Sector	Billion Cubic Feet	Percent of Total
Residential	76	38
Commercial	35	18
Industrial	74	38
Utilities	5	3
Other	7	3
Total	197	100

Estimated Gas Consumption and Employment in Major Gas Consuming Industry Groups

Industry	Percent of Total Industrial Gas Use (percent)	Employment (000)	Percent of Total State Employment (percent)
Primary Metal	29	13.8	2.0
Chemical	15	12.5	1.8
Paper	10	5.2	0.7

Supply Situation

Kentucky is served by seven interstate pipelines, two of which provide approximately 95 percent of the state's supply. Texas Gas Transmission Corporation, the major supplier accounting for 67 percent of total deliveries, is expecting only a one percent reduction in deliveries this year over last. The state's significant supply shortfall is from Columbia Gas Transmission Corporation, which accounts for about 28 percent of total deliveries. Columbia has projected a 15 percent reduction in deliveries to the state this year. Overall the state is projected to receive only four percent less gas than last year.

Industrial Impact

Of the 197 Bcf of natural gas delivered to Kentucky in 1974, the residential and industrial sectors each consumed 38 percent. The major industrial consumers of natural gas in Kentucky are the primary metal (29%), chemical (15%), and paper (10%) industries. These are not highly labor intensive industries. The primary metal industry employs 2.0 percent of the state's total employment, the chemical industry 1.8 percent, and the paper industry only 0.7 percent.

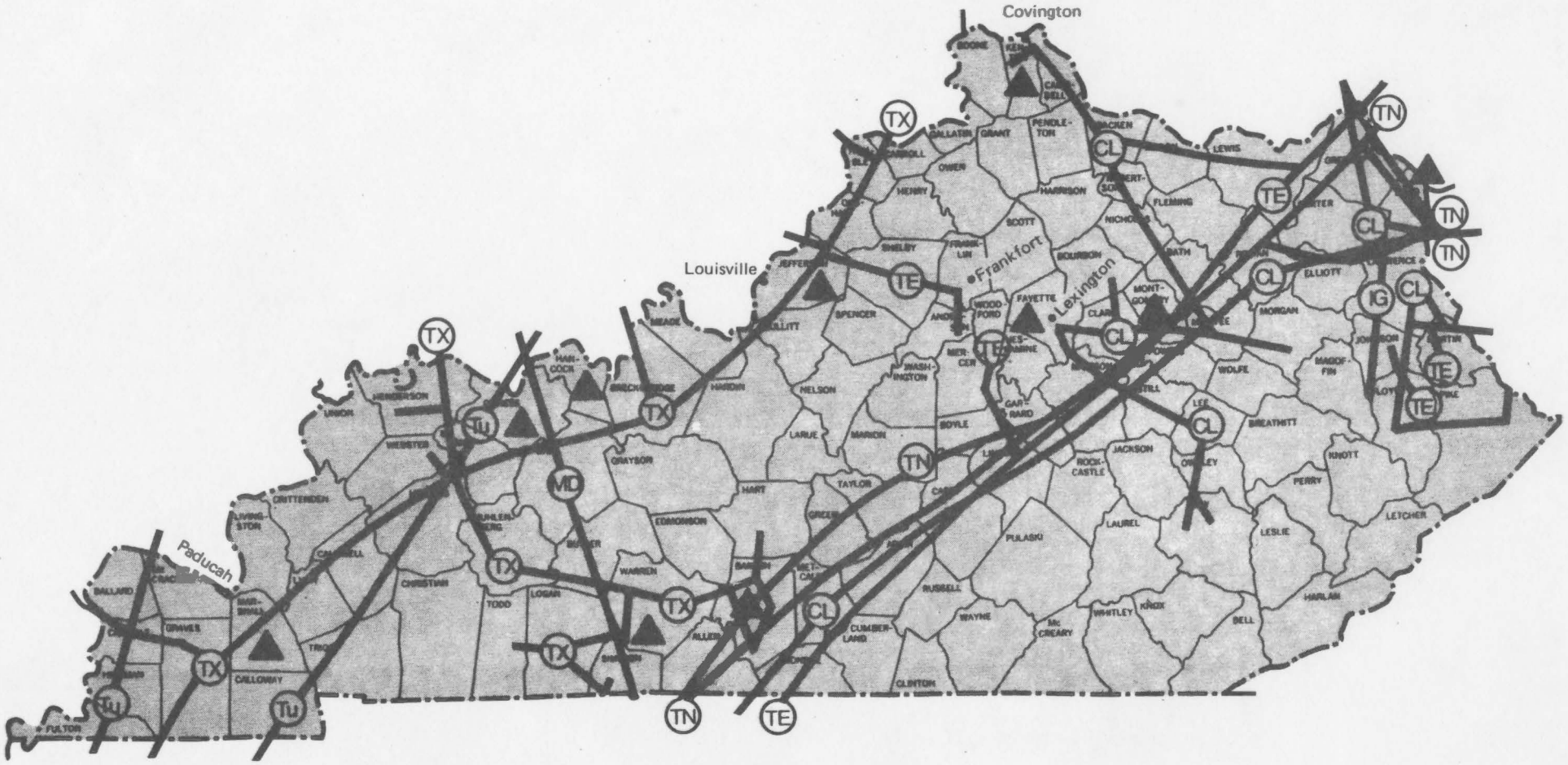
The area of the state which could be most affected by curtailments is central Kentucky which is served by Columbia Gas of Kentucky, an affiliate company of Columbia Gas Transmission Corporation. Columbia Gas Transmission Corporation is currently anticipating a curtailment level of 28 percent which would be distributed on a pro-rata basis under its current curtailment system. A curtailment of 28 percent of requirements would require Columbia Gas of Kentucky to completely cut off its industrial users this winter and to curtail some large commercial users up to 40 percent. Since Columbia Gas Transmission's pro-rata plan expires October 31, 1975, a new curtailment plan will have to be approved by the Federal Power Commission. The Kentucky Energy Office has supported a modified end-use curtailment plan under which Columbia Gas of Kentucky would be curtailed only 22 percent and provision would be made for essential industrial users.

Alternate Capability

Since Columbia Gas has traditionally signed firm rather than interruptible contracts, many industrial users do not have alternate fuel capability. Therefore, a complete cutoff of industrial users could have a severe impact on the region. Last winter the State Energy Office developed the

"Columbia Industrial Pool Plan." Under this plan, commercial users with alternate fuel capability switched to other fuels, making more gas available to industrial users who were experiencing 85 percent curtailments. The higher cost of the alternate fuels was paid for by the industrial users. The energy office has proposed use of the pooling system again this winter. The Governor would ask large Columbia Gas customers with alternate fuel capability to participate in the pool. The energy office has proposed to the Public Service Commission that large natural gas users be notified that within one year they will be assumed to have alternate fuel capability.

It appears that other areas of the state will get through the winter without severe problems. Demand in most areas is down due to the economic slowdown and conversion efforts. At least one pipeline has been able to contract with an intrastate producer for additional supplies for the winter.



Kentucky

Scale of Miles
0 10 20 30 40 50

Natural Gas Pipelines

CL	Columbia	TN	Tennessee Gas
IG	Inland Gas	TX	Texas Gas
Mw	Michigan-Wisconsin	TE	Texas Eastern
MD	Midwestern	Tu	Trunkline

INCREASE

DECREASE

MIXED

COUNTIES WITH CONCENTRATION OF NATURAL GAS-CONSUMING INDUSTRIES (SEE EXHIBIT ATTACHED)

Situation at a Glance, Major Suppliers

Supplier	Natural Gas Deliveries 1974-75 Volume (Bcf)	Projected Change 1975-76 From 1974-75 (percent)
Columbia Gas	183	-21
Transco	15	- 9
Total Interstate Pipelines	198	-19

Natural Gas Consumption by Sector, 1974

Sector	Billion Cubic Feet	Percent of Total
Residential	83	42
Commercial	36	18
Industrial	58	29
Utilities	13	7
Other	7	4
Total	197	100

Estimated Gas Consumption and Employment in Major Gas Consuming Industry Groups

Industry	Percent of Total Industrial Gas Use (percent)	Employment (000)	Percent of Total State Employment (percent)
Primary Metals	32	34.7	2.7
Chemicals	16	15.6	1.2

Supply Situation

The Maryland/D.C. area is served by two major pipelines. Columbia Gas Transmission Company accounted for approximately 92 percent of deliveries last year and Transcontinental Gas Pipeline Corporation accounted for most of the remaining supplies. Columbia is the sole supplier of Western Maryland and a small pipeline, Eastern Shore Natural Gas Co., is the sole supplier of Eastern Maryland.

Last year Columbia Gas Transmission Company supplied about 183 Bcf to Maryland/D.C. and is projected to have 21 percent less available for this year. Transcontinental Gas Pipeline Corporation (Transco) supplied 15 Bcf in 1974-75 and is projecting a 9 percent decrease for this year. (The Washington, D.C. Metropolitan Area received 90 percent of its supply from Columbia and 10 percent from Transco).

Industrial Impact

The Maryland/D.C. area is projected to receive approximately 20 percent less gas this year than last. No customers on firm contracts are expected to be interrupted unless there is a severe winter or a much faster economic recovery than is currently expected. All customers on interruptible contracts are required to have alternate fuel capability and adequate storage facilities.

The demand for natural gas by several large interruptible industrial customers has been much less than anticipated. There are 11 interruptible customers on the Western Maryland distribution system. Two of the largest, Pittsburgh Plate Glass and Celanese, are operating at capacities of only 25 percent and 50 percent, respectively, due to the economic slowdown. Bethlehem Steel Corporation in Baltimore is also expected to operate at less than full capacity for at least the remainder of this year. These production slowdowns have caused a considerable reduction in natural gas demand over what was originally anticipated.

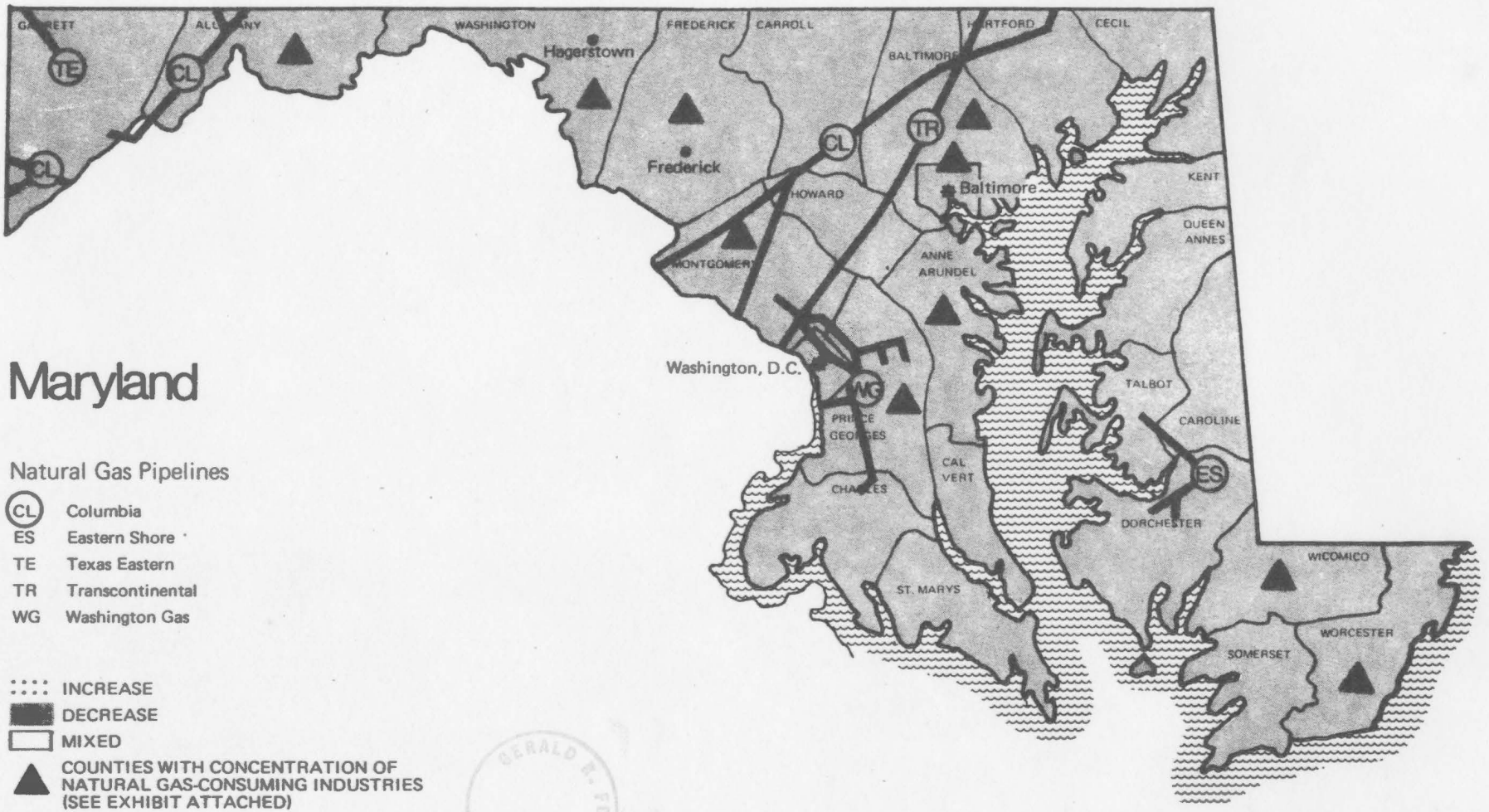
The gas utilities in Maryland are taking actions to relieve potential supply problems. Baltimore Gas and Electric Company, the largest gas distributor in Maryland, submitted a modified end-use curtailment plan to the state Public Services Commission to assure that low priority customers would be provided the minimum amount of gas to maintain operations (for pilot lights, etc). Baltimore Gas and Electric has an underground propane storage capacity of 6 million gallons and LNG storage of 1 million Mcf. In addition, it is constructing an SNG plant for operation in 1976 which will

produce 60 million cubic feet of gas per day. Since April 1974, it has accepted no orders for new or expanded service from commercial or industrial users.

Alternate Capability

The Maryland Energy Policy Office has notified all 341 interruptible customers in the state that they should secure alternate fuel supplies for this winter. The office has completed a breakdown of anticipated alternate fuel demand throughout the state. In addition, it sent questionnaires to all industrial firms using over 900 Mcf of gas per year to determine alternate fuel capability in the industrial sector.

The Metropolitan Washington Council of Governments has met with Washington Gas Light Company to discuss projected natural gas curtailments this winter. The Council has developed an area-wide plan to deal with different levels of possible curtailments.



Maryland

Natural Gas Pipelines

- (CL) Columbia
- ES Eastern Shore
- TE Texas Eastern
- TR Transcontinental
- WG Washington Gas

INCREASE

DECREASE

MIXED

▲ COUNTIES WITH CONCENTRATION OF NATURAL GAS-CONSUMING INDUSTRIES (SEE EXHIBIT ATTACHED)