Approved February 17, 1984
Date

MINUTES OF THE Senate COMMITTEE ON Energy and Natural Resources.

The meeting was called to order by Senator Charlie L. Angell at
Chairperson

8:00 a.m./~~p.m.~~ on Thursday, February 16, 1984 in room 123-S of the Capitol.

All members were present except:
Senator Richard Gannon (Excused)

Committee staff present:
Ramon Powers, Research Department
Wayne Morris, Research Department
Don Hayward, Revisor's Office
LaVonne Mumert, Secretary to the Committee

Conferees appearing before the committee:
J. W. Collins, Cities Service Oil and Gas Corporation

Copies of Preliminary Assessment - Development and Administration of Water Resources of the Arkansas River (Attachment 1) and Preliminary Study of the Impact on Agriculture by an Increased Stream Flow in the Arkansas River, Southwestern Kansas (Attachment 2) were distributed to the Committee.

Mr. J. W. Collins reviewed information distributed to the Committee (Attachment 3). He sai the data explains why Kansas doesn't benefit sufficiently from low gas prices in the state of Kansas. His sources for data were the September 29, 1983 hearing before the State Corporation Commission and PGA and FERC forms filed with the federal government. He pointed out that Kansas has a much lower average price than any other producing state.

Responding to questions from Senator Feleciano about take-or-pay provisions, Mr. Collins said there are various proposals in Congress that would reduce the percentage of the mandatory take. He said his company wants to be able to sell that gas that would become available under such a proposal to someone else rather than being tied to the same producer. Senator Werts asked questions about effects of deregulation. Mr. Collins mentioned a study comparing the long-term effect of continued regulation to deregulation. He said the conclusion was that the dollar amount would end up about the same, the difference was that under deregulation there would be greater development of reserves in the United States and less dependence upon foreign sources. Mr. Collins stated that Kansas low-priced gas is keeping the total system price down for companies. He estimated that under deregulation interstate system prices would go up five or ten cents and intrastate systems would go up thirty or forty cents. Senator Roitz asked about the present oil glut. Mr. Collins said his perception is that "we're not in as good a shape as we think we are". He said the "bubble" is there during times of less than peak demand, but shortages start occurring during high demand times. He told the Committee he thinks it is very difficult to obtain really good data upon which to base projections of the size of the "bubble". He commented that he does not consider the natural gas industry monopolistic because there are alternate energy sources that compete with gas.

The meeting was adjourned at 8:59 a.m. by the Chairman. The next meeting of the Committee will be at 8:00 a.m. on February 17, 1984.

Senate Energy & Natural Resources
Feb. 16, 1984

Name		Organization
George A. Sims	Hugoton	Mobil
WALTER DUNN	Topeka	EKOGA
Penny Plamann	"	KIOGA
Joe Hodgen	Tulsa	Citus Service Oklahoma
Jim Collins	"	" "
Don Schmidt	Topeka	KIOGA
Rick Kready	"	KPL/Gas Service Co.
BILL PERDUE	"	" "
Ed Reinert	"	KS League of Cities
Lon STANTON	TOPEKA	NORTHERN Natural Gas
Glenn Cogswell	"	Northwest Central Pipeline
ROBERT A. ANDERSON	OTTAWA	KANSAS CORN GROWERS
David W Nickel	Topeka	KCC
Ed Peterson	"	KCC
JIM YOUNG	TOPEKA	WASTE MANAGEMENT, INC
Chip Wheeler	Topeka	KLPG
ROSS MARTIN	"	KS PETROLEUM COUNCIL

Attachment

PRELIMINARY ASSESSMENT

DEVELOPMENT AND ADMINISTRATION OF WATER RESOURCES OF THE ARKANSAS RIVER

Prepared for

State of Kansas
Office of the Attorney General
2nd Floor, Kansas Judicial Center
Topeka, KS 66612

By

Simons, Li & Associates, Inc.
4105 East Florida Avenue
Suite 300
Denver, CO 80222

February 1984

Atch. 1

EXECUTIVE SUMMARY

Dispute between the States of Colorado and Kansas concerning the waters of the Arkansas River have been occurring since the beginning of this century. Two U. S. Supreme Court decisions, one in 1907 and another in 1943, regarding this dispute did not give any relief to claims of injury by the State of Kansas. However, these court decisions led to the negotiation of an interstate compact, which was signed by both states in 1948. Although one of the purposes of the compact was to remove any cause for future controversy, the issue of interstate water allocation on the Arkansas River has once again resulted in questions of injury. The State of Kansas, concerned about declining stateline streamflows in recent years, has retained the firm of Simons, Li & Associates, Inc. (SLA) to analyze and document this decline. In addition, SLA has been requested to provide a preliminary assessment as to whether and to what extent this decline has been caused by the failure of Colorado to conform to the provisions of the Arkansas River Compact. Accordingly, this report provides background information on the Arkansas River system, an evaluation of the interstate compact, a river depletion analysis, and a discussion of administrative issues, as well as conclusions and recommendations. Each of these major topics is dicussed in detail in a separate section of the report. A summary of each of these sections is presented here to provide the reader with an overview.

I. Introduction

This section describes the scope and nature of the present study, as well as background information and the physical setting of the basin. A history of water use on the Arkansas River and conflict between the states is presented, as well as a general listing of major issues addressed since 1949, the first year of compact operation. A description of the Arkansas River system, including its major tributaries and hydrological characteristics, is presented for the basin upstream of Garden City, Kansas. A general history of water development in the basin is also included.

II. Compact Evaluation

This section discusses pre-compact litigation in more detail, and describes the negotations which led to the signing of the compact. As an important foundation effort for the rest of the report, the intent of the Compact Commissioners is presented, based on a review of several major reference documents including Compact Commission meeting minutes. In general, the compact was written to:

1. Protect the status quo for existing water rights.
2. Provide for the allocation of John Martin Reservoir conservation benefits in accordance with the historical relationship of water use by the two states.
3. Allow the development of new water supplies in Colorado, so long as Kansas' rights under the compact were protected. This meant that all new native water development in Colorado was supposed to be limited to Colorado's share (60 percent) of John Martin conservation benefits.

Since the compact was signed, the Compact Administration has been responsible for seeing that its provisions are followed by each state. Although the Compact Administration does not have a judicial function, it has reviewed various water projects in order to prevent the kind of material depletion prohibited by the compact. However, the Compact Administration has not intervened into the administration of existing projects except for John Martin Reservoir itself.

III. Depletion Analysis

Analyses have been completed which compare pre- and post-compact streamflows for various strategic locations in the basin. Specifically, these studies include a compilation of basic data, correlation analyses and double mass curve analyses, in order to identify and quantify changes in flows and their causes since the signing of the compact. An important distinction between stateline and usable streamflows is defined, and the criteria used by the Compact Commissioners to determine usable streamflows is described.

Various tables and plots of basic data and comparisons are presented, demonstrating the following facts:

1. Compared to pre-compact flows, the usable stateline streamflows increased by about 9,200 acre-feet per year from 1949 to 1973. However, since 1974, these usable flows have declined by about 62,000 acre-feet per year, as compared with pre-compact values.
2. Inflows to John Martin Reservoir have declined by about 152,000 acre-feet per year since the signing of the compact.
3. Kansas ditch diversions between the stateline and Garden City have declined since 1974. The magnitude of this decline is about equal to the 62,000 acre-feet decrease in usable stateline flows that has occurred since 1974.
4. A preliminary assessment of post-compact depletions indicates that, while there has been some decline in inflows to the basin, this decline does not fully account for the loss of usable flows at the stateline.
5. For the period 1974 to 1981, a conservative estimate of the stateline depletions attributed to post-compact development in Colorado is 40,000 to 50,000 acre-feet per year.

IV. Administrative Issues on the Arkansas River

Several important administrative issues are discussed in this section, including the Trinidad Project, Pueblo Reservoir, well administration and the operation of John Martin Reservoir.

Kansas' recent concerns about the operation of the Trinidad Project have resulted in an appraisal-level comparison of that system's actual operation and the operation envisioned by the Bureau of Reclamation. It has been determined that the system has been operated in a different manner than that envisioned by the Bureau and approved by the Compact Administration. Although the State of Colorado has argued that streamflow measurements of the Purgatoire River at Thatcher can be used to prevent downstream injury, an adequate method of computing hypothetical flows without the Trinidad Project, to insure non-injury, has not been developed. Since 1979, the Trinidad Project has been operated in a manner different than that envisioned by the Bureau of Reclamation and that approved by the Compact Administration. It is estimated that these deviations in the Trinidad Project operation have caused an additional 26,000 to 35,000 acre-feet of depletions to downstream water users.

The Pueblo Reservoir winter water storage program has been operating since 1975 without approval of the Compact Administration. The potential impacts of this program to the State of Kansas have not been conclusively determined as a part of this preliminary assessment. However, the impacts may not be significant, based on studies done by others. Since John Martin Reservoir operation was explicitly addressed in the compact, its operation has not resulted in much controversy. However, a 1980 Storage Resolution was approved by the Compact Administration to address the problem of transit losses between the reservoir and the stateline. With a limited history of operation, it is not known if this resolution has improved the stateline situation.

Well depletions in Colorado have been estimated to be from 150,000 to 200,000 acre-feet per year, according to the Colorado State Engineer and others. This has resulted from a rapid growth of wells between the signing of the compact and about 1972. Since 1972, new wells have been prohibited (without augmentation), but pre-1972 pumping levels have apparently continued unchecked. Two temporary augmentation plans developed in order to mitigate injury from well pumping have replaced only a small portion of stream depletions caused by this pumping.

V. Conclusions and Recommendations

Major conclusions from this investigation are:

1. The Arkansas River Compact entitles Kansas to the pre-compact usable stateline flows and a 40 percent share of the conservation benefits resulting from the construction and operation of John Martin Reservoir.
2. Usable stateline flows increased slightly after the compact until about 1973. Since 1974, however, usable flows have declined to about 45 percent of pre-compact values. This has resulted in material depletion of Kansas ditch diversions.
3. Post-compact well development in Colorado has caused approximately 150,000 acre-feet per year of depletions to the Arkansas River. It is likely that depletion associated with Colorado well development is a major cause of decline in usable stateline flows.

4. Operation of the Trinidad Project since 1979 has caused 26,000 to 35,000 acre-feet of depletions in excess of those which would have resulted from the operation approved by the Compact Administration.
5. Kansas' entitlement to usable quantities of water under the Arkansas River Compact has been materially depleted by post-compact development in Colorado. A conservatively low estimate of this depletion for the period of 1974 to 1981 is 40,000 to 50,000 acre-feet per year.

The major recommendations for further study are:

1. The findings of this preliminary assessment should be verified, including additional comparisons of pre- and post-compact use in Colorado.
2. The operation of the Trinidad Project should be analyzed in more detail.
3. Colorado well development and its effect on Kansas should be further documented and analyzed.
4. The operation of the Pueblo Reservoir winter water storage program should be reviewed and studied to determine if the program has or is causing an adverse impact to the State of Kansas.
5. The operation of John Martin Reservoir should be evaluated to determine the long term effect of the 1980 Storage Resolution.
6. Potential mechanisms to mitigate material depletion to the compact entitlement of the State of Kansas should be developed.

Preliminary Study of the Impact on Agriculture by an Increased Stream Flow in the Arkansas River, Southwestern Kansas

Introduction

This study was made to estimate the economic impact on agriculture in southwestern Kansas resulting from an increase in stream flow in the Arkansas River. Irrigation companies have diverted water from the Arkansas River since the beginning of this century. There have been as many as eight canals used to divert the water from the Canal. However, the Alamo canal has been abandoned and the Fort Aubrey Canal has not been used since 1970. In recent years, streamflow has been inadequate to meet the irrigation requirements for those farmers having vested water rights. Consequently, farmers are supplementing canal water with groundwater.

Description of the Region

The Area under study is the irrigated region supplied by surface water from the Arkansas River from the Colorado-Kansas stateline as the West boundary to Garden City, Kansas as the east boundary. The irrigated region along the river includes the flood plain of the Arkansas River Valley, and parts of the high plains north of the Arkansas River and sandhills south of the river. (see figure 1) This region is divided into west and east with the Bear Creek Fault separating the two.

The reason for separating the west from east is based on how streamflow interacts with the groundwater. In the west there is less groundwater available so that canal flow is more important in

Att. 2

determining the total acres irrigated. In the east the Ogallala aquifer underlies the river alluvial and therefore the total water available for irrigation is much greater.

Western Region

In 1979, 31,000 acres were irrigated along the Arkansas River west of the Bear Creek fault, using 160 wells and pumping 65,000 acre feet. In addition the 1977-81 average diversion in the Frontier ditch was 7645 acre feet. This calculates to 194 acres per well applying 2.1 feet per acre. The diversion from the Arkansas River to the western region was in the Frontier ditch and the Fort Aubrey ditch, however, the Fort Aubrey ditch has not been used since 1970. Based on correspondence with Howard Corrigan, Water Commissioner, no more than 10 percent of the acreage has no other means of irrigation than by surface (canal) water. Thus, 90 percent or more of the acreage is assumed to be irrigated using both surface water supplemented by groundwater. This estimate will be assumed for both the western and eastern regions.

The 1977-81 average diversion of 7645 acre feet to Frontier ditch was 26.6 percent of the total streamflow crossing the Stateline.

For wells in the western region it is assumed the average lift of water is 80 feet and natural gas is the primary source of energy for pumping. Because the Ogallala Aquifer does not underlie this region, the Arkansas River Alluvial is the supply of groundwater.

For this preliminary study it is assumed that an increase in canal flow will replace groundwater pumped on a 1 for 1 acre foot

basis. This is based on conversation and written correspondence with Howard Corrigan.

Eastern Region

The eastern region is that part of the Area lying east of the Bear Creek Fault in Kearney County and bounded in the east by Gray County. This region is irrigated with canal water diverted to the Amazon, South Side, Great Eastern, Farmers and Garden City Ditches. In this region, "... the Arkansas River is dry in most reaches the majority of the time, and pumpage is the principal factor affecting water-level changes" (Dunlap, et.al., p. 4)[1]

> "The Arkansas River is also important in the area because it provides water for irrigation canals. Additionally, water in the river serves to recharge the unconsolidated aquifer system." (Dunlap, et.al., p. 6)[2]

"Agriculture is the principal user of water in the study area. During 1980, 320,000 acres of corn, grain sorghum, alfalfa, and wheat were irrigated by groundwater or by surface water from the Arkansas River. During that same year, approximately 2,900 wells pumped an estimated 738,000 acre-feet of water for irrigation to supplement precipitation." (Dunlap, et.el., p. 21)[3]

The average 1977-1981 diversion into the Amazon, Great Eastern, South Side, Farmers and Garden City ditches was 21,048 acre feet. Allowing for 5 percent seepage losses in canals, an

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[1]Dunlap, L.E., R.J. Lindgren and C.G. Bauer, "Geohydrology and Model Analysis of Stream Aquifer System along the Arkansas River in Kearney and Finney Counties, Southwestern Kansas," U.S. Geological Survey, Open-File Report 83-222, Lawrence, Kansas, P. 4.

[2]ibid., p. 6

[3]ibid., p. 6

estimated 757,996 acre feet of water (surface and groundwater) was applied to crops in the region. An average of 110 acres are irrigated per well, applying 2.3 feet per acre lifting water an average of 250 feet. The important difference between the western and eastern region for this study is the difference in lift of groundwater and with it the difference in pumping groundwater.

The Agricultural Stabilization and Conservation Service in Hamilton and Kearney Counties provided the following crop and land use estimates in the western region: rangeland or non-cropped areas, 56 percent; alfalfa, 16 percent; grain sorghum, 12 percent; corn, 8 percent; and wheat, 8 percent. (Barker, et.al. p. 48) This means that of the cropped area, 37 percent is alfalfa; 27 percent is grain sorghum; 18 percent is corn; and 18 percent is wheat. These crop acreage percentage estimates are used for both the western and eastern regions. Table 4 provides the crop acreage estimates.

General Assumptions

The following list of assumptions were used in developing the estimate of the economic impact of increasing the stream flow on agriculture in Southwestern Kansas. These assumptions are based on conversation and correspondence with Howard Corrigan and cited references.

1. An increase in canal flow will replace groundwater pumped on a 1 for 1 acre foot basis.
2. No additional land will be irrigated by increasing Stateline flow by 20000 acre feet.

3. No change in land use and crop patterns will occur by increasing the Stateline flow by 20,000 acre feet.
4. Average cost per share in the ditch company is $3.00 per acre regardless of the quantity of ditch water received. Therefore, increasing the Stateline flow by 20,000 acre feet will not increase the cost of canal water to the farmer.
5. Seepage from the river to the river alluvium or lower aquifer is estimated to be 28 percent of the increase in river flow. Because the diversion to Frontier ditch occurs near Stateline, and is part of the total river flow, no river seepage is assumed to occur for water diverted to this ditch.
6. Canal seepage loss is 5 percent of the increase flow in the ditch.
7. River and canal flow evaporation loss is 1 percent of the increase flow across Stateline.
8. A 20,000 acre feet increase in stream flow at Stateline is allocated as follows: 26.6 percent to Frontier Ditch irrigating the western region; 73.4 percent diverted to eastern canals which irrigate cropland east of Bear Creek fault.
9. Stateline water flow appropriation includes water diverted to Frontier Ditch.
10. Replacing groundwater with canal water will decrease fuel costs based on feet of lift of groundwater.

11. Replacing pumped water with canal water will decrease other operating costs and fixed costs proportionate to the decrease in hours of use.

12. Price of natural gas is $2.00 per MCF

Analysis and Results

Fuel, operating and fixed costs per well were estimated using an irrigation cost simulator. If an additional 20,000 acre feet cross stateline and allowing for seepage and evaporation losses it is estimated that each well in the eastern region will pump 1.3 percent less and in the western region 7.7 percent less.

Western Region (West of Bear Creek Fault)

Water lift, ft	80
Number of Wells	160
Acres irrigated	31,000
Acre Feet pumped	65,000
feet of water applied per acre	2.1
1977-81 average diversion of total	26.6%
1977-81 average diversion, acre feet	7,645
1977-81 average canal seepage and evaporation, acre ft.(6%)	459
1977-81 water pumped and canal water for crops, acre feet	72,186
Increase river flow 20,000 acre feet at Stateline	
increase canal flow in Frontier ditch, acre feet	5,320
increase canal flow seepage and evaporation, acre feet	319
increase canal water for irrigation, acre feet	5,001
decrease in groundwater pumpage, acre feet	5,001
decrease in groundwater pumpage, %	7.7
Fuel costs per well (194 acres and 2.1 acre feet per well)	$ 1717
Other operating costs per well	$ 2933
Fixed costs per well	$ 5061
Total Cost	$ 9711
Reduction in cost per well (9711 x .077)	$ 748
Reduction in cost for western region (160 x 748)	$119,640

Eastern Region (East of Bear Creek fault)

Water lift, ft	250
Number of Wells	2,900
Acres irrigated	320,000
Acre Feet pumped	738,000

feet of water applied per acre	2.3
1977-81 average diversion acre feet	21,048
1977-81 average diversion, percent	76.4
1977-81 average water losses (canal seepage and evaporation)percent	6.0
1977-81 average water losses, acre feet	1,263
1977-81 average water pumped and canal water for crops	757,785
Increase in canal flow, Stateline 20,000 acre feet	
net increase for diversion in eastern region, acre feet	14,680
increase in river and canal seepage and evaporation (34%)ac.ft.	4,991
increase in canal flow available for crops	9,689
decrease in groundwater pumpage, acre feet	9,689
decrease in groundwater pumpage, %	1.3
Fuel costs per well (110 acres and 2.3 acre feet per well)	$ 2825
Other operating costs per well	$ 2048
Fixed costs per well	$ 5311
Total Cost	$ 10184
Reduction in irrigation cost per well (10184 x .013)	132.39
Reduction in irrigation cost for eastern region (132.39 x 2900)	$383,937
Total reduction in irrigation cost (West & East)	$503,577

Other Considerations

The previous analysis was simplified by assuming no crop pattern changes, a 1 to 1 substitution of canal for groundwater and consequently the only effect was to lower production cost. Two things that will increase the economic impact but not considered in this preliminary study are the benefit from the water seeping into aquifers and changes in cropping patterns.

Benefit From Seepage Losses

Water losses from seepage are not necessarily lost but will eventually be some of the groundwater used for irrigation. It is assumed that 5227 acre feet of the 20,000 acre feet increase seeps into the aquifer. Except for evaporation, the watercrossing stateline will be used for irrigation, either directly from canals or from aquifers where seepage losses accumulate.

The economic benefit from seepage losses are more difficult to estimate because the effect is to increase the life of the aquifer. It was assumed that about 26 percent of the increase in the water crossing Stateline was lost to seepage. At sometime in the future, this water will be used as groundwater but the time varies depending to the current water supply in the aquifer.

A Geohydrologic model should be used to estimate the impact of an increase in seepage on the life of the aquifer.

Benefit of Changing Cropping Patterns

Having more canal water and at a lower cost than pumping groundwater can effect cropping patterns several ways. Farmers may choose to increase the amount of water used for irrigation and not substitute canal water for groundwater. In this case, irrigation costs per acre would not decrease but remain nearly the same and crop production per acre would increase as would income.

Another possible adjustment would be to change crop acreage. With more water available at no increase in cost, farmers might choose to use it on more water intensive using crops by increasing the acreage of alfalfa or corn. The effect of this adjustment would be to increase production costs, increase crop production and increase income.

The third adjustment farmers might adopt would be to irrigate more acres with the increase in canal water. With the reduction in canal water in recent years some farmers may have reduced acres irrigated. For these farmers, knowing that an increase in canal water was likely, they might choose to bring back to irrigation previously watered acres.

The estimate of the economic impact of $503,577 is a conservative estimate. Adding the potential effect from changing cropping patterns and the use of seepage losses for irrigation should significantly increase the estimate of benefits. However, making the above refinements in the analysis requires the use of more elaborate economic and hydrologic models than used for this preliminary study. Time allowed for the preliminary study did not allow including the above mentioned refinements.

Summary

For this preliminary study, it is assumed that the economic impact of increasing stream flow across the Stateline in the Arkansas river is to replace groundwater pumped for irrigation. In each acre foot increase in canal flow, one acre feet less groundwater is pumped, thereby reducing irrigation costs. On this basis, a 20,000 acre foot increase in stream flow crossing Stateline is estimated to reduce farmer's pumping costs $503,577 (current prices and costs) each year. The estimate of cost reduction along the western canals is $119,640 and $383,937 along eastern canals for a total benefit of $503,577.

The estimated benefits from reducing irrigation costs does not include the benefits from water lost as seepage to the river alluvial or groundwater aquifers. An estimated 5227 acre feet of the increased 20,000 acre feet crossing Stateline is lost to river or canal seepage. This amount is 26 percent of the total increase. Seepage losses are not necessarily economic losses because the water remains available for use as groundwater.

However, to estimate the economic benefit from such seepage losses will require more complex economic and hydrologic models than are readily available for the preliminary report.

Other likely benefits not included in the cost reduction estimates are the effect of increased canal flow on farmer's decisions regarding cropping patterns and water use. This preliminary study assumed a 1 for 1 substitution of canal water for groundwater. However, some farmers may choose to use the increase in canal water to increase the amount of water applied to the crop. Or some of the farmers may choose to irrigate more acreage with the increase in canal water. Lastly, farmers may choose to switch to crops such as corn or alfalfa that need more water for full production. To make an estimate of the economic benefit from changes in water use and cropping patterns requires more knowledge than available about individual farmer practices and a more complex economic model to evaluate the result.

The estimate of the economic benefit from a 20,000 acre feet increase in stream flow is a very conservative estimate.

Footnotes and References

Barker, R.A., L.E. Dunlap, and C.G. Sauer, "Analysis and Computer Simulation of Stream-Aquifer Hydrology, Arkansas River Valley, Southwestern Kansas", U.S. Geological Survey, U.S. Department of Interior, Open File Report 81-686,

Dunlap, L.E., R.J. Lindgren, C.G. Sauer, "Geohydrology and Model Analysis of Stream-Aquifer System Along the Arkansas River in Kearney and Finney Counties, Southwestern Kansas", K.S. Geological Survey, U.S. Department of Interior, Open File Report 83-222.

Table 1: Diversion of Canal Water from Stateline to Garden City in Acre Feet by Month from 1977 through 1981

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
1981	0	0	0	270	1146	1709	1384	1374	2279	5866	11518	1584	27130
1980	39	0	0	0	0	210	8464	11380	26427	19352	2927	434	69233
1979	64	6	0	0	0	58	442	2574	2712	1418	722	219	8215
1978	57	17	0	0	0	733	2012	10826	8598	2487	430	93	25253
1977	380	66	0	0	0	2817	2403	2651	661	3306	576	72	12932
Ave. 1977-81	108	18	0	54	229	1105	2941	5761	8135	6486	3234	480	28552
% of Total	.004	.001	0	.002	.008	.039	.103	.202	.285	.228	.113	.017	1.002

Table 2: Diversion of Canal Water from Syracuse to Garden City in Acre Feet by Month from 1977 through 1981

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
1981	0	0	0	270	912	317	0	0	611	3797	9763	61	15731
1980	0	0	0	0	0	910	7640	9321	23777	17161	1267	0	60076
1979	0	0	0	0	0	0	0	1805	1051	0	0	0	2856
1978	0	0	0	0	0	0	1103	10148	6705	1394	0	0	19350
1977	0	0	0	0	0	1661	1573	1770	0	2090	135	0	7229
Total	0	0	0	270	912	2888	10316	23044	32144	24442	11165	61	105242
77-81 Ave.	0	0	0	54	182.4	577.6	2063.2	4608.8	6428.8	4888.4	2233.	12.2	21048.4
% of Total	0	0	0	.003	.009	.027	.098	.219	.306	.232	.106	.001	1.00

Table 3: Diversion of Canal Water from Stateline to Syracuse in Acre Feet by Month from 1977 through 1981

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
1981	0	0	0	0	234	1392	1384	1374	1668	2069	1755	1523	11399
1980	39	0	0	0	0	0	824	2059	2650	2191	1660	434	9857
1979	64	6	0	0	0	58	442	769	1661	1418	722	219	5359
1978	57	17	0	0	0	733	909	678	1893	1095	430	93	5905
1977	380	66	0	0	0	1156	830	881	661	1216	441	72	5703
Total	540	89	0	0	234	3339	4389	5761	8533	7989	5008	2341	38223
77-81 Ave.	108	17.8	0	0	46.8	667.8	877.8	1152.2	1706.6	1597.8	1001.6	468.2	7644.6
% of Total	.014	.002	0	0	.006	.087	.115	.151	.223	.209	.131	.061	.999

Table 4: Crop Acreage by Region

Crop	%	Western Region	Eastern Region	Total Acres
Alfalfa	37	11470	118400	129870
Grain Sorghum	27	8370	86400	94770
Corn	18	5580	57600	63180
Wheat	18	5580	57600	63180
Total	100	31000	320000	351000

EXECUTIVE SUMMARY

Kansas consumer does not adequately benefit from low price Kansas gas.

Kansas low price gas is used as leverage by pipelines to pay for high cost gas from other states and countries.

- Average price paid to Kansas producers by pipelines was $1.61/mcf.
- The $1.61/mcf gas loses its identity because it merges with other high priced gas, both Kansas and interstate, and increases to $2.67/mcf as a system average.

Atch. 3

TABLE 1

COST OF PURCHASED GAS

Submitted by Gas Purchasers in Kansas Hugoton Field
Kansas Corporation Commission Hearing Sept. 29, 1983
January 1, 1983 - June 30, 1983

Gas Prices in $ per mcf

	KANSAS HUGOTON			TOTAL KANSAS			TOTAL SYSTEM		
Purchaser	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.
NW Central	.287	1.06	3.72	.287	1.27	3.72	.287	2.85	7.73
El Paso	.457	.482	3.67	.457	.553	3.67	.08	3.06	9.42
Panhandle Eastern	.12	.57	3.42	.12	.79	3.72	.12	3.19	9.41
Anadarko	.476	1.37	4.13	.192	2.62	4.61			
KP&L	.26	.69	2.36	.26	2.31	4.19			
Northern Natural	.287	.774	3.67	.287	1.43	3.67	.287	2.75	8.02

From Foster Associates Reports

Arkansas Louisiana Gas Co.	2.70
Colorado Interstate Gas Co.	2.55
KN Energy Co.	2.07

TABLE 2

TOTAL SYSTEM
COST OF PURCHASED GAS

Major Kansas Gas Suppliers*

	$/mcf**
KN Energy Co.	2.07
KP&L	2.31
Colorado Interstate	2.55
Anadarko	2.62
Ark-La Gas	2.70
Northern Natural	2.75
NW Central	2.85
El Paso	3.06
Panhandle Eastern	3.19

*Only suppliers for which costs of purchased gas was available.
**Taken from Table 1

TABLE 3

GAS VOLUMES SOLD IN KANSAS
1982
FROM FERC REPORTS #2
1-1-82 to 12-31-82

	Bcf/Year
KN Energy	23.35
KP&L	52.28
Colorado Interstate	4.09
Ark-La Gas	8.86
Northern Natural	38.22
NW Central	155.09
Panhandle Eastern	4.25
Anadarko	10.10
Kansas Gas Supply	25.07
Gas Service Co.	80.56
Union Gas	11.90
Midwest	2.02
Estimated 75% =	415.79
All other sales in Kansas	138.60
Total Sales	554.39

TABLE 4

KANSAS WEIGHTED AVERAGE COST*

	Average Kansas Price	% Volume Sold in Kansas		
KN Energy	1.84	(07.9)	=	.146
KP&L	2.31	(17.6)	=	.407
Colorado Interstate	2.30	(01.4)	=	.032
Ark-LA	2.70	(03.0)	=	.081
Northern Natural	1.43	(12.9)	=	.184
Northwest Central	1.27	(52.3)	=	.664
Panhandle Eastern	0.79	(01.4)	=	.011
Anadarko	2.62	(03.4) / 100.0	=	.089
Average Kansas ~~Sales~~ Purchase Price				1.614

*These eight suppliers are the only ones for which Kansas gas data was available.

The fraction is calculated as a percentage of total volumes sold by these eight companies.

TABLE 5

SYSTEM WEIGHTED AVERAGE COST

Major Kansas Gas Suppliers*

	Total System Cost		% Volume Sold in Kansas		
Anadarko	$2.62	X	(03.4)	=	.089
KN Energy	2.07	X	(07.9)	=	.164
KP&L	2.31	X	(17.6)	=	.407
Colorado Interstate	2.55	X	(01.4)	=	.036
Ark-La	2.70	X	(03.0)	=	.081
Northern Natural	2.75	X	(12.9)	=	.355
NW Central	2.85	X	(52.3)	=	1.491
Panhandle Eastern	3.19	X	(01.4)	=	.045
Average Cost for State = $					2.668

*These eight suppliers are the only ones for which Kansas gas data was available.

The fraction is the same as Table 4.

Table 6

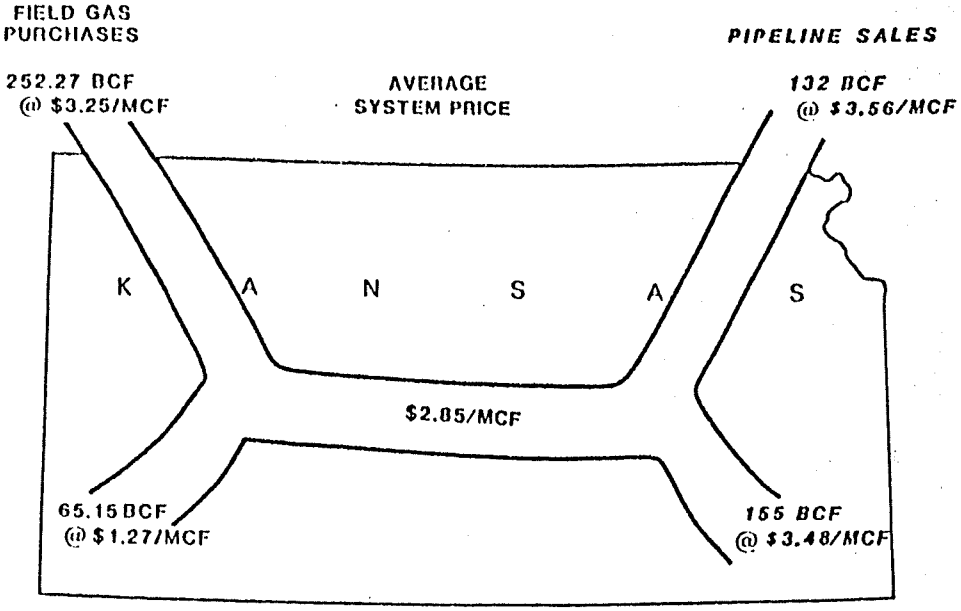
KP&L GAS PURCHASES

An analysis of KP&L gas purchases from their Purchased Gas Adjustment Report, Tariff No. PGA-1A, indicates their current cost/mcf is $2.19 for the twelve month period ending June 30, 1983.

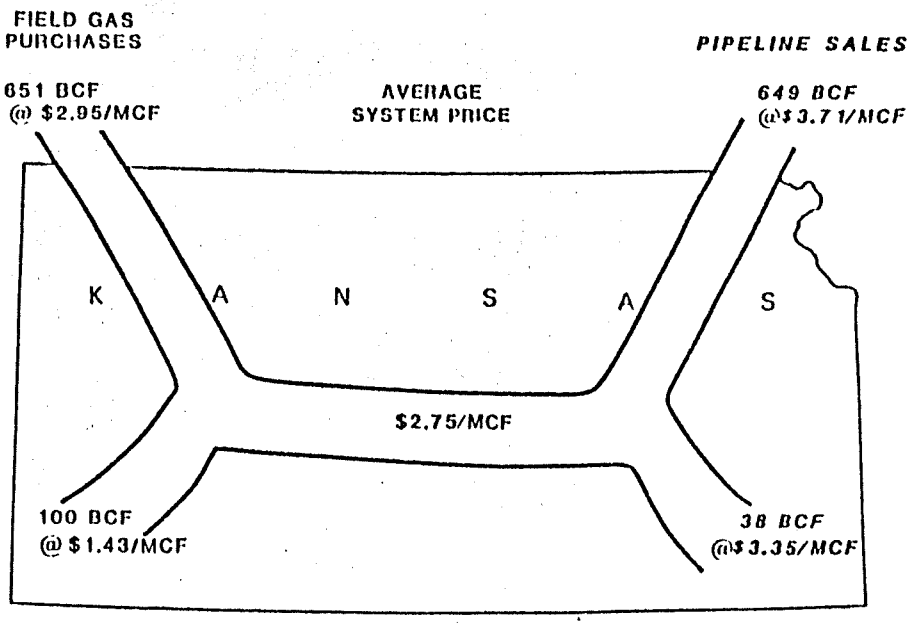
SUMMARY OF ESTIMATED GAS PURCHASES

Seller	Contract Date	Estimated Volume (mcf)	Estimated Cost ($)	$/mcf	
Mesa Petroleum-Hugoton	1-1-82	17,940,000	$ 4,678,752	0.2608	NGL Plant
Mesa Petroleum-Hugoton	4-1-82	5,060,000	11,164,890	2.2065	NGL Plant NGPA Price
Subtotal		23,000,000	$15,843,642	0.6889	Average
Other Major Purchases:					
Central States Transmission	7-27-78	8,255,000	$ 28,365,367	3.4361	NGPA
Delhi Spivey Conn.	4-1-82	2,190,000	8,303,166	3.7914	
Gulf (Wellhead)	2-27-83	676,000	1,690,000	2.5000	
McKinney Field (Wellhead)	1-1-82	1,200,000	3,060,000	2.5500	
Spivey-Casinghead	11-27-81 & 82	3,328,549	7,498,173	2.2527	
Spivey-Gas Well	11-27-81 & 82	4,230,451	$ 9,318,767	2.2028	
Subtotal		23,016,000	69,526,833	3.0208	Average
Total-Purchases Above		46,016,000	$ 85,370,475	1.8552	Average
Other Purchases		11,244,736	40,042,060	3.5609	Average
Total KPL Purchases		57,260,736	$125,412,533	2.1902	Average

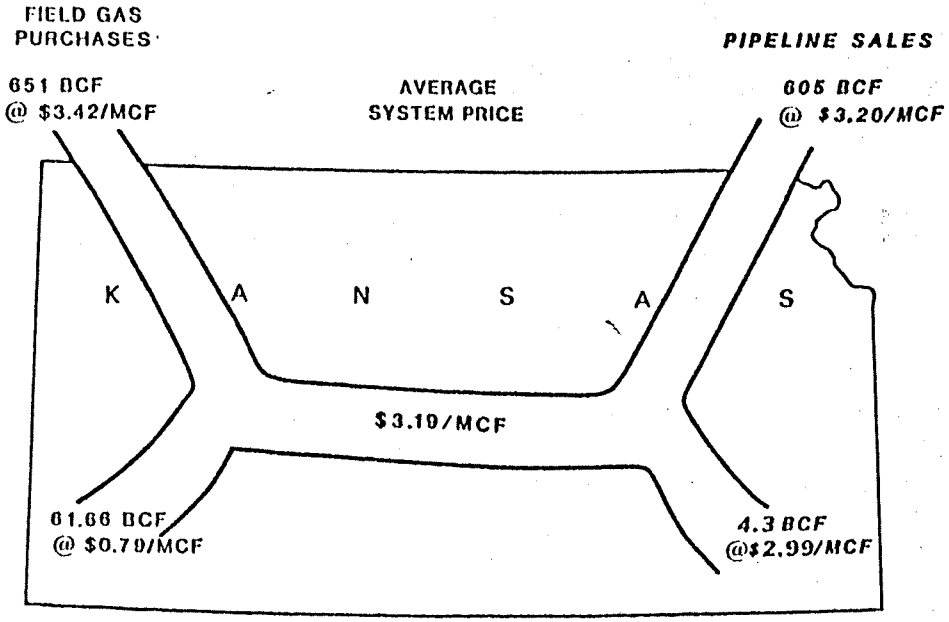
(Price Range $0.2608-$4.2239)



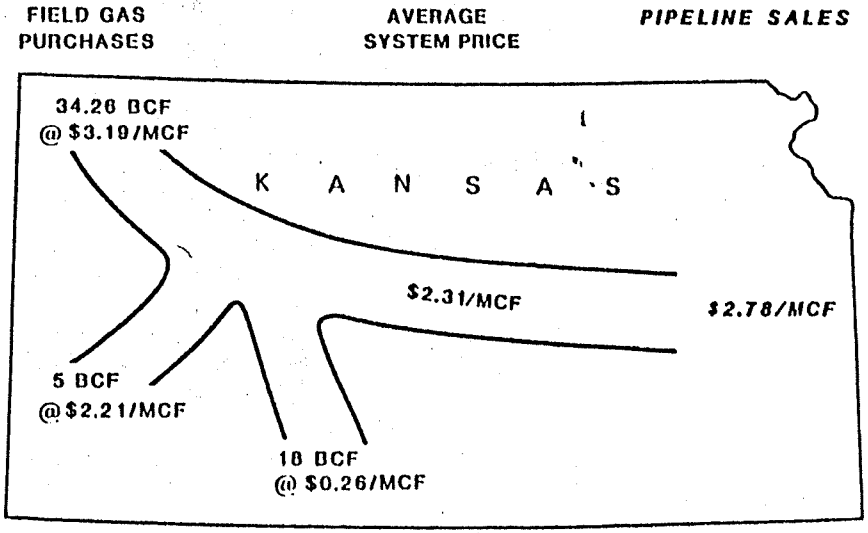
NORTHWEST CENTRAL



NORTHERN NATURAL



PANHANDLE EASTERN



KANSAS POWER & LIGHT

(Update)

TABLE 6

KP&L

PGA Filing February 1, 1984

Main System

Total estimated purchased gas cost 12 month ending June 30, 1984	$128,516,311
Estimated volumes	48,390,108 mcf
Average Price $2.66/mcf	

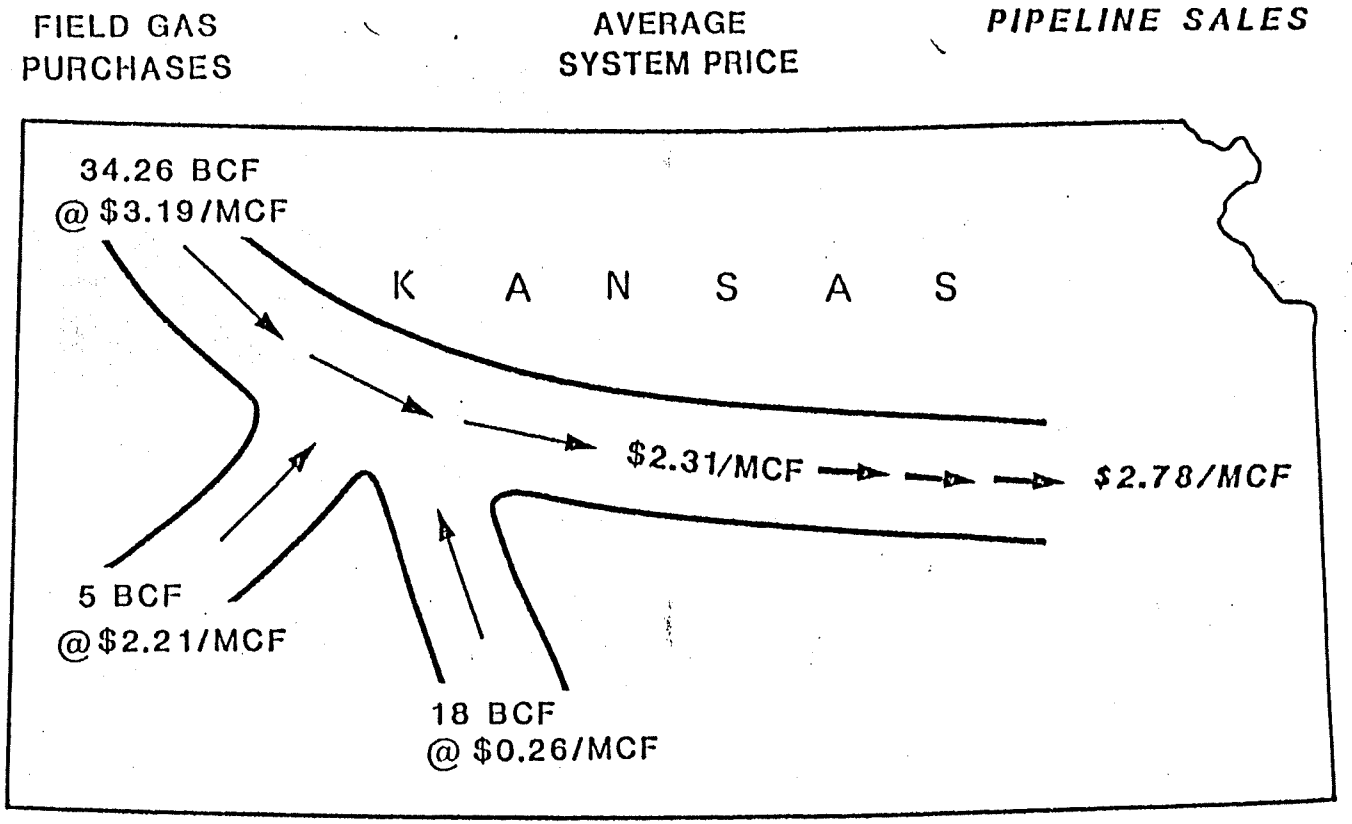
B System
(Northern Natural)

Total Estimated Purchased Gas Cost	$ 1,164,846
Estimated Volumes	232,595 mcf
Average Price $5.02/mcf	

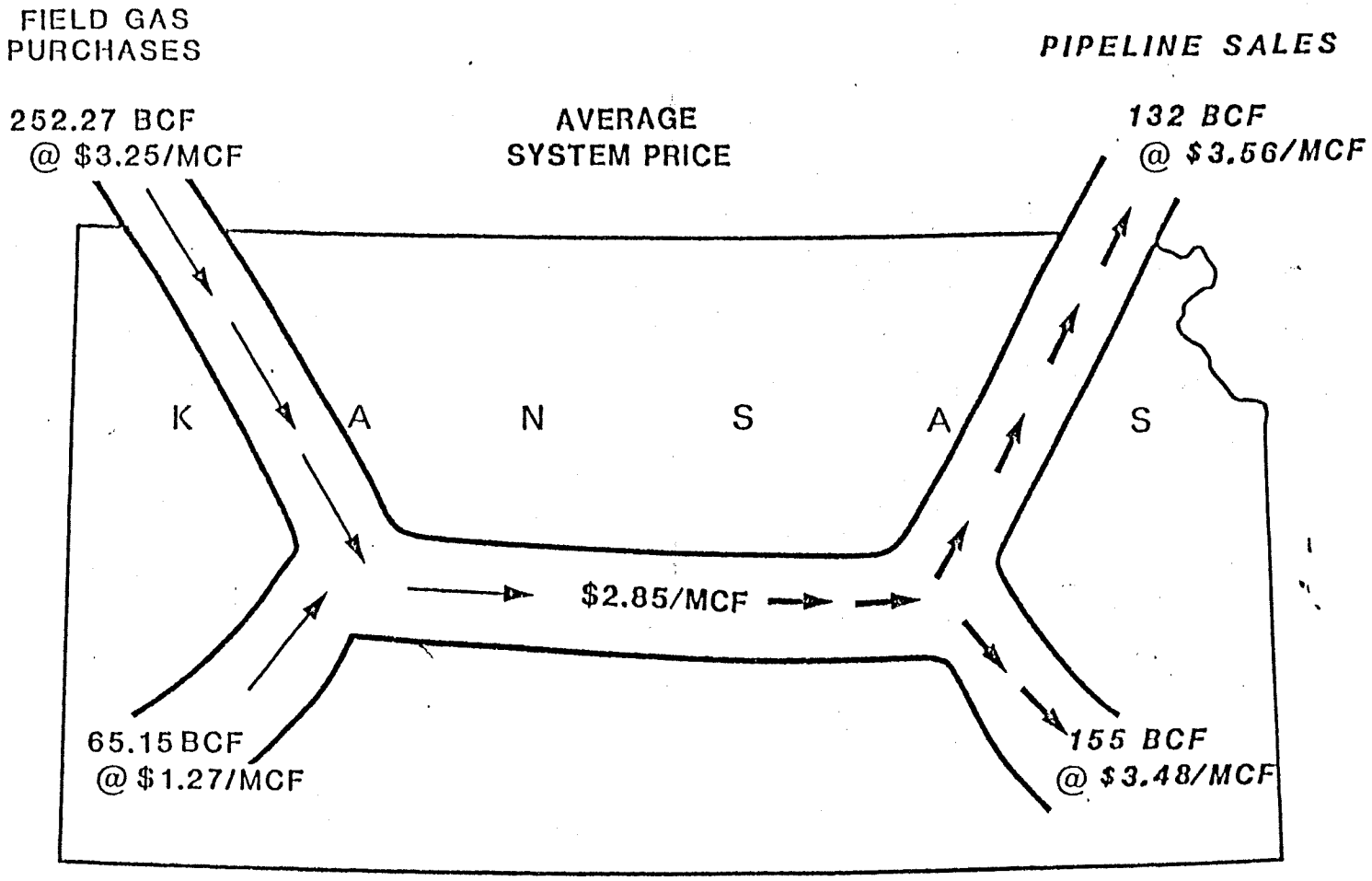
C System
(Northwest Central)

Total Estimated Purchased Gas Cost	$ 12,995,688
Estimated Volumes	3,386,993 mcf
Average Price $3.38/mcf	

Total System Estimated Average Price $2.74/mcf



KANSAS POWER & LIGHT



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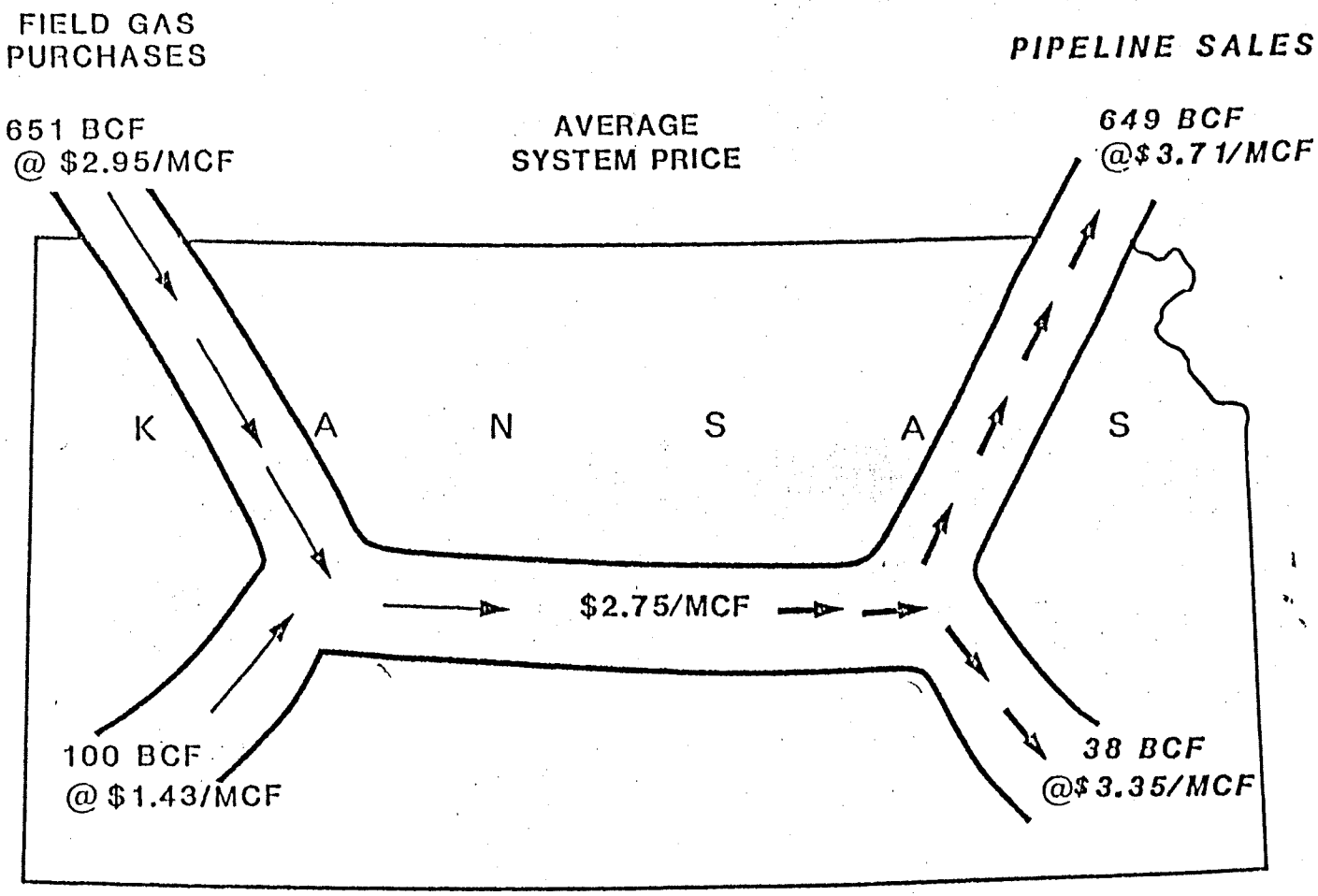

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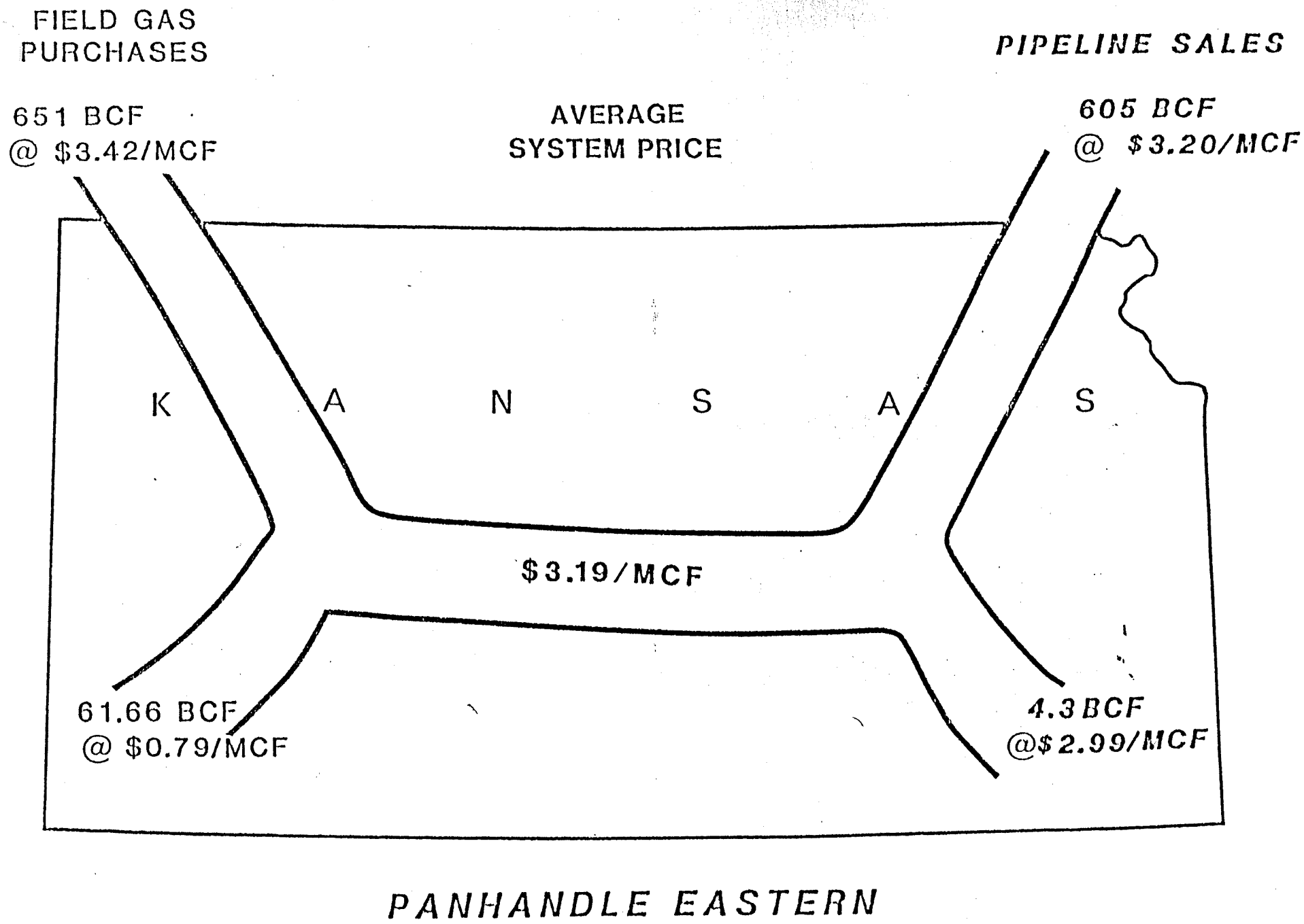
FIELD GAS
PURCHASES
651 BCF
@ $3.42/MCF
AVERAGE
SYSTEM PRICE
PIPELINE SALES
605 BCF
@ $3.20/MCF
K
A
N
S
A
S
$3.19/MCF
61.66 BCF
@ $0.79/MCF
4.3 BCF
@$2.99/MCF
PANHANDLE EASTERN

From: Energy ... DOE/EIA-0404 Dist. Category UC-98

The interstate natural gas sales levels for the 10 largest gas producing States are provided in Table 4. States whose revenues would benefit from decontrol in the interstate market are Texas, New Mexico, and Kansas. Those States with significant levels of high-cost gas, such as Oklahoma, Wyoming, and Mississippi (with this category of gas representing 15, 30, and 52 percent of the gas produced in their respective States) would be affected by the falling price levels. Not only might such a situation portend a decrease in natural gas production in these States, but might also result in a decrease in exploration and development activity and loss of valuable tax revenues.

Table 4. Interstate Sales Levels for the 10 Largest Producing States: Projected Quantities and Price Levels for Late 1982 to Early 1983[a]
(Quantities in Billion Cubic Feet, Prices in Dollars per Mcf)

State Name	Old Gas[b]		New Gas[c]		High-Cost Gas[d]		Miscellaneous[e]		Total	
	Sales Quantity	Average Price	Sales Quantity	Average Price	Sales Quantity	Average Price	Sales Quantity	Average Price	Sales Quantity	Average Price
Louisiana	2,717	1.53	1,627	3.26	328	8.08	36	2.55	4,709	2.60
Texas	1,239	1.27	1,089	3.37	117	6.53	22	4.38	2,468	2.47
New Mexico	421	1.36	407	3.43	49	5.93	f	NA	876	2.57
Oklahoma	230	1.02	352	3.24	105	8.23	19	3.34	706	3.27
Kansas	256	0.73	50	2.90	4	5.33	2	2.65	313	1.15
Wyoming	87	1.21	113	3.59	88	6.49	1	3.36	288	3.72
Colorado	41	1.62	87	3.23	23	5.89	3	2.27	155	3.17
Mississippi	21	1.76	38	3.35	86	6.83	3	3.08	148	5.14
West Virginia	28	1.03	77	3.16	12	6.09	f	NA	117	2.96
Pennsylvania	3	1.46	42	3.01	12	5.52	f	NA	58	3.43
All Others States[g]	93	1.18	204	3.30	81	6.31	5	1.45	383	3.40
Total Projected Sales[h]	5,136	1.38	4,087	3.31	907	7.22	91	3.19	10,221	2.69

[a]Includes only data for PGA filings with an effective date falling between July 1, 1982, and December 31, 1982.
[b]Old gas includes natural gas reported under NGPA categories 104 and 106.
[c]New gas includes natural gas reported under NGPA categories 102, 103, 108, and 109.
[d]High-cost includes natural gas reported under NGPA category 107.
[e]Miscellaneous includes natural gas reported under NGPA section 105 and gas not identified as to NGPA category.
[f]No data reported.
[g]Includes Alabama, Arkansas, Arizona, Florida, Illinois, Indiana, Kentucky, Maryland, Missouri, Montana, Nebraska, Neveda, New York, Ohio, Tennessee, Utah, Virginia, and unidentified sources of gas.
[h]Totals may not sum due to independent rounding.
NA - Not applicable.
Note: California and Michigan are not represented because natural gas from these States does not enter the interstate market.
Source: Purchased Gas Adjustment (PGA) filings of the 20 major interstate natural gas pipeline companies with the Federal Energy Regulatory Commission (FERC). See Appendix B for details.

Interstate production constitutes the majority of sales in many States see Table 5). These States will, of course, be affected by altered market conditions under decontrol.

Table C5. Projected Quantities and Prices of Wellhead Sales For Kansas
(Quantity in Billion Cubic Feet, Prices in Dollars per Mcf)

Type of Gas	Late 1981[a] Early 1982 Quantity	Late 1981[a] Early 1982 Average Price	Late 1982[b] Early 1983 Quantity	Late 1982[b] Early 1983 Average Price
Old Gas	418	0.61	256	0.73
Pre 73 Contracts ..	364	0.56	226	0.66
Post 72 Contracts..	26	1.00	13	1.25
Date Unknown	28	0.87	17	1.23
NGPA 104	418	0.61	256	0.72
NGPA 106	[c]	0.89	[c]	0.97
New Gas	60	2.64	50	2.90
NGPA 102	9	3.01	7	3.36
NGPA 103	45	2.52	36	2.73
NGPA 108	4	3.18	6	3.49
NGPA 109	2	2.34	1	2.30
High-Cost Gas	1	6.16	4	5.33
Miscellaneous.....	2	2.99	2	2.65
Total Projected[d] Sales	480	0.88	313	1.15

[a]Late 1981 - early 1982 includes PGA data filed from July 1, 1981, through December 31, 1981.

[b]Late 1982 - early 1983 includes PGA data filed from July 1, 1982, through December 31, 1982.

[c]Less than .5 billion cubic feet.

[d]Totals may not sum due to independent rounding.

Source: Purchased Gas Adjustment (PGA) filings of major (20) interstate natural gas pipeline companies with the Federal Energy Regulatory Commission (FERC).