Approved: May 2, 2003 Carl Dean Holmes
Date

MINUTES OF THE HOUSE COMMITTEE ON UTILITIES.

The meeting was called to order by Chairman Carl D. Holmes at 9:06 a.m. on March 21, 2003 in Room 526-S of the Capitol.

All members were present except: Representative Nile Dillmore
Representative Carl Krehbiel

Committee staff present: Mary Galligan, Legislative Research
Dennis Hodgins, Legislative Research
Mary Torrence, Revisor of Statutes
Jo Cook, Administrative Assistant

Conferees appearing before the committee:
Ron Gaches, Southern Star
Diana Edmiston, Kansas Corporation Commission
Lee Allison, Kansas Geological Survey
Wayne Penrod,

Others attending: See Attached List

HB 2448 - Storage of hydrocarbons in certain underground formations where the chlorides are less that 5,000 milligrams per liter

Chairman Holmes opened the hearing on **HB 2448**.

Ron Gaches, appearing on behalf of Southern Star Central Gas Pipeline Company, addressed the committee in support of **HB 2448** (Attachment 1). Mr. Gaches explained that they had requested the bill to address an unanticipated issue that arose out of the passage of a 2001 session bill regarding regulatory control of the underground hydrocarbon industry. The issue deals with hydrocarbon storage in depleted water aquifers and the fact that normal porosity storage fields may produce small amounts of water.

Diana Edmiston, Senior Assistant General Counsel for the Kansas Corporation Commission's Conservation Division, testified in support of **HB 2448** (Attachment 2). Ms. Edmiston stated that the Commission's support balanced its statutory duty to protect the waters of the state with the public interest in allowing the economical storage of natural gas for public use.

Mr. Gaches and Ms. Edmiston responded to questions from the committee.

Chairman Holmes closed the hearing on **HB 2448** and opened the debate.

Representative Dreher moved to recommend **HB 2448** favorable for passage. Representative P. Long seconded the motion. The motion carried. Representative Dreher will carry the bill.

Chairman Holmes welcomed Dr. Lee Allison, state Geologist and Director of the Kansas Geological Survey, back to the committee.

Dr. Allison provided a power point presentation on the Hugoton Gas Field and the importance of understanding North America's largest gas field (Attachment 3). He outlined the challenges to be met as the field's resources are depleted and how to maintain production. Dr. Allison also distributed a Kansas Geological Survey Public Information Circular on the Hugoton Natural Gas Area (Attachment 4).

Dr. Allison then addressed the committee on "Sources and Quality of Coal for Electric Power Generation in Kansas" (Attachment 5). Dr. Allison provided data on coal production and coal usage in the state.

Wayne Penrod, Senior Manager of Environment and Production Planning for Sunflower Electric Power Corporation, provided remarks to the committee on clean coal technology (Attachment 6). Mr. Penrod detailed Sunflower's recent Department of Energy awarding.

MINUTES OF THE HOUSE COMMITTEE ON UTILITIES, Room 526-S Statehouse, at 9:06 a.m. on March 21, 2003.

Mr. Randy Rohn, Westar Energy, provided a copy of a presentation on the Powder River Basin that was presented by Thomas Lien of RAG American Coal Holding, Inc. at the PRB Coal Users' Group Annual Meeting on March 3, 2002 (Attachment 7). Mr. Rohn highlighted several of the slides.

Written statements were provided by Great Plains Energy (Attachment 8) and the Kansas City Board of Public Utilities (Attachment 9). Mary Galligan, Research Analyst, distributed information on the state's electricity generating capability (Attachment 10).

Dr. Allison, Mr. Penrod and Mr. Rohn responded to questions from the committee.

The meeting adjourned at 10:24 a.m.

HOUSE UTILITIES COMMITTEE GUEST LIST

DATE: March 21, 2003

NAME	REPRESENTING
Lee Allison	KGS/KU
Mark Schreiber	Westar Energy
Cynthia Smith	GPE
JC Long	Aquila Inc
Joe Dick	KCBPU
Dave Holthaus	KEC
Randy Rahm	Westar Energy
Steve Johnson	Kansas Gas Service
Lawrence L Brady	Kansas Geol. Survey
[illegible]	Kansas Railroads
[illegible]	KCC
[illegible]	Southern Star
Charles Benjamin	KS Sierra Club

Gaches, Braden, Barbee & Associates

Governmental Affairs & Association Management

300 SW EIGHTH • THIRD FLOOR • TOPEKA, KANSAS 66603-3912 • 785-233-4512 • FAX 785-233-2206

House Utilities Committee
Comments of Southern Star Central Gas Pipeline Company
Presented by Ron Gaches
Friday, March 21, 2003

Thank you Chairman Holmes and members of the committee for the opportunity to appear in support of HB 2448.

This proposal is intended to address an unanticipated issue that has arisen out of passage of the bill in the 2001 session intended to bring increase regulatory control of the underground hydrocarbon industry. Many of you will recall that any unfortunate loss of two lives in Hutchinson led to passage of a bill that mandated new, tougher standards on underground storage of natural gas and various hydrocarbon liquids (like propane).

At that time, the Kansas Corporation Commission was given the assignment of implementing new regulations for underground porosity storage of natural gas and the Kansas Department of Health and Environment was given the assignment of implementing new regulations for underground storage of gas and liquids in bedded salt fields.

At the time the bill was passed, it was agreed by all parties that there should not be any underground storage of hydrocarbons in any of Kansas' fresh water aquifers. Natural gas never has been stored in water aquifers in Kansas, but we learned in 2001 that at least one state had some gas storage in depleted water aquifers.

That agreement led to the language in KSA 55-1,115 (b)
"No hydrocarbon storage shall be allowed in any underground formation if water within the formation contains less than 5,000 milligrams per liter chlorides."

Clearly, the intention was to protect our underground fresh water supplies. What we didn't anticipate is that normal porosity storage fields might produce some small amounts of water. In effect, the new statutory language protected fresh water irrespective on how much might be present in the storage field.

Within the past year, Southern Star Central Gas Pipeline Company purchased the Central Gas Pipeline and underground gas storage assets of the Williams Company. Southern Star now operates 11 porosity storage fields in Kansas, comprising about half of the gas storage in Kansas.

HOUSE UTILITIES

DATE: 3-21-03

ATTACHMENT 1

Three of the Southern Star storage fields fail the 5000 mg/l test of KSA 55-1,115 (b). The storage fields are not storing gas in fresh water aquifers. Rather, these storage fields are all in the Colony Sandstone formation.

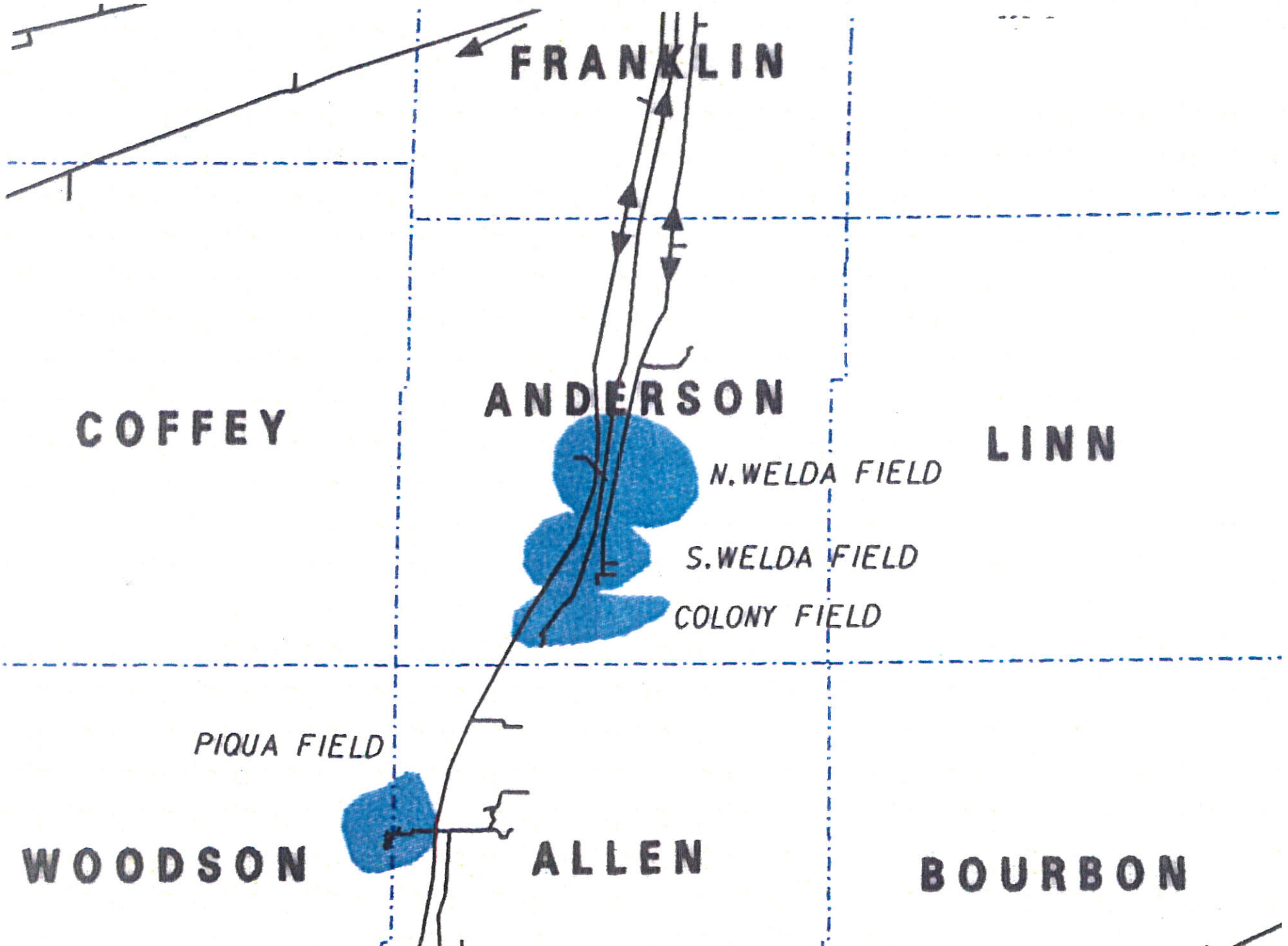
Piqua	Woodson and Allen Counties
Colony	Anderson County
South Welda	Anderson County

Southern Star alerted the KCC Oil and Gas Conservation Division of this problem as we were preparing our applications for temporary permits under the new regulations. Because the chloride threshold is statutory, there really isn't any other alternative than to modify the requirement by statutory change.

There is broad agreement that maintaining gas storage capacity is very important to Kansas and Midwest markets. Gas storage allows utility companies to purchase gas in the off season (when it is cheaper) and store if for use during the high demand winter months.

Passage of HB 2448 will allow these three gas storage facilities to continue operation as they have for more than 30 years, contributing to the local property tax base and helping to stabilize supply and price of natural gas.

Thank you for your time and consideration.


FRANKLIN
ANDERSON
COFFEY
LINN
N.WELDA FIELD
S.WELDA FIELD
COLONY FIELD
PIQUA FIELD
WOODSON
ALLEN
BOURBON

Kansas Corporation Commission

Kathleen Sebelius, Governor John Wine, Chair Cynthia L. Claus, Commissioner Brian J. Moline, Commissioner

Testimony of
Diana Edmiston, Senior Assistant General Counsel
KCC Conservation Division
before the
House Utilities Committee
March 21, 2003

Good morning. I am appearing before you today in support of House Bill 2448, which would make it legal for three underground natural gas porosity storage facilities in Anderson, Woodson and Allen Counties, to continue operating as storage facilities. K.S.A. 55-1,115(b) otherwise prohibits the storage of natural gas in these facilities.

KSA 55-1,115(b) currently prohibits the storage of natural gas in underground porosity formations if water within those formations has less than 5000 mg/l chlorides. The Commission has deemed such water to be "usable". The affected storage fields and their respective chloride contents are listed below:

Field Name	County	Chloride content	Formation	Depth
Welda South	Anderson	1400 mg/liter	Colony Sand	921' to 970'
Colony	Anderson	446 mg/liter	Colony Sand	804' to 882'
Piqua	Woodson & Allen	386 mg/liter	Colony Sand	898 to 918'

The "Colony Sand" is a Pennsylvanian aged sand that lies above the Mississippian section in eastern Kansas. The name "Colony Sand" is a local term. The sand is equivalent to the more commonly named "Bartlesville Sand" of eastern Kansas and would be equivalent to the Lower Cherokee Sands of Western Kansas. All of these fields were originally productive of oil or gas and have been converted to porosity gas storage. The fields have been active as gas storage fields for quite some time.

In supporting this bill, the Commission is balancing its statutory duty to protect fresh and usable waters of the state, with the public interest in allowing for the economical storage of natural gas for ultimate public use. The KCC Staff believes the water in these fields, while technically usable, is not being used, and does not significantly impact any fresh or usable water supplies that are relied upon by the public.

This concludes my comments. Thank you for allowing me to address the committee. Should you have any questions I would be glad to address them.

Conservation Division, Finney State Office Building
*130 S. Market, Room 2078, Wichita, Kansas 67202-3802 316.337.620^*

HOUSE UTILITIES

DATE: 3-21-03

ATTACHMENT 2

TESTIMONY

PRESENTED TO THE
HOUSE COMMITTEE ON UTILITIES

March ~~18~~ 21, 2003

KANSAS NATURAL GAS PRODUCTION AND THE HUGOTON FIELD

M. Lee Allison, Ph.D.
State Geologist and Director

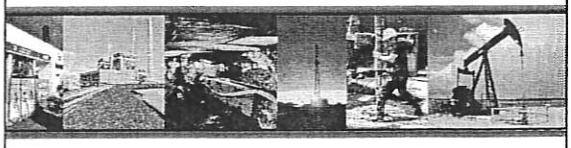
Kansas Geological Survey
University of Kansas
Lawrence, Kansas

HOUSE UTILITIES

DATE: 3-21-03

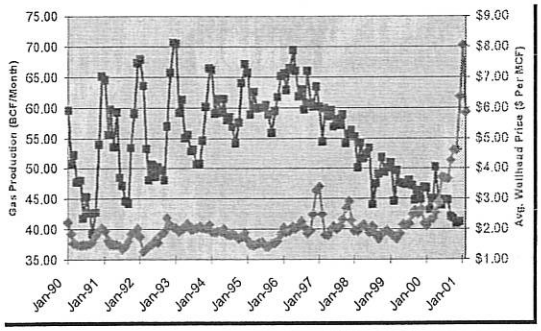
ATTACHMENT 3

Hugoton
The Importance of Understanding North America's Largest Gas Field

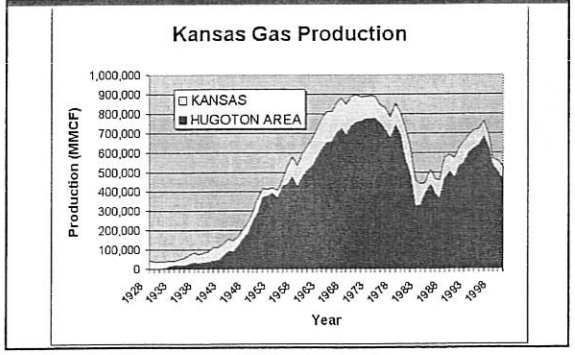


Kansas Geological Survey
University of Kansas -
Energy Research Center

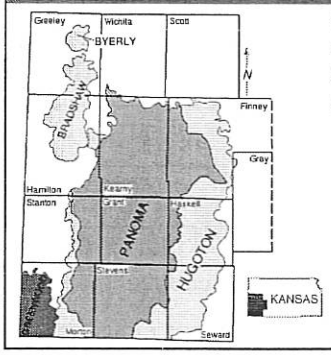
Kansas Gas Production



Southwest Kansas Gas

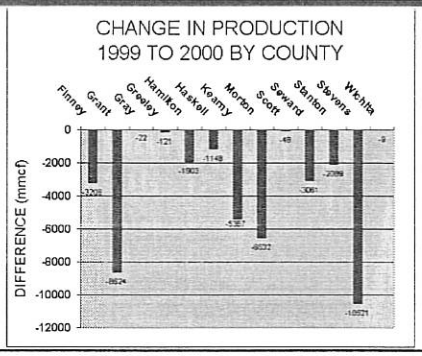


Hugoton Gas Fields



- Discovered 1927
- Area: 12,000 miles^2
- Depth: 3000 feet
- Wells: 11,000 Producing Oil and Gas Wells
  - Hugoton 4,000 Wells
  - Cum. 30 Trillion Cubic Feet
  - Current Annual Production 600 BCF
  - Current Reservoir Pressure is Very Low
  - Multiple Reservoir Zones

Southwest Kansas Gas



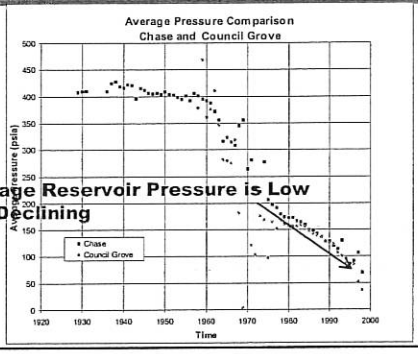
Comprehensive Study of Oil & Gas Resources

- Products are being used to drill additional infill and replacement wells
- Products used for deep Hugoton exploration

Project Organization

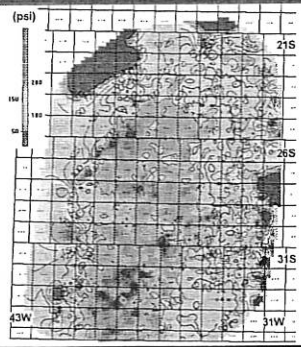
- Industry Consortium
- State Government
  - State Legislature
  - Governor's Office
- Kansas Geological Survey
- University of Kansas
  - Energy Research Center

Hugoton Reservoir Pressure



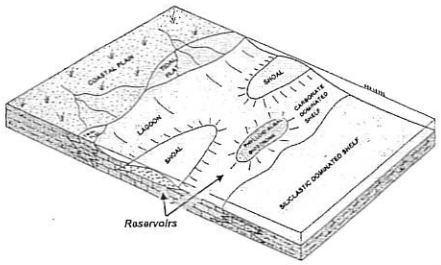
Average Reservoir Pressure is Low and Declining

Hugoton Reservoir Pressure

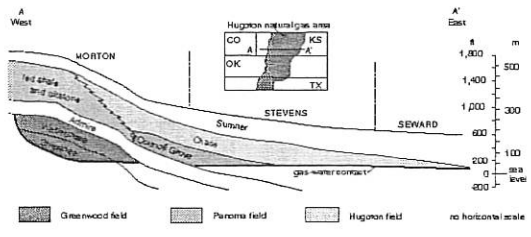


Hugoton Facies Models

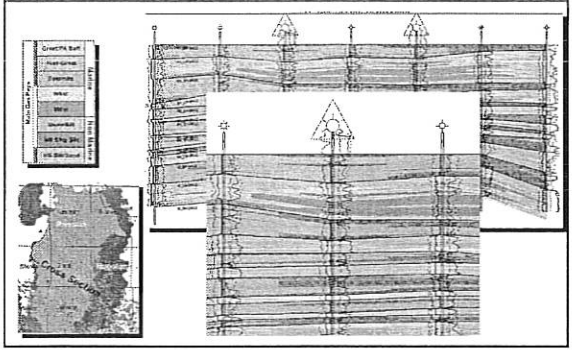
COUNCIL GROVE GROUP
IDEALIZED DEPOSITIONAL MODEL
(modified after Reservoir, Inc.)

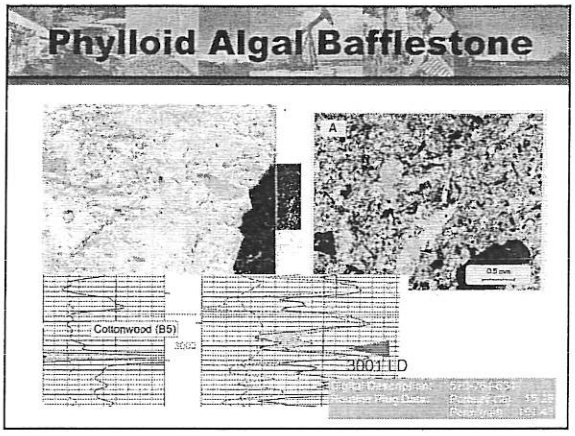


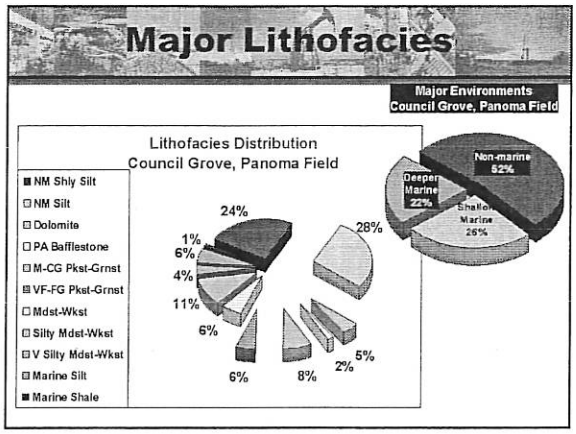
Hugoton

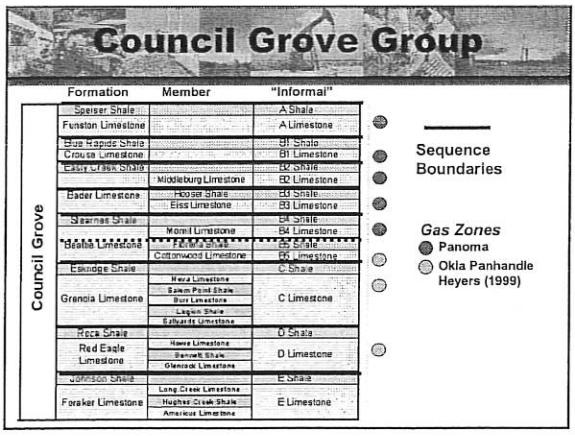


Council Grove Cross Section



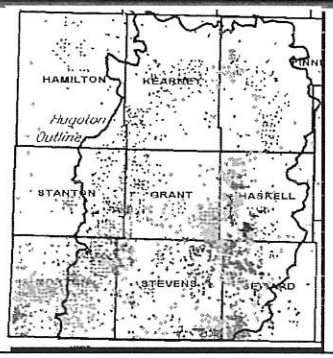

Phylloid Algal Baffestone
A
Cottonwood (B5)
3001 LD


Major Lithofacies
Major Environments
Council Grove, Panoma Field
Lithofacies Distribution
Council Grove, Panoma Field
NM Shly Silt
NM Silt
Dolomite
PA Bafflestone
M-CG Pkst-Grnst
VF-FG Pkst-Grnst
Mdst-Wkst
Silty Mdst-Wkst
V Silty Mdst-Wkst
Marine Silt
Marine Shale
24%
1%
6%
4%
11%
6%
6%
8%
2%
5%
28%
Non-marine
52%
Deeper
Marine
22%
Shallow
Marine
26%


Council Grove Group
Formation
Member
"Informal"
Council Grove
Speiser Shale
Funston Limestone
Blue Rapids Shale
Crouse Limestone
Easly Creek Shale
Middleburg Limestone
Bader Limestone
Hooser Shale
Eiss Limestone
Stearnes Shale
Morrill Limestone
Beattie Limestone
Florena Shale
Cottonwood Limestone
Eskridge Shale
Grenola Limestone
Neva Limestone
Salem Point Shale
Burr Limestone
Legion Shale
Salyards Limestone
Roca Shale
Red Eagle Limestone
Howe Limestone
Bennett Shale
Glenrock Limestone
Johnson Shale
Foraker Limestone
Long Creek Limestone
Hughes Creek Shale
Americus Limestone
A Shale
A Limestone
B1 Shale
B1 Limestone
B2 Shale
B2 Limestone
B3 Shale
B3 Limestone
B4 Shale
B4 Limestone
B5 Shale
B5 Limestone
C Shale
C Limestone
D Shale
D Limestone
E Shale
E Limestone
Sequence Boundaries
Gas Zones
Panoma
Okla Panhandle
Heyers (1999)

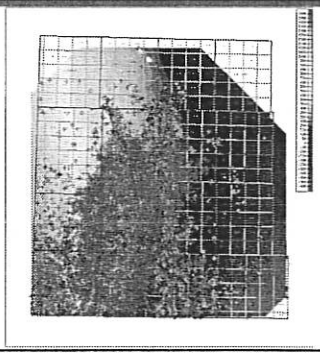
3-10

Digital Electric Logs



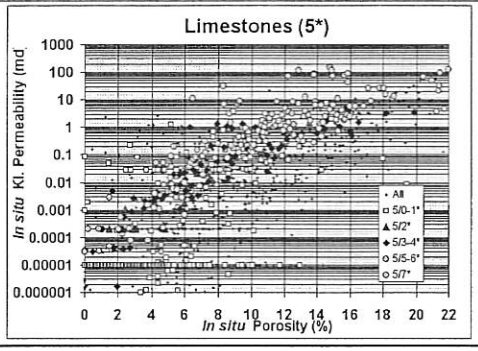
LAS Files

Structure Maps

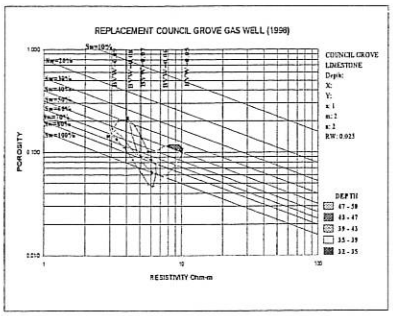


Fort Riley
12,633 Data Points

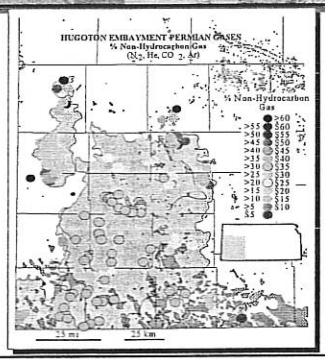
Core Analysis



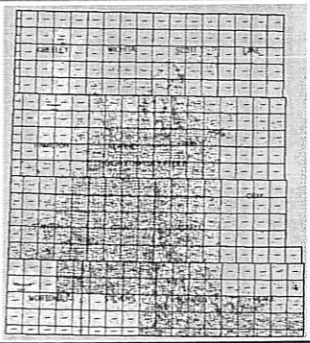
Log Analysis



Geochemistry



Progress



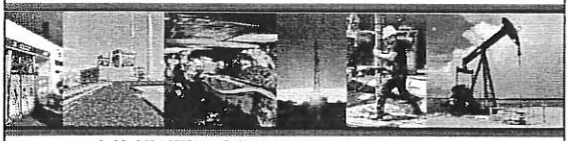
Challenges

- Very Large Data Volumes
- Access All Data
  - Pool Data from Companies
  - Provide Flexible Access
  - Provide Online Analysis and Display Tools
  - Evolving Environment
- Rock/Reservoir Model
- Provide Analysis
  - Basin Evolution
  - Fluid Migration and Trapping
  - Production

Summary

- Large Relatively Simple Basin
  - Large Number of Wells
  - Large Area
- Cooperative Project
  - Funding (Government and Industry)
  - Data (Government and Industry)
- Data Access and Analysis Tools
  - Relational Databases
  - Online
  - Java Based Analysis Tools
- Provide an Understanding of Large Scale Basin Evolution and Fluid Migration
- Goal is to Assist in Maintaining Production

KANSAS GEOLOGICAL SURVEY



UNIVERSITY OF KANSAS

Kansas Geological Survey
Public Information Circular 5
January 1997

Hugoton Natural Gas Area of Kansas

Timothy Carr
Petroleum Research Section, Kansas Geological Survey
Robert S. Sawin
Geology Extension, Kansas Geological Survey

Introduction

The Hugoton field is the largest natural gas field in North America and the second largest in the world. The Hugoton is only one of many gas fields in southwest Kansas (fig. 1) that have been important to Kansas since their development in the 1930's. The major gas fields of this area—Hugoton, Panoma, Bradshaw, Greenwood, and Byerly—have produced almost 27 trillion cubic feet of gas (enough gas to supply every household in Kansas for 364 years, based on 1994 gas consumption rates). The Hugoton and associated gas fields are part of a large, bowl-shaped structure that underlies most of southwest Kansas. This region is referred to as the Hugoton natural gas area.

The Hugoton natural gas area provides gas and oil to Kansas and the nation, generating significant revenues and providing jobs and income in at least 13 counties in southwest Kansas. Economically, the Hugoton area is Kansas's most important natural resource. It will continue to be an important resource for Kansas in the future, but it must be understood, managed, and developed in a way that will maximize its benefit to Kansans. This circular explains the history and geology of the Hugoton gas area, its importance to the state, and how foresight and stewardship will affect its future.

Economically, the Hugoton area is Kansas's most important natural resource.

Geology

Geologists refer to southwest Kansas as the Hugoton basin or Hugoton embayment, a northern shelf-like extension of a larger and deeper subsurface feature in Oklahoma and Texas known as the Anadarko basin. The Hugoton embayment is a large (about 12,000 square miles; 31,080 square kilometers), southward-plunging trough bounded by uplifted areas on the west, north, and east.

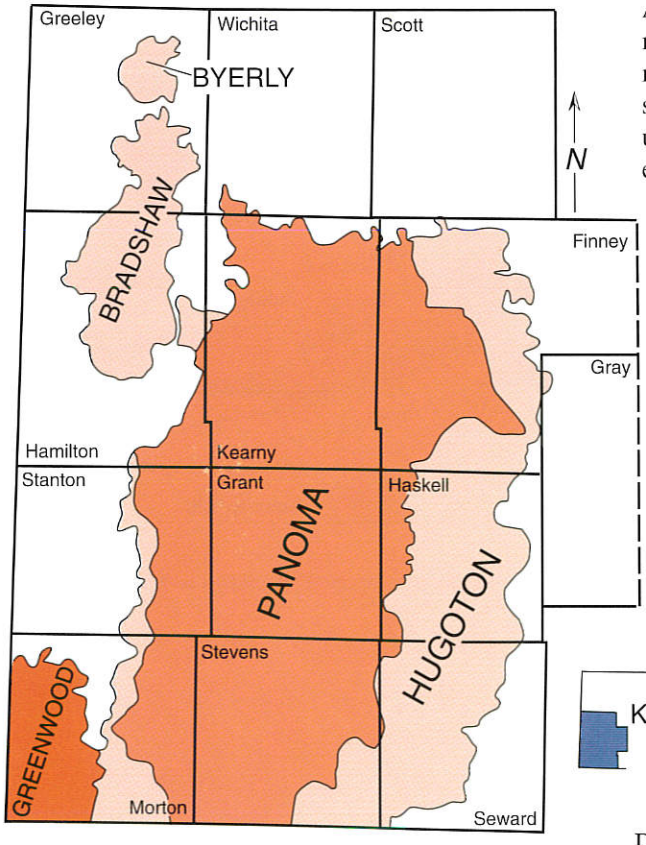


Figure 1—*The Hugoton natural gas area in Kansas.*

In the ancient past, the Hugoton natural gas area was low and often covered by seas that repeatedly inundated and retreated from the shallow arm (or embayment) of the deeper Anadarko basin, leaving interbedded deposits of carbonate (limestone and dolomite) and shale. Thousands of feet of sediment accumulated over millions of years of geologic time. Sedimentary rocks thicken toward the middle of the basin and southward to about 9,000 feet (2,740 meters) near the Kansas-Oklahoma border. Oil and gas wells drilled in the deepest part of the Hugoton in Kansas

The potential for finding significant quantities of oil and gas is good, especially in the older Pennsylvanian and Mississippian rocks.

(1,520 meters) deep, deeper than wells drilled in other parts of the state. As the Anadarko basin deepens into Texas and Oklahoma, some wells are over 20,000 feet (6,090 meters) deep.

Natural gas and oil are produced from several different rock layers (fig. 2) and many individual fields. Most of the gas is produced from two rock units, the Chase and Council Grove Groups, that were deposited during the Permian Period, about 280 million years ago. These same units crop out in the Flint Hills of eastern Kansas. The Hugoton, Byerly, and Bradshaw fields produce gas from the Chase Group. Council Grove Group production is related to the Panoma field that is underneath and geographically overlapped by the Hugoton field (fig. 3). Rocks that are deeper and older than these units also produce significant amounts of oil and some gas in the Hugoton area, but many of these deeper zones have not been thoroughly tested. The potential for finding significant quantities of oil and gas is good, especially in the older Pennsylvanian and Mississippian rocks.

Period	Group	Field
Permian	Sumner	
	Chase	Hugoton Byerly Bradshaw
	Council Grove	Panoma
Pennsylvanian	Admire	
	Wabaunsee	Greenwood
	Shawnee	

Figure 2—*Geologic units that produce gas in the Hugoton area.*

Gas has accumulated in porous reservoir rocks, mostly Permian limestone and dolomite. Figure 3 illustrates a west-east cross section through the Hugoton field. The rocks of the Chase and Council Grove Groups are tilted slightly downward toward the east (and southeast) because of the uplift of the Rocky Mountains to the west. Gas moving from the deeper Anadarko Basin through porous rocks always seeks a higher level (geologists say it moves updip) until it is stopped or trapped. The updip trap on the west and north sides of the field is a stratigraphic-type trap—that is, a trap created by a change in the type of rock. Porous limestones and dolomites interfinger into red shales and siltstones (which were washed eastward from the Rocky Mountain uplift); these shales and siltstones form a barrier that effectively stops the migration of gas. The field is pinched off to the east where the impermeable rocks of the Sumner Group meet the underlying ground water (fig. 3). The top seal is provided by the overlying Sumner Group, a very tight barrier of anhydrite and shale.

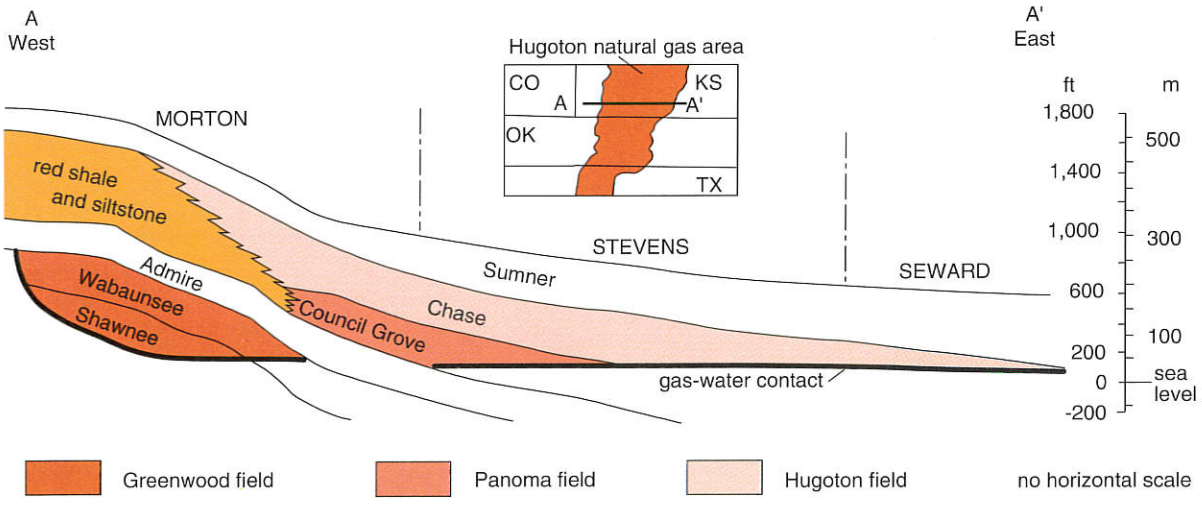


Figure 3—*Schematic west-east cross section through the Hugoton natural gas area (modified from Parham and Campbell, 1993).*

History

Gas in the Hugoton embayment was discovered in 1922 in Seward County, three miles west of Liberal. Because this well did not produce oil, it was considered to have little value and remained unused for several years. In 1927, gas was discovered at the Independent Oil and Gas Company's Crawford No. 1, about 2,600 feet (790 meters) below the surface southwest of Hugoton, Kansas, in Stevens County (Furbush, 1959). This is now considered the center of the Hugoton producing area. By the end of 1928, five wells had been drilled in the field and the first pipeline was transporting gas to local markets. In 1929, Argus Pipe Line Company started construction of a pipeline to furnish gas to Dodge City, Kansas (Hinton, 1952). Construction of major pipelines in the 1930's encouraged further drilling in the area. Today, approximately 11,000 wells produce gas and oil in the Kansas portion of the Hugoton area, and thousands of miles of pipeline carry Hugoton gas to many parts of the U.S.

In the interest of conservation, efficiency, and fairness, Kansas oil and gas production has been regulated since the 1930's. Regulations governing well spacing and rates of production continue to change as new technology and more information become available.

In 1983, the Deep Horizons Bill, which encouraged deeper exploration below the shallower gas-producing zones in the Hugoton area, was passed by the Kansas Legislature. For many years, wells were drilled on 640-acre (2.59-square kilometers) spacing units, or approximately one well per square mile. In 1986, the Kansas Corporation Commission (KCC) ruled that the Chase Group rocks in the Hugoton field were not being efficiently drained of gas and that more wells were needed to improve production. At that time, the Commission estimated that an additional 3.5 to 5 trillion cubic feet of gas, or roughly 10 to 15 years of additional production (at 1985 rates), could be recovered from the Chase Group in the Hugoton field. The Deep Horizons Bill, in conjunction with the KCC ruling, encouraged drilling and has led to increased gas production and the doubling of oil production from southwest Kansas (figs. 4 and 5).

Today, approximately 11,000 wells produce gas and oil in the Kansas portion of the Hugoton area, and thousands of miles of pipeline carry Hugoton gas to many parts of the U.S.

Importance to the State

The Hugoton gas area contributes significantly to the Kansas economy, both in terms of revenue and jobs. Since its discovery, the Kansas portion of the Hugoton gas area has produced almost 27 trillion cubic feet of gas. In 1995 alone, southwest Kansas fields produced 639 billion cubic feet (BCF) of natural gas, or 90% of the total gas produced in Kansas (fig. 4). In the same year, these fields produced 10 million barrels of oil (MBO), about 23% of the state's annual oil production (fig. 5). The combined worth of this gas and oil is estimated at $1.3 billion. During that same year, the Hugoton area provided about $80 million in severance taxes to the State and probably an equal or greater amount from *ad valorum*, sales, and income taxes on royalty owners, companies, and employees. The State also receives other taxes that result from the activities of the oil and gas industry. These include indirect taxes on the goods and services purchased by the oil and gas industry and the taxes paid by downstream industries, those involved in refining, distribution, and manufacturing of hydrocarbon-based commodities, such as plastic and fertilizer. The oil and gas industry also pays property taxes to the counties.

Gas and oil production in the Hugoton area has been increasing, and the long-term producibility is the best in the state. Hugoton gas and oil production have both doubled in the last decade, resulting in

In 1995 alone, southwest Kansas fields produced 639 billion cubic feet (BCF) of natural gas, or 90% of the total gas produced in Kansas.

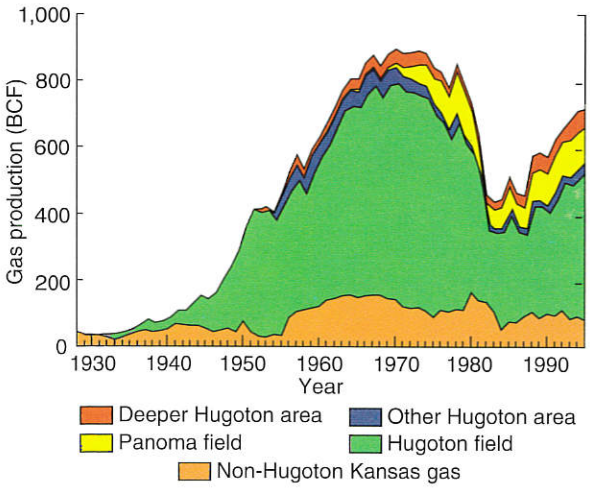


Figure 4—*Gas production in Kansas (BCF = billion cubic feet of gas).*

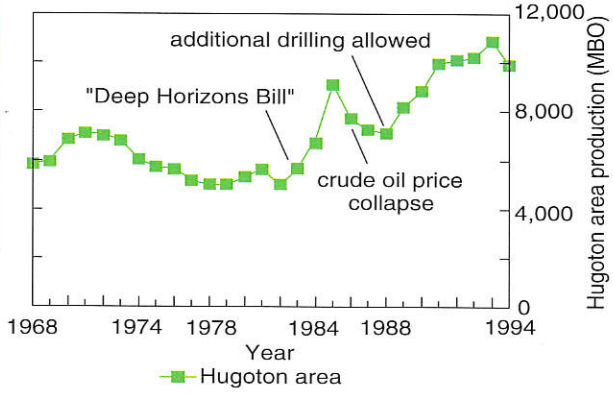


Figure 5—*Hugoton oil production (MBO = million barrels of oil).*

production valued at $1.5 billion, which translates into $90 million in additional severance tax money to the State. This production increase is in sharp contrast to the steady production declines in the rest of the state and nation. Gas and oil production from the Hugoton area of southwest Kansas is important, if not critical, to the economic health of the region and the state.

Future of the Hugoton Gas Area

Published information on the Hugoton area is rare considering its geographic size, the amounts of gas and oil produced, and the revenues generated. Despite the Hugoton's long history of production, no comprehensive study has guided how best to explore, produce, and regulate gas and oil in the Hugoton area. Relatively little is known of the basic architecture of the reservoirs or the fundamental geologic controls on the migration, trapping, and production of gas and oil.

For years, geologists thought the reservoirs that produced gas from the giant fields were relatively continuous, or homogeneous. Modern studies now show the rocks can contain barriers restricting the flow of gas both vertically and horizontally, causing many of the reservoirs to be isolated into individual compartments. Understanding how the reservoir is divided is important for efficient recovery of gas and oil. The ultimate goal is to drill the minimum number of wells that will recover the maximum amount of available gas or oil.

The urgency for policy based on strong scientific knowledge is highlighted by declining trends in reservoir pressure. Reservoir pressures that are higher than the surface pressure force gas to the surface, much like letting air out of a balloon. Because of development, the average reservoir pressure in the Hugoton area has declined from over 400 pounds per square inch (psi) to under 100 psi today. At the current rate of decline (fig. 6), pressures will soon approach their economic limit—that is, the cost of bringing the gas to the surface will exceed the value of the gas. As reservoir pressures continue to decline, intelligent energy policies and new technologies must be developed to assure continued production.

Knowledge and a technical base are required for intelligent stewardship, generation of new opportunities, and continued improvement in recovery strategies. A better understanding of the Hugoton area would allow more efficient exploitation of this resource. State policy-makers, operators, regulators, and mineral owners need accurate information to make informed decisions about regulations, drilling and production programs (for example, infill drilling and drilling of deeper horizons), and how to recover the most gas and oil from the Hugoton area. The Kansas Geological Survey is proposing a comprehensive study that will provide the geological information that is needed for intelligent decision-making.

The Hugoton area in Kansas contains an estimated 10 to 15 trillion cubic feet of natural gas. Even a small increase in annual and ultimate production of gas and oil from the Kansas portion of the Hugoton area will result in many millions of dollars of economic activity and tax revenues. Savings from more efficient production practices and access to smaller, currently unknown reservoirs could extend the field's life. Both the public and private sectors will benefit from efficient and increased production of oil and gas from the Hugoton area.

Kansans should be aware that the oil and gas resources of the state require continuous stewardship. Just as we manage our valuable ground-water resources, we must protect and manage the Hugoton natural gas area. Periodic review of energy policies and development of new technologies must continue in order to maintain the environment for conscientious and beneficial exploration, development, and production.

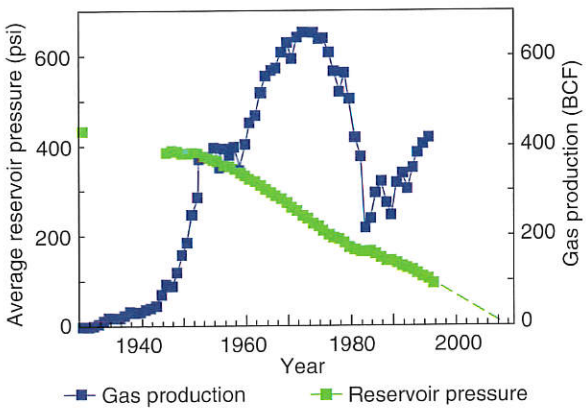


Figure 6—*Declines in reservoir pressure in the Hugoton natural gas area (BCF = billion cubic feet of gas) (modified from David Williams, Kansas Corporation Commission).*

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Despite the Hugoton's long history of production, no comprehensive study has guided how best to explore, produce, and regulate gas and oil in the Hugoton area.

The mission of the Kansas Geological Survey, operated by The University of Kansas in connection with its research and service program, is to conduct geological studies and research and to collect, correlate, preserve, and disseminate information leading to a better understanding of the geology of Kansas, with special emphasis on natural resources of economic value, water quality and quantity, and geologic hazards.

The Geology Extension program furthers the mission of the KGS by developing materials, projects, and services that communicate information about the geology of Kansas, the state's earth resources, and the products of the Kansas Geological Survey to the people of the state.

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TESTIMONY

PRESENTED TO THE
HOUSE COMMITTEE ON UTILITIES

March 21, 2003

SOURCES AND QUALITY OF COAL FOR ELECTRIC POWER GENERATION IN KANSAS

M. Lee Allison, Ph.D.
State Geologist and Director

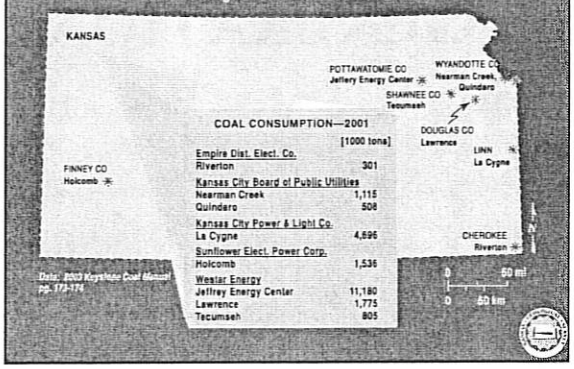
Lawrence Brady, Ph.D.
Senior Scientist

Kansas Geological Survey
University of Kansas
Lawrence, Kansas

Sources and Quality of Coal for Electric Power Generation in Kansas

Kansas Geological Survey
University of Kansas

Coal burned in Kansas power plants



Coal Used in Kansas Electric Power Plants

2001

Source	Receipt (1000 st)	%	Sulfur (#/MMBtu)	Price ($/MMBtu)
KANSAS	160	0.8	3.53	$1.20
Wyoming	19,421	91.2	0.41	1.00
Montana	200	0.9	0.35	1.06
Colorado	1,320	6.2	0.43	1.54
Missouri	167	0.8	5.11	1.17
Oklahoma	17	<0.1	2.45	1.11
Total	21,286	100.0	Avg. 0.49	$1.05

Modified from DOE/EIA "Quarterly Coal Report"

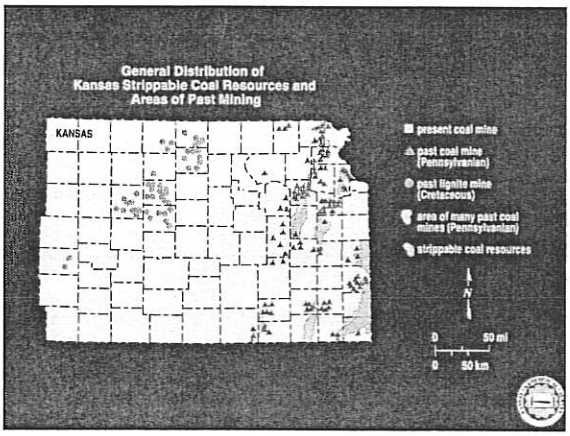
Coal Quality – Kansas & Wyoming

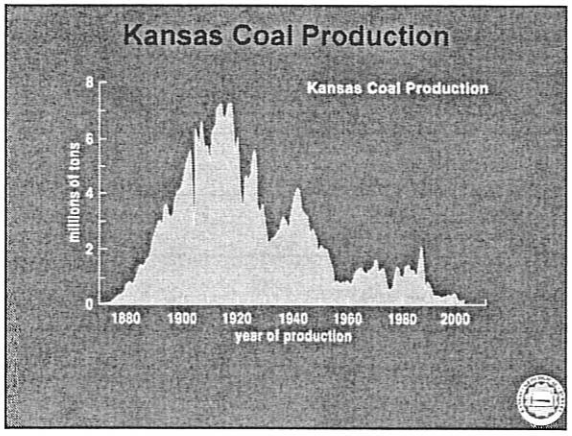
	WYOMING*	KANSAS**	KANSAS***
Sulfur	0.37%	3.5%	3.3%
Ash	4.95%	12.5%	12.5%
Btu/lb	8,407	11,900	12,300

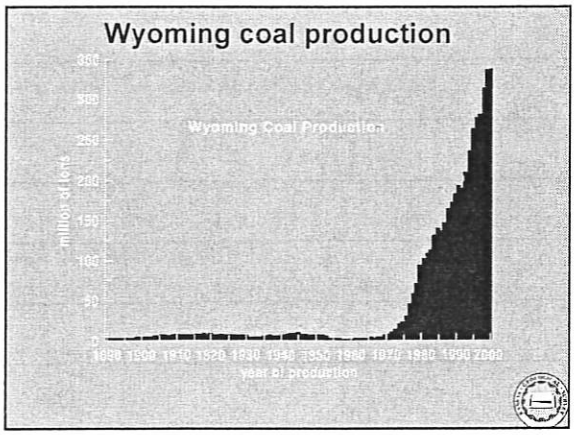
* Jeffery Energy Center-2001 (Powder River Basin)

** Mulberry coal in southeast Linn County

*** Cherokee & Crawford counties (washed)







Demonstrated Coal Reserve Base, Kansas & Wyoming

(million s.t.)

	Underground	Surface	Total
KANSAS	--	974	974
WYOMING	42,503	24,140	66,643
U.S	339,282	163,378	502,660

Modified from U.S. DOE "Coal Industry Annual 2000"

KANSAS GEOLOGICAL SURVEY

UNIVERSITY OF KANSAS

6-4

TESTIMONY SUBMITTED TO THE HOUSE UTILITIES COMMITTEE
By
Wayne Penrod, Senior Manager, Environment & Production Planning
SUNFLOWER ELECTRIC POWER CORPORATION

March 21, 2003

Thank you, Mr. Chairman and members of the Committee for providing Sunflower time to speak today about the Clean Coal Technology award we recently received from the Department of Energy and about other projects we are considering.

Let me begin my saying that I have way more information that you have time to hear, so please stop me at any point in my presentation and ask whatever questions you may have.

Primarily, I want to share with you this morning:

- Why Sunflower made application for this award;
- The current status of the project;
- New projects under consideration

I've also attached two news articles about our project and the DOE programs as well as a DOE Techline report that further describes the project.

Sunflower is among the cleanest coal-fired power plants in the nation. We have participated in emission reduction research projects for 12 years. These have resulted in continuing emission reductions from the existing power plant and provided much insight into the control technologies that we'll use in the new Sand Sage plant.

The current projects extend our knowledge and ability to limit our emissions and that remains a priority for our Board of Directors and staff.

If the Committee would like to have a more comprehensive review of the current project, I'd be happy to return and focus in detail on all elements of either project.

HOUSE UTILITIES

DATE: 3-21-03

ATTACHMENT 6

Harris News Service – OCTOBER 18, 2001
SUNFLOWER TO SHOWCASE CLEAN COAL

Federal officials say a $5.8 million project will turn Sunflower Electric Power Corporation's Garden City plant into a showcase for clean coal technology. Secretary of Energy Spencer Abraham on Tuesday trumpeted in a statement eight new projects worth more than $110 million.

Sunflower's was among eight projects selected to show how America could increase the reliability and environmental performance of its coal-burning plants. "We're delighted beyond words," said Steve Miller, spokesman for the Hays-based cooperative.

When the 630-megawatt power plant went on line in 1983, it ranked sixth-cleanest in the nation, Miller said. It burns low-sulfur coal, and 25 percent of its $450 million cost went for pollution control, Miller said. Still, it leaks nitrogen oxide.

Wayne Penrod, senior manager of environment and production planning, said those emissions don't harm the plant's neighbors. But on hot sunny days, he said, federal authorities contend nitrogen oxide can turn into ozone and drift thousands of miles to highly populated places, causing troubles for people with asthma.

Next year, Sunflower plans to install ultra-low nitrogen oxide burners along with other combustion controls. "If successful, we should reduce the level of NOx emissions 50 percent," Penrod said. Although the concept has been used in other types of power plants, it hasn't been tried on those that burn the type of coal found in Wyoming's Powder River Basin.

Sunflower will test the pollution controls for 48 months. The Energy Department will pay $2.8 million for the effort, with Sunflower providing $3 million. When Sunflower adds a new 600-megawatt facility near its current plant in 2005, air quality will be critical. "The permit will have even tighter restrictions than what we have now," Miller said.

Coal-fired power plants are the workhorses of the nation's power industry. More than 600 coal-burning generators provide more than half the electricity Americans consume. "America cannot generate the electricity it needs without coal," Abraham said. He said the new projects would provide a "jump-start" on the administration's clean coal commitment.

Other demonstration projects will take place in Ohio, Florida, New York, Wisconsin, South Dakota and Virginia.
They'll be funded under the "Power Plant Improvement Initiative," a congressional effort that Abraham said would serve as a precursor to President Bush's clean coal program.

Congress approved the initiative last October following a summer of intermittent power supply disruptions and price increases. Most of the projects, selected from 24 proposals, will focus on lower-cost technologies for reducing pollutants. Others aim to

6-2

improve performance and reliability. In one Florida project, computers will determine how best to clean the inside of boilers without disrupting operations. Another will tackle the problem of waste by turning sludge from a Virginia plant into masonry blocks.

The Energy Department will provide $51 million for the projects. Private sponsors will contribute nearly $61 million.

Electricity Daily – October 26, 2001
DOE DOLES OUT $51M FOR POWER PLANT IMPROVEMENT

The Department of Energy has announced awards under its Power Plant Improvement Initiative, with DOE kicking in around $51 million for eight projects selected from 24 proposals submitted in April. Congress approved the program last October, using funding originally allocated in the 1980s for clean coal technology demonstrations.

Alliant Energy proposes to use advanced computational modeling to reduce NOx from a cyclone boiler at the Edgewood station in Sheboygan, Wisc. Arthur D. Little Inc. will outfit a boiler at the Orion Power's Avon Lake plant near Cleveland, Ohio, with a hybrid NOx control system, integrating natural gas reburning, selective non-catalytic reduction, and selective catalytic reduction.

CONSOL Energy says it plans to demonstrate a multi-pollutant control system to reduce NOx, sulfur dioxide, mercury, acidic gases, and fine particles from smaller coal plants "for less money than it costs to control NOx and SO2 separately." Among the innovations CONSOL plans to install at the AES Greenridge plant near Dresden, N.Y., are catalytic NOx reduction that works inside the ductwork, a low-NOx system that burns coal mixed with biomass, and a flue gas scrubber less complex and costly than conventional systems. In the Midwest, Otter Tail Power Co. will install a technology it says will virtually eliminate particulates. The company will integrate a fabric filter baghouse with an electrostatic precipitator at the company's Big Stone plant in South Dakota. Sunflower Electric Power Corp. says it combines ultra-low-NOx burners with other combustion controls to demonstrate a concept never tried in power plants burning western subbituminous coal. Tampa Electric Co. won two awards. At its Big Bend station, the company will apply a neural network to determine when and how best to dislodge soot that can build up inside a boiler and degrade performance. In a second project, TECO says it uses a laser system to measure the wear pattern of the brick liner inside a coal gasifier. In DOE's original clean coal program in the 1980s and 1990s, TECO built a coal gasification power plant in Polk County, Fla., the test unit for the laser system.

techline

Issued on: January 27, 2003

"Combustion Optimization System" -- Cleaner Coal Burning at Lower Costs

DOE Joins with Sunflower Electric to Outfit Kansas Coal Plant with Lower Cost System to Cut Air Emissions

Finney County, Kansas - A unique combination of high-tech combustion modifications and sophisticated control systems will be tested on a Kansas coal-fired power plant as part of the federal government's efforts to show how new technology can reduce air emissions and save costs for ratepayers.

The U.S. Department of Energy and Sunflower Electric Power Corporation have signed an agreement to use the utility's Holcomb Station power plant in Finney County, KS, to field test an "integrated combustion optimization system" – an array of state-of-the-art sensors, controls, and clean-burning combustion modifications, all linked by sophisticated "neural network" software.

Sunflower Electric's Holcomb Station will be outfitted with a combination of innovative hardware and software to further reduce air emissions.

The pollution reducing potential of the integrated system is expected to rival other devices now being installed on other coal-burning power plants, but overall costs are likely to be only half as much, a significant benefit for ratepayers.

The $5.88 million project is part of the Energy Department's Power Plant Improvement Initiative, a program that provided federal matching funds for projects that would demonstrate innovative ways to reduce air emissions or boost the operating efficiencies of the nation's coal-fired power plants. The Energy Department, through its National Energy Technology Laboratory, is providing $2.8 million for the 26-month project. Sunflower is contributing the additional $3.08 million.

Coal-fired power plants, such as the 360-megawatt Holcomb Station, are the workhorses of the U.S. electric power industry, currently supplying more than half of the nation's electric power. Many of these plants are facing more stringent environmental standards, especially for air emissions such as nitrogen oxides (NOx).

The specific technology components to be added to the plant include a separated overfire air (SOFA) system, furnace sensors, coal flow measuring and control devices, and neural network controls. If successful, the "Integrated Combustion Optimization System" will reduce emissions to 0.15 to 0.22 pounds of NOX per million Btus and simultaneously increase power output by 7 megawatts – all at less than half the cost of state-of-the-art NOX control technology.

Under the terms of the Energy Department's agreement with Sunflower, revenue from sales of the additional power output will be used to repay the federal government's share of the project.

Individually, the components to be installed on Unit 1 of the Holcomb Station are all commercially available. What has not been accomplished is a demonstration of the enhanced pollution and cost reduction potential when they are linked together,

particularly for western Powder River Basin coals.

The Holcomb Unit 1 is already equipped with "first-generation" low-NOX burners, which reduce NOX pollutants by 40 to 45 percent at relatively low cost. With the application of SOFA, most of the necessary incremental NOX pollutant reductions come from combustion staging due to the overfire air. While applicable to all coal types, the low sulfur and high reactivity of Powder River Basin coals lend themselves to the SOFA-based staging and inexpensive burner modifications that are at the core of the pollution reduction project goal.

Adding a mechanism to measure and control coal flow and fineness, along with furnace sensors to define spatial distributions and neural network controls will further minimize the level of emissions at the plant and optimize combustion efficiency.

Today, only selective catalytic reduction (SCR) technology is capable of consistently achieving the most stringent emission limits set by federal and state standards – 0.15 pounds of NOX per million Btus. Rather than reducing NOX in the combustion zone, SCR uses chemical catalysts to scrub NOX pollutants from a power plant's flue gas before it is expelled from the plant. Consequently, SCR adds a complex and expensive chemical plant to the power station.

The Integrated Combustion Optimization System, if it proves successful, could provide a lower cost alternative to SCR controls, ultimately reducing the overall consumer cost of electricity. It could also help reduce the duration of the plant outages necessary for installing the system and improve overall electric system reliability.

Sunflower has selected GE Energy and Environmental Research Corp., a unit of GE Power Systems, to assist with the project and provide the core technologies being demonstrated.

The Sunflower agreement is the fourth of six projects signed under the DOE Office of Fossil Energy's Power Plant Improvement Initiative. Authorized by Congress as the precursor to President Bush's Clean Coal Power Initiative, the program is intended to demonstrate technologies that boost the efficiencies of currently-operating power plants – generating more megawatts from the same amount of fuel – or that allow currently-operating power plants to comply with environmental standards at lower costs. The Sunflower project will accomplish both objectives.

-End of *Techline*-

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Return to top of page Last Updated: 02/11/03

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March 21,2003

Powder River Basin Coal

Slide #2

This presentation was prepared to present a general overview of the Powder River Basin and the many issues that the mining, railroad, electric utility and the government entities have to address on both a short- and long-term basis. There are many independent consultant reports and articles that can be obtained which cover in detail many of the issues that I will just touch on today. But in one respect, there is a consensus of opinion…

Slide #3

The Powder River Basin's trillion ton coal deposit is Energy To Burn! As we look at this vast resource from a historical and development prospective, I hope to leave you, the electric producers of this nation, with the knowledge and belief that the Powder River Basin is America's Premier Energy Resource – yesterday, today, and tomorrow.

Slide #5

There are four major bituminous and sub-bituminous coal regions and two lignite regions that supply the majority of the 1.1 billion tons of coal mined in the U.S. during 2001. The major coal basins are…

Market Share 38%
Appalachian - Pennsylvania through Alabama

Market Share 9%
Illinois - Illinois, Indiana, West Kentucky

Market Share 11%
Mountain - Utah, Colorado, New Mexico, Arizona, Wyoming

Slide #7

To date, four (4) billion tons of coal have been mined from the Wyodak seam in Wyoming and another one (1) billion tons from other seams in Montana.

Although natural gas electrical generation is expected to increase in coming years, coal will continue to be the primary fuel for electrical

HOUSE UTILITIES
DATE: 3-21-03
ATTACHMENT 7

generation for at least the next two decades. The Powder River Basin will continue to be a major player in supplying steam coal to the electric utility industry.

Slide #8
From about one (1) percent of the U.S. production in 1970, the Powder River Basin has grown to produce 40% of the U.S. coal supply. About 400 million tons of coal annually, over one million tons per day, is shipped from this small geographic area. Truly this is one of our nations most valuable energy resources.

Slide #9
In late 1972, the first unit train of coal, departed Belle Ayr Mine for Iowa Public Service and the rest is history.

Slide #10
Basin mines typically have 200 to 600 million tons of coal in their current leases. At their current mining rates, many mines will exhaust their reserves in six (6) to twelve (12) years. Therefore, mining companies must periodically add to their reserves. This is a complicated process and one worth touching upon since it is such a huge part of the agenda of every coal producer today.

GENERAL GEOLOGY

Slide #12
The Powder River Basin consists of a series of interbedded sedimentary formations which have never experienced deep burial or thermal alteration. As a result, the rocks are relatively soft and consist mostly of weak shales, mudstones, and poorly consolidated sandstone. Much of the sandstone is unconsolidated and locally supports small perched acquifers used by the ranchers for domestic and stock watering use.

Slide #13
The coal seams are dispersed within the sedimentary strata and can range in thickness from one or two feet to over one hundred feet. Depending on the local depositional environment, some mines have

one continuous seam of coal while others have two or more seams separated by partings. While the coal seams are regionally flat, small local rolls can occur, probably as a result of sediment settling after deposition, with slopes of 5 to 20 percent. The out-crop and sub-crop zone on the eastern side of the Basin, generally has coal splits and high ash zones which limits mining recovery. As the mines progress westward, drilling indicates more seam splits.

Slide #14
There are five developed mines in Montana and 15 in Wyoming. Three of the Wyoming mines were inactive in 2001. The mines are classified as "thin overburden".

Slide #15
Over the next decade, their average ratio will continue to increase, reaching approximately 3.2 in 2010. In the next 20 years, all of the mines will exceed a 4.0 ratio. In general, the topography rises slowly to the west and the coal seam dips slowly to the west. Depending upon local topography and coal thickness, various mines will be higher or lower than these averages at any given point in time.

Slide #16
COAL QUALITY
The Powder River Basin coal is classified as sub-bituminous - C and ranks just above lignite. Heat content ranges from a low of 7800 BTU/lb. to 9500 BTU/lb. Sulfur content, the main driver in the initial development of the Basin ranges from a low of 0.4 lbs.SO_2 /mm Btu to a high of 1.7 lbs. SO_2/mm Btu.

Slide #18
The Powder River Basin mines are all designed and permitted as large scale surface operations with contemporaneous reclamation following the mining process.

Slide #19
Once the topsoil is removed, the mine operator drills and blasts the overburden covering the coal.

Slide #20
The Basin mines generally use one of two methods for overburden removal:
The truck and shovel method uses 20 to 76 yard stripping shovels to scoop up the broken rock and place it in a rear dump haul truck. These 150 to 360 ton trucks haul the rock to the backfill area, which is the void where the coal has been extracted. The trucks dump the rock at predetermined locations to rebuild the topography and then return to the shovel for another load.

Slide #21
The dragline method uses the power of cast blasting to move some of the rock across the void area previously created by coal removal. The dragline then swings its bucket into the broken rock pile, fills the bucket, and the machine then rotates with the bucket at the end of the long boom to the backfill location where the bucket is dumped. The dragline swings back and the cycle repeats itself. Basin draglines range from 40 to 170 cubic yard capacity. Large dozers assist the dragline for bench development and short distance pushes of the broken rock into the backfill space.
(Right: Black Thunder)

Slide #22
Once the coal has the overburden removed, smaller dozers, graders, or rubber tired equipment remove the rashy, oxidized coal surface until good hard coal is encountered.

Slide #23
The coal is then drilled and blasted.

Slide #24
Shovels and large rubber tired loaders dig the shot coal and load it into haulage trucks.

Slide #25
The coal is hauled to either the crusher dump hopper or to a conveyor belt for crushing and transport to storage.

Slide #26
The stored coal is either batch loaded or flood loaded into unit trains for shipment to the utility. The loadouts are typically high tonnage, precision systems that can load a 115 car unit train with 12,000 to 14,000 tons of coal in less than two hours. A 110 ton car can be loaded with crushed coal in less than 30 seconds with an accuracy of $\pm$ 0.1 ton. Mines use batch loading, flood loading with top-off batch systems, and flood loading as their primary methods. Many of the Basins unit trains are now up to 135 cars in length using distributed locomotive power.

Slide # 27
The pit is backfilled to the approved reclaimed topography. Final shaping is done by dozers and scrapers to achieve the post mining objective. The backfill is allowed to settle for two to three years before final seeding. Low spots that develop due to differential settling are filled using scrapers.

Slide #28
The topsoil is then spread on the surface and final reclamation activities commence. Wyoming reclamation laws do not allow for watering or the addition of fertilizer to enhance the growth of vegetation. The reclaimed surface must stand on its own merits and produce viable vegetation. Spring rains, as well as the winter snow, dictate whether or not a seeding will be successful.

Slide #29
The act of mining the coal in the Powder River Basin has minimal topographic impact. Removing the coal seams drops the land surface proportionately to the coal thickness anywhere from 30 to over 100 feet. Surface runoff to the ephemeral streams must be maintained throughout the reclaimed surface.

Slide #30
Many of the largest draglines ever built have been refurbished and transferred from the Illinois Basin and Appalachia to the Powder River Basin. Draglines are the dominate rock moving equipment at the mines south of Belle Ayr as well as mines in Montana.

Slide #31
Truck and shovel operations begin at the Belle Ayr Mine and go north through Campbell County. Jacobs Ranch Mine and the Rochelle Mine in the southern part of the Basin, also use truck/shovel for overburden removal. As the overburden gets deeper in the future, the dragline mines will need to add truck/shovel prestrip as the digging depth capacity of the dragline is exceeded. The original shovels were 40 ton, but new technology has increased shovel capacity so that now 80 to 120 ton machines are the norm.

RAILROADS

Slide #33
The most efficient mines in the world are nothing if there isn't a world class transportation network to haul the product to market. The Powder River Basin is serviced by the Burlington Northern Santa Fe (BNSF) throughout the Basin and by the Union Pacific (UP) from Caballo Mine south through the Antelope Mine.

Slide #34
Both the BNSF and the UP are Class I railroads who have invested hundreds of millions of dollars in trackage, locomotives, railcars, and support facilities. As the Basin tonnage grew so did the trackage. Double track, then triple track, and even quadruple track was needed to move the increased tonnages.

Slide #35
It wasn't just Basin trackage that was impacted but also the trackage going east and south from the Basin across Nebraska, Kansas, Colorado and other states to accommodate the tonnage growth. Today the BNSF and UP dispatch the Basin from a common center in Fort Worth, Texas. Communication between the mines, the railroads, and the utilities gets better every year. It has to, with over 70 trains a

day moving in and out of the Powder River Basin. Nearly 60 trains a day move on the Joint Line.

Slide #36
Today Powder River Basin markets cover most of the states between the eastern slopes of the Rocky Mountains to the foothills of Appalachia and from Minnesota to the Gulf Coast. Almost all of the coal is rail delivery although there is still some barging on the Mississippi and Ohio Rivers to plants that do not have rail access.

Slide #37
The Powder River Basin – America's Premier Energy Resource. What are some of the "pros and cons" for this claim?
Pros
Huge coal deposit-reserves of hundreds of years, not tens.

Dedicated mining companies * Dedicated railroads * Dedicated equipment suppliers. * Dedicated workforce * Revenue for federal and state governments * Acceptable product to utilities, Reliable supplies of coal
Cons
Environmental concerns grow as basin grows – dust, pollution, Nox pollution.
Federal Leasing Program needs streamlining to ensure future reserves.
Conflicts of interest between coal and CBM need to be resolved.
Kyoto/Environmental concerns may impact coal-fired generation in the future.
Changes in federal government regulations.

Slide #38
Considering the Pro's and Con's for the Powder River Basin it hard to believe that it will not continue to be the same mining power house in the future that it is today. Most of the "cons" are related to environmental, political, and priority concerns which can be, and are being, addressed today. The basics for the continued operation of the Powder River Basin to be the fuel of choice by utilities for decades to come are sound and will remain sound.

March 21,2003

Randy Rahm
Director, Fuel Services
Westar Energy
Topeka, KS
785-575-8140
randy_rahm@wr.com

Mr. Rahm is currently the director, fuel services for Westar Energy. He is responsible for the procurement, transportation and contract administration for over 13 million tons of coal received annually at Westar Energy's three coal burning energy centers. Mr. Rahm also supports these plants technically in the areas of coal handling safety and in the utilization of best practices in the fuel handling systems. Prior to joining Westar Energy he was employed by Amax Coal West, Inc. in Gillette, WY as the Special Projects Manager where he provided electric power companies with comprehensive coal handling risk assessments. From 1991 -1993 Mr. Rahm managed the world's largest commercial sub-bituminous coal dryer located at the Belle Ayr Mine. Where extensive research was conducted in the areas of reducing the dried PRB coal's reactive characteristics, dust collection and suppression, coal dust's explosion characteristics, spontaneous combustion and coal dust fire-fighting procedures. Mr. Rahm was also employed with McNally Pittsburg, Inc. for 14 years as a senior project manager. Mr. Rahm has over 26 years experience in the coal industry and is on the Executive Committee of the ASME's FACT Division. Mr. Rahm is also the past chairman and founder of the PRB Coal Users'

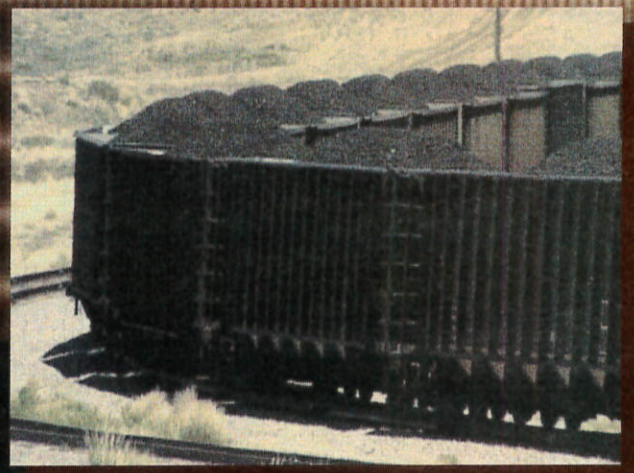
7-8

The Powder River Basin

America's Premier Energy Resource

Presented By Thomas J. Lien
Senior Vice President – Western Operations
PRB Coal Users' Group Annual Meeting
March 3, 2002 - St. Louis, MO

American Coal Holding, Inc.

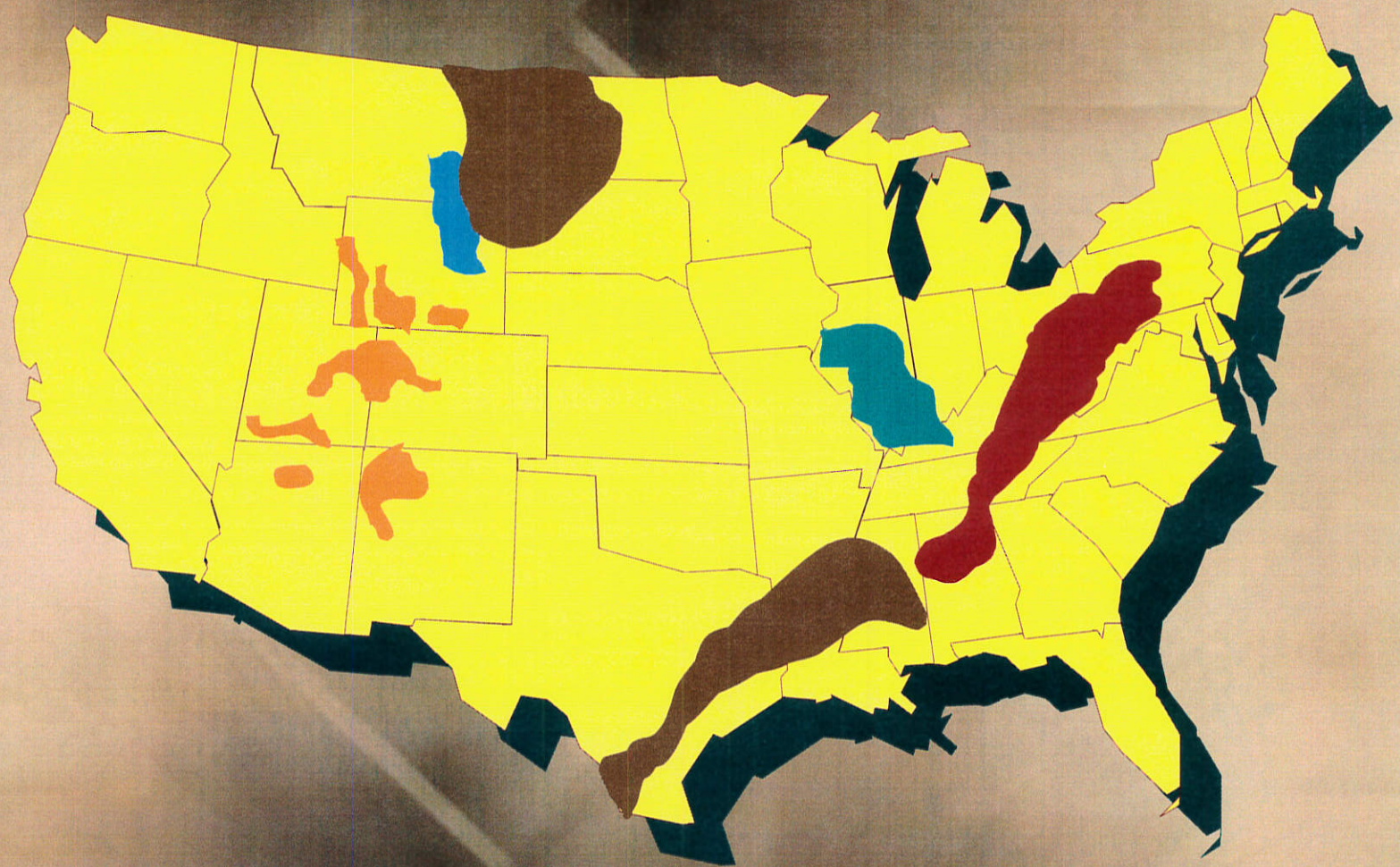


ENERGY to Burn

OVERVIEW U.S. COAL

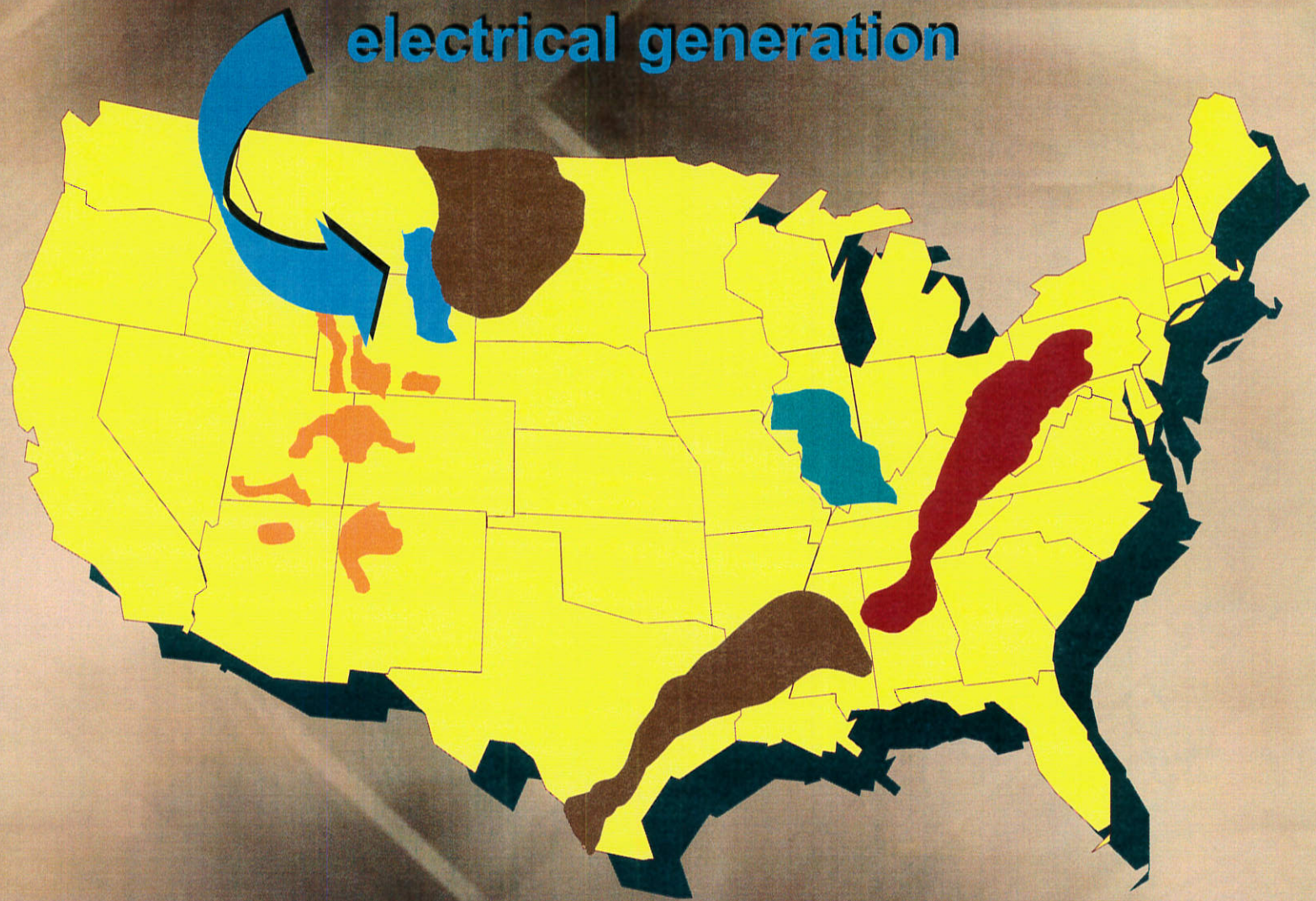
Major U.S. Coal Producing Regions

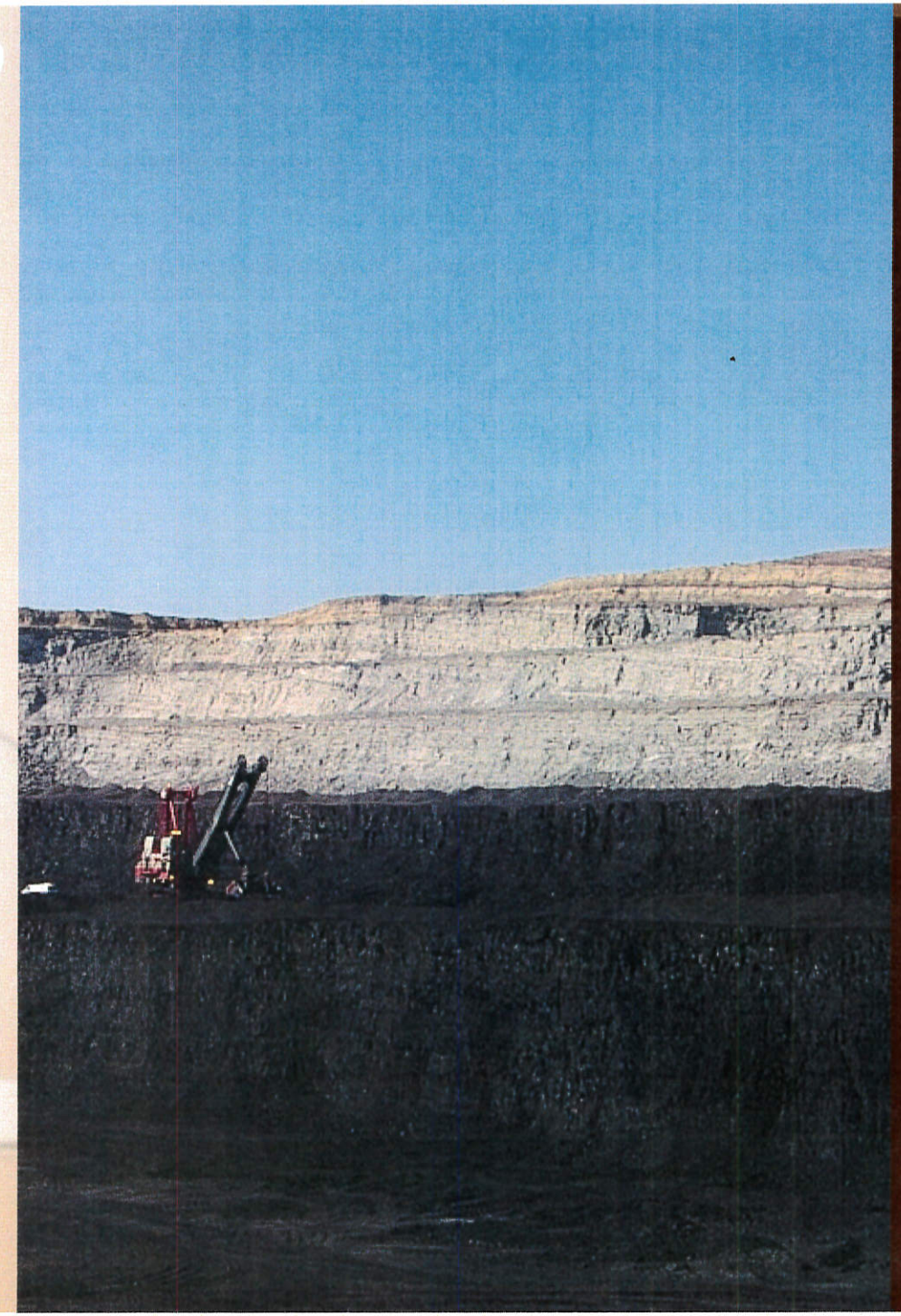
Fueling 52% of U.S. electrical generation



Major U.S. Coal Producing Regions

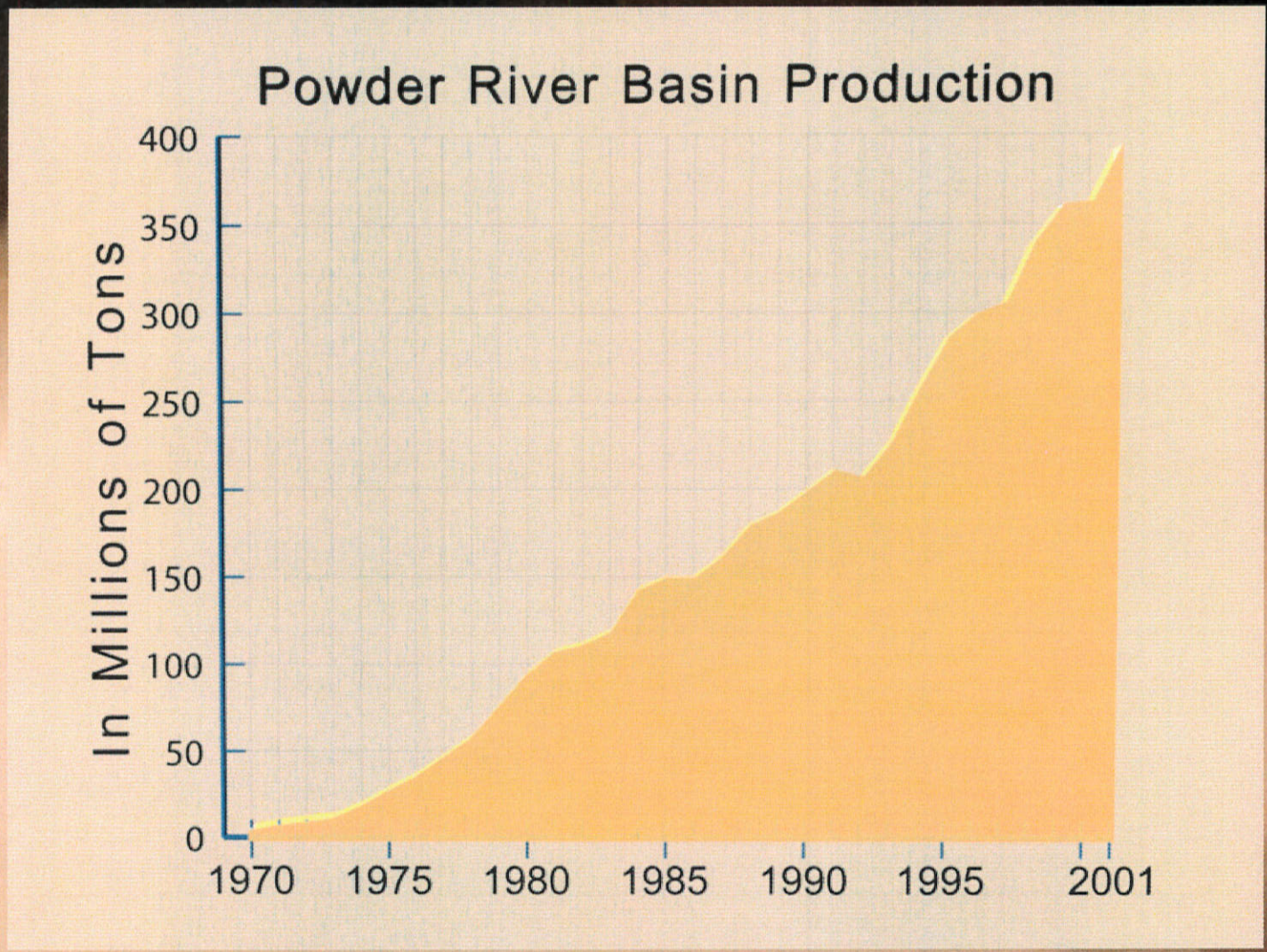
PRB alone fuels 20% of U.S. electrical generation

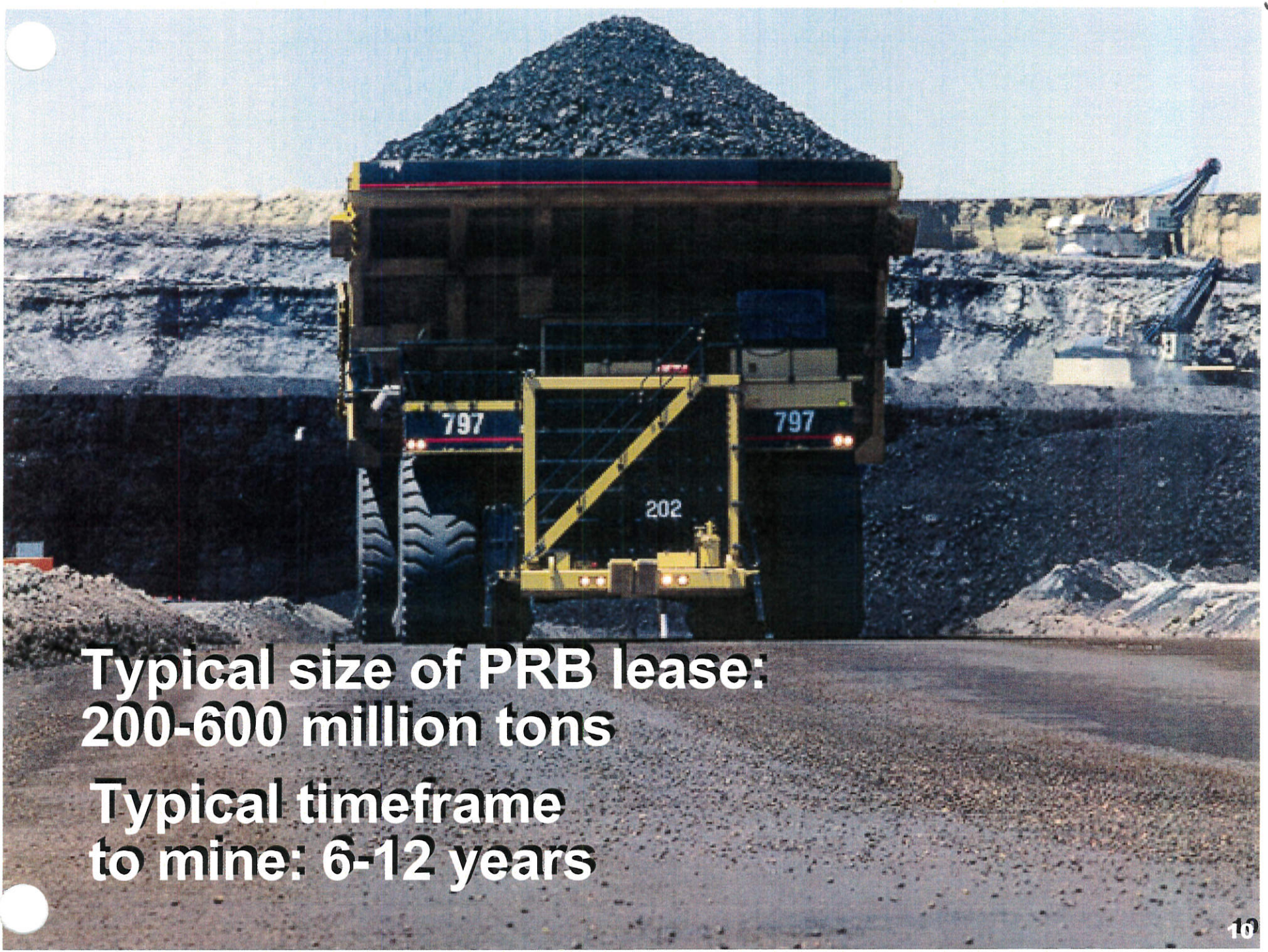




4 billion tons mined from Wyodak seam in Wyoming

1 billion tons mined from other seams in Montana


Powder River Basin Production
In Millions of Tons
400
350
300
250
200
150
100
50
0
1970
1975
1980
1985
1990
1995
2001

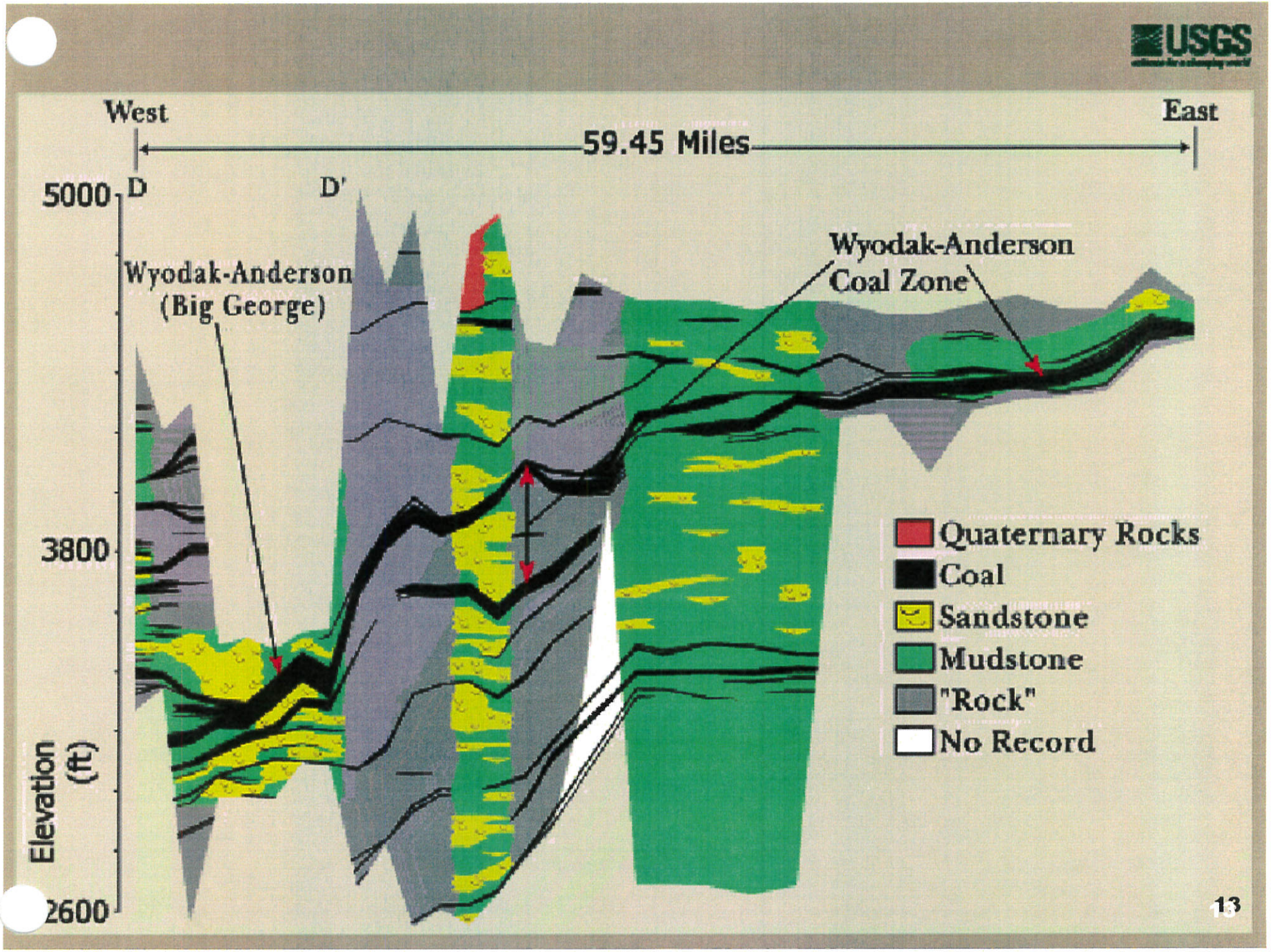


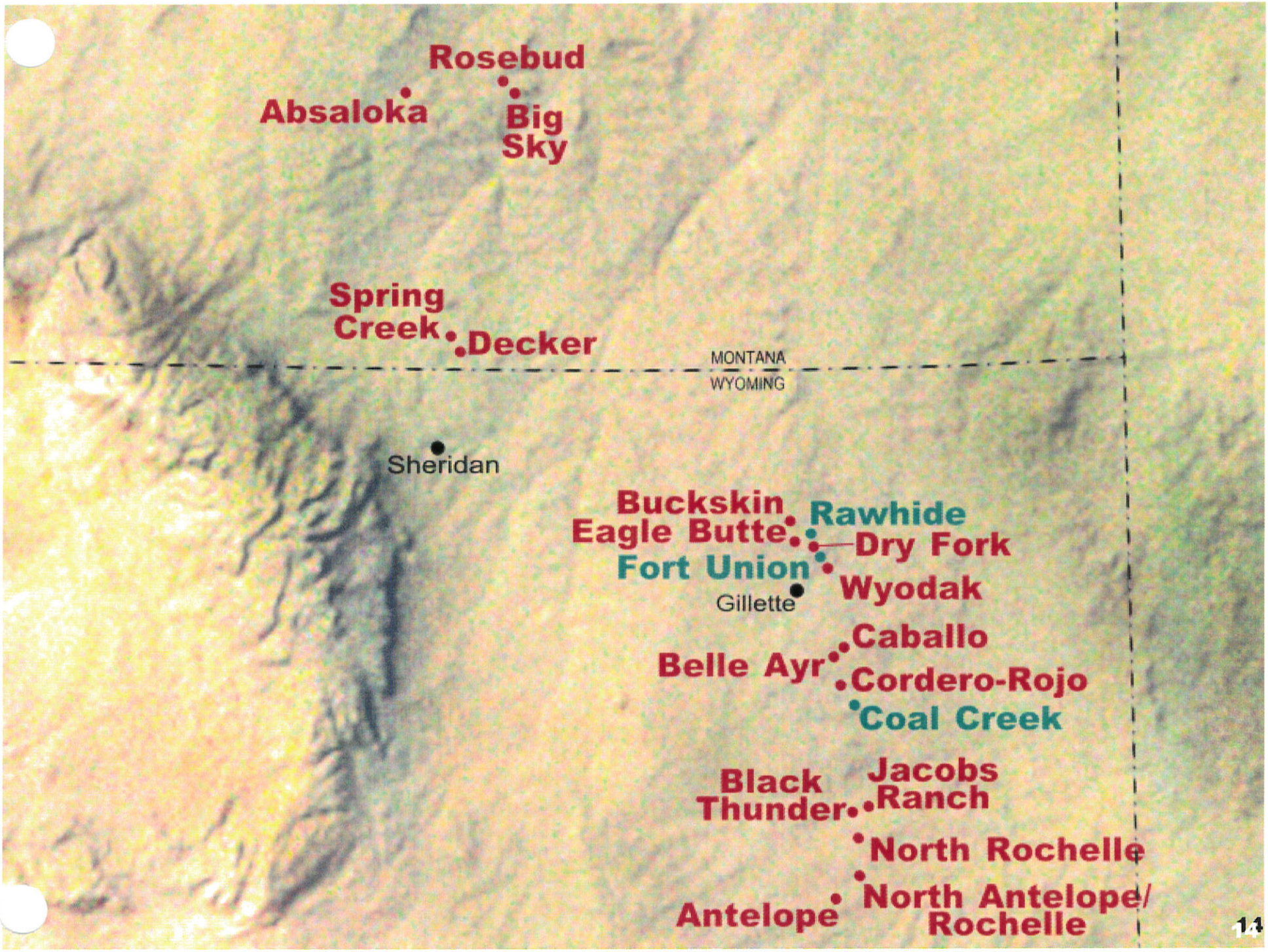
Typical size of PRB lease:
200-600 million tons

Typical timeframe
to mine: 6-12 years

GEOLOGY OF THE BASIN

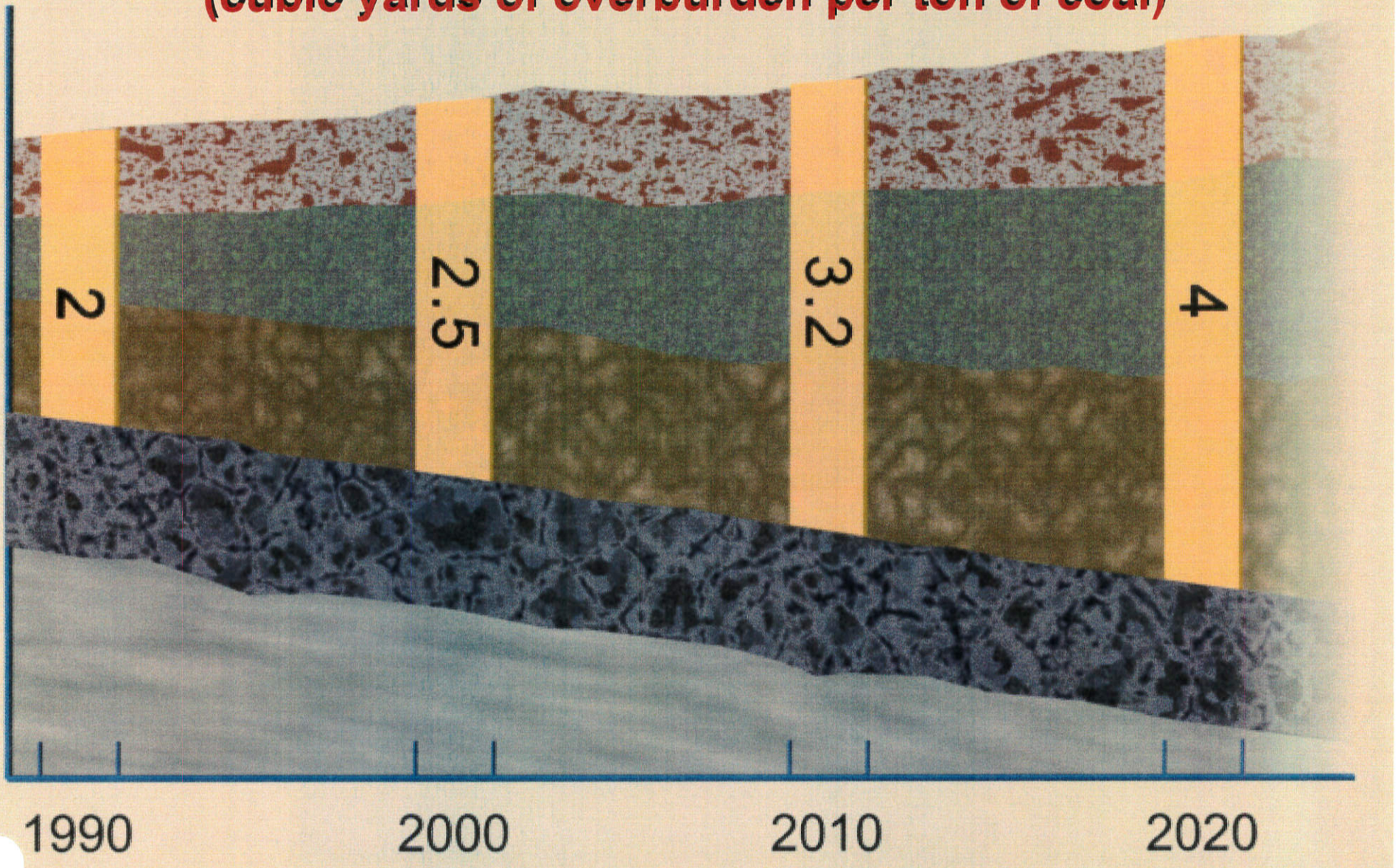
7-22

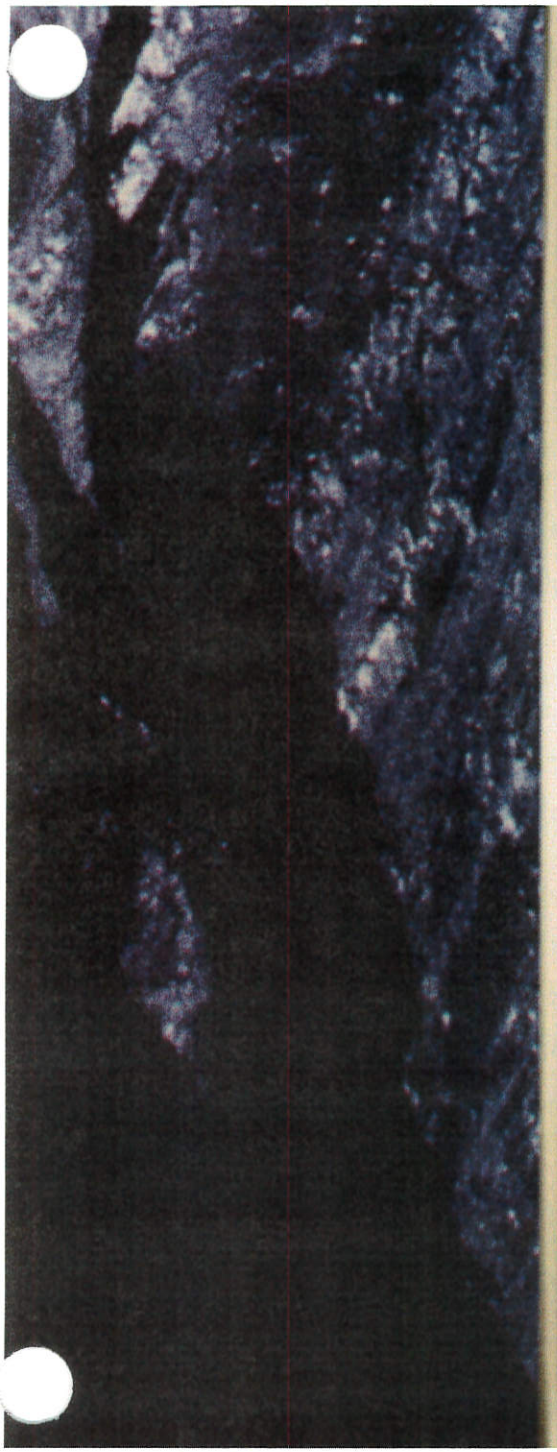

USGS
West
East
59.45 Miles
5000
3800
2600
Elevation (ft)
D
D'
Wyodak-Anderson (Big George)
Wyodak-Anderson Coal Zone
Quaternary Rocks
Coal
Sandstone
Mudstone
"Rock"
No Record
13


Rosebud
Absaloka
Big Sky
Spring Creek
Decker
MONTANA
WYOMING
Sheridan
Buckskin
Rawhide
Eagle Butte
Dry Fork
Fort Union
Wyodak
Gillette
Caballo
Belle Ayr
Cordero-Rojo
Coal Creek
Jacobs Ranch
Black Thunder
North Rochelle
North Antelope/ Rochelle
Antelope

Stripping Ratio

(cubic yards of overburden per ton of coal)



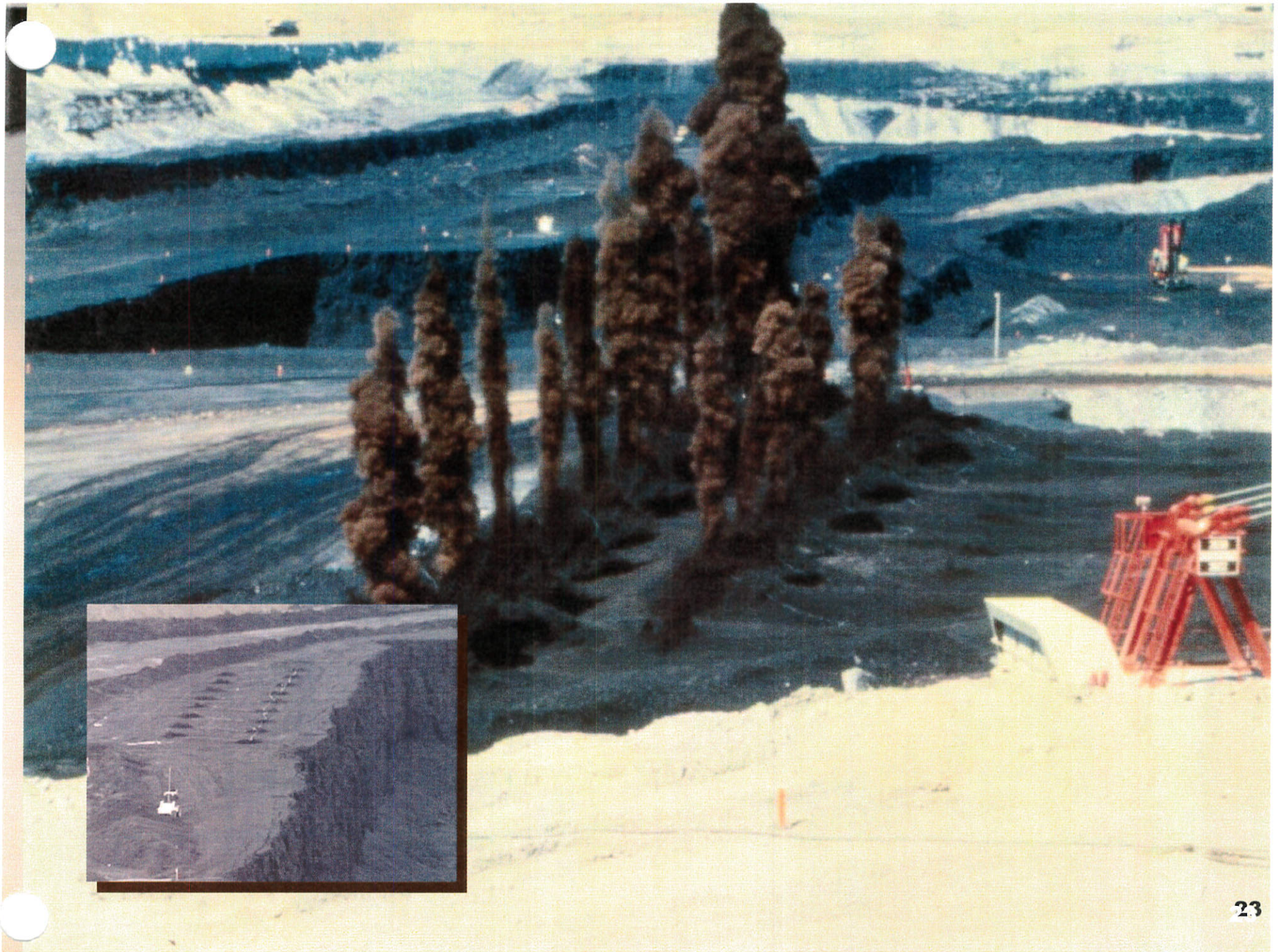


PRB Coal Quality

- **Coal classification:**
  Sub-bituminous C
- **Heat content:**
  7800 Btu/lb. to
  9500 Btu/lb.
- **Sulfur content:**
  0.4 lbs. SO_2/mm Btu to
  1.7 lbs. SO_2/mm Btu

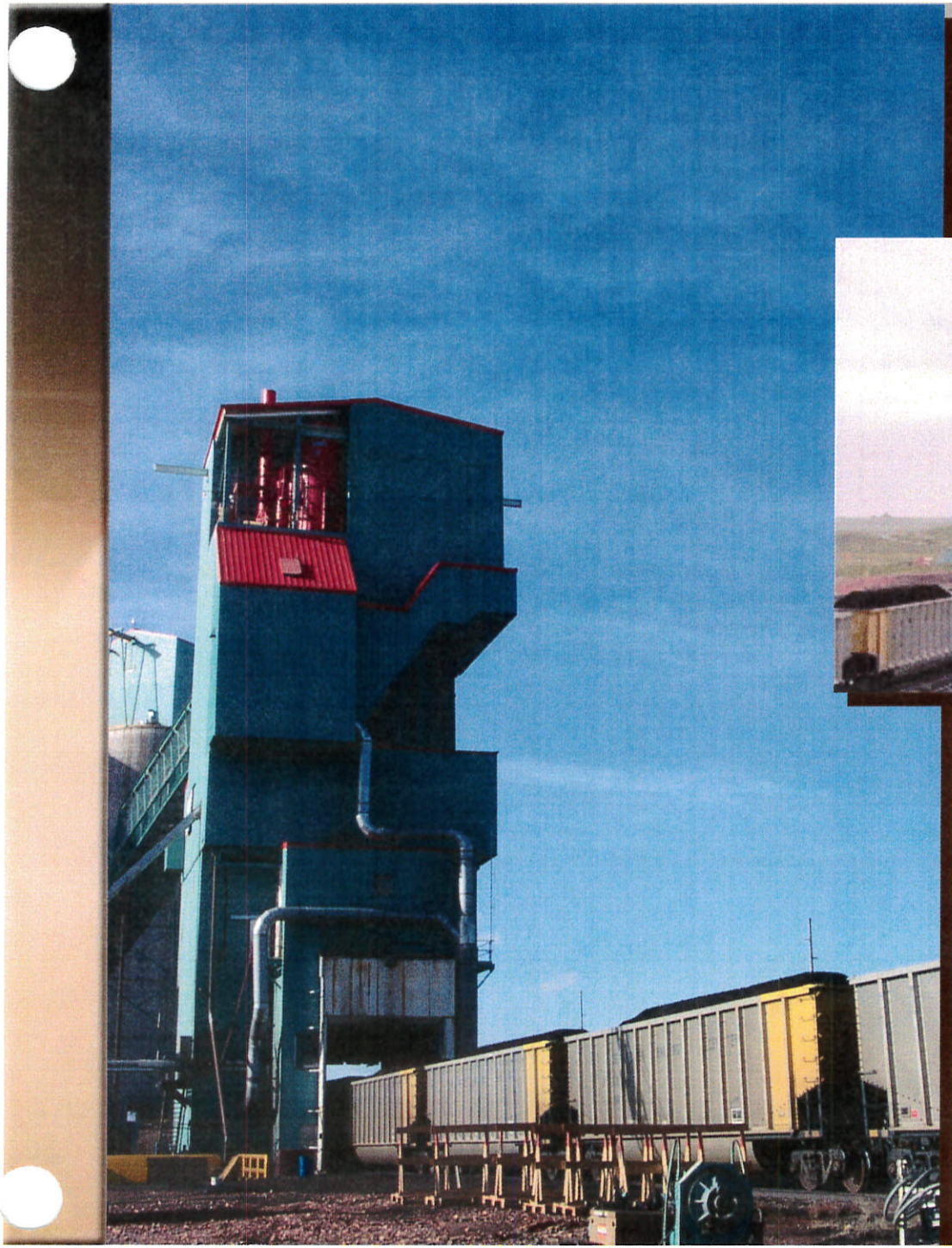
MINING PROCESS


10
RAG
10
P&H




8
AMAX
156
4100


311
311

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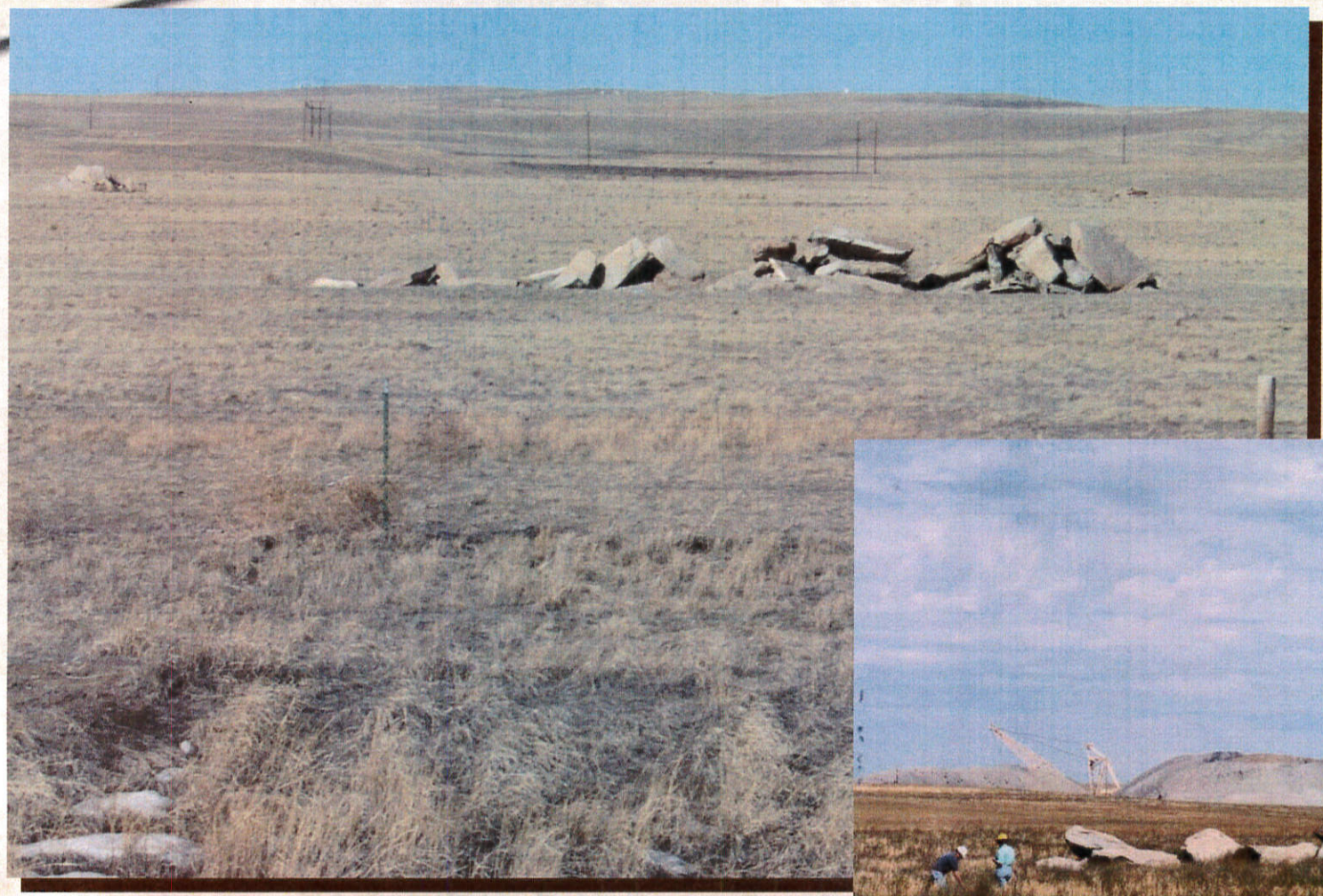
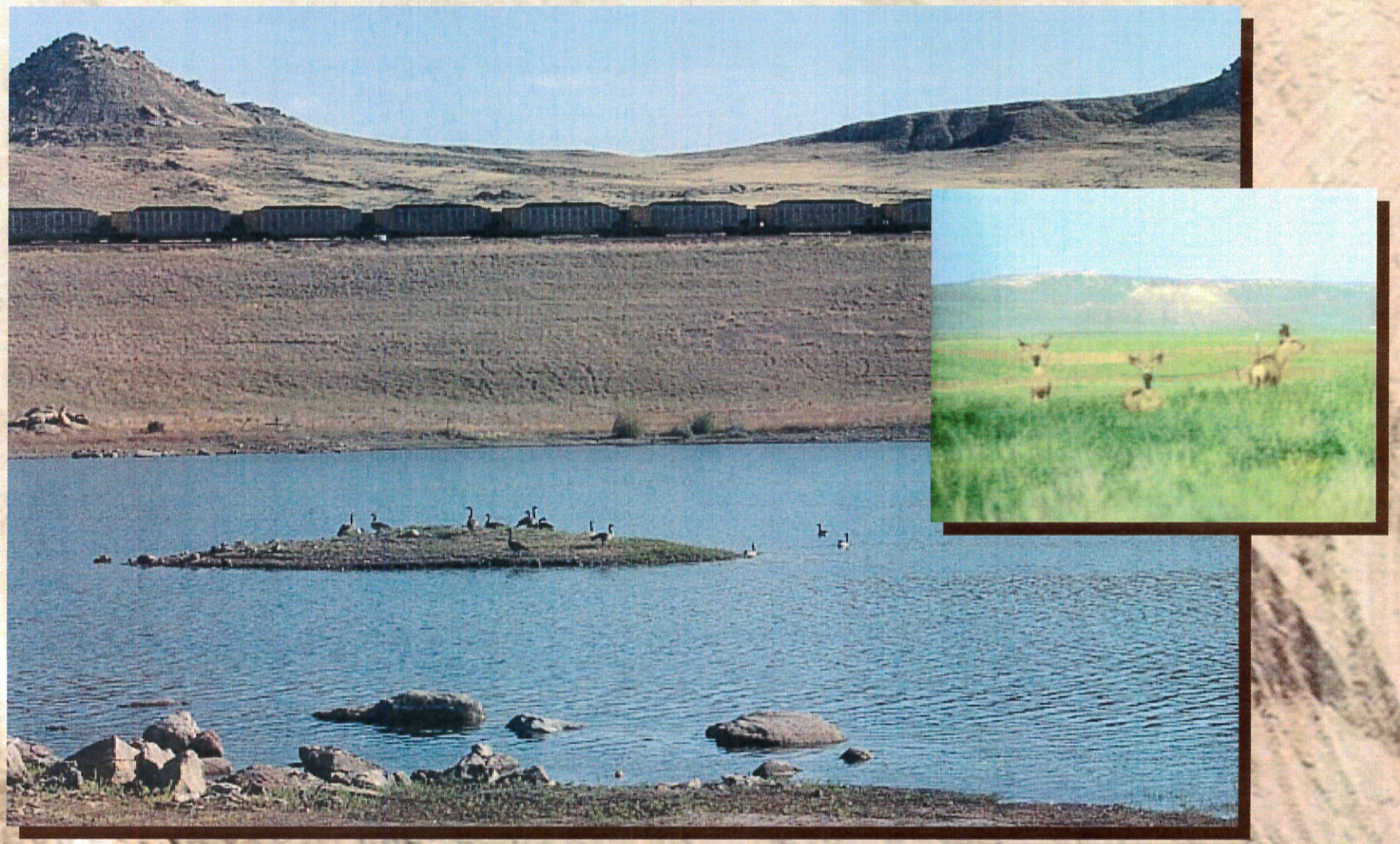
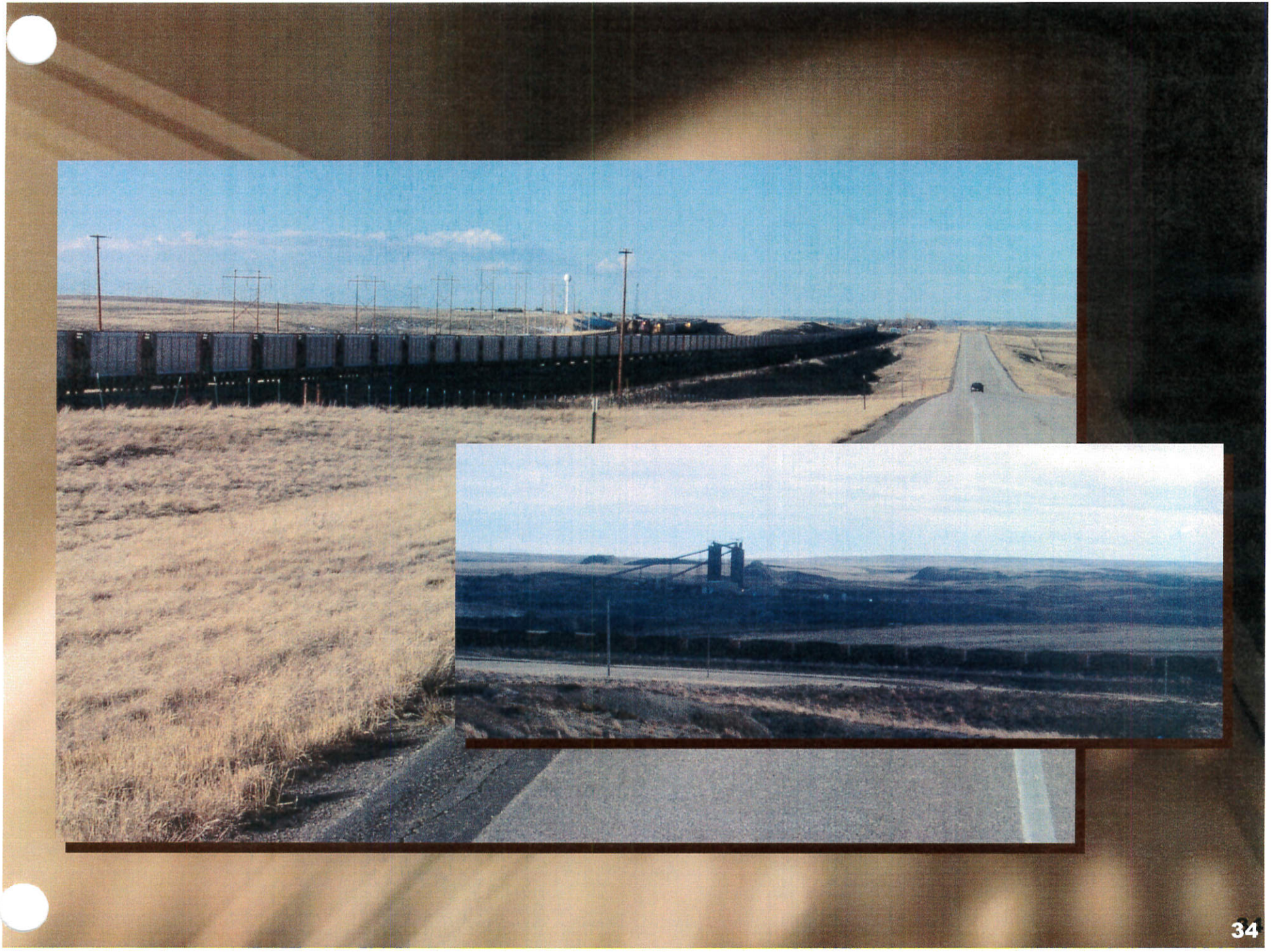
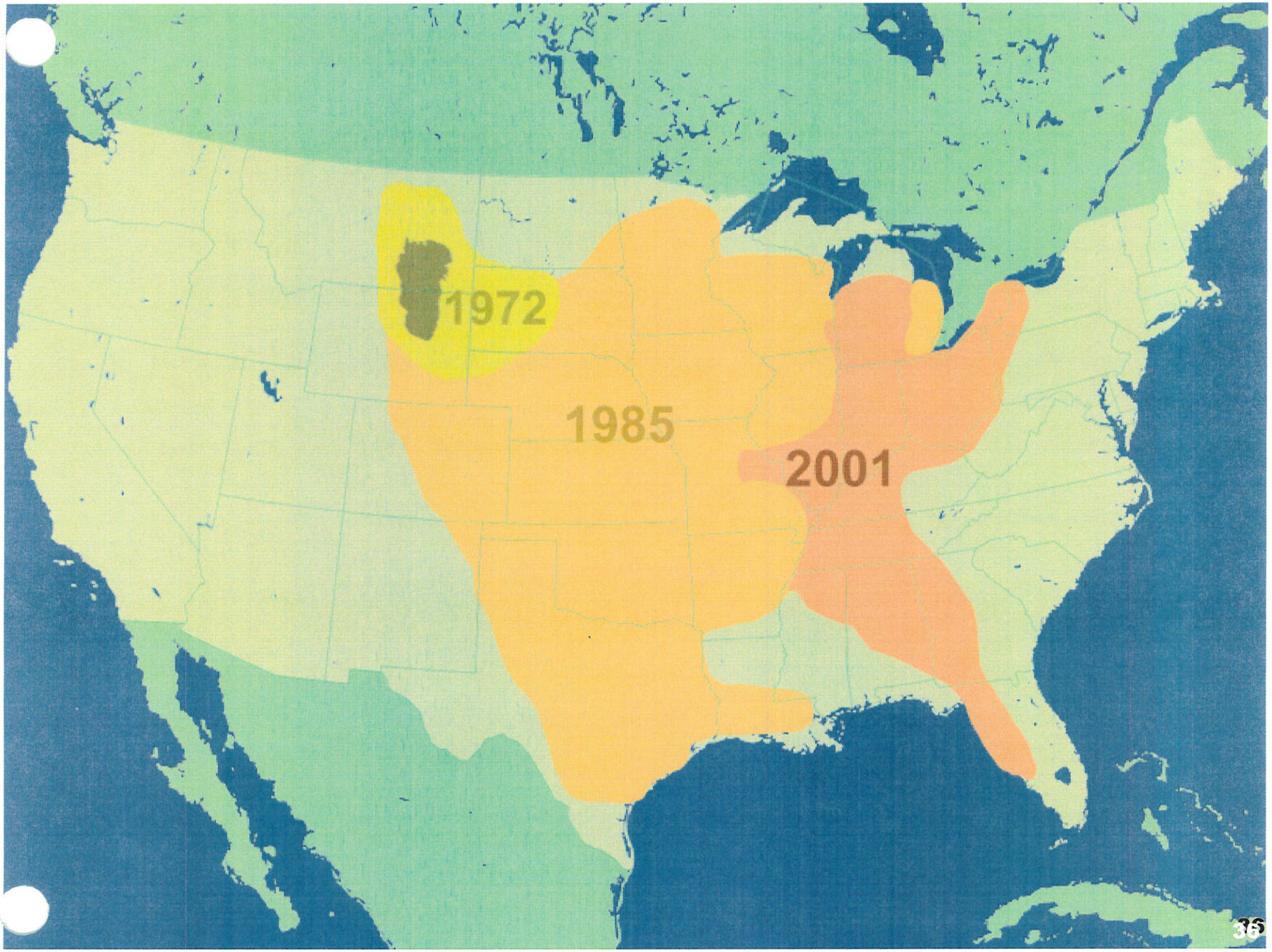




TRANSPORT AND MARKETS




Major Rail Routes
From the PRB
Vancouver
Superior
Salt
Lake
City
Omaha
Chicago
San
Francisco
Kansas
City
Denver
St. Louis
Los Angeles
Albuquerque
Memphis
Ft. Worth
El Paso
Mobile
New Orleans
Houston
UP
BNSF
Joint Line


1972
1985
2001
36

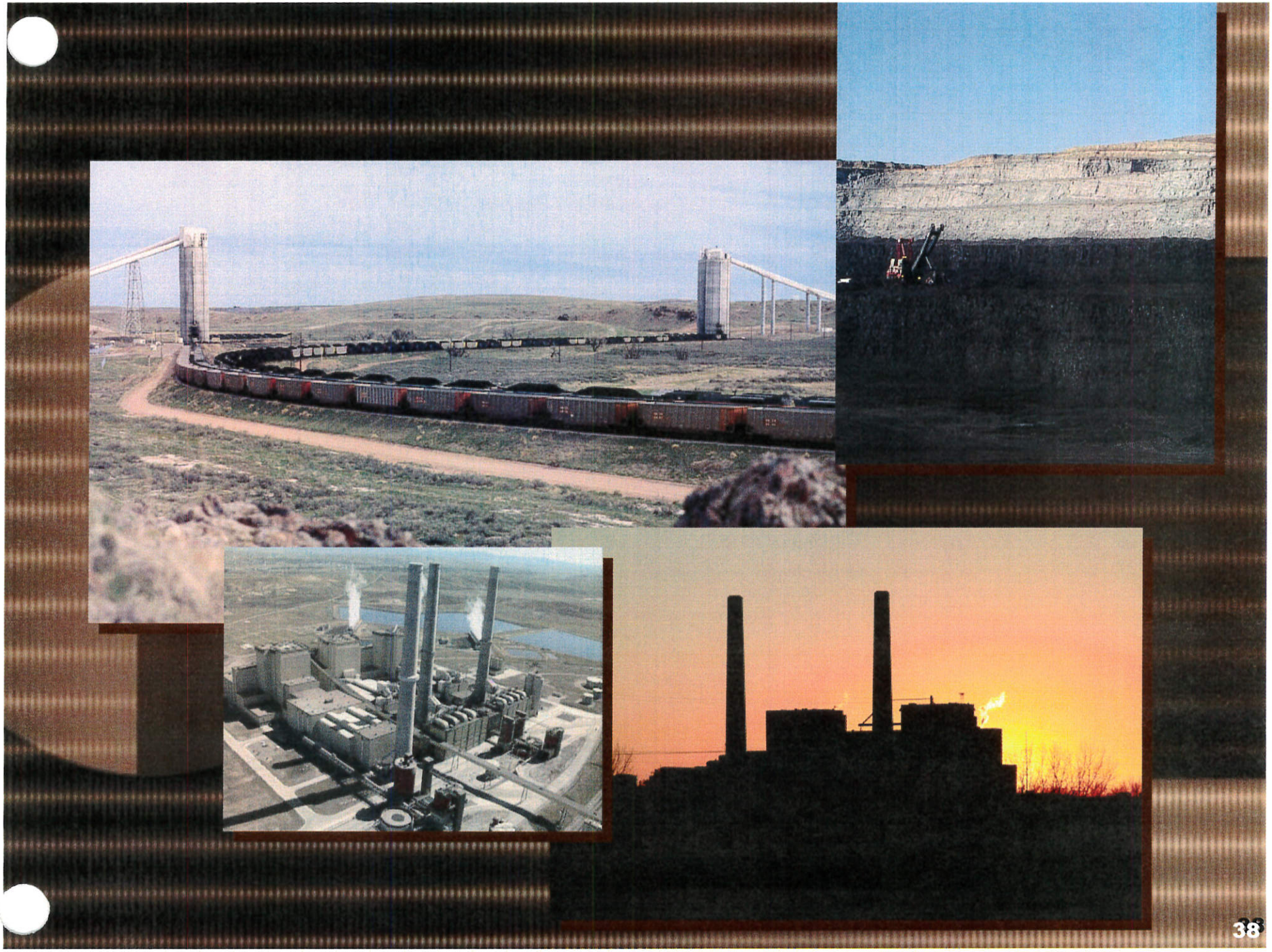
PRB Outlook

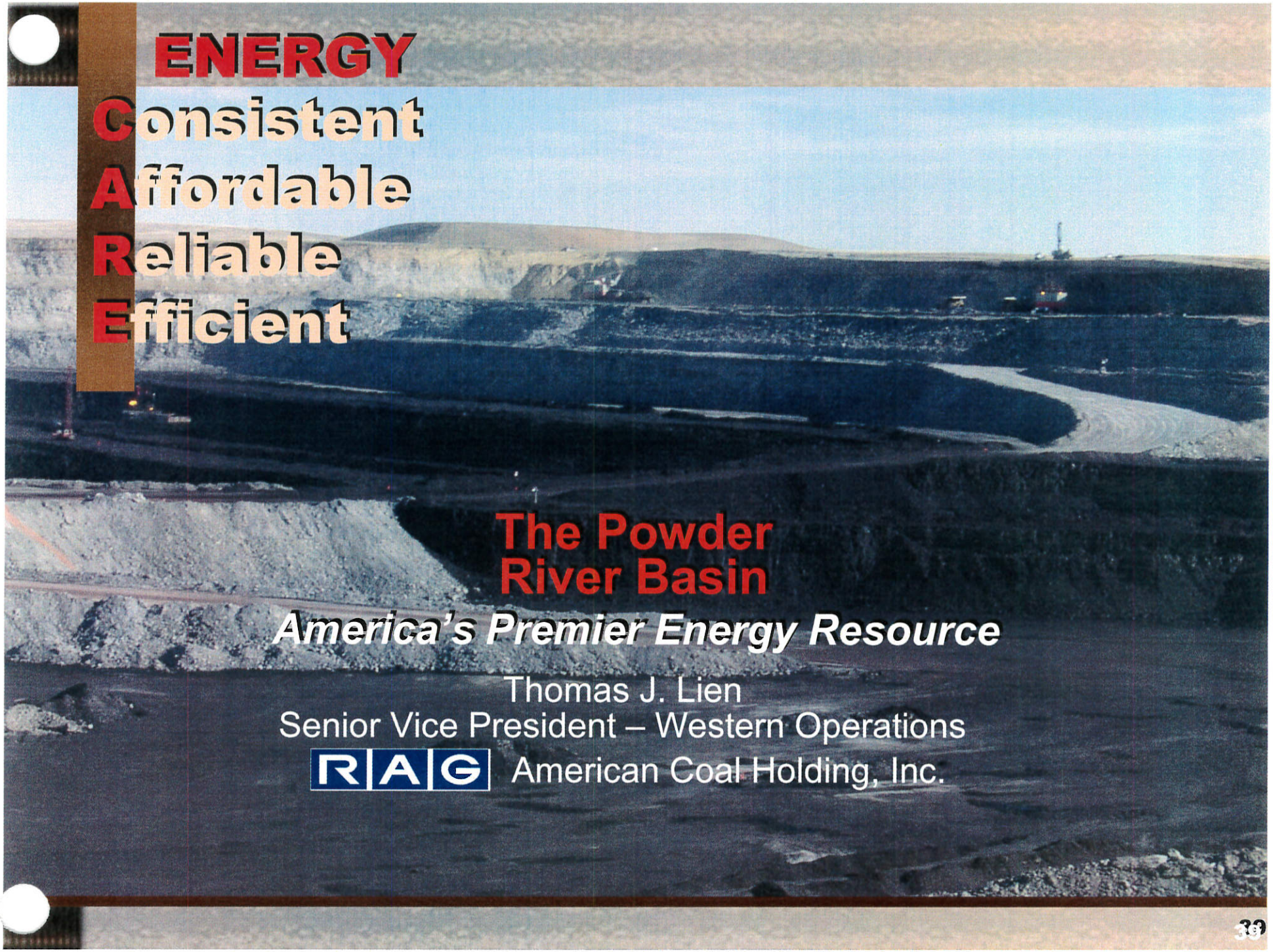
Pros

- Huge reserves
- Dedicated mining companies
- Dedicated railroads
- Dedicated equipment suppliers
- Dedicated workforce
- Revenue for federal and state governments
- Acceptable product to utilities
- Reliable supplies of coal

Cons

- Environmental concerns
- Cumbersome federal leasing programs
- Conflicts with CBM
- Kyoto/environmental impacts on coal usage
- Changing regulations




ENERGY
Consistent
Affordable
Reliable
Efficient
The Powder River Basin
America's Premier Energy Resource
Thomas J. Lien
Senior Vice President – Western Operations
RAG American Coal Holding, Inc.

Great Plains Energy/Kansas City Power & Light
Statement on Wyoming Coal
for the
Kansas House Utilities Committee
March 21, 2003

The overwhelming majority of KCPL's current coal supply is from the large surface mines in the producing district of northeastern Wyoming known as the Southern Powder River Basin (SPRB). Several of KCPL's stations (Iatan 1 and LaCygne 2) were designed to burn this coal. Our Montrose units and LaCygne 1 were designed to burn Missouri & Kansas coals but were switched to SPRB in the 1980's and 1990's. Our Hawthorn unit burns SPRB coal because for economic reasons, and because the scrubber inlet SO2 limit established by the EPA following the destruction of the old #5 unit.

The rationale for burning SPRB coal is as follows:

1) The rail transportation cost is about 50-75% of the delivered cost of coal from these mines. Fortunately, the mines which KCPL relies upon are served by both the BNSF and the UP railroads, which gives us the ability at some stations to solicit competitive proposals from the railroads. Rail competition does not exist at many other coal-producing areas.

2) The coal mines enjoy favorable geologic conditions such as coal seams up to 75' thick and limited amounts of overburden rock which allow for low cost of coal removal relative to other surface mining districts, and costs much lower than any source of underground mined coal. These conditions justify investments in high-productivity equipment.

3) Although the number of mining companies has decreased over the last 15 years in the SPRB, there are several large publicly-held and privately-held companies that maintain a competitive market from their mines.

4) The low sulfur content of SPRB coal allows KCPL to comply with the New Source Performance Standard of 1.2 lb SO2 per million Btu at our stations where this standard applies, without the need for SO2 scrubbing systems.

5) LaCygne 1 burns a blend of SPRB coal with a dilute blend of high-BTu, high-sulfur Missouri-Kansas coal, in order to maintain an average fuel moisture content that is low enough to allow full-load operation.

Kansas City,
Board of Public Utilities 540 MINNESOTA AVENUE • KANSAS CITY, KANSAS 66101 • (913) 573-9000

The ability to burn Wyoming coal especially from the Powder River Basin area has saved the KCBPU ratepayers many millions of dollars over the last twenty years. Production costs in this area are unusually low due to the shallow depth of the coal and the very large seam thickness. In addition the lower sulfur content in this coal has reduced the pollution emissions in our area. The BPU currently burns Wyoming coal exclusively at the rate of 1.7 million tons per year.

Our Nearman Station was designed to burn Powder River Basin coal and has benefited from the vast supply produced by over fifteen mines in this region. Price competition between these mines assures that our costs will remain low. By using Wyoming coal and lowering the sulfur in the fuel supply the cost to purchase and operate a scrubber was not necessary to meet the sulfur dioxide emission requirements. The burning of this coal generates an ash, which is used in the production of cement as well as a stabilizer for soil. Because of its usefulness most of the ash produced at Nearman has been sold adding to the revenue generated by the plant.

About five years ago changes were made at the Quindaro Station to allow the plant to burn Wyoming coal exclusively. The resulting fuel cost savings have more than paid for the modifications and these savings will continue for the life of the plant. The lower sulfur dioxide emissions resulting from switching to a cleaner coal were an additional benefit to our region. For many years the coal ash from Quindaro has been used to structurally fill old mines. Doing so eliminates the danger of surface collapse and increases the value of the land. Using the ash from Wyoming coal results in a stronger fill and eventually a market may develop to sell this ash as well .

It is the BPU's plan to continue to burn Wyoming coal exclusively for the foreseeable future and continue to reap the benefits of doing so.

HOUSE UTILITIES

DATE: 3-21-03

ATTACHMENT 9

Kansas

Table 1. 1999 Summary Statistics

Item	Value	U.S. Rank
NERC Region(s)		SPP/MAPP
Primary Energy Source		Coal
Net Summer Capability (megawatts)	10,067	29
Utility	10,020	27
Nonutility	47	47
Net Generation (megawatthours)	42,070,297	30
Utility	42,002,924	29
Nonutility	67,373	49
Emissions (thousand short tons)		
Sulfur Dioxide	89	26
Nitrogen Oxide	137	21
Carbon Dioxide	36,417	28
Sulfur Dioxide/sq. mile	1	34
Nitrogen Oxide/sq. mile	2	33
Carbon Dioxide/sq. mile	445	37
Electricity Consumption (MWh) (excludes line losses)	33,865,932	32
Utility Retail Electricity Sales (megawatthours)	33,820,108	32
Nonutility Retail Sales and Direct Use (megawatthours)	45,824	50
Utility Average Retail Price (cents/kWh)	6.22	25

Table 2. Ten Largest Plants by Generating Capability, 1999

Plant	Primary Energy Source(s)	Operating Company	Net Summer Capability (MW)
1. Jeffrey EC	Petroleum, Coal	KPL Western Resources Co	2,227
2. Lacygne	Petroleum, Coal	Kansas City Power & Light Co	1,362
3. Wolf Creek	Nuclear	Wolf Creek Nuclear Oper Corp	1,170
4. Lawrence EC	Gas, Coal	KPL Western Resources Co	598
5. Gordon Evans EC	Petroleum, Gas	Kansas Gas & Electric Co	527
6. Hutchinson EC	Petroleum, Gas	KPL Western Resources Co	498
7. Holcomb	Gas, Coal	Sunflower Electric Power Corp	360
8. Murray Gill EC	Petroleum, Gas	Kansas Gas & Electric Co	332
9. Quindaro	Petroleum, Gas, Coal	Kansas City City of	316
10. Tecumseh EC	Gas, Coal	KPL Western Resources Co	284

Table 3. Five Largest Utilities by Retail Sales within the State, 1999
(Megawatthours)

Utility	Total	Residential	Commercial	Industrial	Other
A. Western Resources, Inc	8,996,335	2,949,454	3,789,382	2,194,582	62,917
B. Kansas Gas & Electric Company	8,607,403	2,601,308	2,413,126	3,548,216	44,753
C. Kansas City Power & Light Co	4,934,348	2,129,647	2,372,187	410,913	21,601
D. Board of Public Utilities	2,223,243	507,320	816,155	854,696	45,072
E. UtiliCorp United, Inc	1,751,355	477,849	545,301	702,687	25,518
Total	26,512,684	8,665,578	9,936,151	7,711,094	199,861
Percentage of Utility Sales	78	76	8		

HOUSE UTILITIES

DATE: 3-21-03

ATTACHMENT 10

Table 4. Electric Power Industry Generating Capability by Primary Energy Source, 1990, 1994 and 1999
(Megawatts)

Plant Type	1990	1994	1999	Average Annual Rate of Growth (Percent)	Percentage Share 1990	Percentage Share 1994	Percentage Share 1999
Total Utility	9,578	9,715	10,020	0.5	99.5	99.5	99.5
Coal	5,064	5,220	5,325	0.6	52.6	53.5	52.9
Petroleum	622	613	520	-2.0	6.5	6.3	5.2
Gas	2,755	2,722	3,005	1.0	28.6	27.9	29.8
Nuclear	1,135	1,160	1,170	0.3	11.8	11.9	11.6
Hydroelectric	2	0	0	-100.0	0.0	0.0	0.0
Other	*	*	0	-100.0	0.0	0.0	0.0
Total Nonutility	44	49	47	0.6	0.5	0.5	0.5
Petroleum	W	W	4	W	W	W	0.0
Gas	4	36	38	30.2	0.0	0.4	0.4
Petroleum/Gas Combined	W	W	3	W	W	W	0.0
Hydroelectric	W	W	3	W	W	W	0.0
Total Industry	9,623	9,764	10,067	0.5	100.0	100.0	100.0
Coal	5,064	5,220	5,325	0.6	52.6	53.5	52.9
Petroleum	W	W	524	W	W	W	5.2
Gas	2,758	2,758	3,043	1.1	28.7	28.2	30.2
Petroleum/Gas Combined	W	W	3	W	W	W	0.0
Nuclear	1,135	1,160	1,170	0.3	11.8	11.9	11.6
Hydroelectric	W	W	3	W	W	W	0.0
Other	*	*	0	-100.0	0.0	0.0	0.0

Figure 1. Industry Generating Capability by Primary Energy Source, 1999

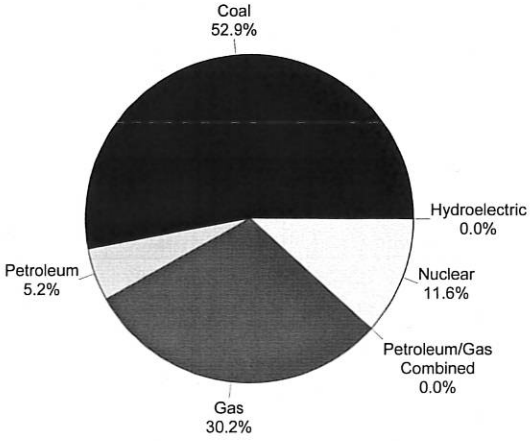


Figure 2. Industry Generation by Energy Source, 1999

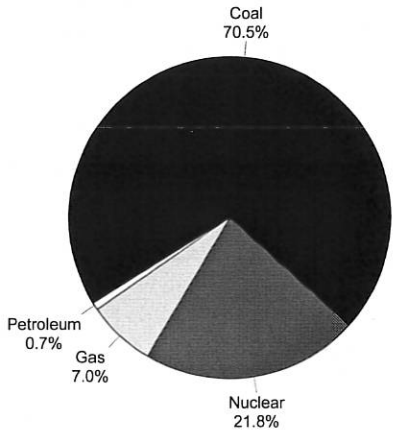


Table 5. Electric Power Industry Generation of Electricity by Energy Source, 1990, 1994, and 1999
(Megawatthours)

Fuel	1990	1994	1999	Average Annual Rate of Change (Percent)	Percentage Share 1990	Percentage Share 1994	Percentage Share 1999
Total Utility	33,868,644	37,283,871	42,002,924	2.4	99.1	99.1	99.8
Coal	23,720,258	26,488,755	29,649,100	2.5	69.4	70.4	70.5
Petroleum	65,744	82,809	311,010	18.8	0.2	0.2	0.7
Gas	2,196,341	2,183,250	2,886,195	3.1	6.4	5.8	6.9
Nuclear	7,874,487	8,529,002	9,156,619	1.7	23.0	22.7	21.8
Hydroelectric	11,769	0	0	-100.0	0.0	0.0	0.0
Other	45	55	0	-100.0	0.0	0.0	0.0
Total Nonutility	324,518	335,997	67,373	-16.0	0.9	0.9	0.2
Petroleum	W	W	2,728	W	W	W	0.0
Gas	306,467	320,355	52,279	-17.8	0.9	0.9	0.1
Hydroelectric	W	W	12,367	W	W	W	0.0
Total Industry	34,193,162	37,619,868	42,070,297	2.3	100.0	100.0	100.0
Coal	23,720,258	26,488,755	29,649,100	2.5	69.4	70.4	70.5
Petroleum	W	W	313,738	W	W	W	0.7
Gas	2,502,808	2,503,605	2,938,474	1.8	7.3	6.7	7.0
Nuclear	7,874,487	8,529,002	9,156,619	1.7	23.0	22.7	21.8
Hydroelectric	W	W	12,367	W	W	W	0.0
Other	45	55	0	-100.0	0.0	0.0	0.0

Table 6. Utility Delivered Fuel Costs and Quality for Coal, Petroleum, and Gas, 1990, 1994, and 1999

Fuel	1990	1994	1999	Average Annual Rate of Change (Percent)
Coal (cents per million Btu) (1999 dollars)	150.6	111.9	95.4	-4.9
Average heat value (Btu per pound)	8948	8708	8628	-0.4
Average sulfur Content(percent)	0.6	0.5	0.4	-3.3
Petroleum (cents per million Btu) (1999 dollars) . . .	655.1	433.2	319.0	-7.7
Average heat value (Btu per gallon)	138177	138892	147609	0.7
Average sulfur Content(percent)	0.0	1.0	1.5	0.0
Gas (cents per million Btu) (1999 dollars)	213.1	209.7	234.1	1.0
Average heat value (Btu per cubic foot)	990	983	1010	0.2

10-3

Table 7. Electric Power Industry Emissions Estimates by Fuel, 1990, 1994, and 1999
(Thousand Short Tons)

Emission Type	1990	1994	1999	Average Annual Rate of Change (Percent)
Sulfur Dioxide				
Coal	85	70	87	0.3
Petroleum	1	*	2	5.6
Total	86	71	89	0.3
Nitrogen Oxide				
Coal	112	114	132	1.8
Petroleum	*	*	*	3.9
Gas	3	5	5	3.5
Total	116	119	137	1.9
Carbon Dioxide				
Coal	27,669	30,012	33,935	2.3
Petroleum	305	74	325	0.7
Gas	1,583	1,857	2,157	3.5
Total	29,556	31,943	36,417	2.3

Figure 3. Industry Generation of Electricity by Energy Source, 1990-1999

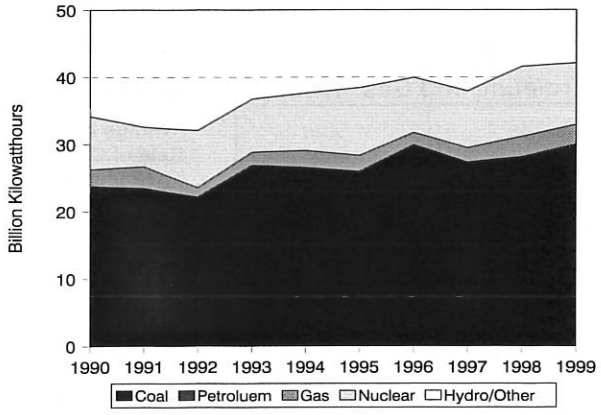


Figure 4. Utility Delivered Fuel Costs for Coal, Petroleum, and Gas, 1990-1999 (1999 Dollars)

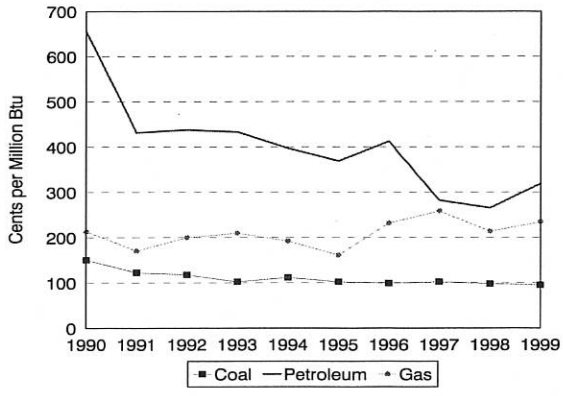


Figure 5. Estimated Sulfur Dioxide Emissions, 1990-1999

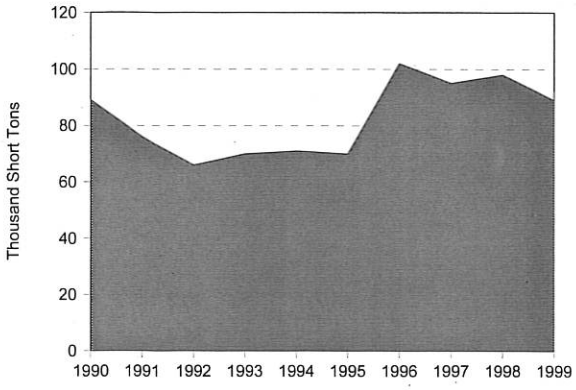


Figure 6. Estimated Nitrogen Oxide Emissions, 1990-1999

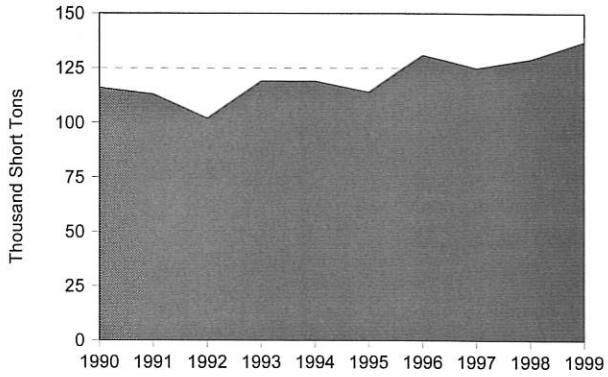


Figure 7. Estimated Carbon Dioxide Emissions, 1990-1999

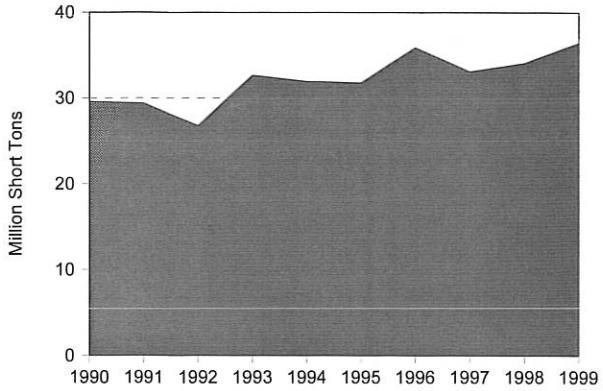
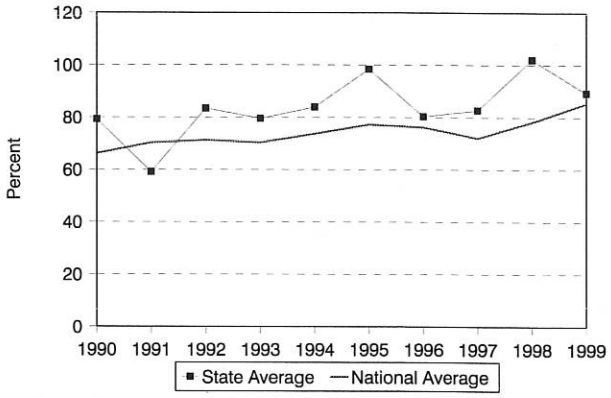


Figure 8. Nuclear Power Capacity Factor Comparison, 1990-1999



10-5

Table 8. Utility Retail Sales, Revenue, and Average Revenue per Kilowatthour by Sector, 1990, 1994, and 1999

	1990	1994	1999	Average Annual Rate of Change (Percent)	Percentage Share 1990	Percentage Share 1994	Percentage Share 1999
Utility Retail Sales							
(thousand megawatthours)							
Residential	9,515	10,131	11,347	2.0	35.0	34.2	33.5
Commercial	9,169	10,111	11,822	2.9	33.8	34.1	35.0
Industrial	8,087	9,001	10,215	2.6	29.8	30.4	30.2
Other	378	371	436	1.6	1.4	1.3	1.3
Total	27,149	29,614	33,820	2.5	100.0	100.0	100.0
Retail Sales Revenue							
(million 1999 dollars)							
Residential	902	872	867	-0.4	41.7	40.8	41.3
Commercial	738	735	739	*	34.1	34.4	35.1
Industrial	484	484	457	-0.6	22.4	22.7	21.7
Other	37	44	39	0.4	1.7	2.1	1.8
Total	2,162	2,136	2,102	-0.3	100.0	100.0	100.0
Average Revenue per Kilowatthour							
(cents/kWh) (1999 dollars)							
Residential	9.48	8.61	7.64	NA	NA	NA	NA
Commercial	8.05	7.27	6.25	NA	NA	NA	NA
Industrial	5.99	5.38	4.47	NA	NA	NA	NA
Other	9.9	11.94	8.91	NA	NA	NA	NA
Total	7.96	7.21	6.22	NA	NA	NA	NA

Table 9. Utility Retail Sales, Revenue, and Number of Customers by Type of Utility, 1999

Item	Investor-Owned	Public	Federal	Cooperative	Total
Number of Utilities	6	119	0	31	156
Number of Retail Customers	902,528	232,872	0	194,634	1,330,034
Retail Sales (thousand megawatthours)	24,531	5,717	0	3,573	33,820
Percentage of Retail Sales	72.5	16.9	0.0	10.6	100.0
Revenue from Retail Sales (million dollars)	1,477	336	0	289	2,102
Percentage of Revenue	70.3	16.0	0.0	13.7	100.0
Average Revenue per Kilowatthour (cents/kWh)	6.02	5.88	0.00	8.08	6.22

http://www.eia.doe.gov/cneaf/electricity/st_profiles/toc.html

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10-4