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Analysis of U.S. Underground Thin Seam Mining Potential

Volume II - Appendices

Final Technical Report

December 1978

Published June 1979

Prepared For:

U.S. Department of Energy

Assistant Secretary for Energy Technology

Division of Solid Fuels Mining and Preparation

Under Contract No. HCP/T77-C-01-8915-01(5)

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Washington, D.C. 20585

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APPENDIX A

Current Mining Practices in Seams

Lower than 60 Inches

- o Number of Mines per Seam Height Range and Tonnage Class Across States
- o Frequency of Use of Various Mining Methods by Seam Height Range and Tonnage Class Across States
- o Production per Shift and per Man Shift
 - Conventional
 - Continuous
 - Longwall
- o Accident Statistics
- o Underground Mine Expansion Plans in States East of the Mississippi
 - Alabama
 - Kentucky
 - Ohio
 - Pennsylvania
 - Tennessee
 - Virginia
 - West Virginia
 - Summary of all Eastern States

Number of Mines Per Seam Height Range
And Tonnage Class Across States (Alabama, Ohio, Tennessee,
Kentucky, Pennsylvania, Virginia and W. Virginia). Total Sample: 780.

**Frequency of Use of Various Mining
Methods per Seam Height Range and
Tonnage Class**

Seam Height Range \ Tonnage Class	<10,000	10,000-19,999	50,000-99,999	100,000-199,999	200,000-499,999	≥500,000	TOTALS
20-29"		Ct=1	Ct=1			Ct=1	Ct=3 F=3
30-39"	Ct=4 Cv=1	Ct=12 Cv=6	Ct=16 Cv=1 Ct/Cv=1	Ct=7 Cv=8 Ct/Cv=5 Ct/Lg=1	Ct=13 Cv=3 Ct/Cv=2 Ct/Lg=1	Ct=6 Cv=1 Ct/Cv=3 Ct/Lg=1 Ct/Lg-Sh=1	Ct=58 Cv=20 Ct/Cv=11 Ct/Lg=3 Ct/Lg/Sh=1 F=93
40-49"	Ct=4 Cv=1	Ct=5 Cv=9 Ct/Cv=2	Ct=15 Cv=8 Ct/Cv=2 Ct/Lg=1	Ct=26 Cv=16 Ct/Cv=2	Ct=30 Cv=13 Ct/Cv=17 Ct/Cv/Lg=1 Cn/Lg=3	Ct=8 Cv=4 Ct/Cv=6 Ct/Lg=9 Ct/Cv/Lg=2 Lg/Sh=1 Ct/Sh=1	Ct=88 Cv=51 Ct/Cv=29 Ct/Cv/Lg=3 Ct/Lg=13 Lg/Sh=1 Ct/Sh=1 F=185
50-60"	Ct=4	Ct=4 Cv=5	Ct=10 Ct/Cv=2	Ct=8 Cv=7 Ct/Cv=2 Ct/Lg=1 Lg=1	Ct=15 Cv=4 Ct/Cv=5 Ct/Lg=2	Ct=24 Cv=9 Ct/Cv=11 Ct/Lg=11 Lg=1	Ct=65 Cv=25 Ct/Cv=20 Ct/Lg=14 Lg=2 126
TOTALS	Ct=12 Cv=2	Ct=22 Cv=20 Ct/Cv=2	Ct=42 Cv=9 Ct/Cv=5 Ct/Lg=1	Ct=41 Cv=51 Ct/Cv=9 Ct/Lg=2 Lg=1	Ct=58 Cv=20 Ct/Cv=24 Ct/Cv/Lg=1 Sh=1 Ct/Lg=6	Ct=39 Cv=14 Ct/Cv=20 Ct/Lg=21 Ct/Lg/Sh=1 Ct/Cv/Lg=2 Lg/Sh=1 Ct/Sh=1 Lg=1	Grand Totals Ct=214 Cv=96 Ct/Cv=59 Ct/Lg=30 Ct/Sh=1 Lg/Sh=1 Lg=2 Ct/Cv/Lg=3 Ct/Lg/Sh=1
KEY: Ct: Continuous Cv: Conventional Lg: Longwall Sh: Shortwall /: Combinations						ALL METHODS TOTAL = 407	

Production per Shift and per Man Shift

Conventional Section Characteristics

Section	Conditions						
	Cover (Approx.)	Immediate Roof	Main Roof	Bottom	Water	Grade	Gas
1	350'	Sandy Shale	Sandy Shale	Fire Clay	Damp	< 1%	Low
2	300'	Weak Shale	Sandstone	Fire Clay Shale	Standing	< 5%	None
3	500'		Sandy Shale		Damp	< 1%	Moderate
4	500'	Draw Slate Limestone	Sandstone	Fire Clay	Damp	< 3%	Moderate
5	500'	Draw Rock Dark Gray Shale	Shale & Sandstone	Shale	Dry	< 1%	Low

Conventional Section Characteristics

Section	System				
	No. of Entries	Entry Width	Center to Center Distance	Coal Height	Working Height
1	5	24'	60' x 60'	30"	30"
2*	5	--	---	40"	40"
3	5	24'	85' x 85'	41"	41"
4	5	30'	60' x 60'	36"	44"
5	4	18'	70' x 90'	40"	49"

* Pillar Recovery using Conventional Equipment

Conventional Section Characteristics

Section	Crew		Foreman
	Size	Average Seniority (Yrs.)	Approximate Experience (Yrs.)
1	11	23.6	30
2	10	8.5	--
3	12	5.2	7
4	12	2.5	8
5	9	13.3	25

Production and Productivity: Conventional Sections

Section	Average Production Per Shift (Raw Tons)	No. Of Shifts For Which Data Was Collected	Productivity (Tons per Manshift)
1	289	107	26.3
2*	310	---	31.0
3	318	101	26.5
4	264	89	22.0
5	140	116	15.6

* Pillar Recovery using Conventional Equipment

Continuous Section Characteristics

Section	General					Mining Conditions			
	Seam	Use of Coal	Over-Burden (ft.)	Top Coal (in.)	Seam Height (in.)	Methane Level	Water in Mine	Roof Condition	Floor Condition
1	Hazard #1	Steam	900-2000	0	38-46	Low	Yes	Poor	Poor
2	Lower Freeport	Steam	475	-	48	High	Slight	Good	Good
3	Elkhorn	Met	127	0	58	Low	No	Good	Good

A-6

Production and Productivity: Continuous Sections

Mine	Ave. Age Of Crew	Ave. Mine Exp.	Ave. Exp. On Job	No. of Men on Crew	Ave. Crew Age-To-Foreman Age Ratio	Tons Per Shift	Tons Per Manshift
1	34.0	5	3	9	.76	191	21.2
2	40.2	10.4	2.4	6.5	.65	187	28.8
3	47.4	24.1	4.9	8	1.39	342	42.8

Production and Productivity: Longwall Sections

SECTION	1	2	3
LOCATION	Pennsylvania	Utah	West Virginia
OPERATING SEAM	D	Upper, Sunnyside	Pocahontas #3
OPERATION PROFILE			
o Production Shifts/Day	3	2	2
o Maintenance Shifts/Day	0	1	0-1
o Production Crew TOTAL	11	12	10
PANEL DESCRIPTION			
Panel Width (ft.)	480	550	400
Seam Height (in.)	42	52	54
Sump Depth (in.)	30	30	24
Mining System	Full Face	Half Face/ Full Face	Full Face
Panel Development	Retreat	Retreat	Retreat
Percent Reject	~ 20	~ 12	~ 20
Main Roof	Shale	Sandy Shale	Shale & Sandstone
Main Bottom	Shale	Sandstone	Shale
Cover (ft.)	240-250	1,750	500
AVERAGE PRODUCTION (tons per shift)	252	683	305
NUMBER OF SHIFTS IN DATA BASE	119	151	93
PRODUCTIVITY (tons per manshift)	22.9	56.9	30.5

Relationships Between the Injury Hazards for
Low (L), Medium (M), and High (H) Coal for Fatal Injuries,
Disabling Injuries, Non-disabling Injuries and Non-injury Accidents, for
January 1, 1974 - June 30, 1976

<u>Accident Type Code</u>	<u>Type of accident</u>	<u>Fatal Injuries</u>	<u>Disabling Injuries</u>	<u>Nondisabl. Injuries</u>	<u>Non-injury accidents</u>
	Total	*	L>M>H	H>M, L	M>H>L
01	Falls	*	L>M>H	H>M, L	M>H>L
02	Pressure bumps, bursts	*	*	*	*
03	Falls of face	*	*	H>M>L	*
04	Inrush of water	*	*	*	*
05	Sliding or falling materials/objects	*	L, M>H**	H>M	*
06	Slips and falls	*	M>L, H	H>M>L	*
07	Handling materials	*	L>M>H	H>M, L	*
08	Hand tools	*	L>M>H	H, L>M	*
09	Stepping/kneeling on sharp/loose objects	*	L>M>H	H, L>M	*
10	Striking/bumping against objects	*	L>M>H	*	*
11	Haulage	*	L>M>H	H>M, L	H>L
12	Explosions of gas or coal dust	*	*	*	*
13	Explosives	*	*	L, M>H	*
14	Electricity	*	L, M>H	H>M, L	*
15	Machinery	*	L>M>H	H, L>M	*
16	Suffocation	*	*	*	*
17	Mine fires and suffocation from them	*	*	*	*
18	Miscellaneous	*	L, M>H	H>M	*
19	Lifting and pulling	*	L, M>H	H>M, L	*
20	Ignition of gas or dust	*	*	*	*

* no statistically significant difference at 95 percent confidence level.

** L, M>H is read "Both L and M are significantly greater than H. However, L and M are not significantly different from each other."

Underground Mine Expansion Plans in
Alabama

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39					1		1
40-49					1	2	3
50-60					2	6	8
61-69							
70-79							
80-89							
90-100							
≥ 100							
TOTALS					4	8	12

Total = 13 minus one with unknown seam height.

Underground Mine Expansion Plans in

Kentucky

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39							
40-49						1	1
50-60						4	4
61-69							
70-79					1		1
80-89							
90-100							
≥ 100							
TOTALS					1	5	6

Total = 19 minus 13 with unknown seam height.

Underground Mine Expansion Plans in

Ohio

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39							
40-49						2	2
50-60						5	5
61-69						2	2
70-79							
80-89							
90-100							
≥ 100							
TOTALS						9	9

Total = 10 minus one with unknown seam height.

**Underground Mine Expansion Plans in
Pennsylvania**

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39							
40-49					7	1	8
50-60					3	2	5
61-69							
70-79							
80-89						1	1
90-100						4	4
≥ 100							
TOTALS					10	8	18

Total = 28 minus 10 with unknown seam height.

Underground Mine Expansion Plans in
Tennessee

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39						2	2
40-49							
50-60							
61-69							
70-79							
80-89							
90-100							
≥ 100							
TOTALS						2	2

Total = 2

Underground Mine Expansion Plans in
Virginia

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39							
40-49							
50-60						2	2
61-69						1	1
70-79					1	3	4
80-89							
90-100							
≥ 100							
TOTALS					1	6	7

Total = 10 minus 3 with unknown seam height.

Underground Mine Expansion Plans in

West Virginia

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39					1	1	2
40-49			1		3	7	11
50-60					2	5	7
61-69						1	1
70-79						1	1
80-89							
90-100							
≥ 100						1	1
TOTALS			1		6	16	23

Total = 46 minus 23 with unknown seam height.

Underground Mine Expansion Plans in

Eastern States with Low Seam Mining

Tonnage Class Seam Height	<10,000	10,000- 49,999	50,000- 99,999	100,000- 199,999	200,000- 499,999	≥500,000	TOTALS
20-29							
30-39					2	2	4
40-49			1		11	14	26
50-60					7	25	32
61-69						4	4
70-79					2	5	7
80-89						3	3
90-100							
≥ 100							
TOTALS			1		22	53	76

Total = 128 minus 52 with unknown seam height.

APPENDIX B

Coal Resources

- o **Resource Adjustments**
- o **Coal Quality in the Thin Seam States**

RESOURCE ADJUSTMENTS

Production figures by county were available for Ohio and Pennsylvania. Several steps were taken before the data was used. Since 98% of the tonnage in Ohio was an original estimate, the USGS data was adjusted to account for total cumulative underground production.

Since the data from 1935 to 1965 were reported in five-year intervals, it was necessary to interpolate the production between given years. Assuming that there was little or no strip mining before 1935, the approximate cumulative surface production for Ohio was determined. The surface production was subtracted from the total production to arrive at total underground production. The percentage of underground production was applied to the production in each county and the resultant figures were doubled to account for losses in mining¹. The tonnages were then subtracted from the total tonnage in seams greater than 28 inches for each county.

To estimate current resource tonnages at the bed level, the cumulative underground production per county was distributed over the beds in the county by the ratio of the bed tonnages. The measured and indicated resources per bed were then adjusted for production and loss-in-mining. This method for estimating current Ohio resources is sufficiently accurate for the purpose of this study.

In Pennsylvania, the dates of the USGS tonnage estimates varied greatly. The estimates have been updated on an average basis, by subtracting cumulative underground production and loss-in-mining since 1940.

Production figures for years not given were interpolated. The total underground production since 1940 was doubled to account for loss-in-mining. The percentage of this figure to the total mined and lost tonnage was then applied to the mined and lost tonnages for each county in Pennsylvania. These tonnages were then subtracted from the total tonnage in seams greater than 28 inches for each county. At the bed level, production was distributed as in Ohio.

¹ 50% recovery is an accepted average ^{FIG} for room-and-pillar mining.

To update other states current Bureau of Mines Reserve Base data¹ were used to replace measured and indicated USGS data in seam heights greater than 28 inches in the 0-1000 foot overburden category.

Only those states with a small percentage of inferred resources were updated with this data, since the possibility of double counting the inferred resources existed (some inferred data from USGS may be included in the more recent measured reserve base of the Bureau of Mines). These states include Virginia, Kentucky, and West Virginia.

By substituting USBM data for USGS data, the strong parts of both systems have been combined:

- o USBM data are current, but do not include overburdens over 1,000 ft., seam heights lower than 28 inches, or inferred resources.
- o USGS data are not current, but do include overburdens over 1,000 ft., seam heights from 14-28 inches and inferred resources.

The reader should be aware of the fact that USBM reserve estimates are generally thought to be conservative.

1

U. S. Bureau of Mines Information Circular 8655 - The Reserve Base of Bituminous Coal and Anthracite for Underground Mining in the Eastern U. S., 1974.

	Strippable Resources	Unclassified Resources	Updated Production	BOM Data
Alabama	X			
Indiana				
Iowa				
Kentucky	X			X
Missouri	X			
Ohio	X	X	X	
Pennsylvania	X	X	X	
Virginia	X			X
West Virginia	X	X		X

Coal Quality In Alabama

SEAM THICKNESS	
14-28"	————
28-42"	- - - - -
> 42	~~~~~

(Millions of Short Tons)

Coal Quality In Indiana

Coal Quality In Iowa

SEAM THICKNESS

14-28" ———
 28-42" - - - -
 42" ~~~~~

(Millions of Short Tons)

All Of Iowa > 3% Sulfur

Coal Quality In Kentucky

Coal Quality In Missouri

All of Missouri 30% Sulfur

Coal Quality In Ohio

Coal Quality In Pennsylvania

SEAM THICKNESS

14-28" ———

> 28" - - - -

(Millions of Short Tons)

All of Pennsylvania 9-11% Ash

Coal Quality In Virginia

Coal Quality In West Virginia*

* Includes classified counties only. B-13

APPENDIX C

Definition of Producing Districts

BITUMINOUS COAL PRODUCING DISTRICTS AS DEFINED IN THE BITUMINOUS COAL ACT OF 1937 AND AMENDMENTS

The districts were originally established to aid in formulating minimum prices of bituminous coal and lignite. Because much statistical information was compiled in terms of these districts, their use for statistical purposes has continued since the abandonment of that legislation in 1943.

Definition of Bituminous Coal and Lignite Producing Districts

DISTRICT 1.—EASTERN PENNSYLVANIA

Pennsylvania
Armstrong County (part).—All mines east of Allegheny River, and those mines served by the Pittsburgh & Shawmut Railroad located on the west bank of the river.
Fayette County (part).—All mines located on and east of the line of Indian Creek Valley branch of the Baltimore & Ohio Railroad.
Indiana County (part).—All mines not served by the Saltsburg branch of the Pennsylvania Railroad.
Westmoreland County (part).—All mines served by the Pennsylvania Railroad from Torrance, east.
All mines in the following counties:
Bedford Centre Forest McKean
Blair Clarion Fulton Mifflin
Bradford Clearfield Huntingdon Potter
Cambria Clinton Jefferson Somerset
Cameron Elk Lycoming Tioga
Maryland.—All mines in the State.
West Virginia.—All mines in the following counties:
Grant Mineral Tucker

DISTRICT 2.—WESTERN PENNSYLVANIA

Pennsylvania
Armstrong County (part).—All mines west of the Allegheny River except those mines served by the Pittsburgh & Shawmut Railroad.
Fayette County (part).—All mines except those on and east of the line of Indian Creek Valley branch of the Baltimore & Ohio Railroad.
Indiana County (part).—All mines served by the Saltsburg branch of the Pennsylvania Railroad.
Westmoreland County (part).—All mines except those served by the Pennsylvania Railroad from Torrance, east.
All mines in the following counties:
Allegheny Butler Lawrence Venango
Beaver Greene Mercer Washington

DISTRICT 3.—NORTHERN WEST VIRGINIA

West Virginia
Nicholas County (part).—All mines served by or north of the Baltimore & Ohio Railroad.
All mines in the following counties:
Barbour Jackson Randolph Webster
Braxton Lewis Ritchie Wetzel
Calhoun Marion Roane Wirt
Doddridge Monongalia Taylor Wood
Gilmer Pleasants Tyler
Harrison Preston Upshur

DISTRICT 4.—OHIO.—All mines in the State.

DISTRICT 5.—MICHIGAN.—All mines in the State.

DISTRICT 6.—PANHANDLE

West Virginia.—All mines in the following counties:
Brooke Hancock Marshall Ohio

DISTRICT 7.—SOUTHERN NO. 1

West Virginia
Fayette County (part).—All mines east of Gauley River and all mines served by the Gauley River branch of the Chesapeake & Ohio Railroad and mines served by the Virginian Railway.
McDowell County (part).—All mines in that portion of the county served by the Dry Fork branch of the Norfolk & Western Railroad and east thereof.
Raleigh County (part).—All mines except those on the Coal River branch of the Chesapeake & Ohio Railroad and north thereof.

DISTRICT 7.—SOUTHERN NO. 1 (Continued)

Wyoming County (part).—All mines in that portion served by the Gilbert branch of the Virginian Railway lying east of the mouth of Skin Fork of Guyandot River and in that portion served by the main line and the Glen Rogers branch of the Virginian Railway.
All mines in the following counties:
Greenbrier Mercer Monroe Pocahontas Summers
Virginia
Buchanan County (part).—All mines in that portion of the county served by the Richlands-Jewell Ridge branch of the Norfolk & Western Railroad and in that portion on the headwaters of Dismal Creek east of Lynn Camp Creek (a tributary of Dismal Creek).
Tazewell County (part).—All mines in those portions of the county served by the Dry Fork branch to Cedar Bluff and from Bluestone Junction to Boiesevain branch of the Norfolk & Western Railroad and Richlands-Jewell Ridge branch of the Norfolk & Western Railroad.
All mines in the following counties:
Montgomery Pulaski Wythe Giles Craig

DISTRICT 8.—SOUTHERN NO. 2

West Virginia
Fayette County (part).—All mines west of the Gauley River except mines served by the Gauley River branch of the Chesapeake & Ohio Railroad.
McDowell County (part).—All mines west of and not served by the Dry Fork branch of the Norfolk & Western Railroad.
Nicholas County (part).—All mines in that part of the county south of and not served by the Baltimore & Ohio Railroad.
Raleigh County (part).—All mines on the Coal River branch of the Chesapeake & Ohio Railroad and north thereof.
Wyoming County (part).—All mines in that portion served by the Gilbert branch of the Virginian Railway and lying west of the mouth of Skin Fork of Guyandot River.
All mines in the following counties:
Boone Kanawha Mason Wayne
Cabell Lincoln Mingo
Clay Logan Putnam

Virginia
Buchanan County (part).—All mines in the county, except in that portion on the headwaters of Dismal Creek, east of Lynn Camp Creek (a tributary of Dismal Creek) and in that portion served by the Richlands-Jewell Ridge branch of the Norfolk & Western Railroad.
Tazewell County (part).—All mines in the county except in those portions served by the Dry Fork branch of the Norfolk & Western Railroad and branch from Bluestone Junction to Boiesevain of Norfolk & Western Railroad and Richlands-Jewell Ridge branch of the Norfolk & Western Railroad.
All mines in the following counties:
Dickinson Russell Wise
Lee Scott
Kentucky.—All mines in the following counties in eastern Kentucky:
Bell Greenup Lawrence Morgan
Boyd Harlan Lee Owley
Breathitt Jackson Leslie Perry
Carter Johnson Letcher Pike
Clay Knott McCreary Rockcastle
Elliott Knox Magoffin Wayne
Floyd Laurel Martin Whitley

Tennessee.—All mines in the following counties:
Anderson Cumberland Overton
Campbell Fentress Boone
Claiborne Morgan Scott

North Carolina.—All mines in the State.

DISTRICT 9.—WEST KENTUCKY

Kentucky.—All mines in the following counties in western Kentucky:
Butler Hancock McLean Todd
Christian Henderson Muhlenberg Union
Crittenden Hopkins Ohio Warren
Davless Logan Simpson Webster

DISTRICT 10.—ILLINOIS.—All mines in the State.

DISTRICT 11.—INDIANA.—All mines in the State.

DISTRICT 12.—IOWA.—All mines in the State.

DISTRICT 13.—SOUTHEASTERN

Alabama.—All mines in the State.

Georgia.—All mines in the following counties:
Dade Walker

Tennessee.—All mines in the following counties:
Bledsoe Merion Sequatchie White
Grundy McMinn Van Buren
Hamilton Rhea Warren

DISTRICT 14.—ARKANSAS-OKLAHOMA

Arkansas.—All mines in the State.

Oklahoma.—All mines in the following counties:
Haskell Le Flore Sequoyah

DISTRICT 15.—SOUTHWESTERN

Kansas.—All mines in the State.

Texas.—All mines in the State.

Missouri.—All mines in the State.

Oklahoma.—All mines in the following counties:
Coal Latimer Okmulgee Rogers Wagoner
Craig Muskogee Pittsburg Tulsa

DISTRICT 16.—NORTHERN COLORADO

All mines in the following counties:
Adams Douglas Jackson Larimer
Arapahoe Elbert Jefferson Weld
Boulder El Paso

DISTRICT 17.—SOUTHERN COLORADO

Colorado.—All mines except those included in District 16.

DISTRICT 18.—NEW MEXICO

New Mexico.—All mines in the following counties:
Grant McKinley Sandoval San Miguel Socorro
Lincoln Rio Arriba San Juan Santa Fe

Arizona.—All mines in the State.

California.—All mines in the State.

DISTRICT 19.—WYOMING

Wyoming.—All mines in the State.

Idaho.—All mines in the State.

DISTRICT 20.—UTAH.—All mines in the State.

DISTRICT 21.—NORTH DAKOTA-SOUTH DAKOTA.

All mines in North Dakota and South Dakota.

DISTRICT 22.—MONTANA.—All mines in the State.

DISTRICT 23.—WASHINGTON

Washington.—All mines in the State.

Oregon.—All mines in the State.

Alaska.—All mines in the State.

APPENDIX D

Definition of Census Regions

CENSUS REGIONS

APPENDIX E

The Present and Future Coal Market

- o Comparative Market Shares of Districts 8 and 9
- o 1977 Coal Shipments from the Thin Seam Districts to Electric Utilities
- o 1977 Coal Shipments from the Thin Seam Districts to Coke and Gas Plants
- o 1977 Coal Shipments from the Thin Seam Districts to "All Other Industrial" Users
- o BAU Thin Seam Districts Underground Forecast

Comparative Market Shares
of Districts 8 and 9¹

State	District Shipments (% of State Total Purchases)	
	8	9
Alabama	10.4	16.5
Georgia	70.1	19.2
Illinois	6.8	3.2
Indiana	13.2	9.5
Kentucky ²	31.7	56.8
Michigan	31.4	3.7
Minnesota	4.5	0.0
Missouri	2.8	4.1
Ohio	25.0	2.3
Tennessee	42.2	47.4
Wisconsin	11.3	14.2

1 "Bituminous Coal and Lignite Distribution, January-September 1977" and "Bituminous Coal and Lignite Distribution, October-December 1977."

2 In 1977, Kentucky shipped a total of 209,278 short tons. District 8 represented about 76% of this figure. While District 8 represents the major portion of production, Kentucky purchased more than half of its coal from western Kentucky.

1977 Coal Shipments from Thin Seam Districts to

ELECTRIC UTILITIES (Thousand Short Tons)

States	Districts								Total
	1	2	3 & 6	4	7	8	11	13	Other Districts
New Hampshire			833						0
New York	4,763	482	522	212		542			0
New Jersey	686		1,271			571			0
Pennsylvania	23,384	6,700	4,389	1,151		161			0
Delaware	638								0
Maryland	4,113	1	1,008			39			0
Virginia	78		210		199	5,244			0
North Carolina					316	20,270		3	0
South Carolina						6,483		11	0
Georgia						12,916	991	1,159	3,406
Ohio	537	1,635	3,053	31,686		8,863	12		6,550
West Virginia	3,169	326	11,375	657	66	11,986			0
Kentucky				306		7,096	1,691		16,487
Tennessee				1,271	1	7,719	*	38	11,295
Alabama				64		1,104		11,948	4,338
Michigan	439 (4th qtr.)	166	4,668	5,626	11	4,403	21		5,831
Indiana		7 (4th qtr.)		17		277	17,775		27,628
Canada	1,544	2,564	4,477	265		39			0
Other States	1,149	78	46	58	2	2,505	1,992	505	161,543

* Specific amount to end consumer undisclosed for January - September, 1977.

Translating these data into dependencies by state, show the 1977 need for steam coal from thin seam states.

1977 Coal Shipments from Thin Seam Districts to
Coke and Gas Plants
(Thousand Short Tons)

States									Other Districts
	1	2	3 & 6	4	7	8	11	13	
New York	823	1,115	387		187	1,306			0
Pennsylvania	3,559	9,782	749		1,517	5,328		11	2
Michigan	* 41 (4th qtr.)		360		827	2,617			184
Minnesota	* 86 (4th qtr.)				111	293			171
Wisconsin					12	274	*		0
Illinois	*				182	1,106			1,143
Indiana	1,103	779	181		3,413	5,487		184	2,221
Maryland	479	248	311		366	1,384			0
Kentucky			*		30	431			49
Ohio	502	3,425	744		1,888	5,971		42	101
Missouri					125	185			0
Alabama					75	311		4,007	1,294
Tennessee					* 22 (4th qtr.)	193		10	29
Virginia					213	9			0
Canada	269	438	54		1,189	4,193			0
West Virginia	208	1,879	110		625	1,697		4	0
Other States	367	166	7		539	1,782	4	15	3,328

* Specific amount to each consumer undisclosed for January - September, 1977.

1977 Coal Shipments from Thin Seam Districts to
"All Other Industrial" Use

States									Other Districts
	1	2	3 & 6	4	7	8	11	13	
Connecticut			13			5			0
Massachusetts	14	26	30			2			0
New York	1,652	259	453		59	118			0
Pennsylvania	1,787	1,490	452	61	61	132			9
Ohio	147	220	150	4,200	314	3,492			6
Wisconsin	44	19	145	104		876			897
Minnesota	*		36	13		8		11	1,114
Virginia			22		15	1,976			0
West Virginia	48	203	971	59	53	1,661			0
North Carolina					4	1,476			0
South Carolina						1,337			0
Georgia						468			160
Kentucky		13			4	895			590
Tennessee					1	1,749		219	465
Alabama					64	285		1,328	30
Indiana	5	*		4	25	569	3,380		768
Michigan	* 135 (4th qtr.)	18	94	651	188	1,884			477
Maryland	258	3	13			11			0
Canada	206	67	27		23	59			0
Other	322	28	35	126	27	832	105	197	16,664

* Specific amount to each consumer undisclosed for January - September, 1977.

BAU Thin Seam Districts
Underground Production Forecast
(In Million Short Tons)

District	1980	1985	1990
1	25.5	28.0	30.8
2	34.1	38.9	40.3
3	33.3	35.7	38.4
6	10.9	11.6	12.5
Total 3 & 6	44.2	47.4	50.9
4	19.6	21.6	23.8
7	37.3	44.8	51.4
8	145.0	177.4	206.5
11	1.9	2.2	2.6
12	.5	.7	.8
13	12.9	14.7	15.1
TOTAL	365.2	423.0	473.1

Source: Project Independence

APPENDIX F

Definition of Classification of Resource Terms

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The terms used in the classification system are defined as follows:

Resource -- A concentration of coal in or on the earth's crust in such form that economic extraction is currently or potentially feasible.

Identified resources -- Specific bodies of coal whose location, quality and quantity are known from geologic evidence supported by engineering measurements with respect to the demonstrated category.

Undiscovered resources -- Unspecified bodies of coal surmised to exist on the basis of broad geologic knowledge and theory.

Reserve -- That portion of the identified coal resource that can be economically and legally mined at the time of determination-- also referred to as "recoverable reserve."

Reserve base -- The component of the identified coal resource from which the reserve is derived by recoverability calculations.

The following definitions for measured, indicated, and inferred are applicable to both the Reserve and Identified-Subeconomic resource components.

Measured -- Coal for which estimates of the quality and quantity have been computed, within a margin of error of less than 20 percent; from sample analyses and measurements from closely spaced and geologically well-known sample sites.

Indicated -- Coal for which estimates of the quality and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections.

Inferred -- Coal in unexplored extensions of "demonstrated" resources for which estimates of the quality and size are based on geologic evidence and projection.

Identified-subeconomic resources -- Coal beds that are not "reserves", but may become so as a result of changes in economic and legal conditions.

Paramarginal -- The portion of "subeconomic resources" that (1) borders on being economically producible, or (2) is not commercially available solely because of legal or political circumstances.

Submarginal -- The portion of "subeconomic resources" that would require a substantially higher price (more than 1.5 times the price at the time of determination) or a major cost reducing advance in technology.

Hypothetical resources -- Undiscovered coal that may reasonably be expected to exist in a known mining district under known geologic conditions. Exploration that confirms their existence and reveals quantity and quality will permit their reclassification as a "reserve" or "identified-subeconomic resource".

Speculative resources -- Undiscovered coal that may occur either in known types of deposits in a favorable geologic setting where no discoveries have been made, or in as yet unknown types of deposits that remain to be recognized. Exploration that confirms their existence and reveals quantity and quality will permit their reclassification as "reserves" or "identified-subeconomic resources".