REPORT OF THE
DEPARTMENT OF ECONOMIC DEVELOPMENT

SENATE JOINT RESOLUTION NO. 208
EXPORT PLAN FOR VIRGINIA COAL

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 50

COMMONWEALTH OF VIRGINIA
RICHMOND
1994

COMMONWEALTH of VIRGINIA

Department of Economic Development

MEMORANDUM

TO: The Honorable George Allen, Members of the Virginia General Assembly and Members of the Coal and Energy Commission

FROM: Mark R. Kilduff MRK

DATE: February 11, 1994

SUBJECT: Senate Joint Resolution 208 - 1993

The 1993 General Assembly, by Senate Joint Resolution 208, requested the Department of Economic Development, in consultation with the Department of Mines, Minerals and Energy and the Virginia Center for Coal and Energy Research to create a comprehensive export plan for Virginia coal. Enclosed for your review and consideration is the document that has been prepared in response to this resolution.

MRK/bat

Enclosure

cc: Secretary Robert T. Skunda

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PREFACE

Senate Joint Resolution No. 208 passed by the 1993 General Assembly requested the Department of Economic Development (DED), in consultation with the Department of Mines, Minerals and Energy (DMME) and the Virginia Center for Coal and Energy Research (VCCER) to create a comprehensive export plan for Virginia coal for the next decade.

In order to accomplish this task, Export Development and Public Affairs and Legislative Services staff from DED, developed a plan to complete the scope of the project. In consultation with the DMME and the VCCER, DED engaged an International Market Planning (IMP) study to identify and analyze foreign markets for Virginia coal and address potential future markets and issues facing the Virginia coal industry for the 1990's. With guidance from the DED staff and the VCCER, the IMP study was conducted by graduate students of the Pamplin College of Business at Virginia Polytechnic Institute and State University.

Findings from the IMP study were reviewed by the DED, DMME and VCCER. Dr. John Randolph and Dr. Carl Zipper of the VCCER utilized these findings to develop the primary information for the Background, Findings and Conclusion chapters of the study. The section on "The International Market for Clean Coal Technology" was a collaborative effort between the DMME and DED staff. Recommendations were then formulated to address short-term, as well as, long-term ways to further export opportunities for global consumption of Virginia coal.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

The economic activity of the coalfield region of Virginia is linked to the state's mining firms' ability to access markets beyond the state's borders. In 1992, 296 active Virginia mines produced 42,561,785 tons of coal, making Virginia the nation's seventh largest coal producing state. Virginia is considered to be a high production cost state. According to the U.S. Energy Information Administration (EIA), the average 1992 mine price for coals produced in Virginia was $27.55 per ton, vs. $21.03 per ton for the nation as a whole. Virginia's coal producers depend upon the ability of the state's high quality coal reserves to draw price premiums in the market place, and overcome high costs of mining.

BACKGROUND

Virginia's coal mining industry serves two distinct end-use markets: metallurgical and steam. The metallurgical market purchases coals used for coking. Electric utilities are the primary purchasers in the steam coal market. In 1992, 37 percent of the coal produced in Virginia was sold to overseas buyers, and more than 80 percent of that tonnage was metallurgical grade.

Virtually all of Virginia's overseas exports are transported by rail from the southwest coalfields through the state, and shipped from the Port of Hampton Roads, which exports greater quantities of coal than any other U.S. port. Coal shipped through Hampton Roads in 1992 generated $2.4 billion in economic benefits, 23,000 jobs and $800 million in wages in the state.

FINDINGS

The United States, Australia and Canada are the world's primary metallurgical coal suppliers. Over 70 percent of the U.S. metallurgical grade export coals have been shipped through the Port of Hampton Roads in recent years.

Primary metallurgical coal markets are the Far East, Europe, and Brazil. The United States holds a 60 percent share of the west European coal market and a 51 percent share of Brazil's metallurgical coal market. Hampton Roads is the dominant U.S. port for the European metallurgical coal market. The Far East is the world's largest metallurgical coal market. Japan is the world's largest metallurgical coal importer, yet Hampton Roads exports amounted to just 7 percent of that market share in 1992. In the past, trade agreements for the purchase of U.S. coal by Japan has helped to offset our staggering trade deficit with that country.

The EIA 1993 projections showed the Far Eastern metallurgical coal market shrinking by 10 percent during the decade. EIA's 1993 projections also show a relatively steady demand for metallurgical coal in Europe over the next decade. However, the United States is expected to lose market share to Australia in both the Far Eastern and European markets. Due to an expected decline in traditional metallurgical coal suppliers to Eastern Europe (i.e., from the former USSR) through the year 2000, there may be opportunities for United States metallurgical coal suppliers in this market.

The world's major steam coal exporters are Australia, South Africa and the United States. New Orleans, Hampton Roads and Baltimore are the three major U.S. ports of international steam coal supply. Non-Virginian Appalachian steam coal producers have the option of transporting their product by barge to New Orleans for export. This barge transportation alternative tends to be cheaper than rail transportation from Virginia mines to the Port of Hampton Roads.

Primary steam coal markets are western Europe and the Far East. The United States competes most effectively in the Netherlands and Britain. The major Far Eastern steam coal importer is Japan. Hampton Roads exporters are not expected to compete in the Far Eastern steam coal market

Unlike declining projections for the metallurgical coal market, experts expect the world's major steam coal exporters to increase tonnage over the next decade. This increase will come from a continually expanding market in Europe and Eastern Asia. Major factors impacting this increased demand include economic growth and the resulting increased demand for electricity, decreasing subsidies to high cost European coal suppliers, and stringent environmental restrictions in the European marketplace.

Changing technologies will have a major impact on future international markets for Virginia coal. Metallurgical coal use will be influenced by changing technologies for both steel production and materials utilization. The existing clean coal technologies for steam coal are divided into three categories: pre-combustion; combustion and post-combustion. All of these technologies are being researched, developed and tested worldwide. Strong markets for clean coal technologies include Italy, Japan, and Turkey.

The United States is encouraging clean coal technology utilization in international markets under provisions of the Energy Policy Act of 1992. Through this Act, the U. S. Department of Energy will provide financial assistance for participation by U.S. industries in targeted international markets.

In analyzing the findings it was found that: Western Europe should be viewed as a primary market opportunity for future exports of Virginia coal; Brazil should continue to be a strong market; Eastern European markets should provide some market opportunities for Hampton Roads coal suppliers; and trade relationships with Far Eastern buyers and the ability of Virginia to act as a dependable source of high quality coal supplies, will be assets in efforts to maintain exports of metallurgical coals to the Far East.

CONCLUSIONS

* Coal exports through the Port of Hampton Roads has a substantial benefit to the Virginia economy ($2.4 billion in 1992). Consequently, what is good for Hampton Roads coal exports is good for Virginia. It is appropriate for Virginia state government to do what it can to enhance Hampton Roads' coal exports.

* Critical factors affecting the world coal trade and the Hampton Roads market share (the state of the global economy, international environmental regulations, and foreign subsidies) are beyond the influence of state government.

* Price is the most important factor in exporting coal. Efforts by producers, transporters of coal, and governments to mitigate coal costs will enhance the overall competitiveness of Virginia coal.

* Trade agreements between governments have been effective in maintaining coal shipments to certain countries. Such agreements are often justified to rectify trade imbalances or to maintain a reliable supply source.

* It may become increasingly difficult for Hampton Roads coal exporters to compete on the world market based on price alone. In order for them to compete effectively, coal exporters may have to develop and employ creative trade packages of coal and coal related technologies. These packages may include clean coal technologies and low sulfur coal in the steam market and advanced coking technologies or value-added coke in the metallurgical market.

* The metallurgical coal market will likely continue to be the mainstay of Virginia's coal exports, with Western Europe continuing to be the primary market opportunity for Hampton Roads coal sales. However, exporters of metallurgical coal must try to maintain a foothold in all markets, including Japan, Korea, and Brazil. The metallurgical coal market is expected to shrink and become more competitive in coming years, especially in Western Europe. Because of this expected situation, Hampton Roads exporters must look for opportunities in the expanding steam coal market to maintain tonnage. While the Eastern European coal trade is now small, this market may increase with economic modernization.

RECOMMENDATIONS

1. Conduct a Governor's Symposium with leaders of the coal industry and coal related industries to (1) review the findings of the study required by SJR 208 related to international markets for Virginia coal; (2) receive advice on the appropriate role of the Commonwealth in promoting coal exports; (3) identify federal and state regulations, tax policies, and other factors affecting the sale of Virginia coal and recommend executive action to minimize regulations that constrain trade; and (4) discuss emerging technological advancements and ecological issues in Virginia's major coal export markets. This proposed Governor's Symposium would be coordinated by the Virginia Department of Economic Development with assistance by the Virginia Center for Coal and Energy Research, the Virginia Port Authority, and the Virginia Department of Mines, Minerals and Energy.

2. Introduce a joint resolution during the 1994 Session of the General Assembly requesting the Virginia Congressional Delegation to encourage and work for the export of United States coal which will positively impact the export of Virginia coal. The increase in coal exports could reduce the current dramatic trade imbalances with selected foreign governments, including Japan.

3. Advocate through the Governor's Office to the President and the U.S. Secretary of Commerce, for the export of United States coal which will positively impact the export of Virginia coal. The increase in coal exports could reduce the current dramatic trade imbalances with selected foreign governments.

4. Encourage the development of state and national strategies to export combined packages of coal, coal-use technology, and coal equipment through a consortia of Virginia agencies, the National Coal Council, the U.S. Secretary of Energy, and the U.S. Department of Energy, for market opportunities including Eastern Europe.

5. Have the Virginia Department of Economic Development aggressively pursue available federal funds to support export assistance in the coal industry.

6. Encourage and promote the use of export financing programs available through the Virginia Department of Economic Development's Small Business Financing Authority (SBFA). These pre-export working capital and credit guarantee programs of the Export-Import Bank of the United States, accessed through the SBFA could be used to help smaller technology and equipment suppliers develop competitive export pricing deals for their goods and services.

INTRODUCTORY CHAPTER

Commercial mining of Virginia's coal resources began in the 1880s, when new railroads began providing transportation of Virginia mined coal to potential markets closer to the east coast. Today, economic activity in the coalfield region remains linked to an ability of Virginia mining firms to access markets beyond Virginia's borders. In 1990, less than 10 percent of Virginia mined coal sales were made to in-state customers. The Virginia coal industry's major customers are in markets located in other eastern states, Canada, and overseas.

In 1992, 296 active Virginia mines produced 42,561,785 tons of coal (Randolph, *et al.*, 1993), making Virginia the nation's seventh largest coal producing state. Virtually all of Virginia's coal is produced in the state's southwestern coalfield. Eighty-four percent of Virginia's 1992 production originated in three counties: Buchanan, Wise, and Dickenson. All but 1,700 of the remaining tons were produced in portions of Lee, Scott, Russell, and Tazewell counties which adjoin the three primary coal producing counties.

Virginia coal is mined by underground and surface mining from over 20 minable seams. Virginia's mines vary widely in size. In 1992, 65 of the state's active mines produced coal in quantities of less than 10,000 tons, while Virginia's largest mine produced in excess of 2.6 million tons (Randolph, *et al.*, 1993). The bulk of the state's coal is produced by its larger ng firms, most of which maintain operations in other states as well as Virginia.

Virginia is considered to be a high production cost state. According to U.S. Energy Information Administration (EIA), the average 1991 mine price for coals produced in Virginia was $27.55 per ton, vs. $21.03 per ton for the nation as a whole (U.S. EIA, 1993c). Reasons for Virginia's high costs of production include thin seams, relative to other coal producing areas; a steep terrain in the state's coalfield region; and a reserve base which has been depleted by past mining. Virginia's producers depend upon the ability of the state's high quality coal reserves to draw price premiums in the market place, and overcome high costs of mining.

Markets Served by Virginia's Coal Producers

Virginia's coal-mining industry serves two distinct end-use markets: metallurgical and steam (Table 1).

Table 1. Virginia Coal Production and Major Markets Served

	1985	1990	1992
Total Production (million tons)	42.4	46.5	42.6
Major Markets Served[1]			
Domestic + Canada:			
Electric Utilities	40%	37%	33%
Coking	14%	17%	20%
Other (mostly industry)	21%	8%	9%
Overseas:			
Metallurgical	21%	36%	34%
Steam	4%	2%	3%

[1]Percent of total production to each market.

Source: VCCER analysis of U.S. EIA figures: 1985 figures estimated by Hibbard (1986), 1992 market shares do not add to 100%, due to rounding.

The metallurgical market purchases coals used for coking, an intermediate step in the production of steel. This market is very selective with respect to coal characteristics, and generally pays a premium price, about one-third more at the mine than the steam market (Table 2). Good coking coals have a high Btu content, are low in sulfur and ash, with volatile matter within a well-defined range. Over 50 percent of the coal mined in Virginia in recent years has been sold for coking purposes.

Table 2. Representative Prices (July, 1993) for Central Appalachian Coals, As Affected by Quality Characteristics ($/ton)

COAL QUALITY	PRICE	COAL QUALITY	PRICE
Steam Market:		**Metallurgical Market:**	
< 0.75 % S, 11,500 Btu/lb	$25.50	< 21% Volatiles, < 6% Ash	$34.00
< 0.75 % S, 12,500 Btu/lb	27.50	21-30% Volatiles, < 6% Ash	36.00
0.76 - 1.5 % S, 12,500 Btu/lb	24.00	21-30% Volatiles, 6-7% Ash	34.00

Source: *Coal Outlook* (Pasha Publications).

Electric utilities are the primary purchasers in the steam coal market. A variety of industrial users are also active in the steam coal market. Due to clean air concerns and boiler requirements, steam coal purchasers are also very selective with respect to coal quality.

The best steam coals are low in ash and sulfur and have a high Btu content. Metallurgical grade coals can generally be marketed as high-quality steam coals. Virginia's high-Btu, low-sulfur coal is well suited to steam markets where the quality of air emissions is a concern.

In both the steam and metallurgical markets, coal quality characteristics other than volatiles, ash, sulfur, and energy content are important to coal purchasers. The way in which certain coals coke and/or burn is sometimes uniquely suited to a specific facility. Thus, purchasers will seek to obtain those coals which they know to be suited to their intended use.

The export market has been an important outlet for Virginia's coal producers for many years. In 1992, 37 percent of the coal produced in Virginia was sold to overseas buyers (Figure 1), and more than 80 percent of that tonnage was metallurgical grade.

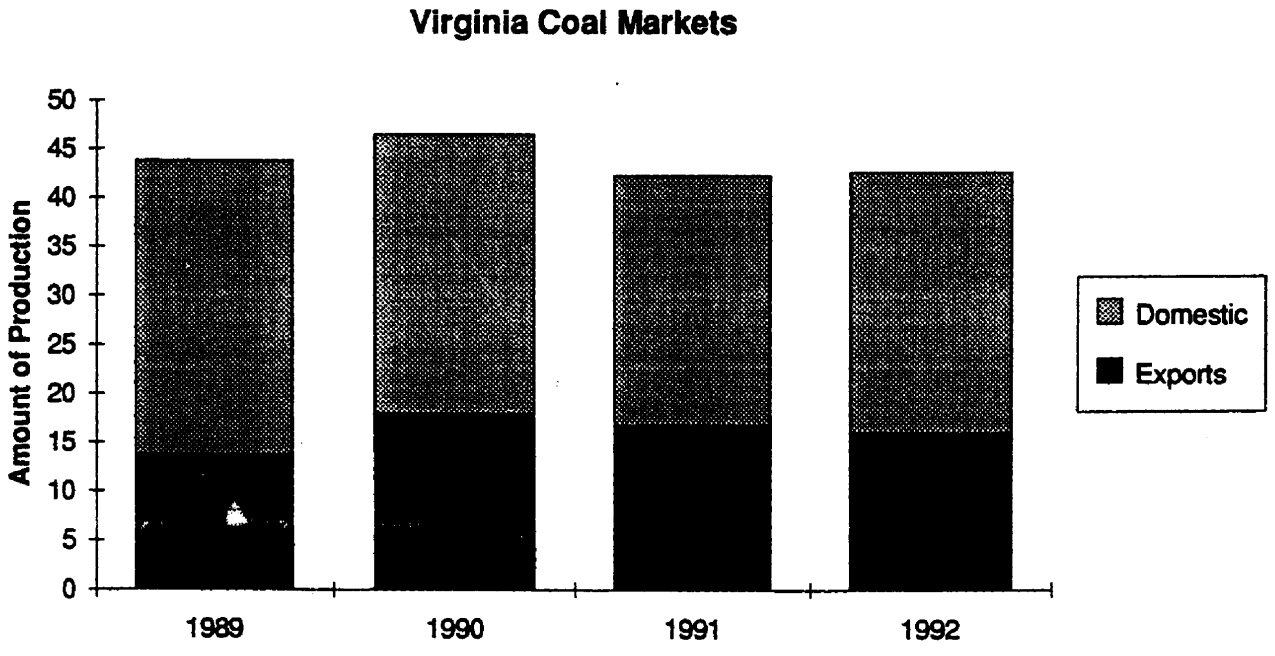


Figure 1. **Virginia Coal Sales to Domestic (including Canadian) and Overseas Export Markets, 1989 - 1992**

Virginia's Coal Exports

Virtually all of Virginia's overseas exports are transported by rail from the southwest coalfields through the state, and shipped from the Port of Hampton Roads. In recent years, coals produced in Virginia have been responsible for approximately 30 percent of the coal exports through Hampton Roads (Table 3), with production from the eastern Kentucky and southern West Virginia coalfields making up the majority of the Virginia port's export volume.

Table 3. Hampton Roads Exports, Virginia Coal Production and Exports, 1989-1992

	1989	1990	1991	1992
Hampton Roads:				
Coal exports shipped (10^6 Tons)	49.3	55.2	57.7	52.9
Metallurgical coal (% of total)	85%	82%	80%	81%
Virginia:				
Production (10^6 Tons)	43.8	46.5	42.3	42.6
Overseas exports (10^6 Tons)	13.7	17.9	16.7	15.9
Exports as % of Production	31%	38%	39%	37%
Virginia coal as percent of Hampton Roads exports	28%	32%	29%	30%

Source: Virginia production from VDMME, Virginia exports from U.S. EIA, Hampton Roads exports from Virginia Maritime Association and *Coal Outlook.*

Hampton Roads exports greater quantities of coal than any other U.S. port. In 1992, coal shipments through Hampton Roads were responsible for 52 percent of U.S. coal exports (Tables 4 and 5; Figures 2 and 3). Major markets include western Europe (60 percent of metallurgical coal and 67 percent of the total Hampton Roads exports), Japan (10% of total exports) and Brazil (9%) (Tables 4 and 5; Figures 4 and 5). World-wide demand for central Appalachia's wide high-grade metallurgical coal reserves is a major factor responsible for Hampton Roads export volumes. Coal shipped through Hampton Roads in 1992 was a source of $2.3 billion in U.S. export earnings.

Precise figures for overseas exports of coal produced in Virginia mines have been available only since 1989. Prior to that date, Virginia mined exports could only be estimated. Data since 1989 show that Virginia coal exports, as a percentage of total coal moving through the Port of Hampton Roads, have remained constant. In terms of total tonnages, however, exports from Virginia and total exports through the Hampton Roads are both down from peaks in 1990, a record year for Virginia coal exports, and 1991, a record year for the Port of Hampton Roads (Table 3). Virginia Maritime Association figures for coal moved through Hampton Roads during 1993 show a decline of 28 percent from 1992 figures.

Table 4. U.S. Coal Exports to Major Markets, by Customs District (Point of Shipment), 1992 (million short tons)

Destination	Balti-more	Hampton Roads	Mobile	New Orleans	L.A.- Long Beach	Other	Total
				- - - METALLURGICAL - - -			
North America	<0.1.	-	<0.1	-	-	4.9	4.9
South America	0.6	4.6	0.2	1.0	-	0.1	6.5
Western Europe	0.3	26.2	1.2	0.5	-	0.2	31.4
Eastern Europe	1.1	0.5	0.2	-	-	0.2	2.0
Far East	0.4	8.4	2.7	1.0	-	-	12.5
Other	0.2	3.6	1.4	-	-	-	2.1
Total	2.6	43.3	5.7	2.5	-	5.3	59.4
				- - - STEAM - - -			
North America	<0.1	-	-	<0.1	-	9.8	9.9
South America	<0.1	<0.1	-	0.1	-	-	0.2
Western Europe	5.6	9.7	0.4	7.4	-	0.5	23.7
Eastern Europe	-	-	-	<0.1	-	-	<0.1
Far East	0.3	<0.1	0.1	3.1	2.7	0.9	7.2
Other	0.8	0.2	0.6	0.3	-	-	1.5
Total	6.7	9.9	1.1	10.9	2.7	11.2	42.5

Source: National Coal Association (1993); Customs District "Other" includes inland freight shipments to Canada. Some totals do not add due to rounding.

Figure 2

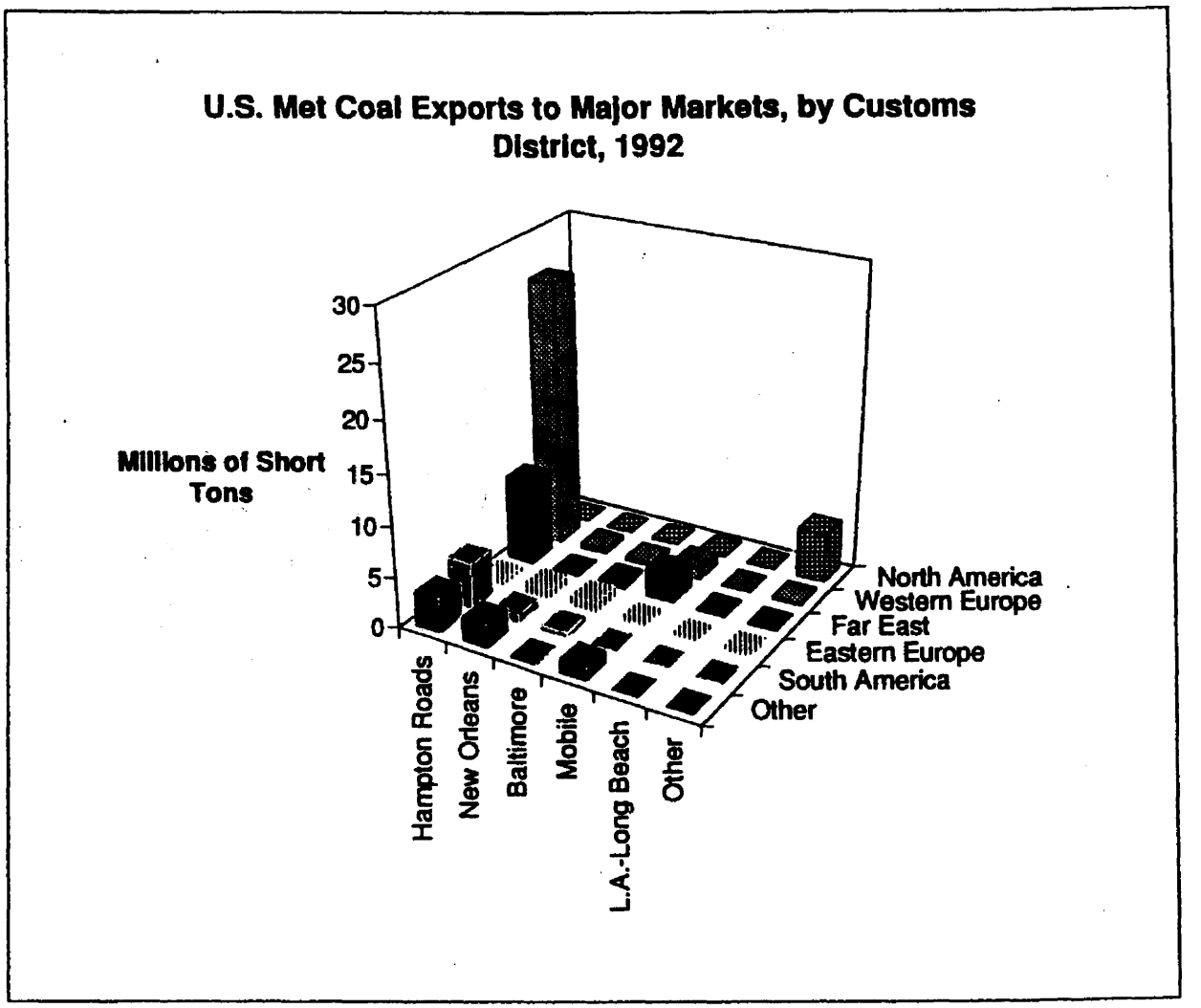

U.S. Met Coal Exports to Major Markets, by Customs District, 1992
Millions of Short Tons
30
25
20
15
10
5
0
Hampton Roads
New Orleans
Baltimore
Mobile
L.A.-Long Beach
Other
North America
Western Europe
Far East
Eastern Europe
South America
Other

Figure 3

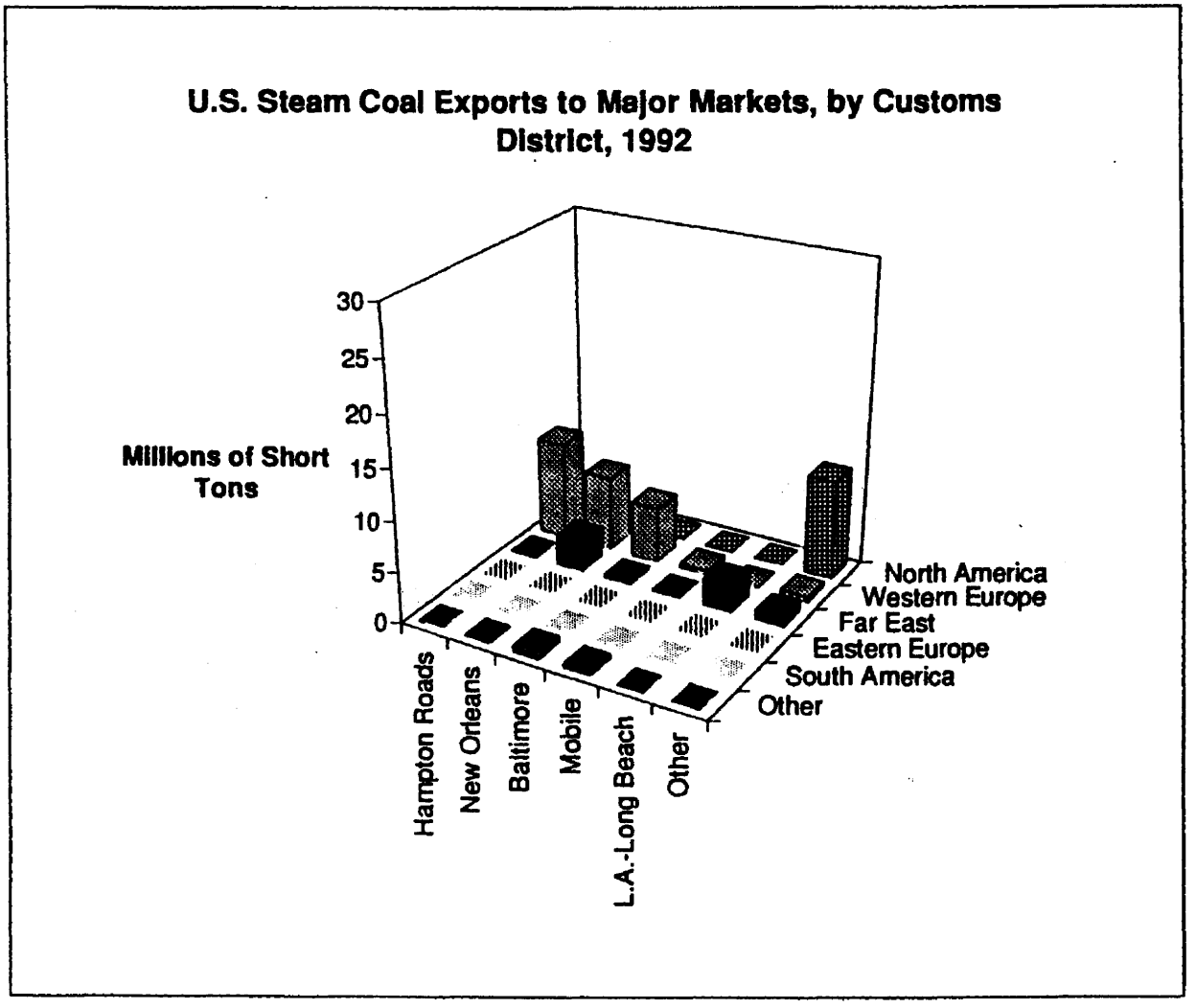
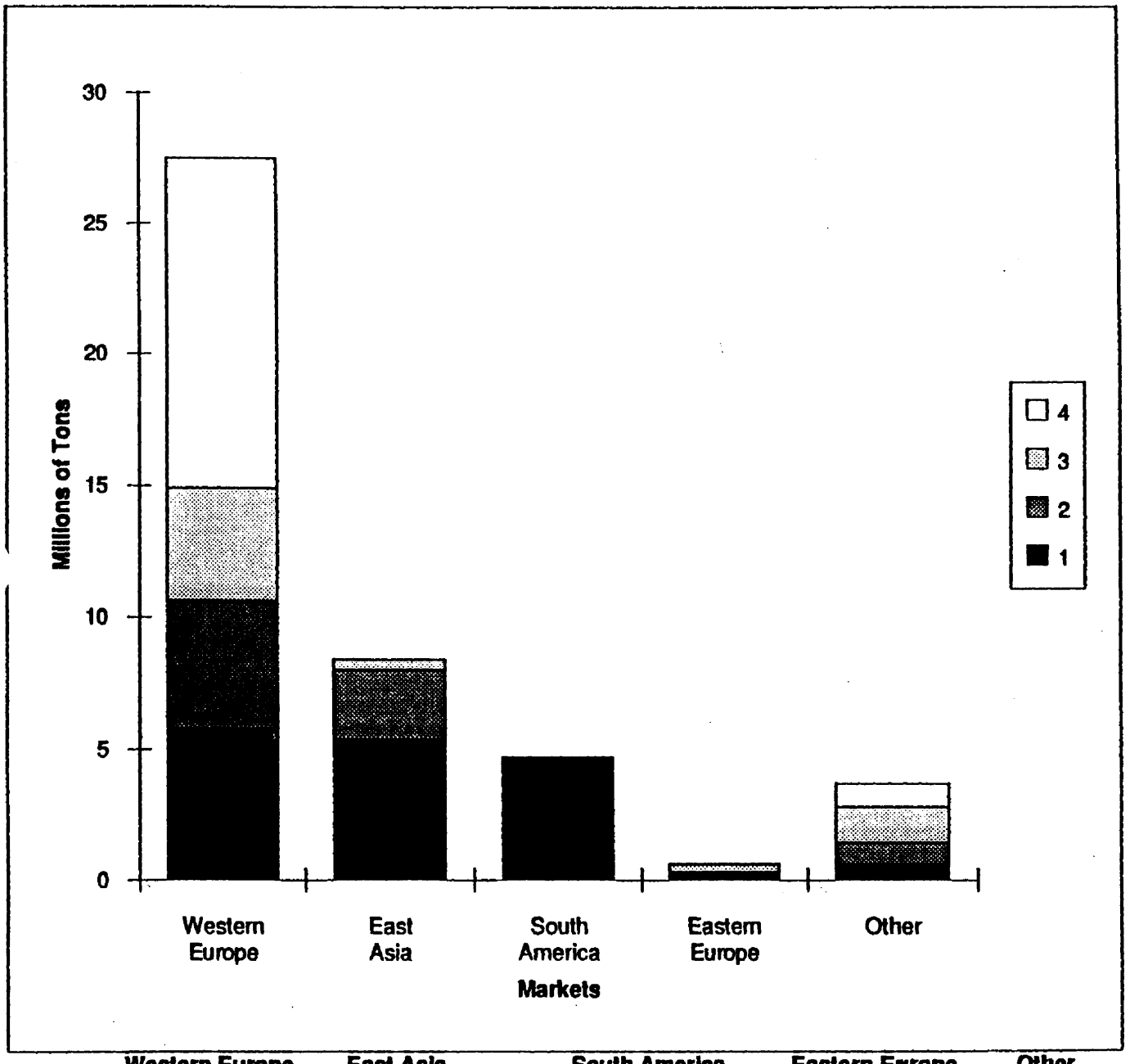

U.S. Steam Coal Exports to Major Markets, by Customs District, 1992
Millions of Short Tons
30
25
20
15
10
5
0
Hampton Roads
New Orleans
Baltimore
Mobile
L.A.-Long Beach
Other
North America
Western Europe
Far East
Eastern Europe
South America
Other

Figure 4

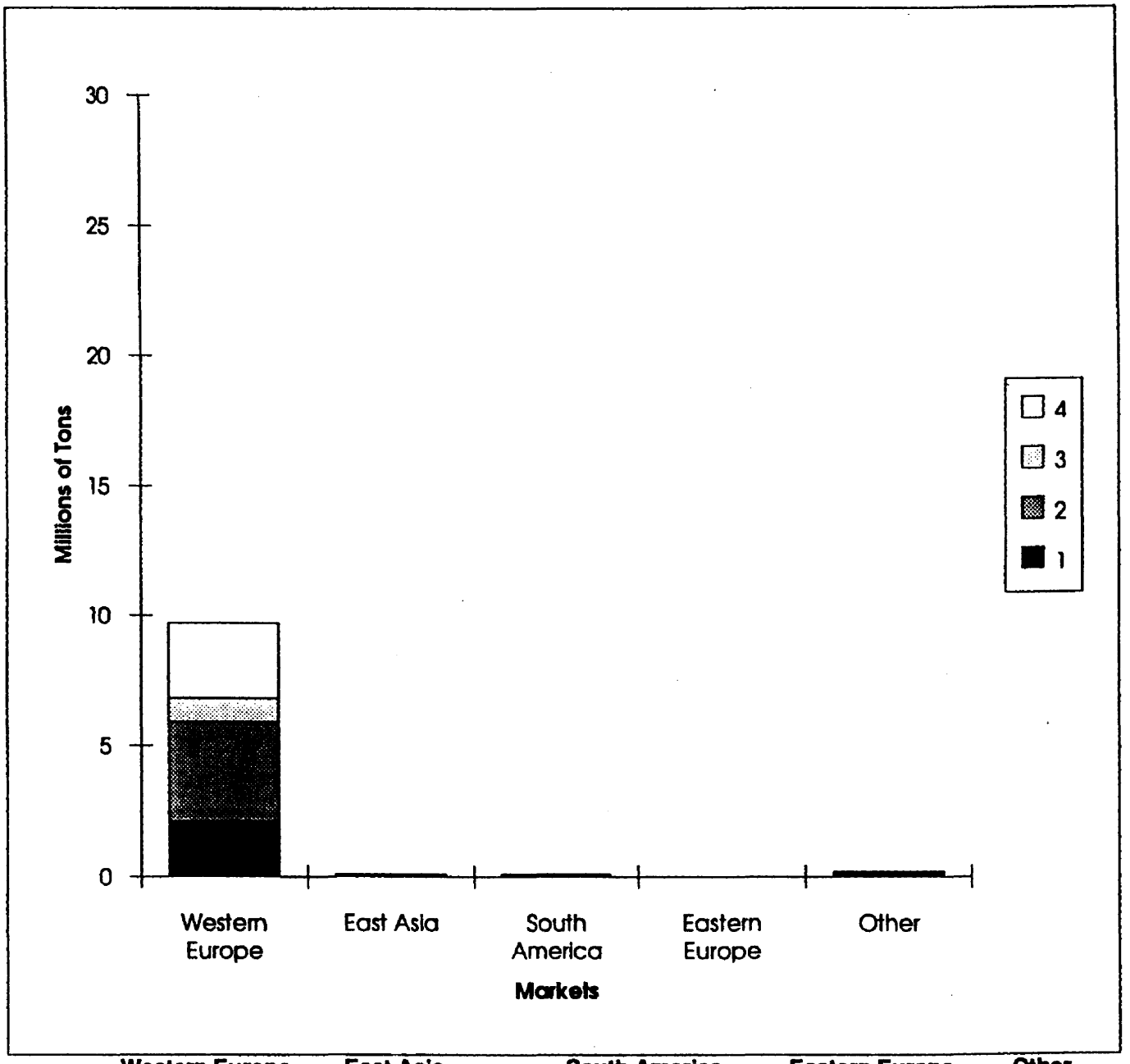
Hampton Roads Metallurgical Coal Exports to Major Markets, 1992



Western Europe	East Asia	South America	Eastern Europe	Other
1=Italy	1=Japan	1=Brazil	1=Bulgaria	1=Algeria
2=Netherlands	2=Korea	2=Other	2=Romania	2=Egypt
3=France	3=Other		3=Yugoslavia	3=Turkey
4=Other			4=Other	4=Other

Figure 5

Hampton Roads Steam Coal Exports to Major Markets, 1992



Western Europe	East Asia	South America	Eastern Europe	Other
1=Italy	1=Japan	1=Brazil	1=Bulgaria	1=Algeria
2=Netherlands	2=Korea	2=Other	2=Romania	2=Egypt
3=France	3=Other		3=Yugoslavia	3=Turkey
4=Other			4=Other	4=Other

Table 5. **Hampton Roads and U.S. Coal Exports to Major Markets, 1992 (million short tons, and percent market share)**

	- - METALLURGICAL - -				- - STEAM - -			
	Hampton Roads		U.S.		Hampton Roads		U.S.	
	(10^6t)	(%)	(10^6t)	(%)	(10^6t)	(%)	(10^6t)	(%)
North America	-		**4.9**		-		**9.8**	
Canada	-		4.9	100	-		9.8	100
Other	-		<0.1		-		0.1	
					-		9.9	
South America	4.6		**6.5**		**0.1**		**0.2**	
Brazil	4.6	38	6.2	51	<0.1		0.2	61
Other	<0.1		0.4		-		<0.1	
Western Europe	**26.1**	64	**29.2**		**9.7**		**23.6**	
Belgium/Lux	4.1		5.1	80	0.7	7	2.0	21
Denmark	-	52	-		0.4	3	3.8	28
France	4.3	13	4.3	52	0.9	6	3.8	24
Germany	0.2	73	0.2	13	0.2	1	0.7	5
Italy	5.8	92	6.2	78	2.1	18	3.2	27
Netherlands	4.8		4.8	92	3.8	37	4.3	42
Portugal	<0.1		0.1	26	0.7	15	1.3	29
Spain	2.8	58	2.8	58	0.2	2	1.7	16
Sweden	1.2	71	1.2	71	-		-	
U.K.	2.9	31	4.2	45	0.5	4	1.5	11
Other	<0.1		0.3		0.2		1.3	
Eastern Europe	**0.5**		**2.1**		-		**<0.1**	
Bulgaria	0.2		0.6		-		-	
Romania	<0.1		0.8		-		-	
Yugoslavia	0.3		.7		-		<0.1	
Other	-		<0.1		-		-	
East Asia	**8.4**		**12.4**		**<0.1**		**7.1**	
Japan	5.4	7	9.4	12	<0.1		2.8	7
Korea	2.6	15	2.6	15	-		0.7	4
Other	0.4		0.4		-		3.6	
Other	**3.7**		**9.2**		**<0.1**		**1.7**	
Algeria	0.6		0.6		-		-	
Egypt	0.8		0.8		-		-	
Turkey	1.4	36	2.0	51	-		-	
Other	0.9		5.8		<0.1		1.7	
Total	**43.3**		**59.4**		**9.9**		**42.5**	

Source: Export shipments from National Coal Association (1993). Market shares calculated based on OECD/IEA (1993). Some totals may not add due to rounding. Some market shares purposefully omitted due to data inadequacies. Data represent shipments to initial destination only, do not account for transhipments to secondary point of use.

The Virginia Coal Industry's Exporting Firms

The majority of Virginia mined coal exports are produced by the state's largest coal mining firms (Tables 6 and 7).[1] These firms all produce coal from operations in other eastern states as well as Virginia. Virginia mines are operated by these firms as one component of their central Appalachian production capacity.

Table 6. Coal Exports Shipped Through Hampton Roads by Producers with Virginia Operations, 1990-1992, and First 8 Months, 1993 (million short tons)

Producer	1990	1991	1992	1993
Amvest	<0.1	0.2	0.2	<0.1
Coastal	0.6	0.5	0.2	0
Consolidation	4.8	4.0	3.0	1.8
Island Creek	5.6	5.5	5.0	2.6
Koch Carbon	0.6	0.6	0.3	<0.1
MAPCO	2.4	2.3	2.1	1.2
Pittston	7.1	8.4	8.6	5.1
Sun	<0.1	0.1	0.1	0
United	2.0	2.5	0.9	0.2
Westmoreland	4.5	5.2	4.9	1.8

Source: *Coal Outlook* (Pasha Publications).

Note: Consol purchased Island Creek in 1993. United figures include exports from Dal-Tex Coal prior to sale in 1992. Figures include coal purchases for export, as well as company production.

Pittston Coal is the largest U.S. coal exporter, and the largest U.S. exporter of metallurgical grade coals. Pittston's Virginia operations, especially its Clinchfield subsidiary, are important sources for its metallurgical grade export coals.

[1]The information in this section was drawn from Fieldston (1993) and MacLean-Hunter Publications (1992 and 1993), and from discussions with company sources.

Table 7. **1991 Production and Export Data for Virginia Coal Producers, Virginia Operations and Eastern United States Operations**

Producer	Virginia Production	Eastern Production	Eastern Exports	Eastern Exports	Other Eastern Operations
	(— Millions of Short Tons—)			(% Met)	
Amvest	2.8	4.4	0.2	100%	WV
Coastal	2.2	7	0.6	> 90%	KY, WV
Consolidation	2.6	~50	6.6	~50%	O, PA, TN, WV
Island Creek	6.0	20	9.0	~90%	KY, WV
Koch Carbon	N/A	N/A	> 0.5	~90%	KY
MAPCO	2.2	14	3.9	~85%	IL, IN, KY, MD
Pittston	9.5	15	10.2	> 90%	KY, WV
Sun	2.2	10	> 0.1	N/A	KY
United	(est) 6	7	0.5	> 90%	KY, WV
Westmoreland	3.4	12	4.8	~60%	KY, WV

Source: Fieldston Publications (1993), MacLean-Hunter (1993), Randolph, *et al.* (1992), company reports.

Notes: Figures include company-owned and contracted production: intended to represent relative magnitudes, not precise quantities. United production figures for 1990. All United figures exclude Dal-Tex Coal (WV) operation, which was sold in 1992.

Consolidation Coal (Consol) is the nation's second largest coal producer. Consol's 1993 purchase of Island Creek will allow the company to rival, if not surpass, Pittston as Virginia's largest coal producer. Consol is a major U.S. steam coal producer. Most of this company's Island Creek's non-Virginia mines produce coal for the domestic steam markets. The majority of Consol's steam coal exports are produced in northern Appalachia and shipped out of Baltimore.

Virginia capacity in the Pocahontas #3 seam has been important to both Pittston Coal's and Consol's capacities to produce metallurgical grade coals for export.

MAPCO, Coastal, and Sun are mainly steam coal producers whose primary metallurgical grade production capacity is located in Virginia. MAPCO's Race Fork and Permac subsidiaries are located in Buchanan County, and produce primarily metallurgical grade coals, largely for export. Sun's Jewell Smokeless facility, in Buchanan County, represents its only significant metallurgical grade production capacity. Coastal's Virginia Iron, Coal, and Coke (VICC) facility in Wise County, although primarily a steam coal producer, was the source of most of that company's 1991 metallurgical grade export coals.

Although Westmoreland Coal is a major player in the export markets, its Virginia operations produce primarily steam coals for domestic markets. Amvest operates Glamorgan Coal (Wise County) and Powell Mountain Coal (Lee County) in Virginia. Powell Mountain produces primarily steam coals, while Glamorgan produces for both markets. Neither Powell Mountain Coal nor Glamorgan Coal are major exporters.

Koch Carbon is a metallurgical coal producer operating in Virginia, through its Koch Raven facility in Buchanan County. United Coal's Wellmore facility (Buchanan County) was that company's major source of metallurgical grade exports in 1991. Wellmore also produces coal for the steam market.

Importance of Coal Exports to Virginia's Economy

Coal exports make two major contributions to economic activity within the state:

1. Coal Production: 15.9 million tons of coal produced in Virginia were sold on overseas markets in 1992. This coal production supported jobs in mines, processing facilities, and administrative offices ("direct economic impacts"). Coal production also caused other economic impacts, termed here as indirect. These indirect economic impacts include jobs in firms supplying coal mining companies with materials, supplies, and equipment; and jobs in businesses supported by mining-firm employee wage expenditures.

2. Coal Transportation: Coal mined in Virginia for export through Hampton Roads is transported by rail through the state, transferred to vessels, and shipped out of that port. All major rail transport routes from the central Appalachian coalfields of Kentucky and West Virginia also pass through Virginia. Like coal mining, coal transportation expenditures have both direct and indirect economic impacts.

The figures of Table 8 estimate the economic contributions of coal exports to Virginia's economy in 1992. These impacts are estimated at approximately $2.4 billion in total economic activity, 23,000 jobs, and $800 million in wages. These estimates consider both direct and indirect impacts of coals mined in Virginia for sale in overseas markets, and transportation of coals mined in Virginia, West Virginia, and Kentucky for overseas export through the state to the Port of Hampton Roads. The estimates are approximate as they are based on multipliers from an earlier study using 1990 data (Zipper, *et al.*, 1992).

The estimates of Table 8 indicate Virginia mining activity to be responsible for approximately one-third of the overall economic impacts of coal exports from the state, while transportation and port-related activities are responsible for the remaining two-thirds. Mining and transportation of Virginia origin export coals appear to be responsible for slightly more than one-half of the total economic impacts, whereas transportation of coals mined out-of-state to the Port of Hampton Roads are responsible for approximately 45 percent of the total impacts.

Table 8. **Estimated Economic Impacts of Coal Exports from Virginia, 1992 and Multipliers Used to Derive Those Estimates**

	JOBS	PAYROLL	TOTAL ECONOMIC ACTIVITY
Multipliers[1]		(--per million tons--)	
Production	489.7	$15.118M	$48.731M
Rail Transport[2]	304.5	11.622M	29.181M
Ship from Port	29.9	0.829M	5.843M
Economic Impact Estimates			
Virginia Production (15,893,000 Tons)	(Total)	($10^6)	($10^6)
Production	7,783	240.3	774.5
Rail Transport	4,839	184.7	463.8
Ship from Port	475	13.2	92.9
Total	13,097	438.2	1331.2
Other Coal (37,040,000 Tons)[3]			
Rail Transport	9,023	344.4	864.7
Ship from Port	1,107	30.7	216.4
Total	10,130	375.1	1,081.1
Total Impacts	23,227	813.3	2,412.3

[1]Derived from results of study conducted by Zipper, et al. (1992); based on 1990 data.

[2]From Virginia. Non-Virginia production transport impacts calculated at 80% of these figures, to account for dispatch and gathering activity being conducted out-of-state.

[3]Primarily production from southern West Virginia and eastern Kentucky.

CHAPTER II -- FINDINGS

World Coal Trade

A number of countries participate in world coal markets (Table 9; Figure 6). Australia and the U.S. are the world's number 1 and 2 export coal suppliers. Together, these two countries were the source of over 50 percent of world coal exports in 1992. Unlike other market participants, both are major suppliers of both metallurgical and steam coals. Because metallurgical grade coal reserves are limited in extent, relative to reserves of coals with qualities suitable for the steam market, world metallurgical coal markets have fewer major players than steam coal markets. In 1992, Australia and the U.S. originated 72 percent of the world metallurgical coal trade, but only 41 percent of the world steam coal trade. A number of the players in the steam coal market (including China, Indonesia, Colombia, and South Africa) are expanding production and export capacity.

Table 10 lists estimates of recoverable coal reserves in the world's major exporting countries, and compares those reserve estimates to current production levels by calculating a Reserves/Production (R/P) ratio to serve as an indicator of a region's coal reserves to sustain current production levels. The figures in Table 10 indicate that coal reserves in most of the world's major exporting countries are capable of supporting current or expanded production and export levels for a considerable time to come. Central Appalachian reserves in southwestern Virginia and eastern Kentucky, having been heavily mined for over 100 years, are likely to show the effects of depletion long before most of our major international competitors. Reserve data specific to southern West Virginia are not available.

Estimates of China's recoverable reserves (Table 10) may underestimate actual reserves by a considerable margin. Reserves are only classified as recoverable when the results of geologic exploration are able to demonstrate their existence with a defined level of certainty (Milici, *et al.*, 1991). There has been a lack of formal geologic exploration of China's potential reserves outside of current mining areas. Actual Chinese reserves are believed to exceed the recoverable reserves estimate of Table 10 by at least a factor of ten (OECD/IEA, 1993).

Most metallurgical grade coals are classed within the "Lo S, Hi Btu" category of Table 10. Data within the table show that Virginia, eastern Kentucky, and West Virginia contain 85 percent of these highest grade coal reserves known to exist within the U.S. The majority of these reserves, however, are located in Kentucky and West Virginia. A lack of reserve quality data for other countries makes it difficult to determine how central Appalachia's metallurgical grade coal producers' ability to sustain current production levels compares with that of some international competitors.

Table 9. 1992 Coal Exports by Top Exporting Countries (million short tons)

Exporting Country	Metallurgical	Steam	Total
Australia	74.9	64.3	139.1
United States	59.4	43.1	102.5
South Africa	4.3	50.9	55.2
Canada	24.0	5.5	29.5
Former USSR	7.4	20.6	28.0
China	4.1	17.5	21.6
Poland	6.1	15.2	21.3
Columbia	0.5	16.0	16.5
Indonesia	1.2	14.8	16.0

Source: OECD/IEA (1993. Converted from metric ton figures). Some totals do not add, due to rounding.

Figure 6

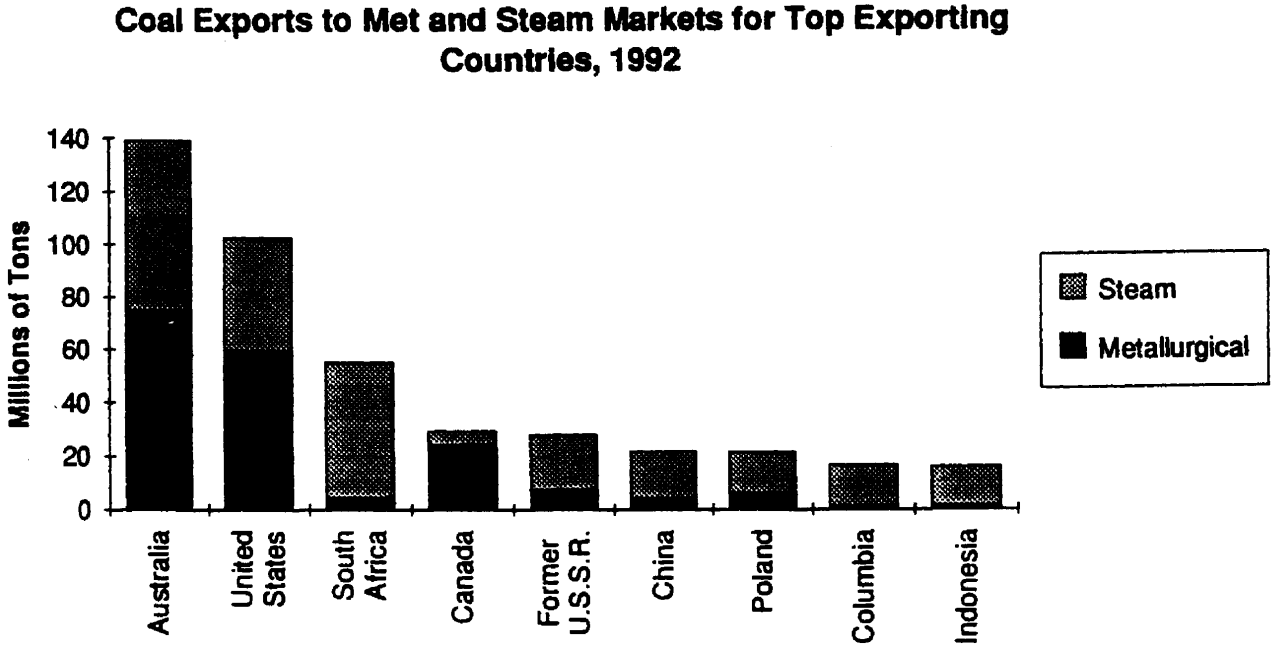


Table 10. **Hard Coal Recoverable Reserve Estimates, Production, and Reserves Production Ratios; Major World Coal Producers and Appalachian States**

Region	1992 Production (P)	1/1/92 RESERVES Total (R)	Lo S, Hi Btu	R/P Ratio
	(10^6 t)	(10^9 t)	(10^9 t)	(years)
U.S.	916.5	122,337	10.7	134
Former USSR	515.4	113,540	N/A	220
China	1,207.0	66,147	"	55
Austria	197.2	49,602	"	252
Germany	79.6	26,199	"	329
India	262.6	66,328	"	253
South Africa	192.9	60,579	"	314
Poland	145.1	32,310	"	223
Columbia	25.9	4,620	"	178
United Kingdom	96.3	3,425	"	36
Canada	35.6	4,881	"	137
Czechoslovakia	19.5	2,019	"	104
Mexico	6.1	1,368	"	224
Indonesia	22.6	1,030	"	46
West Virginia	164.9	20.1	6.6	122
Kentucky	161.3	14.4	1.8	89
Virginia	42.6	1.5	0.7	35
East Kentucky	119.8	5.0	1.8	41

Notes: "Hard Coal" includes anthracite and bituminous. Eastern Kentucky figures included in Kentucky figures; no separate figures for southern West Virginia available. "Lo S, Hi Btu" reserves are less than 1.2 lbs. SO_2 per million Btu (*i.e.*, Clean Air Act compliance-grade steam coals), and greater than 26 million Btu/ton.

Source: Calculated by VCCER from data contained in EIA (1992), EIA (1993e), NCA (1993), and OECD/IEA (1993).

Metallurgical Coal

The data of Table 11 summarize 1992 world coal trade in metallurgical markets. The major exporting countries have systems in place to document tonnages and destinations for export coal shipments. However, data for some of the smaller market participants are incomplete. Other data problems include accounting for shipments in transit; coal re-shipped from an initial destination to an end-user in another country; and lack of complete data from countries exporting small tonnages. Therefore, although the data in Table 11 provide an accurate picture of major world coal flows, they may differ in detail from data found in other sources.

Table 11. Summary of World Metallurgical Coal Trade, 1992 (million short tons)

	- - - MAJOR MARKETS - - -						
	North Am.	South Am.	West. Europe	East. Europe	East. Asia	Other	Total
Exports from:							
Australia	-	3.8	12.1	1.3	45.8	11.9	74.9
U.S.	4.9	6.6	29.3	2.1	12.5	4.1	59.4
South Africa	-	-	0.2	-	4.1	-	4.3
Canada	0.3	1.8	2.6	-	19.0	0.2	24.0
Former USSR	-	-	0.7	3.4	3.3	-	6.1
China	-	-	0.1	0.2	3.8	-	4.1
Poland	-	1.5	2.6	1.8	-	0.1	6.1
Columbia	-	0.1	-	-	0.2	-	0.3
Indonesia	-	-	-	-	1.2	-	1.2
Other	0.1	-	-	2.0	-	-	2.1
Imports by/ Total trade	5.4	14.0	48.5	13.0	100	N/A	185

Sources: OECD/IEA (1993), National Coal Association (1993), International Coal Report. Data for "Other" markets and exporters are incomplete. Export totals do not equal imports/total trade due to data inadequacies and coals in transit. Some figures estimated from incomplete data by VCCER.

Suppliers

The U.S., Australia, and Canada are the world's primary metallurgical coal suppliers. Canada's metallurgical grade exports are mined mainly in western Canada and shipped through west coast ports.

Over 70 percent of the U.S. metallurgical grade export coals have been shipped through the Port of Hampton Roads in recent years, because of that port's proximity to central Appalachian coal reserves. While central Appalachian steam coals are often shipped by barge through the Mississippi system to the Port of New Orleans, most metallurgical grade coals are

moved by rail due to the tendency of barged coal to absorb moisture and the coal quality requirements of metallurgical markets. Due to its proximity to the major U.S. metallurgical coal reserves, Hampton Roads is likely to remain as the U.S. primary port of metallurgical coal supply.

Extensive metallurgical grade coal reserves are believed to occur in Australia. Approximately 40 percent of the country's total reserves are believed to be of coking quality (OECD/IEA, 1993). Three important steam coal suppliers -- Colombia, Indonesia, and South Africa -- are not important metallurgical grade coal suppliers at present. In the case of Colombia and Indonesia, this is believed to be due to a lack of reserve quantity. Approximately 2 percent of South Africa's coal reserves (or 1.2 billion tons classified as recoverable) are considered to be of metallurgical grade (OECD/IEA, 1992). South Africa's limited participation in metallurgical markets to date has been related, at least in part, to a desire to retain the highest quality reserves for domestic consumption due to national security considerations. Now that political changes are causing a relaxation of international sanctions against that country, there is a chance that South Africa could choose to increase metallurgical market participation.

Both the former USSR and China are believed to possess large quantities of metallurgical grade reserves, relative to current domestic and export requirements. China's major metallurgical grade reserves are believed to be located in the north central part of the country, in Shanxi and Shaanxi provinces. Metallurgical reserves in the former USSR are located both west and east of the Urals. At least 20 billion tons of metallurgical coal remain to be mined in the Donetsk basin, near the Black Sea. Little information is available on the extent of Poland's metallurgical coal reserves. In these regions, lack of capital to support development of mine capacity and transportation infrastructure are factors which limit international sales.

Markets

Primary metallurgical markets are the Far East, Europe, and Brazil. Brazil is the only major South American metallurgical grade coal importer. In 1991, 51 percent of that country's metallurgical import requirements were supplied by the U.S., with Hampton Roads acting as the primary U.S. port of supply (Table 4, page 9). Australia, Canada, and Poland also were able to supply significant quantities to the Brazilian market.

The U.S. also holds a substantial share (60 percent) of the west European market, due in part to ocean transportation cost advantages over Australian and Canadian suppliers (Table 12; Figure 7).[2] Hampton Roads is the dominant U.S. port of metallurgical coal supply to the European marketplace. The U.S. currently holds a greater than 50 percent share in 5 of Europe's 6 largest metallurgical markets (Belgium, France, Italy, Netherlands, and Spain), each of which imported more than 4 million tons of metallurgical grade coals in 1992. The largest

[2]Note that the Table 12 "representative production cost estimate for central Appalachian coal is significantly less than the representative metallurgical coal prices of Table 2.

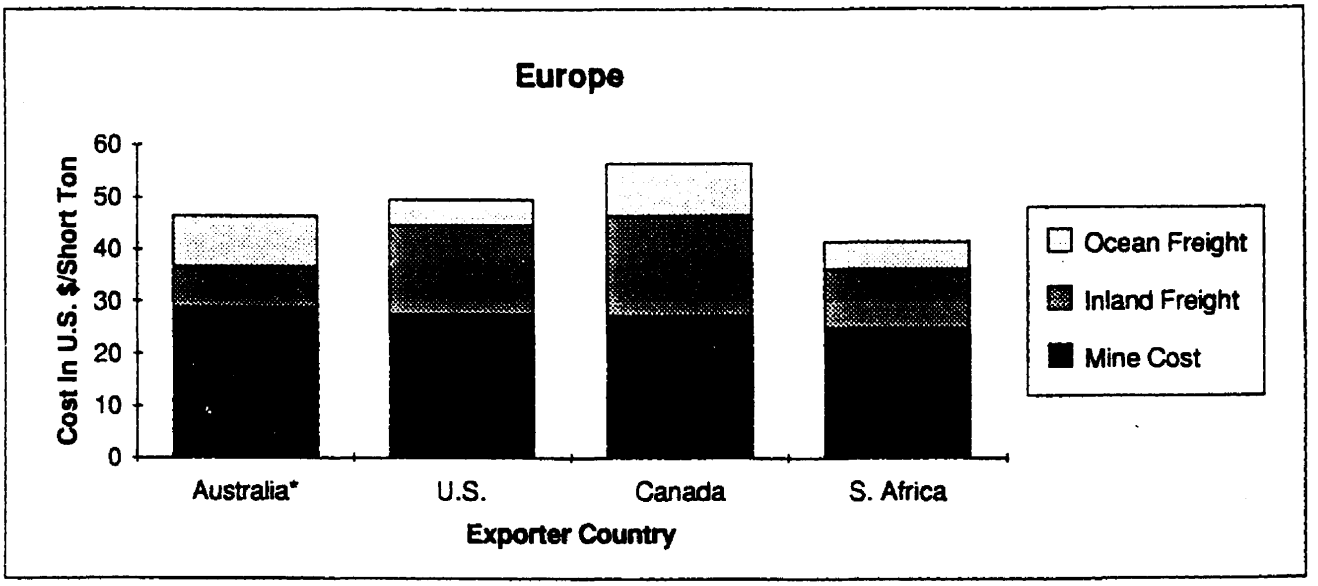
Table 12. Representative Costs of Metallurgical Coal Imports in Europe and Japan (US $/short ton)

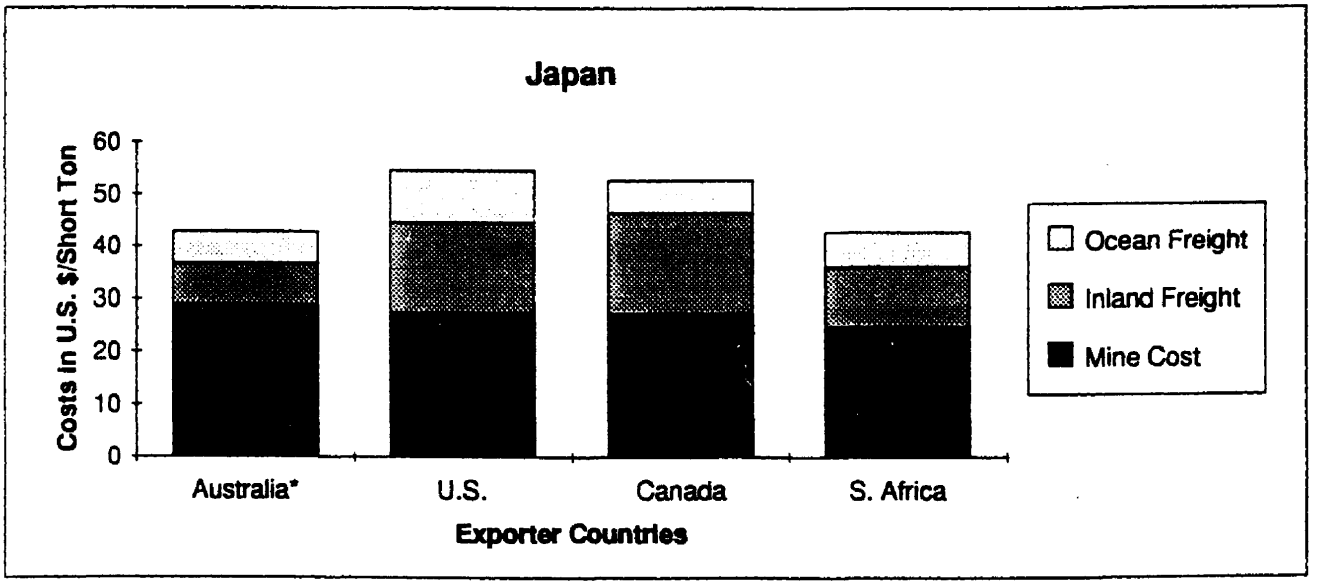
Exporter	Mine Cost	Inland Freight	JAPAN Ocean Freight	JAPAN Total	EUROPE Ocean Freight	EUROPE Total
Australia:						
Queensland	31.3	12.0	5.4	48.5	9.5	52.6
N.S. Wales	28.8	7.8	6.3	42.9	10.0	46.5
U.S.: Central Appalachia via Hampton Roads	27.4	17.2	10.0	54.6	5.0	49.6
W. Canada	27.2	19.2	6.3	52.8	10.0	56.4
S. Africa: Transvaal	24.8	11.3	6.8	42.9	5.4	41.5

Source: OECD/IEA, 1993, Table 6.12. Averaged and converted from $/metric-ton values. Totals may not add due to independent rounding. Mine costs include capital recovery; inland freight includes rail/barge transport, and loading at Port. Actual costs may vary from representative estimates, especially at individual mines.European metallurgical market where the U.S. does not hold a dominant market share is the U.K., where Australia is able to supply over 40 percent of import requirements.

Figure 7

Representative Costs of Met Coal Exporters to Europe and Japan





*Refers to N.S. Wales of Australia and the Central Appalacian Area Via N.O.

eastern European countries imported 13 million tons of metallurgical grade coals in 1992, about 25 percent of western Europe's international purchases. The primary metallurgical coal buyers in eastern Europe are Bulgaria, the former Czechoslovakia, Romania, and Hungary, while the primary suppliers have been the former USSR and Poland. East European coal trade statistics exemplify the disparity between import and export figures which can occur, due to coals in transit and other accounting difficulties. The U.S. supplied 2 million tons of metallurgical coals to eastern Europe in 1992, more than any other supplier from outside the immediate region.

The Far East is the world's largest metallurgical coal market, and Japan is the world's largest metallurgical importer, having purchased over 70 million tons in 1992. South Korea and Taiwan are also significant metallurgical importers. Together, these two countries imported 25 million tons in 1992.

U.S. suppliers have difficulty providing coal to Far Eastern markets at competitive prices, primarily due to ocean shipping cost disadvantages relative to both Australian and Canadian suppliers. The U.S. holds a Far Eastern market share of approximately 12 percent, in spite of cost disadvantages. One reason for the success of U.S. suppliers in these markets is believed to be the desire of buyers to retain a secure relationship with multiple suppliers. Also, during the Reagan Administration a "Gentleman's Agreement" for the purchase of U.S. coal by Japan was initiated. This agreement was entered into to offset the staggering U.S. trade deficit with Japan. This "Gentleman's Agreement" expired in 1992 and to date has not been renegotiated. The non-existence of this agreement may impact the future coal export market to Japan. According to the latest reports available, the U.S. trade deficit through October of 1993 is $113 billion. The U.S. trade deficit with Japan accounts for a full 44 percent of the U.S. trade deficit and the United States Department of Commerce projects that the 1993 trade deficit with Japan will be the largest in recorded history.

The region's primary coal suppliers at present are Australia and western Canada. China supplied 4 million tons of metallurgical coals to Far Eastern markets (Japan, South Korea, and North Korea) in 1992.

Projections

Table 13 contains U.S. EIA projections of world coal trade. This information was published in early 1993 and provides the most detailed projections currently available. However, according to EIA personnel, these projections have recently been revised downward, with the most significant revisions occurring for the period beyond the year 2000. In some cases, the new data for 2010 projections may be as much as 40 percent below the figures in Table 13. A major factor in the downward revision is the expectation of more rapid adoption of new steel making technologies than had previously been expected. The above information was obtained in discussion with EIA personnel. The revised projections are in the process of review and are not yet available for public release.

Table 13. U.S. DOE/EIA 1993 Projections of World Metallurgical Coal Trade and 1990 Reference (million short tons per year)

EXPORTERS	MET COAL TO EUROPE			MET COAL TO ASIA		
	1990	2000	2010	1990	2000	2010
Australia	14	33	38	48	51	50
United States	35	24	26	14	9	7
Former USSR	13	4	4	6	11	12
Canada	3	2	4	26	14	13
Other	8	7	6	5	6	3
Total	**74**	**70**	**78**	**100**	**90**	**86**
	MET COAL TO OTHER			**TOTAL MET EXPORTS**		
	1990	2000	2010	1990	2000	2010
Australia	2	10	10	63	93	99
United States	12	7	8	63	40	42
Former USSR	3	0	0	25	15	16
Canada	2	2	2	30	18	19
Other	0	2	4	25	15	12
Total	**18**	**20**	**25**	**205**	**181**	**189**

Note: Some totals do not add due to EIA use of balancing items, data inadequacies, and independent rounding. EIA estimates have been revised downward since publication of these figures, but new estimates are not yet available. See text.

Source: U.S. DOE/EIA, "Supplement to Energy Outlook 1993," Table 38.

The year 2000 metallurgical coal trade projections of Table 13 are similar to figures prepared by the Australian Bureau of Agricultural and Resource Economics, and exceed by 20 percent the expectations of London based WEFA Energy (OECD/IEA, 1993). All parties expect a slight decline from 1990- 92 world coal trade levels. Major factors in the expected decline are reductions in the growth rate of demand for steel, due to material substitutions; increased steel recycling; and the introduction of new steel making technologies which can utilize electrical energy and lower grade coals.

Aside from reduced trading volumes, other major trends observable in Table 13 are: projected declines of the U.S. share in all major markets; the decline of Canadian presence in Far Eastern markets; and the expansion of Australian exports to all major markets. Analysts expect Canadian exports to suffer due to increasing costs associated with transportation and difficult mining conditions. A major reason for Australia's expected gains is current and planned expansion of Australia's port capacities. At present, the throughput capabilities in Australian ports limit the amount of coal that country is able to move into international markets.

Expectations of increasing Australian market shares are based on presumed cost advantages due to favorable mining conditions (thick seams, close to the surface); the relatively low inland freight costs, which result from proximity of reserves to port facilities; and reduced shipping distances to Far Eastern markets relative to U.S. and Canadian suppliers.

EIA's 1993 projections show a relatively steady demand for metallurgical coal in Europe over the next decade. The U.S., however, is expected to lose market share to Australia.

The 1993 EIA projections of eastern Europe's metallurgical grade imports remain in the 13 to 15 million ton range through the year 2000 (NCC, 1993). However, exports from the former USSR and Poland to eastern Europe are expected to decline considerably during this decade, which may produce market opportunities for other suppliers.

The EIA 1993 projections showed the Far Eastern metallurgical coal market shrinking by about 10 percent over the decade prior to the year 2000, and U.S. shipments to the region shrinking by about 50 percent, to less than 10 million tons. EIA projections, however, did not show Chinese metallurgical coal exports to the Far East expanding beyond 1990's 1 million ton level, prior to the year 2000. This expectation may have been optimistic, from a U.S. standpoint, as the Chinese supplied 4 million tons of metallurgical coal to Far Eastern importers in 1992.

The only major metallurgical coal market projected by EIA (Table 13) to expand is South America. However, the U.S. is expected to lose a share of that market to Australia. South American producers (primarily Columbia, and also Venezuela) are expected to increase metallurgical coal production by approximately 4 million tons over the next two decades. This increased metallurgical coal production will be mainly for shipment to other South American markets.

Steam Coal

The data in Table 14 summarize world coal trade in steam coal. As with Table 11, only major exporters are represented, and exports by major exporters to a region do not total the imports by that region.

Table 14. Summary of World Steam Coal Trade, 1992 (million short tons)

	--- MAJOR MARKETS ---						
	North Am.	South Am.	West. Europe	East. Europe	East. Asia	Other	Total
Exports from:							
Australia	0.1	0.3	12.0	0.3	49.5	2.1	64.3
U.S.	10.2	0.4	23.8	0.1	7.1	1.5	43.1
South Africa	-	0.6	31.9	-	13.2	5.3	50.9
Canada	0.1	0.2	1.5	-	3.9	-	5.6
Former USSR	-	-	8.7	6.3	1.8	3.9	20.6
China	-	-	2.8	-	14.7	0.1	17.5
Poland	-	-	11.0	4.2	-	0.1	15.3
Columbia	-	0.4	13.1	-	0.1	2.5	16.2
Indonesia	0.5	-	2.4	-	13.2	0.1	16.2
Other	1.7	-	12.7	-	-	-	-
Imports by/ Total trade	12.5	1.8	119.9	10.8	103.4	N/A	249.7

Sources: OECD/IEA (1993), National Coal Association (1993), International Coal Report. Data for "Other" markets and exporters are incomplete. Export totals do not equal imports/total trade due to data inadequacies and coals in transit. Some figures estimated from incomplete data by VCCER.

The Appalachian region is the source of the majority of U.S. steam coal exports. New Orleans, Hampton Roads, and Baltimore are the three major U.S. ports of international steam coal supply (Table 5, page 14). Appalachian steam coal producers have a number of transportation options available for moving coal to export markets (Table 15). While Virginia producers have only one transportation option available for moving significant quantities of export coals, rail shipments to Hampton Roads, Kentucky and West Virginia producers located close to major waterways also have the option of moving the coal by barge to New Orleans. The lower reaches of the Kanawha River system carry barge traffic from southern West Virginia to the Ohio River, while the Ohio itself and its Monongahela tributary also provide barge transport access to some northern and central Appalachian producers. At current rates, producers located close to these rivers, are able to move coal to the docks without incurring substantial trucking costs. These coal producers can ship coal to New Orleans for less cost than Virginia producers, who must access Hampton Roads (Fieldston, 1993). This is one reason why the Port of New Orleans was the U.S. leader in steam coal exports in 1992.

Table 15. **Representative Coal Shipping Costs From Appalachian Areas to Major East Coast Port**

	Range
From Northern Appalachia:	
Rail to Baltimore	$12.50 - 16.30
Barge to New Orleans	$12.15 - 16.00
From Central Appalachia:	
Rail to Hampton Roads	$15.25 - 17.35
Truck/Barge to New Orleans	$12.65 - 16.00
From Southern Appalachia:	
Rail to Mobile	$13.90 - 14.45
Barge to Mobile	$ 6.50 - 7.55

Source: Fieldston Publications, 1993.

Suppliers

The world steam coal market totaled 250 million short tons in 1992, compared to the 185 million ton metallurgical market. Australia (26 percent of the total market in 1992), South Africa (20 percent), and the U.S. (17 percent) are the world market's major steam coal suppliers. In addition, the former USSR, Poland, China, Indonesia, and Colombia each exported more than 15 million tons in 1992. China, Australia, Indonesia, and South Africa are among the international suppliers planning mine capacity expansion in areas producing steam coals for export (OECD/IEA, 1993), while Australia and South Africa are currently expanding capacity at major export terminals.

Markets

Primary steam coal markets are western Europe and the Far East (Table 14). Eastern European countries also import significant quantities of steam coal, but the majority of these imports are supplied by Poland and the former USSR.

The U.S. holds only about a 20 percent share of the west European market. The major western European steam coal importers are France, Germany, Denmark, Italy, the Netherlands, Spain, and the United Kingdom. Each of these countries imported more than 10 million short tons in 1992. German and French imports each exceeded 15 million tons. Belgium could also be considered as a major importer, at 9 million tons in 1992.

In most of the western European countries, the U.S. market share is between 20 and 30 percent. The U.S. competes most effectively in the Netherlands and Britain, where the respective import market shares are on the order of 30 and 40 percent, and least effectively in Germany. Note that the (Table 4, page 9) data on exports to the Netherlands and Britain are misleading, because the Netherlands Port of Rotterdam acts as a transshipment point for U.S. exports to Britain and the National Coal Association (1993) data are based on U.S. Department of Commerce figures, which show only an initial destination.[3]

Hampton Roads shippers are able to supply at least half of U.S. direct shipments to the Netherlands and Italy. Together, steam coal shipments to these two destinations comprised 60 percent of the total steam coal supplied to the European market through Hampton Roads in 1992. Baltimore was the primary U.S. port of supply to Denmark and Ireland in 1992, while New Orleans shippers were the primary U.S. suppliers to France and Spain.

South Africa and the U.S. have been the principal steam coal suppliers to European markets in recent years, while Columbia and Australia have gained increased shares in this market. The representative cost figures of Table 16 and Figure 8 show that mining costs in South African and Australian mines are far below Appalachian mining costs. These cost savings are due to more favorable geologic conditions that exist in South Africa and Australia. Australian producers, however, suffer one disadvantage in some European markets. Some waterways (such as the Mediterranean) and ports are unable to accommodate the largest ocean going colliers. As an example, Australia was able to supply only about 5 percent of 1992 steam coal import requirements in both Italy and eastern Europe, while failing to establish any market presence whatsoever in Israel or Greece. In comparison, South African shippers do not suffer from any similar disadvantage.

The aggregated figures of Table 16 give a distorted picture of Columbian mining costs. One-half (*i.e.*, $18) of the $36 per ton "representative" Colombian mining cost figure in Table 16 is due to capital recovery. In July of 1992, a major portion of the debt burden at Colombia's principal coal exporting mine facility was recapitalized. Consequently, future financing costs of Colombian export mines are expected to be significantly less than those represented in Table 16 (OECD/IEA, 1993). Columbia is expected to participate in European steam coal markets as a low-cost supplier. Actual European steam coal import costs from Colombia averaged $43.40 per short ton in 1992, vs. $45.12 per ton for U.S. imports (OECD/IEA, 1993). In comparison, South African steam coal import prices in Europe were significantly lower, at $39 per ton.

East European countries purchased in excess of 10 million tons on international markets in 1992. Their primary suppliers, however, were the former USSR and Poland. Less than one million tons of steam coal were supplied to eastern Europe from producers outside of the immediate region.

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[3]Moya Phelleps, National Coal Association, Coal Exporters Association, Washington, D.C.

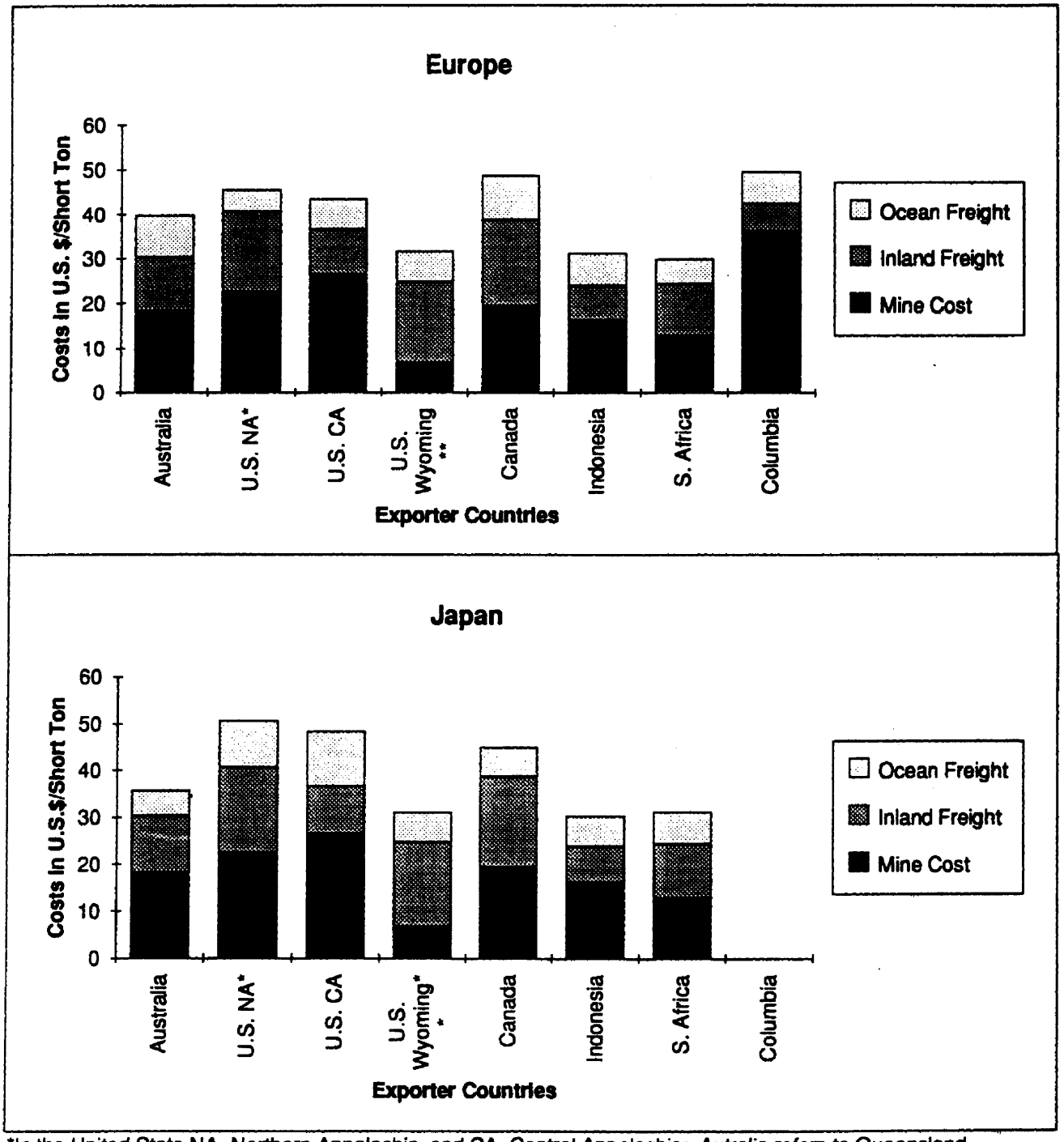
Table 16. **Representative Costs of Steam Coal Imports in Europe and Japan (U.S. $/short ton)**

			JAPAN		EUROPE	
	Mine Cost	Inland Freight	Ocean Freight	Total	Ocean Freight	Total
Australia						
Queensland	18.3	12.0	5.4	35.7	9.5	39.8
N.S. Wales	30.0	7.8	6.3	44.2	10.0	47.8
U.S.						
N. App. via H.R.	22.5	18.1	10.0	50.6	5.0	45.6
C. App. via N.O.	26.5	10.1	11.8	48.4	6.8	43.4
S. App. via Mobile	30.4	6.4	11.8	48.5	6.8	43.5
Wyoming:						
Rail to Gulf	6.8	18.0	-	-	6.8	31.6
Rail to Vancouver	6.8	17.6	6.3	30.8	-	-
W. Canada	19.5	19.2	6.3	45.1	10.0	48.7
S. Africa	12.9	11.5	6.8	31.2	5.4	29.8
Colombia	36.2	6.2	-	-	4.5	47.0
Indonesia	16.3	7.7	6.3	30.4	7.2	31.3

Source: *Coal Information*, 1992, Table 6.11. Averaged and converted from $/metric-ton values. Totals may not add due to independent rounding. Mine costs include capital recovery; inland freight includes rail/barge transport, and loading at Port. Actual costs may vary from representative estimates, especially at mine.

Figure 8

Representative Costs of Steam Coal Exporters to Europe and Japan



*In the United State NA=Northern Appalachia, and CA=Central Appalachia; Autralia refers to Queensland

** U.S. Wyoming ships to Gulf for Europe and by rail to Vancouver for Japan

The major Far Eastern steam coal importer is Japan, which purchased 40 million tons on international markets in 1993. South Korea, Taiwan, and Hong Kong also purchased in excess of 10 million tons in 1992. U.S. east coast steam coal suppliers suffer a substantial disadvantage in the Far East, due to ocean shipping distances. U.S. suppliers were most successful in Taiwanese and Japanese markets, exporting between 2 and 3 million tons to each in 1992. New Orleans was the primary source of U.S. supply to Taiwan, whereas, Japanese shipments from the U.S. were primarily from west coast ports. Shipments to the Far East from Hampton Roads in 1992 were not significant.

The primary steam coal supplier to the Far East is Australia, which supplied approximately 50 percent of the total market in 1992. China, South Africa, and Indonesia also supplied more than 10 million tons each to Far Eastern markets in 1992. Chinese steam coal shipments to markets in that region have increased by more than 100 percent since 1988, while Indonesian shipments have increased even more rapidly. U.S. suppliers are at a serious disadvantage in Far Eastern markets, due to the diversity of lower-cost supplies available from regional producers.

Market Prospects

U.S. EIA 1993 projections of world steam coal trade are listed in Table 17. Since publication of these figures, EIA has revised its projections downward. The revised estimates are not yet available. The 1993 EIA projections of world steam coal trade for the year 2000 exceed those of the Australian Bureau of Agricultural and Resource Economics (ABARE) by about 30 percent, and those of London-based WEFA Energy by 17 percent (OECD/IEA, 1993). Both WEFA and ABARE expect continuing expansion of world markets, with primary expansion expected to take place in Europe and eastern Asia, as does the EIA. The only major difference among various projections appears to be the extent of steam coal market expansion over the next two decades.

The major factor in expectations of increased steam coal demand is economic growth, and the consequent increased demand for electricity. Another factor in expectations of increased European imports is decreasing subsidies to high-cost European coal suppliers, which is a result of open markets. The most accessible European coal deposits have been mined heavily for many years, and current production in some areas is being heavily subsidized. The phasing out of subsidies is expected to significantly decrease European production. Production by Germany and the U.K., Europe's only two major coal producers, is expected by the OECD to decline by 30 percent, from 230 million short tons in 1992 to 160 million tons in the year 2000.

U.S. EIA expects the world's major steam coal exporters (Australia, South Africa, and the U.S.) to increase exports over the next decade, in response to increasing demand. Canadian, Chinese, and Indonesian exporters are expected to increase their presence in Asian steam coal markets, while South American exporters (chiefly Columbia) expand shipments to Europe and to other South American markets.

Table 17. U.S. DOE EIA 1993 Projections of World Steam Coal Trade and 1990 Reference (million short tons per year)

EXPORTERS	STEAM COAL TO EUROPE			STEAM COAL TO ASIA		
	1990	2000	2010	1990	2000	2010
Australia	11	23	32	41	73	103
United States	24	87	177	6	11	11
South Africa	31	57	86	18	13	13
Canada	1	4	2	3	15	18
China	3	1	1	8	27	38
South America	11	37	50	1	1	1
Other	48	11	0	8	23	25
Total	**130**	**220**	**346**	**84**	**163**	**211**

	STEAM COAL TO OTHER			TOTAL STEAM EXPORTS		
	1990	2000	2010	1990	2000	2010
Australia	0	0	0	54	97	135
United States	11	9	12	42	107	200
South Africa	1	0	0	50	70	99
Canada	1	2	2	5	21	22
China	0	0	0	17	27	38
South America	2	9	18	16	47	69
Other	0	0	4	51	34	30
Total	**15**	**20**	**37**	**236**	**403**	**593**

Note: Some totals do not add due to balancing items, data inadequacies, and independent rounding. EIA estimates have been revised downward since publication of these figures, but new estimates are not yet available.

Source: U.S DOE, "Supplement to Energy Outlook 1993," Table 38.

EIA expects that expanded market penetration by the above countries will be accompanied by a sharp drop in exports by the former USSR and Poland. Together, these two producing regions were responsible for 39 million tons of steam coal exports in 1990. A major factor in their expected decline is the opening of formerly captive east European markets and an inability to provide competitively priced supplies due to inadequate mine mechanization and transportation infrastructure. OECD figures support the assumption of high-cost supplies from Poland in 1992, as the average price of Polish steam coal in the European market was about $48 per short ton. The average price of supplies from the former USSR, however, was approximately $36 per ton, the lowest of the major European suppliers (OECD/IEA, 1993).

Environmental restrictions, and costs of meeting those restrictions using coal relative to other fuels, will be major factors which influence future steam coal demands, especially in the European marketplace. Europe's clean air laws are among the world's strictest (OECD/IEA, 1993). For example, new source performance standards for sulfur dioxide emissions from large coal fired boilers range are below 0.2 lbs per million Btus in Austria and the Netherlands, and

are between 0.2 and 0.4 lbs. per million Btus in Belgium, Denmark, Germany, Italy, Sweden, Switzerland, and the U.K. The corresponding standard in the U.S. is 1.2 lbs per million Btu (OECD/IEA, 1993). The European limits are generally met by coal burning facilities through a combination of low-sulfur coal and stack gas cleanup systems.

New source NO_x emissions limits in many European countries are also less than corresponding limits in the U.S. Air emissions limitations for existing sources are being phased in, gradually, over a period extending to the year 2003. A driving force in establishing strict air emissions limitations has been European Community agreements driven by transboundary air pollution problems. Air emissions limits in Japan are also among the world's strictest. The possibility of legislation limiting "greenhouse gas" emissions creates uncertainty for future exports.

The availability of natural gas from the former USSR and the North Sea fields will influence steam coal imports. According to U.S. EIA (1991), the natural gas reserves of the former USSR are "far and away the largest in the world." Major limitations to that production and export capacity in the former USSR, at present, are the capital requirements of establishing more efficient extraction methods and modernizing pipeline capacities. Expanded use of North Sea gas in the U.K. has already had the effect of decreasing steam coal imports below formerly projected levels.

The price of oil on world markets will also influence European and other steam coal markets. 1993 EIA projections were conducted assuming a mid-level 1993 oil price of $19.05 per barrel, and assuming price rises of between 2 and 3 percent annually, to $22.90 in the year 2000. As of this writing, the price of oil on most world markets is between $14 and $15 per barrel.

The U.S. EIA 1993 projections show an expansion of east European steam coal imports, from 11 million tons in 1992 to 19 million tons in the year 2000, while shipments to the region from former USSR and Poland undergo substantial decline. However, these projection do need to be viewed with some skepticism (NCC, 1993). The EIA projections for annual growth in real Gross Domestic Product in east European economies through the year 2000 is 1.8 percent annually, while coal imports are projected to increase at an annual rate of 11 percent.

The International Market for Clean Coal Technology

Several major coal using countries including: the United States, Germany, Italy, Japan, South Korea, and the United Kingdom are pursuing research, development, and demonstration projects relating to clean coal technologies. Generally, these countries are interested in clean coal technologies, because they use coal and address concerns about emissions of air pollutants.

The United States is encouraging clean coal technology utilization in international markets under provisions of the Energy Policy Act of 1992. This Act authorizes funding for projects, typically in developing countries, that are designed to improve energy efficiency and reduce environmental emissions.

To meet the goals of this Act, the U.S. Department of Energy (DOE) will sponsor either demonstration projects in key international markets, or facilitate the export of commercial technologies. DOE will also provide financial assistance for the participation by U.S. industries in targeted international projects.

Clean coal technologies may have some positive and negative effects on the use of Virginia coal. Certain technologies might be marketed overseas in conjunction with Virginia coal. However, clean coal technologies may reduce the demand for Virginia's high quality low sulfur coal. There are important advancements taking place in the development of coal technologies for both the metallurgical and steam coal markets.

Metallurgical Coal Technologies

The use of pulverized coal injection systems, electrical furnaces, and the increasing use of alternative methods of making iron in recent years has held down world demand for metallurgical coke. It is also anticipated that by the mid-to-late 1990s, the supply of coke will be reduced because of the many antiquated coke ovens that will need to be replaced. Furthermore, many of these existing ovens are coming under increased environmental scrutiny.

Several clean metallurgical coal technologies are in the process of development. In Virginia, two companies are developing new coking technologies. Jewell Smokeless, located in Vansant, Virginia, has modified conventional coking processes to produce coke with low emissions. Coal Technology Corporation in Bristol, Virginia, has created a new clean coking process, known as the "mild gasification CLC" (Coal, Liquids & Coke) process. The process is pollution free and the gases are recycled for use in other chemical products such as windshield wiper fluid, methanol blends for gasoline, carburetor cleaner, and antifreeze. Coal Technology Corporation has been granted a patent for the mild gasification CLC process, and has received funds from the DOE to help finance a pilot plant located in Bristol.

Steam Coal Technologies

The existing clean coal technologies for steam coal can be divided into three categories: pre-combustion technologies; combustion technologies; and post-combustion technologies. All of these technologies are being researched, developed, and tested worldwide.

Pre-combustion technologies include advanced physical coal preparation. This technology reduces levels of ash and sulfur in coal, enabling countries with indigenous lower quality coal resources to develop these resources. This technology will be commercially available between 1996 and 2000. A second promising pre-combustion process is coal water mixture. This process converts existing oil-fired capacity to coal-fired capacity, with minimum modification of the combustor and ancillary equipment. This technology is already commercially available.

Combustion technologies include a variety of processes. Integrated coal gasification combined cycle (IGCC) systems and atmospheric fluidizied-bed combustors (AFBCs) offer the potential for very efficient use of coal, while providing high levels of atmospheric emissions control. The AFBC technology is commercially available, while the IGCC systems should be commercially available between 1996 and 2005.

Post-combustion technologies, such as flue gas desulfurication are designed to control sulfur and other emissions. One process not only removes various pollutants, but also produces a marketable byproduct which reduces the problems associated with solid waste disposal.

Foreign Markets for Clean Coal Technologies

There is great diversity in foreign markets for clean coal technology. Based on such factors as: local energy demand, fuel resources and exploitation, electrical generating capacity, and the environmental climate, countries may be categorized into three groups. These groups are: industrialized countries, developing industrialized countries, and newly emerging industrialized countries.

Industrialized Countries

The first group of countries are European and Pacific Basin industrialized countries with an expressed interest in expanding coal consumption. Two of these countries, Italy and Japan, import large amounts of Virginia coal. Both countries have expanding energy needs, few indigenous energy resources, and strict environmental standards. Accordingly, both countries are likely to utilize clean coal technology. A number of clean coal technologies are currently being developed and demonstrated in these two countries. In addition, both Italian and Japanese manufacturers are marketing clean coal technologies.

Italy has an active program to substitute coal based fuel for oil in large boilers and to construct coal fired power plants. In addition, electricity generation is predicted to grow in this country at about 3% per year through 2000.

As stated previously, Japan continues to import more coal than any other country in the world. Not only is Japan's electricity generation market expected to continue to grow, but the nation and its individual localities have enacted stringent emissions and solid waste reduction requirements.

Developing Industrial Countries

The second category of countries are those with developing industrial bases that are experiencing significant economic growth and a corresponding demand for electricity. Turkey is a prime example of this type of industrialized country. Because electricity generation is a growth industry, a significant market for clean coal technologies exists in this country. Turkey plans to quadruple its electrical production capabilities by the year 2000.

However, there are two factors which hinder the ability of clean coal technologies to penetrate this market. First, there is a lack of environmental awareness. Although emissions levels are high in some countries, the governments of these developing nations are often reluctant to enact restrictions that would encourage clean coal technology.

The second factor is the reluctance of the government owned utilities in these developing countries to risk investment in innovative technologies. A significant market for clean coal technologies, however, does exist with the privately owned utilities in these countries. These utilities are often interested in forming partnerships with foreign coal exporters and other investors who are willing to provide the capital, technology, expertise, and fuel to build new facilities. In Turkey, the government is actively encouraging such partnerships with private firms.

Many eastern European countries would also be classified as having a developing industrial base. Linking capital for clean coal technology with long-term supply contracts would assist these countries in obtaining needed technology, while offering Virginia exporters an opportunity to expand their share of this market. However, the relative political and economic instability of these markets must be contrasted with the mature coal markets in the stable industrialized countries in Western Europe, as well as Japan.

Newly Emerging Industrialized Countries

The third category of countries are those in the very early stages of industrialization. The rapid growth in these countries is expected to continue with a corresponding need for the generation of electricity. This category of countries include Pakistan and the Peoples' Republic of China.

Many of these countries, however, also have significant indigenous energy resources and lack the infrastructure necessary for large scale coal importation. In Pakistan, for example, harbor and transportation structures would have to be built before coal could be imported. China also intends to provide for its own domestic coal needs, as well as, becoming a major coal exporter to Pacific Rim countries. China, however, may be a potential market for coal technology.

Analysis of Metallurgical and Steam-Coal Markets

Virginia's coal exporters supply coal for both the metallurgical-and steam use. The world metallurgical and steam coal markets are likely to have very different characteristics in the years ahead.

World metallurgical markets -- where Virginia coal exporters are currently able to compete most effectively -- will likely be characterized by a small number of major suppliers competing for shares of a shrinking market. Virginia producers, and other Hampton Roads shippers, are likely to continue as the dominant source of U.S. participation in the metallurgical coal market, because central Appalachia is the location of the major U.S. metallurgical coal reserves, and because coal quality considerations favor rail rather than barge transport.

The major uncertainty in the metallurgical coal market segment occupied by central Appalachian producers will be the rate at which trade declines due to adoption of new steel making technologies which substitute other forms of energy or lower grade coals for central Appalachia's premium grade product by steel producers.

Hampton Roads shippers of metallurgical coals will likely be competing primarily with Australian producers in European and South American markets, and with Canada, Australia, and possibly China in the Far East. The extent to which producers in Poland and the former USSR will be participants in the European market is unclear.

In contrast, steam coal markets are likely to be characterized by worldwide expansion and increasing numbers of major competitors. The dominant economic forces driving steam coal demand will be economic expansion in Europe and the Far East; declining European coal

production subsidies; and the economics of meeting clean air requirements. Availability of alternative fuels especially natural gas in Europe will have a major influence on the rate of steam coal market expansion.

Virginia's steam coal exporters, and other Hampton Roads shippers, will be competing in world markets with two major international suppliers (Australia and South Africa); low-cost international producers seeking to expand export sales (including China, Indonesia, and Colombia); U.S. mining operations in areas outside of central Appalachia; and central Appalachian producers of similar quality coals shipping inland by barge and exporting through New Orleans.

Influence of Technology on Markets

Changing technologies will have a major impact on future international markets for Virginia coal. Metallurgical coal use will be heavily influenced by changing technologies for both steel production and materials utilization. Development and adaptation of cost effective, environmentally sound coking technologies in overseas markets will have the effect of extending metallurgical coal utilization.

Coal's ability to produce electrical energy with a minimum of air pollution, using new generation and air-pollution control technologies, at competitive prices will be a key to its ability to compete with other potential electrical generation fuels, especially in the all important European markets.

Installation of new coking or electrical generation technology, with coal requirements consistent with central Appalachia's product, has the effect of "locking in" a potential market for coals that can be supplied by Virginia producers, and exported from Hampton Roads.

World Market Prospects

Many of the factors that will influence international coal markets are beyond the control of coal producers and others operating from within the state of Virginia. Just a few such factors include rates of exchange between the U.S. dollar and the world's other major currencies; world market prices for competing sources of energy; the pace of transportation infrastructure and mine mechanization investments in China, the former USSR, and Poland; effects of political change in South Africa on mine labor costs and export coal prices; and the rate of economic growth in Europe, the Far East, and other regions of the world.

In spite of the difficulty of evaluating these uncertainties, we believe that principal opportunities for future exports of Virginia coal will be in the European markets.

Western Europe is likely to remain as the primary market for metallurgical coals shipped from Hampton Roads, and Hampton Roads is likely to remain as the principal port for U.S. metallurgical shipments. The pace of adoption by European producers of new steel making technologies, and the types of new technologies adopted by European steel producers, will have an important influence on the size of the market open to central Appalachian producers. Efficient, environmentally clean technologies for making coke and producing steel using central Appalachian coal must be available to European steel producers if a significant market for Virginia coal exports is to be preserved. Primary competition is expected to come from Australian coal producers. Poland and South Africa will also be likely to compete for European metallurgical markets, but these countries will probably be limited in ability to supply significant tonnage.

European steam coal imports are likely to increase, although the pace of that increase is uncertain. Environmental restrictions on air emissions from European generating plants, the extent to which coal fired generation using clean air technologies are chosen by European utilities as a means of complying with these restrictions, and the types of technologies adopted will be major factors in determining future demand for central Appalachian coals in the European steam coal marketplace. The ability of central Appalachian producers shipping through Hampton Roads to compete on a price basis in these markets, and the extent to which natural gas utilization is expanded, will also be important determinants of future Hampton Roads export levels. Hampton Roads exporters will have a slight ocean freight advantage when shipping to European markets, relative to U.S. Gulf Coast shippers.

The major competition for the European steam coal market will come from Australia and South Africa. Indonesian and South American exporters are also expected to compete for European steam coal customers. Given the need for hard currency in Poland and the former USSR, EIA expectations of a significant drop in exports to western Europe from the former communist economies may prove to be overly optimistic from a U.S. standpoint. Nonetheless, given the size of the western European market and the proximity of Hampton Roads to its ports, it must be viewed as a primary market opportunity for future exports to Virginia coal.

Eastern European markets may also provide some market opportunities for Hampton Roads coal suppliers. Although total tonnages imported by that region are unlikely to expand significantly, coal shipments to the region from the former USSR, currently a major supplier, are expected to decline. Lack of access to the region's ports by large Australian steam coal carriers may provide U.S. steam coal shippers with some advantage, because of their shorter shipping distances. That same advantage is not likely to be shared in metallurgical markets, however, as metallurgical coals are typically shipped in smaller vessels. Thus, the principal competition for eastern European metallurgical markets will come from Australia.

Price competition in eastern European steam coal markets from South African producers, and perhaps from U.S. producers shipping from non-Virginia ports, is likely to provide a significant challenge to Hampton Roads shippers. However, shippers from Hampton Roads will have an ocean freight advantage to these ports, relative to Gulf Coast and South American

exporters. The rate of economic modernization and growth within the region, and the ability of Polish producers to obtain needed capital, will have a major influence on eastern European opportunities available to U.S. suppliers.

Opportunities to ship relatively small quantities of metallurgical coals to the Far East and South America should also be viewed favorably, although it is doubtful that Hampton Roads shippers will be able to expand volumes shipped to either of these markets. Relationships with Far Eastern buyers, possible trade agreements, and a perceived ability for Virginia to act as a dependable source of high-quality coal supplies, will be assets to efforts to maintain an ability to ship metallurgical coals to the Far East. As in Europe, adoption of new technology by South American and Far Eastern steel producers will influence the state's metallurgical coal market opportunities in South America.

It is unlikely, however, that Hampton Roads exporters will be originating significant steam coal shipments to either South American or Far Eastern markets. The diversity of low cost, regional steam coal suppliers, and the transportation cost disadvantage faced by Hampton Roads shippers, create formidable barriers to Virginia steam coal exports to Far Eastern markets.

In South America, U.S. Gulf Coast ports and Colombian producers are likely to be able to supply substantial quantities of steam coals priced lower than supplies available through Hampton Roads. Even given the most optimistic growth assumptions, the overall steam coal capacity of South American markets will be small. Gulf Coast ports will have significant transportation cost advantages when shipping to South America, relative to shippers using the Port of Hampton Roads.

CHAPTER III -- CONCLUSIONS

- What is good for Hampton Roads coal export is good for Virginia. It is appropriate for Virginia state government to do what it can to enhance Hampton Road's coal exports.

  Findings:

  - Thirty-seven percent of Virginia mined coal is exported from Hampton Roads.
  - Thirty percent of Hampton Roads' exports come from Virginia mines.
  - All coal shipped from Hampton Roads provides economic benefits to the state from rail transport and port operations.
  - During 1992, the estimated Virginia economic benefits derived from coal exports was $2.4 billion.

- Several critical factors affecting world coal trade and the Hampton Roads market share are beyond the influence of state government.

  Factors include:

  - impacts of the global economy, i.e., more growth would spur more coal trade;
  - implementation of advanced coke making and steel making technologies, which would diminish the market for metallurgical coal;
  - relative prices of competitors, Australia and Canada, in the metallurgical coal market and Australia, South Africa, the former USSR, Poland, and new-comers Columbia, Indonesia, and China in the steam market, i.e., lower prices and more competition would force some Hampton Roads exporters out of the market;
  - rate of subsidies for coal production in Britain and Germany, i.e., trade opportunities would increase if subsidies decrease; and
  - environmental regulations in importing countries, i.e., stricter controls would diminish coal market or enhance market for clean coal and technologies.

- Price is perhaps the most important factor in world coal trade. Efforts by producers and transporters of coal and governments to mitigate cost will enhance competitiveness.

- Trade agreements between government have been effective in maintaining coal shipments to certain countries. Such agreements are often justified to rectify trade imbalances or to maintain a reliable supply source.

- The metallurgical coal market will likely continue to be the mainstay and western Europe will continue to be the primary market opportunity for Hampton Roads coal sales. However, exporters of metallurgical coal must try to maintain a foothold in all markets, including Japan, Korea, and Brazil. The metallurgical coal market is expected to shrink and become more competitive in coming years, especially in Western Europe. Because of this expected situation,

- Hampton Roads exporters must look increasingly to the growing steam coal market to maintain tonnage. While Eastern European coal trade is now small, this may increase with economic modernization.

Findings:

- Eighty-one percent of Hampton Roads exports go to the metallurgical coal market; 19 percent of Hampton Roads exports go to the steam coal market.

- Western Europe accounts for 60 percent of metallurgical coal, 98 percent of steam coal, and 67 percent of total coal exports from Hampton Roads.

- Hampton Roads supplies 54 percent of western Europe's metallurgical coal imports.

- Metallurgical coal to Japan is now 10 percent of Hampton Roads' exports, while Brazil accounts for 9 percent, and Korea accounts for 5 percent of the metallurgical coal exports.

- By the year 2000, the global metallurgical market is expected to drop by 10 percent.

- Expected advances in coke making and steel making technologies will continue to cause dramatic decreases in the global metallurgical market through 2010.

- Australia, which has a 40 percent share of the world metallurgical market and 25 percent of the European market, is expected to capture more than one-half of the world market and nearly one-half of the European market over the next decade.

- Global steam market is now 35 percent more than the metallurgical coal market, and is expected to grow considerably.

- Facing increasing difficulty competing on price alone, Hampton Roads exporters may have to employ creative trade packages of coal and related technologies. These may include clean coal technologies and low sulfur coal in the steam market, and advanced coking technologies or value-added coke in the metallurgical coal market.

  Findings:

  - Industrialized countries, such as Italy and Japan, are likely to continue importing coal and to utilize clean coal technologies. Efforts for export to these countries should concentrate on Virginia coal which meets the specifications of foreign clean coal technologies.

  - Developing industrialized countries lacking indigenous energy sources, such as Turkey, are a large potential market for clean coal technologies. These countries could be offered packaged opportunities including capital, technology, expertise, and Virginia coal. Efforts for export to these countries could focus on joint endeavors with the Department of Energy's clean coal technology export program.

  - Newly emerging industrialized countries with indigenous energy sources, such as the People's Republic of China and Pakistan, offer little opportunity for increased exportation of packages linking Virginia coal and clean coal technologies.

CHAPTER IV -- RECOMMENDATIONS

1. Conduct a Governor's Symposium with leaders of the coal industry and coal related industries to (1) review the findings of the study required by SJR 208 related to international markets for Virginia coal; (2) receive advice on the appropriate role of the Commonwealth in promoting coal exports; (3) determine federal and state regulations, tax policies, and other factors affecting the sale of Virginia coal and recommend executive action to minimize regulations that constrain trade; and (4) discuss emerging technological advancements and ecological issues in Virginia's major coal export markets. This proposed Governor's Symposium would be coordinated by the Virginia Department of Economic Development with assistance by the Virginia Center for Coal and Energy Research, the Virginia Port Authority, and the Virginia Department of Mines, Minerals and Energy.

2. Introduce a joint resolution during the 1994 Session of the General Assembly requesting the Virginia Congressional Delegation to encourage and work for the export of United States coal which will positively impact the export of Virginia coal. The increase in coal exports could in effect reduce the current, dramatic trade imbalances with selected foreign governments, including Japan.

3. Advocate through the Governor's Office to the President and the U.S. Secretary of Commerce, for the export of United States coal which will positively impact the export of Virginia coal. The increase in coal exports could in effect reduce the current dramatic trade imbalances with selected foreign governments, including Japan.

4. Encourage the development of state and national strategies to export combined packages of coal, coal-use technology, and coal equipment through a consortia of Virginia agencies, the National Coal Council, the U.S. Secretary of Energy, and the U.S. Department of Energy, for market opportunities including Eastern Europe.

5. Have the Virginia Department of Economic Development aggressively pursue available federal funds to support export assistance in the coal industry.

6. Encourage and promote the use of export financing programs available through the Virginia Department of Economic Development's Small Business Financing Authority. These pre-export working capital and credit guarantee programs of the Export-Import Bank of the United States, accessed through the Financing Authority could be used to help smaller technology and equipment suppliers develop competitive export pricing deals for their goods and services.

APPENDIX A

SENATE JOINT RESOLUTION NO. 208

Requesting the Department of Economic Development, in consultation with the Department of Mines, Minerals and Energy and the Virginia Center for Coal and Energy Research, to create a comprehensive export plan for Virginia coal.

Agreed to by the Senate, February 2, 1993
Agreed to by the House of Delegates, February 17, 1993

WHEREAS, coal exports contributed $1.5 billion to Virginia's economy in 1990, and 40 percent of Virginia's total coal production in 1991 was exported; and

WHEREAS, 94 percent of all exports of Virginia coal in 1991 went to foreign coke plants, and the remaining six percent went to utilities and industrial power plants abroad; and

WHEREAS, a major expansion of world coal trade in the 1990s is forecast by the U.S. Department of Energy, but the growth will be due to increased demand for steam coal for utilities and industrial power plants; and

WHEREAS, international competition is strong, particularly from Colombia, Australia, Poland and South Africa, which are able to produce coal at a lower cost than the United States; and

WHEREAS, price is a crucial factor in the steam coal market and Virginia is a relatively high-cost producer of coal; and

WHEREAS, almost all of Virginia's coal is exported for use as coke in the production of steel, and the demand for coking coal has slowed abroad; and

WHEREAS, international events, growing environmental concerns abroad, and changing technology create uncertainty for the future of the coal export market; and

WHEREAS, Virginia could benefit from a long-term plan to take advantage of new opportunities and to position itself for changes in market demands; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Department of Economic Development, in consultation with the Department of Mines, Minerals and Energy and the Virginia Center for Coal and Energy Research, be requested to create a comprehensive export plan for Virginia coal for the next decade.

The Department shall complete its work in time to submit the plan to the Governor, the Coal and Energy Commission, and the 1994 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

APPENDIX B

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