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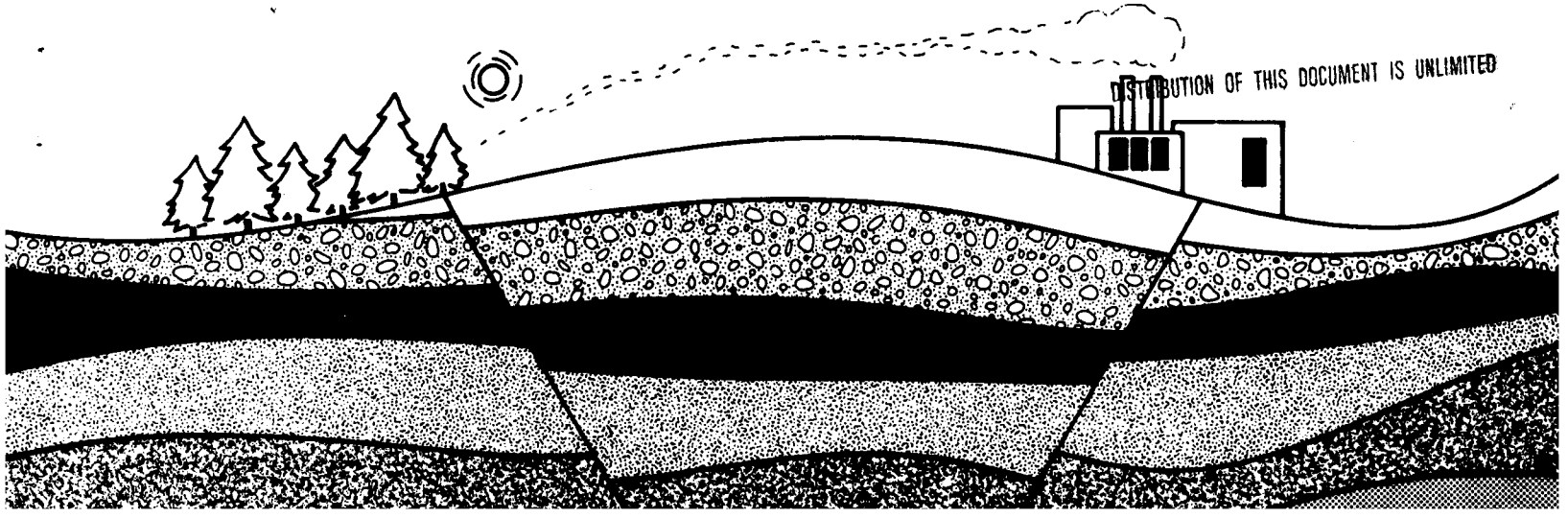

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VIRGINIA COAL PRODUCTION: IMPACTS AND PROJECTIONS

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POTENTIAL FOR INCREASED DEMAND

We anticipate that U.S. annual coal production will increase to 1.5 billion tons in 1995, based on the Center's recent revisions to earlier projections developed by ICF (1981), EIA/DOE (1982b,d,e), and NCA (1983). Appalachian output is projected to drop from about 50 percent to 40 percent of total U.S. production as western coals become more dominant. Virginia's yield is projected to remain at nearly 5 percent of the U.S. total. Because the metallurgical coal[1] market is flat (Anon., 1983d), Virginia's anticipated increase in coal production must penetrate the steam coal market.[2] Increased steam coal sales assume Virginia's coal-delivered price will remain competitive with eastern Kentucky and southern West Virginia, and that Virginia's low-sulfur premium coal will be sold as compliance coal in the utility market and as a pulverized coal-water slurry substituting for residual or No. 6 fuel oil (Hibbard, 1983).

PULVERIZED COAL-WATER SLURRY OR COAL-OIL MIXTURE FUELS

Pulverized coal-water slurry (Bacon, 1983) and coal-oil mixtures (Anon., 1980) are being developed as substitutes for No. 6 fuel oil in numerous boiler applications, using the same storage and handling facilities as No. 6 fuel oil, and can be transported by pipeline. This slurry, or mixture, requires low-sulfur, low-ash coal to compete successfully with No. 6 fuel oil (Walia, 1982). High quality Virginia coal is appropriate for this application, and can utilize coal fines. A potential market for 150 million tons would exist in the eastern United States if all oil-fired boilers were converted to burn coal. Florida Power and Light Company is presently using a coal-oil mixture (Anon., 1980). Vepco is evaluating the technical and economic viability of a coal-water slurry fuel (Brown, 1983).

COMPETITIVE DELIVERED PRICES

Virginia currently is the high-cost (marginal) coal supplier for both world and domestic markets in terms of mine-mouth and delivered prices.[3] Its position in the market at any one time is determined by the quality of its coal, delivery reliability, and the availability of coal from other sources at a competitive or better price (Bacon, 1982a,b). For these reasons, only about 13 million tons of the 47 million tons of coal exported through Hampton Roads in 1980 came from Virginia

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[1] Metallurgical coal is low-sulfur, low-ash, medium-volatility coking coal used to make coke. It is cleaned, and is usually less than 1 percent sulfur and 8 percent ash. Seventy to eighty percent of Virginia's annual coal production is metallurgical coal.

[2] Steam coal is burned in boilers to make steam in an electric utility plant. It is usually not cleaned, and is sold by Btu, sulfur, moisture, and ash content. Compliance coal contains less than 1.2 pounds of sulfur dioxide per million Btu. Metallurgical coal can be burned in boilers if it is blended to avoid caking.

[3] Delivered prices include mining, gathering, transportation, preparation, port, shipping, and distribution costs.

(Virginia Port Authority, 1982). Its coal exports peaked at a time when strikes in Australia limited the availability of coal to Japan, and political unrest in Poland limited the availability of coal in Europe. When Hampton Roads' exports peaked at 53 million tons in 1982, Virginia's coal exports actually dropped to 12.1 million tons, a loss of 4.9 percent of market share (EIA, 1983b).

Of competing states within the central Appalachian region, southern West Virginia has the largest reserves, the largest production, and produces the most coal for export. Eastern Kentucky has the lowest priced coal, and Virginia has the highest quality coal as shown in the following tables.

The demonstrated bituminous coal reserve base, as of January 1980, for Virginia, eastern Kentucky, and southern West Virginia (EIA, 1982c), in million tons, was as follows:

	Underground	Surface	Total	Avg. Sulfur
Virginia	2,625.3	846.2	3,471.4	0.9
E. Kentucky	8,723.3	4,204.2	12,927.5	1.1
West Virginia	34,581.1	5,195.1	39,776.2	1.6

(Source: EIA, 1982c)

Distribution of coal reserves (Thomson and York, 1975) in million tons by sulfur content is:

	≤.4%	.5-.6%	.7-.8%	.9-1.0%	1.1-1.4%
Virginia	60	581	809	637	767
E. Kentucky	26	1,228	3,049	2,265	1,816
So. West Virginia (20 counties south of 38°30' north latitude)	310	3,819	5,657	3,207	3,099

(Source: U.S. Bureau of Mines Information Circular 8680, 1975)

Distribution of coal reserves in billion short tons by servicing railroad is as follows:

	CSX (B&O)	CSX (C&O)	TOTAL (NS)	CSX (L&N/Clinch)	TOTAL CSX
Virginia	---	---	2.1	1.4	1.4
E. Kentucky	---	3.7	3.0	6.1	9.8
So. West Virginia	2.6	10.7	7.4	---	13.3

(Source: URS in association with A. D. Little, 1981)

Average mine price, 1980 dollars per short ton, was as follows:

	Underground	Surface	Weighted Average
Virginia	$36.47	$28.05	$34.58
E. Kentucky	30.98	26.23	28.72
West Virginia	36.46	28.72	34.88

(Source: EIA, 1982c)

Virginia coal production by county in 1980 was:

	Million Tons	Avg. Sulfur	Avg. Ash
Buchanan	17.7	0.8%	8.2%
Wise	12.5	0.6	9.4
Dickenson	5.9	0.6	8.2
Tazewell	2.2	0.6	6.2
Russell	1.5	0.5	7.4
Lee	1.2	0.7	7.0
Scott	0.01	0.9	6.4
Total:	41.01	0.7%	8.7%

(Source: Varndell, 1982 Marketing Digest, MVN Pub.)

Hampton Roads is forecast, by many analysts, to retain its share of the met-coal exports market, following the economic recovery of the steel and foundry industries, even though Australia will become the world's largest met coal exporter. Study estimates assume that Virginia steam-coal production will rise by a factor of four. If its delivered coal price is not competitive with eastern Kentucky and West Virginia prices, Virginia will lose its market share (Hibbard, 1983).

A Japanese buyer (Tada, 1981) stated the $20-a-ton price differential for U.S. coal, as compared to Australian, South African or Canadian coals, was not acceptable and that the industry must increase productivity, decrease rail rates and avoid shipping delays if it is to maintain its market share. With the labor situation now more stable in Australia and Poland, buyers appear to be returning to these sources as they contract for future shipments. Poland, driven by the need for hard currency, is alleged to be selling below cost, which makes it attractive to the market. Meanwhile, the differential between U.S. and Australian coal, delivered in Japan, has dropped to $10 a ton (Anon., 1982a,b; 1983a,b).

As a result of a recent 18 percent price reduction, Australian metallurgical coal is now available at the port for $50-55 per metric ton ($45-50 per short ton) and costs $10-12 per metric ton ($9-11 per short ton) for shipment to Japan (Snow, 1983). Canada has reduced its price 25 percent to $48 per short ton to win a Japanese contract. In order to gain Japanese orders, some Virginia producers have reduced their mine price by $12-16 per ton to $32 per ton in order to compete with Australia (Virginia Coal Council, 1983). Current rail transportation costs are about $15 per ton from Virginia coal fields to Lamberts Point, with a loading charge

of $.50 per ton and a shipping cost of $12.50 per ton to Tokyo. Australian coal costs $54-61 per short ton delivered in Japan, while Virgina coal costs approximately $59 per short ton (Cahill, 1983).

As noted previously, Virginia is also one of the high-cost (marginal) producers in the central Appalachian region. It has been reported that even when the Virginia producers match the mine-mouth price of coal from West Virginia or eastern Kentucky, they are still not completely competitive because transportation rates within Virginia may be $3 per ton higher than those from the other states (Virginia Coal Council, 1983). Rates among railroads are highly competitive, but to gain the best rail rates customers must often change suppliers depending on which railroad has the best rate. The recent steam coal contract incident involving New England Electric demonstrated its need to switch both railroad and coal supplier to achieve lower transportation rates. The contract was finally negotiated with a return to the original coal supplier when its servicing railroad lowered rates by $3 per ton (Bacon, 1982c). The delivered price of coal depends on costs set by both the supplier and its transporter. But the transportation system which serves the supplier, or group of suppliers, has a profound impact on that supplier's future since it is often the only transportation available and can set its rates without regard to supplier competition.

EFFECT OF A COAL SLURRY PIPELINE

Pending federal legislation that might have a significant impact on the competitiveness of Virginia coal are Coal Slurry Pipeline Bills S267, and HR1010 (U.S. Congress, 1983b). If passed, the final bill would permit right of eminent domain for interstate coal slurry pipelines, overriding Virginia's statute prohibiting such rights. This would apply if a pipeline were built in Kentucky or West Virginia and traveled through Virginia to Hampton Roads. Such a pipeline might result in a $5-10 a ton cost advantage to Kentucky or West Virginia coal, which could then invade Virginia's coal markets -- both domestic and foreign, accounting for about 10 million tons per year. West Virginia is studying several such pipeline routes (Smith, 1983).

Considerable debate has been generated regarding the potential adverse effect of a Virginia coal slurry pipeline on Virginia's coal industry and railroads. The facts are that CSX transports little Virginia coal to Hampton Roads, and 90 percent of N&W coal is metallurgical coal which probably cannot be carried by slurry due to larger coal-size requirements. Only 22.8 percent of the coal exported from Hampton Roads in 1982 was Virginia coal, most came from West Virginia and Kentucky (Hunter, 1983). Most of the Virginia coal which could be carried by a slurry pipeline would be met quality coal seeking a steam coal market (new or additional sales) either overseas or in New England. And, 3.7-6 million tons (9-15 percent of Virginia's current production) could be used, or has a potential to be used, by Vepco. Thus, the coal moved would represent almost entirely new or additional coal sales with little or no adverse effect on Virginia's coal industries or N&W's existing businesses.

The Virginia Coal Slurry Pipeline study (Yucel, 1982a,b), conducted under the Center's supervision and rated as sound engineering research by both Bechtel and Boeing, lacks only the calculation which would add profits and taxes to determine rates. In spite of comments to the contrary, all of the other costs are there, including gathering-by-truck and discharge-water purification, but focus on a single point of delivery such as Lamberts Point.

If we take Yucel's study numbers for a pipeline throughput of 10 and 25 million tons per year with a 10 percent money cost, 50 percent profit before taxes, and a 40 percent tax rate, the following rates result:

10 million tons per year amounts to $7.15 to $8.83 per ton (1981 dollars).
25 million tons per year amounts to $5.33 to $6.73 per ton (1981 dollars).

The rate range depends upon which route from southwest Virginia is selected.

The railroad rate from southwest Virginia to Lamberts Point was reported at a recent Virginia Coal Council meeting (Virginia Coal Council, 1983) as being $15.72 per ton. The differences from that compared to the 10-25 million ton-per-year pipeline rates is $6.89 to $10.39 per ton, which is approximately the same as the values noted in the OTA study.

In addition, there is a study by Aude, Wasp and Thompson (1979) which estimates coal transportation cost-inflation, and notes that pipeline costs are 75 percent capital costs compared to 25 percent for railroads. Based on this analysis, the study projects inflation rates for pipelines at 2.69 percent per year and at 6.79 percent per year for railroads. Therefore, even if the coal transportation costs for railroads and pipelines are exactly alike today (assume $8 per ton), by the year 2000 the per-ton cost differential becomes $24.40 minus $12.56, or $11.84.

A Virginia coal slurry pipeline would have little impact on the United States' share of the world coal market (and the central Appalachian region's share). As the marginal producer, the United States sets the world price for coal based on its higher costs. Coal from Australia, South Africa and Poland is significantly less expensive than U.S. coal (Anon., 1982b; 1983a,b). Hence, if U.S. prices were dropped $12 to 16 per ton (as they were recently), the other producers could easily follow (as they did) and still earn a profit (Virginia Coal Council, 1983). Thus, a drop in price of $5 to 10 per ton due to a coal slurry pipeline would not provide the United States with a larger share of the world coal market, but it would make the United States' share more profitable.

However, if Virginia's delivered coal price were reduced $5 to 10 per ton, due to a Virginia coal slurry pipeline, it would probably gain for Virginia a larger share of the coal market now served by the central Appalachian region (i.e., increase its share of the Hampton Roads exports, now 22.8 percent, to as much as 50 percent, because its delivered price would be lower than coal from eastern Kentucky or southern West Virginia). Eastern Kentucky might match this reduction since it has the lowest coal cost and could truck coal from eastern Kentucky mines to the Virginia pipeline. It is doubtful if West Virginia could match this reduction. Hampton Roads might gain a larger portion of the total export market, and domestic shipments out of Hampton Roads could amount to an additional 2 to 4 million tons per year. This additional market might increase the useful capacity of the pipeline from 10 to 25 million tons per year.

POTENTIAL IMPACTS OF AN INCREASE IN COAL DEMAND BASED ON COAL DELIVERED COSTS

Although further detailed studies will be required when a specific pipeline proposal is made, there are numerous reasons why a coal slurry pipeline could bring

increased output, employment, and income to Virginia's coal producing areas (Campbell and Katell, 1975).

Lower costs could make Virginia coal more competitive, relative to eastern Kentucky and southern West Virginia, and amplify the expected growth in coal demand which would create more mining, coal-related jobs, and bring additional income to Virginia's coal mining areas (Larwood and Benson, 1976).

A lower delivered price, and the expectation of stabilized transportation costs, might make electric utilities more willing to use coal. And, lower transportation costs would probably tend to increase Virginia's share of the utility coal market. Utilities now account for approximately 80 percent of domestic coal use, and their future energy needs represent a vast potential market (Kearny, 1981).

An indication of the benefits to coal-producing areas from a coal pipeline is provided by a 1980 study (Nat. Econ. Res. Assoc., 1980) of the proposed Coalstream Pipeline from Illinois, Kentucky, West Virginia and Tennessee, to Georgia and Florida. The Coalstream Pipeline will have an annual capacity of 30 million tons compared with a maximum of 27.6 million tons (25 million metric tons) for the Virginia pipeline. The study found that the development of the Coalstream Pipeline could lead to:

* the production of 17.3 million tons of additional coal,
* the addition of $432 million to the economies of the coal-producing areas, and
* the creation of 5,200 new jobs for miners.

SMALL PRODUCERS

Expanded coal production could bring benefits to small coal producers as well as large. Traditionally the small independents thrive in expanding markets, and they could deliver coal to pipeline or rail by truck as they do now. A pipeline would enable those coal producers, too small to supply a unit train, to compete with larger mines on the delivered price of coal.

Small coal producers will also be protected by common carrier provisions, which means that the carrier operator should not give undue preference to any one customer. This obligation extends to the securing of contracts for a portion of the pipeline's capacity before construction, during operation, and all the way to the sale of uncommitted capacity.

Although oil and gas pipelines carry only one commodity, they have operated for years as common carriers. Coal pipelines will operate as common carriers in the same fashion, providing a service, subject only to capacity limitations to shippers who are ready, willing and able to ship coal along the pipeline route.

EFFECT OF SULFUR DIOXIDE EMISSION CONTROLS

A factor which might increase the use of Virginia coal is the clean air legislation, now being considered in the U.S. Congress, which would require electric utilities to reduce sulfur dioxide emissions by 10 million tons per year (S145, HR132, U.S. Congress, 1983a).

One of the ways to meet the proposed legislation is to buy from coal producers whose product is low in sulfur content. Much of the low-sulfur steam coal produced in the United States is sub-bituminous coal which eastern utilities can't use efficiently without a boiler retrofit (OTA, 1982). Therefore, utilities may find it more attractive to switch to blended low-sulfur met coal rather than to depend exclusively on scrubbers for flue gas desulfurization, or a boiler retrofit.

East of the Mississippi River there are 50 large coal-burning utilities using high sulfur coal with more than 1.2 pounds of sulfur dioxide per million Btu, the proposed emission control standard. The demand for coal by eastern U.S. utilities in 1980 was 232 million tons with Virginia utilities consuming 5.2 million tons (EIA, 1982c). Eastern utilities are expected to increase this demand by 10 million tons in 1984 with Virginia utilities increasing their consumption by 3.5 million tons. By the year 2000, eastern utilities are expected to use 250 million tons, an addition of 18 million tons.

In the same geographical area there are 28 billion tons of coal reserves containing lower amounts of sulfur than that prescribed by the emission control standard. Virginia has 2.253 billion tons of these. Other principal reserves are in southern West Virginia, eastern Kentucky and Alabama. There are also small amounts in Pennsylvania, Indiana and Tennessee, but essentially none in Illinois, Michigan, Ohio, Maryland and North Carolina (EIA, 1981).

Eastern low-sulfur coal reserves of 28 billion tons could supply eastern utilities with low-sulfur coal for 100 years -- provided the delivered price is competitive with coal from the northern plains states and with the cost of installing and operating scrubbers. Virginia could supply its electric utilities with low-sulfur coal, and provide an additional 90 million tons per year for eastern utilities for a period of 100 years.

Thomasian, 1982; OTA, 1982; Parker, 1982, and others have estimated a 60-70 percent production increase of low-sulfur coal in central Appalachia if the proposed clean air legislation is enacted. If this estimate is correct and the legislation passes, an additional 21 million tons of low-sulfur, low-ash met coal might be produced in Virginia and sold to the electric utilities for steam coal blending. This amount is in addition to the possible 10 million tons of Virginia met coal which might also be exported for steam coal use and the 9 million tons of steam coal produced in 1980. This amounts to 40 million tons which might be added to the projected steel market requirement of about 39 million tons. However, for political and economic reasons[4], total expected tonnages may not develop. The projections used in this report do not include the impact of a coal slurry pipeline, which might offset the political and economic effects.

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[4]The Clean Air Act permits a state to use its own coal, even if it is high sulfur, if the switch to compliance coal causes economic disruption as determined by the governor of that state. Ohio has used this provision.

RECENT TRENDS IN VIRGINA'S COAL PRODUCTION

In 1982, Virginia's coal production dropped to 37.2 million tons from 41.9 million tons in 1981, a reduction of 11.2 percent, while U.S. coal production remained stable at 824 million tons. During the first five months of 1983, Virginia's coal production sank 25 percent compared to the first five months of 1982, and U.S. coal production declined 15 percent. During this same period, Virginia's share of U.S. coal production dropped from 5.12 percent to 4.23 percent, a loss of nearly 1 percent of market share (EIA, 1982a; 1983a,b).

Hampton Roads terminals exported 53 million tons in 1982, up 11.3 percent from the 47.3 million tons exported in 1981. However, during 1982, Virginia-produced coal exported through Hampton Roads dropped 6.9 percent from 13.0 to 12.1 million tons. All of this coal was transported by the Norfolk Southern Corporation, which increased its haulings for foreign export from 33.6 million tons in 1981 to 34.6 million tons in 1982. Of this, eastern Kentucky coal gained 4.6 million tons reaching 9.9 million tons in 1982. Concurrently, domestic coal traffic from Hampton Roads increased from 2.4 million tons in 1981 to 4 million tons in 1982 (EIA, 1983b; Hunter, 1983).

The above information suggests and the table below illustrates that the Virginia coal industry is not maintaining its production share of the U.S., central Appalachian, or Hampton Roads market activity. The loss, it seems, results from the lower competitive cost of eastern Kentucky coal. If this trend continues, the future for Virginia's coal industry looks very grim, indeed.

Production (Million Tons) and Regional Percentages

	1980	1981	1982	1983 (21 wks)
United States	829.7	823.8	833.4	289.9
Central Appalachia*	271.8	272.7	277.3	101.3
Percent of U.S. production	32.8%	33.1%	33.3%	34.9%
Eastern Kentucky	109.2	117.9	111.4	40.4
Percent of central Appalachian production	40.2%	43.2%	40.2%	39.9%
Virginia	41.0	42.0	37.2	13.4
Percent of central Appalachian production	15.1%	15.4%	13.4%	13.2%
West Virginia	121.6	112.8	128.8	46.4
Percent of central Appalachian production	44.7%	41.4%	46.4%	46.9%

(Source: Energy Information Admin. Weekly Coal Reports DOE/EIA 83-1 to 21)

*Central Appalachia includes eastern Kentucky, Virginia and West Virginia.

To reverse this trend, the delivered costs of Virginia-mined coal must be reduced to meet the competition from eastern Kentucky. Several Virginia coal producers (Paramont and Westmoreland, Virginia Coal Council, 1983) maintain that when they match the mine-mouth prices in eastern Kentucky, they are beaten by lower competitive transportation costs. Significantly, the railroads are attracted to eastern Kentucky coal because of its larger reserves, larger production capacity, lower mining costs, lower transportation costs and railroad-owned reserves.

It is believed that Norfolk Southern can provide faster turn-around time for ships at Hampton Roads than can CSX. Faster turn-around time reduces demurrage and thus lowers ship transportation costs. If this is true, Norfolk Southern may gain export market-share from CSX at Hampton Roads. However, CSX is still the largest coal transporter in the United States, and may be capable of meeting its transportation competition (Anon., 1983e).

SUMMARY

Virginia's coal sales have been largely for metallurgical (coking) applications.

The met coal market is facing a serious decline. Those suppliers with long-term contracts believe they will not be affected unless force majeure (coercive power) is imposed. Long-term projections, based on a worldwide recovery of the steel industry and the changing technology and economics of steel making, suggest that future sales will be flat. Based on studies of market trade-preferences, evidence suggests that Australia will displace the United States as the leading exporter of met coal. The possible requirement that U.S. coal-burning utilities reduce sulfur dioxide effluents may lead to met coal being burned in steam boilers as a measure to avoid installing the more costly flue-gas scrubbers. This requirement, if it becomes law, would improve sales prospects for the central Appalachian coal market. Coal slurries to replace fuel oil in commerical and utility boilers and clean fine coal for chemical feed stocks are other potential new markets totaling 200 million tons per year.

In any event, the Virginia coal market is presently an erratic buyers market with more production capacity than demand, and a growing sensitivity to prices resulting from the unstable world economic situation. Our coal suppliers, because of rising mine, railroad, port, and shipping costs, now charge the highest worldwide delivery prices which will make Virginia a residual supplier and possibly vulnerable to more foreign imports.

A coal slurry pipeline which will reduce the delivered cost of Virginia's coal and make it more competitive with eastern Kentucky and southern West Virginia coal, of similar quality, will assist the state in maintaining its market share as the market recovers. Although it will not increase the world-market share exported from Hampton Roads, it may increase Virginia's share of that market from 22.8 percent to 50 percent.

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