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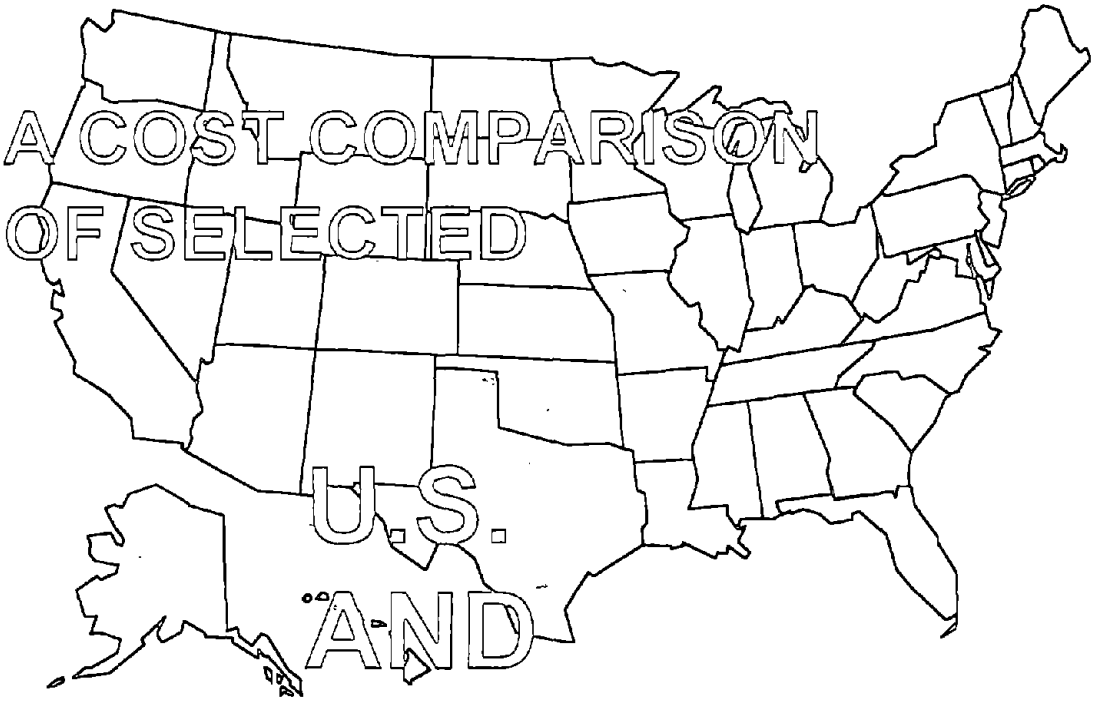
A COST COMPARISON OF SELECTED U.S. AND VENEZUELAN COAL MINES



U.S. DEPARTMENT OF THE INTERIOR

U.S. BUREAU OF MINES

A COST COMPARISON OF SELECTED U.S. AND VENEZUELAN COAL MINES

PREPARED BY

U.S. DEPARTMENT OF THE INTERIOR
U.S. Bureau of Mines
Division of Resource Evaluation

FOR

U.S. DEPARTMENT OF COMMERCE
International Trade Administration
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FOREWORD

This report was prepared by the Division of Resource Evaluation, Bureau of Mines, U.S. Department of the Interior, for the Energy Division, International Trade Administration, Department of Commerce.

The study is the sixth of coal exporting country reports to fulfill the second part of a two-part congressional directive to analyze the potential for increased imports of steam coal into the United States. In its report 98-1030 accompanying the Continuing Resolution for FY 1985 (H.J. Res. 648), the House Appropriations Committee stated:

> In recent years, several foreign countries, most notably Colombia, have expanded their coal marketing in the United States.
>
> In view of the fact that such coal imports seriously threaten American coal sales, the Committee calls upon the Secretary of Commerce, working in consultation with the Secretary of Energy, to conduct a comprehensive study of the current and long-range impact of expanded coal marketing by these foreign countries. This study should include an analysis of potential market penetration and the impact on coal employment and American coal exports.
>
> In addition, this study should include a full report comparing the conditions in these foreign mines, including worker safety, wage rates, and environmental protection, with American regulations and standards.

Special thanks are given to Carbosuroeste, the individual Venezuelan and U.S. coal mines, Venezuela's Ministry of Energy and Mines, and the U.S. Embassy in Caracas for their kind cooperation. This study would not have been possible without the cooperation of these parties. Thanks are also due to many U.S. governmental and nongovernmental personnel and organizations for their continuing project support.

Questions and comments on this report are welcomed. These should be directed to Don Clarke, U.S. Bureau of Mines, Minerals Availability Field Office, Building 20, Denver Federal Center, Denver, Colorado 80225. Telephone, (303) 236-5200, extension 243.

Previous country reports in this series include cost comparisons of U.S. and Colombian, Canadian, Australian, South African, and Polish coal mines. Copies of these reports may be obtained by contacting Don Clarke.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

bcm	bank cubic meter
dwt	deadweight ton
km	kilometer
m	meter
Mmt	million metric ton
mi	mile
mt	metric ton
mt/h	metric ton per hour
mt/yr	metric ton per year
sq	square
st	short ton
yr	year

EXECUTIVE SUMMARY

Introduction

This report on the Venezuelan coal industry is the seventh in a series of studies on coal exporting countries requested by the House Appropriations Committee. The committee asked that the basic differences in mining costs for U.S. and foreign mines be identified, especially those costs incurred in complying with health, safety, and environmental regulations.[1] Basic costs in extracting raw coal are analyzed in this report for surface operations.

This report also provides a limited analysis of the relative market competitiveness of selected Venezuelan and U.S. steam coal mines in three electric utility markets: New England and the east coast of Florida in the United States, and western Europe. Although some Venezuelan coal has coking characteristics, all coal-producing regions of Venezuela sell coal in steam markets.

Venezuela owns its coal resources, but exploration is by private, public-private, and nationally owned regional development enterprises. Production is by private and public-private enterprises. More than 90% of Venezuela's coal is produced by surface mining methods. Surface mining is mechanized to the same extent as U.S. mines, but Venezuelan underground mines are generally hand operations. They have no continuous miners or longwalls, commonly found in U.S. underground mines.

The Venezuelan coal industry operates under regulations covering exploration, mining, health, safety, environment, and taxation. The President of Venezuela has the authority to set prices of exports leaving the country.

In 1991, Venezuela produced 2.5 million metric tons (Mmt) of salable coal, of which 2.4 Mmt was exported, 1.1% of total world steam coal trade. It ranked 26th in hard coal world production and 34th in proved, recoverable coal reserves.[2]

The Venezuelan coal industry earned about US$70 million in 1991 from export coal sales. Although now a relatively small coal exporter, Venezuela anticipates its exports to rise by year 2000 to 20-25 Mmt/yr. Should Venezuela achieve this target, it will have experienced a growth rate of a magnitude comparable to

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[1]H.J. Resolution 648, House Appropriations Committee Report 98-1030, U.S. Congress. Previous studies analyzed the coal industries of Colombia, Canada, Australia, South Africa, and Poland.

[2]National Coal Association. International Coal, 1992 Edition (1990-1991 Data), p. I-1. (Refer to the Bibliography at the end of the body of the report.) Note: For ranking, "Ex-U.S.S.R." is counted as one country.

that achieved in recent years by Colombia and Indonesia. Venezuela's most important markets are the eastern United States and western Europe.

The three Venezuelan mines in this study represent the major coal producing areas, which are in the States of Anzoátegui, Táchira, and Zulia. The mines produce bituminous coal of varying steam coal quality characteristics. As is the case for most Venezuelan mines, the mines studied here export most or all of their production. The seven U.S. mines in this study are located in the Appalachian and western coal-producing regions. Most of these mines were initially developed to supply primarily domestic markets. To obtain the cooperation of the U.S. and Venezuelan mining companies, the U.S. Bureau of Mines agreed not to identify the mines, and that individual mine cost data would be aggregated to ensure confidentiality of certain cost figures.

Study Method and Scope

As in the previous studies, the case approach is used, each case comprising selected Venezuelan and U.S. mines. The basic mining cost (made up of capital, operating, land, and tax costs) in this study is the average cost to extract 1 mt of raw coal over the remaining life of the mine. Delivered cost includes the mine-mouth cost of cleaned coal (basic mining cost plus coal preparation and loading costs) and transportation costs. Average mining costs are derived from a discounted cash-flow rate of return (DCFROR) analysis.[3]

Capital and operating costs are estimates based on evaluations made in late 1992 and expressed in January 1993 U.S. dollars and the corresponding value of the Bolivar, the Venezuelan currency (1 Bolivar = US$0.0128).[4]

The DCFROR analyses were made at 0% and 15% discount rates. The 0% rate represents a recovery of all costs and invested capital. The average mining cost at 15% includes a cost component equivalent to 15% return on cash-flow.

Regulatory compliance costs are specific cost items that could be isolated from the normal activities involved in mining coal. These items are specialized health and safety equipment, mandatory training, selected reclamation activities, dust control, and regulatory fees and taxes.

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[3]The DCFROR analysis uses SMINSIM, a U.S. Bureau of Mines computer program that calculates the average mining cost over the life of the mine for specified rates of return on investments.

[4]At end of 1992, from Colorado National Bank.

Results

General

Guasare Basin is Venezuela's most competitive coal region. It contains Paso Diablo, the country's largest mine, producing 3.5 Mmt/yr, with the potential of 10 Mmt/yr. Near Paso Diablo are two undeveloped properties whose combined potential is about 10 Mmt/yr.

Whether Venezuela will remain a minor participant in the world steam coal market, exporting about 5 Mmt/yr, or become a much larger player, exporting 20-25 Mmt/yr, depends on the construction of a new railway and port infrastructure for the Guasare Basin. Now, the region is bottlenecked at about 5 Mmt/yr.

Ocean shipping for Venezuela's export coal is limited to small ships, handy-size and panamax vessels, whose shipping costs are relatively high compared to larger ships. Nevertheless, its coal is competitive in U.S. east coast markets. The small ships, however, harm Venezuela's competitiveness in the more distant European market. In a few years, however, a 75-km-long railroad may be built from the Guasare Basin to a new deep-water port that could handle larger, capesize ships that have lower unit shipping costs.

The President of Venezuela has the authority to set the value of coal exports for successive periods of up to 3 years each. If this set value exceeds the exporter's declared value, an additional tax must be paid on the difference.[5]

The findings from these cost competitive market case studies should be understood as being time dependent. Relative cost competitiveness can change quickly for a variety of reasons. The major cost factors subject to change are currency exchange rates relative to competing coal exporting countries, ocean freight rates, and governmental policies.

Basic mining cost case studies

In this study, national differences in the basic cost of mining reflect costs that are inherent within prevailing social, political, and economic conditions in Venezuela and the United States. To identify these differences, an attempt is made to compare costs that have similar geologic profiles, mining plans, and production capacities. Similar marketing qualities of the coals (for example, heat value and sulfur content) are not required in this portion of the study because the objective here

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[5]Latin American Mining Institute, Sept. 1993, p. 389.

is to compare the cost of extracting 1 mt of raw coal. The following discussion identifies the main differences in basic cost factors that were found between Venezuelan and U.S. coal mines.

Three surface mines in Venezuela were compared with four similar mines in the western United States. All of these mines use typical surface mining equipment and operating practices for removing the overburden from the coal seams and recovering the coal. The dip averages about 11° for Venezuelan mines and about 21° for U.S. mines. The number of seams mined ranges from 2 to 12 for Venezuelan mines and 4 to 9 for U.S. mines.

Table I shows comparative mine costs for raw coal.

Table I—Comparison of raw coal production costs

January 1993 US$/metric ton

COST CATEGORY	U.S. RANGE			VENEZUELA RANGE		
AT 0% DCFROR						
CAPITAL	$1.00	-	$2.26	$0.50	-	$4.42
OPERATING	$5.60	-	$10.64	$9.80	-	$15.83
LAND	$1.17	-	$8.45	$0.84	-	$1.77
TAXES	$0.75	-	$4.14	$0.04	-	$0.34
TOTAL MINING	$8.52	-	$23.49	$12.22	-	$21.03
AT 15% DCFROR						
CAPITAL	$1.90	-	$5.36	$1.04	-	$7.56
OPERATING	$5.60	-	$10.64	$9.80	-	$15.83
LAND	$1.35	-	$8.56	$0.91	-	$2.27
TAXES	$0.98	-	$4.95	$0.29	-	$1.02
TOTAL MINING	$9.83	-	$24.41	$13.06	-	$22.83

Totals may not add because they represent the cost at an individual mine. Cost components within a column may be from several different mines to illustrate the minimum or minimum value for each cost component among the mines. Exchange rate used: 1 Bolivar = US$0.0128.

Total mine costs Total mine cost ranges for U.S. and Venezuelan mines are similar at both 0% and 15% DCFROR. Although U.S. operating costs are at the low end of or below Venezuelan operating costs, U.S. taxes are usually higher than Venezuelan taxes.

Capital costs The ranges for returns on capital at 15% DCFROR are similar for Venezuelan and U.S. mines. Venezuelan equity capital costs range higher than U.S. equity costs. The highest Venezuelan cost is almost twice as high as the highest U.S. cost, being $2.16/mt higher. This difference may be accounted for by noting that the sample Venezuelan mines average 5 years old, whereas U.S. mines average 18 years old. U.S. mines thus have depreciated much of their initial investment, leaving fewer capital dollars to be recovered at this stage of their mine lives.

Operating costs Mine operating costs per metric ton in Venezuela are generally higher than in the United States. Operating costs are made up of two categories: labor, and equipment and supplies.

U.S. labor costs per metric ton are generally higher than those in Venezuela. U.S. labor costs are more consistent, generally about 60% of each mine's operating costs. Venezuelan labor productivity varies greatly: the mine with the highest productivity is 14 times higher than the lowest. U.S. mines have an average productivity of 5.4 mt/worker-hour versus Venezuela's 3.4. Labor cost as a percentage of operating costs varies quite a bit for Venezuelan mines, averaging between 10% and 35%.

U.S. mines have a distinct advantage in the equipment and supplies category. The lowest Venezuelan cost is higher than the highest U.S. mine cost in this category by 86%, or $3.72/mt. Virtually all Venezuelan mine equipment is imported, most originating in the United States. As a result, most equipment parts are imported from the United States. The cost of equipment parts and supplies delivered to Venezuela depends on U.S. prices, the exchange rate, and costs of importation.

Land costs U.S. land costs are generally higher than those in Venezuela. Three of the four sample U.S. mines extract coal from Federal leases and must, therefore, pay a 12.5% Federal royalty on the value of the coal f.o.b. mine. Most Venezuelan coal is mined from concessions let from nationally owned regional development corporations. These corporations collect royalties that are generally lower than U.S. Government royalties, and can be applied f.o.b. port.

Taxes Federal incomes taxes for the United States and Venezuela are about the same at 0% DCFROR. At 15% DCFROR, taxable income is higher, and Venezuelan mines generally pay higher Federal income taxes than U.S. mines. U.S. State taxes and Federal health and safety taxes add to the difference between total U.S. and Venezuela taxes.

When income taxes are imposed by U.S. States, they are relatively small, but other taxes are more substantial. For three of the four U.S. mines, the sum of property and severance taxes total more than $2/mt. Venezuelan States impose no income tax. Venezuela has no property tax of comparable magnitude nor does it have severance taxes.

Black lung and abandoned mine lands taxes are major U.S. mine taxes, representing about 5% of the total cost of U.S. mines. Venezuela has no similar taxes.

Safety and health, and environmental compliance costs Refer to table II. Overall, total compliance costs for the selected regulatory activities range from $1.15 to $2.06/mt for U.S. mines and $0.11 to $0.53/mt for Venezuelan mines. U.S. mines pay at

least twice as much in compliance costs. The major cost difference is due to the black lung tax and reclamation fee imposed by the U.S. Government.

For selected mine safety and health regulatory costs, the cost of compliance for U.S. mines ranges from $0.62 to $0.78/mt, whereas the Venezuelan mines range from $0.01 and $0.49/mt. The major difference between U.S. and Venezuelan mine safety and health costs is the U.S. black lung tax, which ranges from $0.42 to $0.61/mt; Venezuelan mines pay no comparable tax.

For selected environmental compliance costs, the cost of compliance for U.S. mines ranges from $0.53 to $1.36/mt, whereas the Venezuelan mines range from $0.04 to $0.52/mt. The major difference in these selected environmental compliance costs is the abandoned mine lands fee of $0.39/mt of salable coal (or 10%

Table II—Comparison of selected regulatory compliance costs at 0% DCFROR

January 1993 US$/metric ton raw coal

	U.S. RANGE			VENEZUELAN RANGE		
Mine Safety and Health						
Training	$0.02	-	$0.04	$0.01	-	$0.01
Dust control	$0.05	-	$0.18	$0.00	-	$0.48
Black lung tax	$0.42	-	$0.61	$0.00	-	$0.00
SUBTOTAL	$0.62		$0.78	$0.01		$0.49
Environmental						
Reclamation	$0.21	-	$0.92	$0.03	-	$0.52
Water treatment	$0.04	-	$0.05	$0.00	-	$0.00
Reclamation fee	$0.27	-	$0.39	$0.00	-	$0.00
SUBTOTAL	$0.53	-	$1.36	$0.04	-	$0.52
TOTAL	$1.15	-	$2.06	$0.11	-	$0.53

Total regulatory costs shown do not include costs that are indirectly affected by regulations (for example, Federal income taxes). Totals may not add because they represent the costs at individual mines. Cost components within a column may be from several different mines to illustrate the lowest to highest values for each cost component among the mines.

Specific safety and health training is not required in Venezuela. The figures shown are either the amount the Venezuelan company must pay to the National Institute of Cooperative Education (INCE) or the estimated cost of training that the company was providing its employees. Exchange rate used: 1 Bolivar = US$0.0128.

of the f.o.b. value of coal, whichever is less) that U.S. mines incur. Venezuela has no comparable fee.

Competitiveness case studies

The relative competitiveness as measured by delivered costs is analyzed for electric utility markets in three markets: New England and the east coast of Florida in the United States, and Western Europe. Competitiveness in international coal trade is difficult to define in explicit terms. Delivered price is a major factor; but other factors such as consistent quality and reliability of supply are also important to buyers. In this study, only the delivered costs are analyzed. The delivered price is made up of two major cost components: mine-mouth cost and transportation cost. These costs are summarized in table III for the three cases.

Table III—Comparison of delivered costs

January 1993 US$/metric ton delivered coal

CASE I: NEW ENGLAND STEAM COAL IMPORT MARKET

COST CATEGORY	U.S RANGE			VENEZUELAN RANGE		
MINE MOUTH*	$31.32	-	$41.11	$12.62	-	$21.91
TRANSPORTATION**	$18.25	-	$26.40	$13.07	-	$25.45
TOTAL DELIVERED	$49.58	-	$67.51	$33.06	-	$38.07

CASE II: FLORIDA EAST COAST STEAM COAL IMPORT MARKET

COST CATEGORY	U.S RANGE			VENEZUELAN RANGE		
MINE MOUTH*	$31.32	-	$41.11	$12.62	-	$21.91
TRANSPORTATION**	$19.00	-	$24.20	$10.82	-	$24.20
TOTAL DELIVERED	$50.32	-	$63.64	$30.56	-	$36.82

CASE III: WESTERN EUROPE STEAM COAL IMPORT MARKET

COST CATEGORY	U.S RANGE			VENEZUELAN RANGE		
MINE MOUTH*	$31.32	-	$41.11	$12.62	-	$21.91
TRANSPORTATION**	$18.95	-	$24.60	$14.71	-	$36.20
TOTAL DELIVERED	$50.28	-	$65.71	$31.16	-	$48.82

*Includes all capital, mine-operating, mill, land, and tax costs.

**Includes mine-to-port transport, export port charges, and ocean freight.

Totals may not add because they represent the cost at an individual mine. Cost components within a column may be from several different mines to illustrate the minimum or maximum value for each cost component among the mines. Exchange rate used: 1 Bolivar = US$0.0128.

The mine-mouth cost is defined as the cost to produce 1 mt of salable coal ready for shipping. Mine-mouth costs at 0% rate of return are compared because they represent the breakeven point. A sales revenue netback at the mine equal to the mine-mouth cost is sufficient to cover all mining costs and recover the capital investment.

Transportation cost is the total cost of delivering the coal to an export terminal, port terminal service charges, and ocean

transport to the unloading port terminal. In this study, transportation costs are the prices paid by the shipper and not the costs incurred by the transport or other service companies. The transport modes and routes used in the market case studies conform to normal coal trade practices.

Three U.S. mines are compared with three Venezuelan mines in each market. The U.S. mines are in the Eastern United States, two surface and one underground longwall mines. Two of the U.S. mines have preparation plants, whereas none of the Venezuelan mines has such plants. The method of mining and production capacities vary substantially between the mines.

Steam coal markets having access to international competition continue to grow more competitive. Buyers have become more price conscious, and cheaper coal from more diverse sources is commonplace. In this environment, coal suppliers with high costs are especially at risk.[6] In each market case examined, for delivered costs, the lowest cost U.S. mine is more expensive than the highest cost Venezuelan mine. Below are reasons for the difference:

- U.S. mine production costs, which include costs of preparing the coal, are higher than Venezuelan production costs.
- U.S. mines have in each case equal or greater land-plus-tax costs.
- Venezuelan mines are much newer than the U.S. mines.
- Almost all Venezuelan export coal comes from mines close to the ocean, whereas U.S. export mines are generally farther from the coast, resulting in substantially higher transport costs between mine and ship.

U.S. and Western European electric utility markets

Venezuelan coal has easy access to U.S. east coast powerplants that can handle the handy-size and panamax ships that come out of Venezuela. Three such plants took Venezuelan coal in 1991, and 13 additional plants have been recently identified as possible users of imported coal, having the capability of building ocean facilities for offloading of import coal.[7]

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[6]Productivity Trends and Competitive Implications for Pacific Rim Coal Supplies, by E. Sherer, U.S. Bureau of Mines, gives a more complete discussion of this theme.

[7]International Coal Report, Nov. 27, 1992, pp. 14-21. Earlier work was done by the U.S. Department of Commerce, 1985.

Case I: New England steam coal import market

Venezuelan mines can deliver coal to the coastal New England steam coal market much cheaper than the U.S. mines. The Venezuelan mine with the highest delivered cost is still $11.51/mt cheaper than the lowest cost U.S. mine. The difference is largely accounted for by higher U.S. mine-mouth costs, which is the sum of production, land, and tax costs. The difference between the lowest U.S. mine-mouth cost and the highest Venezuelan mine-mouth cost is $9.41/mt.

Case II: Florida east coast steam coal market

An even greater difference in delivered cost exists in this case than in case I. Here, Venezuelan mines have at least a $13.50/mt advantage over the sampled U.S. mines. Again, the bulk of the difference comes from the comparative mine-mouth costs, where the Venezuelan mines have at least a $9.41/mt advantage.

In this case, a large difference occurs in the lowest transportation costs. The lowest Venezuelan transportation cost is $6.10/mt less than the lowest U.S. transportation cost. This difference is largely due to the lower ocean freight costs from Venezuela against the higher rail freight costs for the U.S. mines.

Case III: Western European electric utility market

In the Western European market, Venezuelan mines hold a distinct advantage in total delivered costs over the U.S. export mines, although the difference is less than in U.S. markets. In the European case, Venezuelan transportation costs can be higher than U.S. transportation costs because, at present, Venezuelan mines are restricted to smaller vessels, whereas some U.S. exporters can use larger, less expensive capesize vessels.

Between 1992 and 2000, steam coal imports into western European markets have been estimated to increase 38%, to 203.8 Mmt.[8] Western Europe is the largest market for steam coal for U.S. and Venezuelan suppliers.

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[8]International Energy Agency. Coal Information 1992, 1993 Edition, p. 61.

CHAPTER I

INTRODUCTION

This report on the Venezuelan coal industry is the sixth in a series of coal-exporting-country studies requested by the House Appropriations Committee of the U.S. Congress. Previous studies examined the Colombian, Canadian, Australian, South African, Polish, and Indonesian coal industries. The Committee requested that basic differences in mining costs between U.S. and foreign mines be identified, especially those costs incurred in complying with health, safety, and environmental regulations.[9]

This report compares the basic costs of mining coal among comparable Venezuelan and U.S. mines. Basic mining cost is defined as the cost of producing 1 mt of raw coal over the remaining life of the mine. Unit component costs (costs per metric ton) that make up the basic cost are analyzed to identify inherent differences in cost structures. Unit component costs are capital, labor, equipment and supplies, land, taxes, and compliance with selected health and safety, and environmental regulations.

This report also includes a limited analysis of the relative market competitiveness between selected Venezuelan and U.S. steam coal mines in three electric utility markets: New England and the Florida east coast in the United States, and western Europe. Although some Venezuelan coal has coking characteristics, coal from all areas of Venezuela is sold in steam markets.

Venezuela is a fast-growing exporter of steam coal. Almost all its coal production is exported, 2.4 Mmt in 1992, 1% of total world steam coal trade. In year 2000, should Venezuela meet its expectations of exporting 20-25 Mmt/yr,[10] its share of the world steam coal export market could rise to 7%.[11] Venezuela's export expectations are likely to be realized, however, only by the building of the proposed rail-port infrastructure between the Guasare Basin and the Gulf of Venezuela in the relatively near future. Though still a small exporter, Venezuela has been a reliable supplier. Its low cost, good quality coal has displaced some higher cost U.S.-mined coal in U.S. and European steam coal markets.

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[9]H.J. Resolution 648, House Appropriations Committee Report 98-1030, U.S. Congress.

[10]Essis B., A., p. XI-2.

[11]This estimate assumes world steam coal exports in year 2000 are 366 Mmt, the Energy Information Administration's reference case forecast, as quoted in International Energy Agency's Coal Information 1992, 1993 Edition, p. 65.

Study Approach

As in previous country studies, the case approach is used. For comparison of basic mining costs, three surface Venezuelan mines are compared with four similar surface mines in the Western United States. For comparison of delivered costs in the three markets noted above, three surface Venezuelan mines are compared with two surface mines and one underground mine in the Eastern United States.

Method

The method for calculating the average basic mining cost over the life of the mine is identical to that employed in other studies.[12] Chapter 3 compares basic mining costs of U.S. and Venezuelan mines and explains the costing procedures and the discounted cash-flow analysis used to calculate the average basic mining cost.

Chapter 4 compares competitiveness, the delivered-to-market costs (basic mining costs plus preparation and transportation costs) for the three markets. Point-to-point transportation costs are estimated prices paid by the shipper, not the costs incurred by the transporter.

Scope of Study

The three Venezuelan mines in this study represent Venezuela's major coal-producing areas. All the mines produce bituminous coal of varying steam coal quality characteristics. As is the case for most Venezuelan mines, the study mines export most of their production. The seven U.S. mines in this study are in the Appalachian and western coal-producing regions. Most of these mines were developed primarily to supply domestic markets.

To secure the cooperation of the Venezuelan and U.S. coal companies, it was agreed that the mines would not be identified and that individual mine cost data would be aggregated to ensure confidentiality of certain cost figures.

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[12] A Cost Comparison of Selected U.S. and Colombian Coal Mines, 1986.
A Cost Comparison of Selected U.S. and Canadian Coal Mines, 1988.
A Cost Comparison of Selected U.S. and Australian Coal Mines, 1989.
A Cost Comparison of Selected U.S. and South African Coal Mines, 1990.
A Cost Comparison of Selected U.S. and Polish Coal Mines, 1993.
A Cost Comparison of Selected U.S. and Indonesian Coal Mines, 1994.

The Venezuelan mines in this study use conventional surface mining methods and have annual production capacities ranging from 0.2 to 10 Mmt.

The U.S. mines in the basic mining cost portion of this study (chapter 3) also use conventional surface mining methods and have annual production capacities ranging from 0.3 to 3.4 Mmt. U.S. mines in the competitiveness portion of the study (chapter 4) are two conventional surface mines and one longwall underground mine, whose annual salable production ranges from 1.5 to 2.3 Mmt.

In calculating the costs of compliance with health and safety, and environmental regulations, it was assumed that the mines fully met the minimum requirements. Site visits to U.S. and Venezuelan mines were not made for the purpose of verifying regulatory compliance.

Caution should be used in comparing the basic mining and market-specific delivered costs in this report to current mine-mouth or market prices. Mining costs in this study are averages over the life of a mine and may not reflect the actual cost at any one period during a mine's life. In addition, the delivered costs do not include marketing, sales, and other corporate overhead charges. Additionally, the U.S. sample size is a small part of the total mine population, and some U.S. mines have lower or higher costs than those in this study.

Also, it is important to recognize that transportation costs in this report may not be representative of current market rates. Both inland and ocean freight spot shipment rates may differ from contract rates or charter rates. Further, ocean freight rates can be extremely volatile, as they respond to cyclical and sudden changes in demand and supply of bulk freighters.

The cost evaluations in this study are based on mine operating conditions in 1992 and the January 1993 value of the Venezuelan Bolivar, which was US$0.0128. Any increase or decrease in the value of the Bolivar to the U.S. dollar would similarly affect the cost of mining in Venezuela when expressed in U.S. dollars. All costs—including the individual mine-mouth costs, and inland and ocean transport costs—are in January 1993 U.S. dollars per metric ton.

Organization of Report

Chapter 2 is an overview of the Venezuelan coal mining industry. Chapter 3 compares the basic costs of extracting raw or run-of-mine coal by surface mining methods. Chapter 4 examines the competitiveness of selected mines in specific world markets.

This study has three appendixes: appendix A describes the tax and royalty requirements in Venezuela; appendix B describes the U.S. Federal and State taxes, fees, and bonding requirements;

appendix C sets out requirements of some Venezuelan laws and regulations that affect coal mining; and appendix D provides additional information about coal mining in Venezuela.

CHAPTER 2

OVERVIEW OF THE VENEZUELAN COAL INDUSTRY

This chapter's goal is to familiarize the reader with the Venezuelan coal industry. Included in the discussion that follows are Venezuela's major coal regions and activities, the importance of coal to Venezuela, production and exports, reserves and resources, transportation and ports, governmental regulations, and coal-related environmental topics.

Industry in Perspective

Background

The land area of the Republic of Venezuela is 912,050 sq km, about the size of Texas and Oklahoma combined. It borders Brazil, Colombia, and Guyana and has a population of about 20 million (1991). Caracas, the capital city, lies about 10° north of the Equator.

The remainder of this section sets out names and facts associated with Venezuela's coal industry. (Appendix D provides additional detail on mining activities.) Figure 2.1 is a map of Venezuela showing States that are most active in coal production, mine locations, potential near-term future mines, and coal ports.

Zulia

The State of Zulia produces most of Venezuela's coal. Zulia contains the Guasare Coalfield, Venezuela's largest and most economical coal resource. The Paso Diablo mine, in the Guasare, is 30 km east of Colombia's major coal-exporting mine, El Cerrejon. Paso Diablo is about 85 km northwest of Maracaibo, Zulia's capital and largest city.

Paso Diablo is Venezuela's largest coal mine. It is operated by Carbones del Guasare, which is owned by Carbozulia[13] (49%), Agip[14] (48%), and Inversionistas Regionales (SOFIMARA)[15] (3%). ARCO Coal Company was involved in the development of Paso Diablo but sold its 24% interest to Agip in 1989 for $20 million. At the end of 1993, Agip was in the process of selling its share to

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[13]Carbozulia is wholly owned by Petróleos de Venezuela S.A. (PDVSA), Venezuela's national energy company.

[14]Agip's parent company is ENI, a nationally owned Italian oil company.

[15]A group of private Venezuelan investors.

Figure 2.1—Venezuelan coal mines and ports

interested bidders. Production in 1992 was 2.1 Mmt, and estimates of future production range from 6.5 to 10 Mmt/yr.

Salable reserves are 230 Mmt. It will likely be joined in the future by two neighboring surface coal mines.

Should a proposed railroad be built (see the coal transportation and ports section below), Paso Diablo will likely

gain a large neighboring mine to the south, Socuy. Socuy is 15 km south of Paso Diablo and could produce 8 Mmt/yr. Mina Norte, which abuts Paso Diablo to the north, will likely start a pilot underground and surface mine in 1994 without waiting for the rail. It could produce about 1.5 Mmt/yr.

Carbozulia, a major equity holder in all three projects, has stated that coal production from Zulia by year 2000 could reach 20-25 Mmt/yr. Coal mined in Zulia is leased from the nationally owned development company of Corpozulia (note that Corpozulia differs from Carbozulia).

Táchira

Táchira, Venezuela's second largest coal-producing State, shares its northern border with Zulia and its western border with Colombia. Its major coalfield is Lobatera, part of the Andean Region, which is in the southern Maracaibo Basin. Táchira coal has coking and steam characteristics and deposits neither as large nor as surface-minable as those in Zulia.

Most of the production is near the town of Lobatera, 20 km north of Táchira's capital of San Cristóbal. Exmivenca, a private Venezuelan company, and Coopemin, a cooperative of about 200 small mines, are the major producers in Táchira. (See table 2.2. for production figures.) Surface-minable coal, mined by Exmivenca, is said to be almost depleted. Coal from Táchira is sold domestically and exported.

Carbosuroeste, a nationally owned coal development company, is the lessor for coal concessions in Táchira and is active in exploration, cataloging, and evaluation activities. It can take equity positions and furnish technical assistance and some startup capital for promising coal ventures. Also included in Carbosuroeste's region are the Municipality Ezequiel Azmora of the State of Barinas and the Municipality Paez of the State of Apure, both of which lie to the south and southeast of Táchira.

Anzoátegui

Some 250 km east of Caracas, on Venezuela's northern coast, are the nearby State of Anzoátegui coastal cities of Barcelona and Puerto la Cruz. The State's major coal deposits are in the Naricual Coalfield of the Eastern Basin, south and west of the cities. Until 1993 when it closed, the largest regional mine was Fila Maestra. It lies about 95 km west of Puerto la Cruz and is

owned by Cavoven and Cavoex.[16] The mine began producing in 1987 and has been selling about 200,000 mt/yr to European markets.

Carbonar, owned by England's Young Group PLC, mines the Carbones Naricualdeposit, 25 km south of Puerto la Cruz. Its underground and surface production, about 65,000 mt in 1992, is exported to Europe. Corporiente is the national development company that grants coal concessions in this region of Venezuela.

History of Venezuelan coal development[17]

Coal mining dates from the early part of the 19th century when coal was mined near Naricual, where coal is still mined. In 1952, Minas de Carbón de Lobatera was formed to supply coal to the iron and steel industry. In 1967, when coke prices in international markets became attractive to Venezuelan customers, investment in the higher cost local coal projects declined. When international coal prices rose 2 years later, however, private offers were received to explore in Naricual and the State of Zulia.

In 1972, Venezuela reserved the rights of coal exploration and production for all national territory. In 1973, the responsibility for coal development was transferred to regional governmental corporations, such as Corpozulia. Corpozulia and the Investment Fund of Venezuela created Carbozulia in 1978 to explore, mine, and process coal in Zulia's Guasare coal basin.

In 1982, Carbozulia contracted with Fluor Mining & Metals and Tecnoconsult (of Venezuela) to design and build the Paso Diablo mine. In 1985, the Guasare project was transferred to Carbozulia. In 1986, ownership of Carbozulia was transferred to Petróleos de Venezuela S.A. (PDVSA), the national oil company. The same year, the name of Minas de Carbón de Lobatera was changed to Carbones del Sur Oeste[18] C.A., known as Carbosuroeste.

In November 1987, the first coal was produced from the Paso Diablo mine and sold in Italy and France. In August of the following year, Carbozulia formed the operating company Carbones del Guasare S.A. to continue Paso Diablo's production and development. Ownership was Carbozulia 49%, Inversionistas

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[16]Cavoven owned the mine functions of management, planning, sales, and exploration. Cavoex owned the mining and stripping functions. Cavoex is 49% Mitsubishi, 51% Vencemos.

[17]This section is from a publication by Venezuela's Ministry of Energy and Mines: Ministerio de Energía y Minas, Estudio de Mercado del Carbon (Tomo II), p. 263 ff.

[18]Coal of the southwest.

Regionales (SOFIMARA) 3%, and 48% foreign, A.A. Antilles Coal N.B.[19]

From 1987, Carbosuroeste's mission has been to plan, promote, and develop the coal industry of southwestern Venezuela. In northeastern Venezuela, including the State of Anzoátegui, the regional development corporation Corporiente does the same.

The national Government participates in the coal industry through ownership in Paso Diablo and several prospects (via Carbozulia's investment in Carbones del Guasare), control of some coal ports, and by promoting coal development through Government-owned development corporations.

Present economic and political conditions

At the time of this analysis, Venezuela was experiencing severe economic and political conditions. Economically, the country has been experiencing stagnant growth, accelerating inflation, and a gaping fiscal deficit. Inflation was more than 31% in 1992 and exceeded 45% in 1993.[20] During 1992, the Venezuelan currency, relative to the U.S. dollar, devalued 29%; during 1993, the relative devaluation was 32%.[21] The direct effects of these occurrences on most export coal mines have been slight. Since export coal is normally sold in U.S. dollars, the devaluation helped Venezuelan exporting companies keep pace with local inflation. Also, since the mines often buy a large amount of U.S. equipment, parts, and supplies, currency risk is eliminated for those costs because U.S. dollars earned from export sales can be used directly to buy U.S. goods.

Former president Carlos Andrés Pérez was removed from office in May 1993 because of alleged irregularities and replaced by interim president Ramón J. Velásquez. The removal resulted in political turmoil. A revised mining law narrowly missed being approved in 1993 by the Congress. President Rafael Caldera and a new Congress were elected in early December 1993, but it is unclear when the new president and Congress, which assume office in early 1994, will take up the issue. Uncertainty over the content and timing of a new mining law and regulations may hinder further coal development. An agreement signed in June 1990 between Venezuela and the U.S. Overseas Private Investment Corporation (OPIC) enables U.S. firms to insure against political risk for new investments.

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[19]24% ARCO Coal Company and 24% Agip. ARCO sold its interest to Agip in 1989.

[20]The Daily Journal, Aug. 13, 1993; International Monetary Fund.

[21]International Monetary Fund. International Financial Statistics.

Industry organization

Public entities participate in Venezuela's coal industry at three levels, as shown in figure 2.2. At the highest level are organizations that formulate policies, do national coal sector planning, and control the organizations and companies of the other two levels.

The first level includes the following:

- Ministry of Energy and Mines (MEM), responsible for mining matters. SERVIGEOMIN does geological and analytical work; CAIGEOMIN is the analysis center of the Mining and Geological Information Service.[22]
- Ministry of the Environment and Renewable Natural Resources (MARNR), concerned with environmental consequences of mining. MARNR regional offices must authorize each mining project after reviewing the environmental impact.
- Central Office of Coordination and Planning (CORDIPLAN), whose responsibilities encompass coal mining.
- Venezuelan Investment Fund (FIV), which finances Carbosuroeste, the enterprise that coordinates and regulates coal activities in southwestern Venezuela.

Level 1 organizations report to Venezuela's president.

At the second level, public entities plan and promote regional development and provide technical assistance to public development and production organizations. At the third level, public entities work with private companies in the mining, transportation, and commercial aspects of coal, both nationally and internationally.[23]

Importance of coal to Venezuela

Exporting coal to international customers is of significant benefit to Venezuela. For example, in 1992, the average export price, f.o.b. port, was US$35.93/mt. At that price, coal earned US$86.4 million in revenues for Venezuelan operations. At the same price, should coal exports reach 20 Mmt in year 2000, export revenue would reach US$718.6 million. Because Venezuela is well endowed with oil, gas, and hydroelectric power sources, most of its coal can be exported. By comparison, 1992 U.S. steam coal

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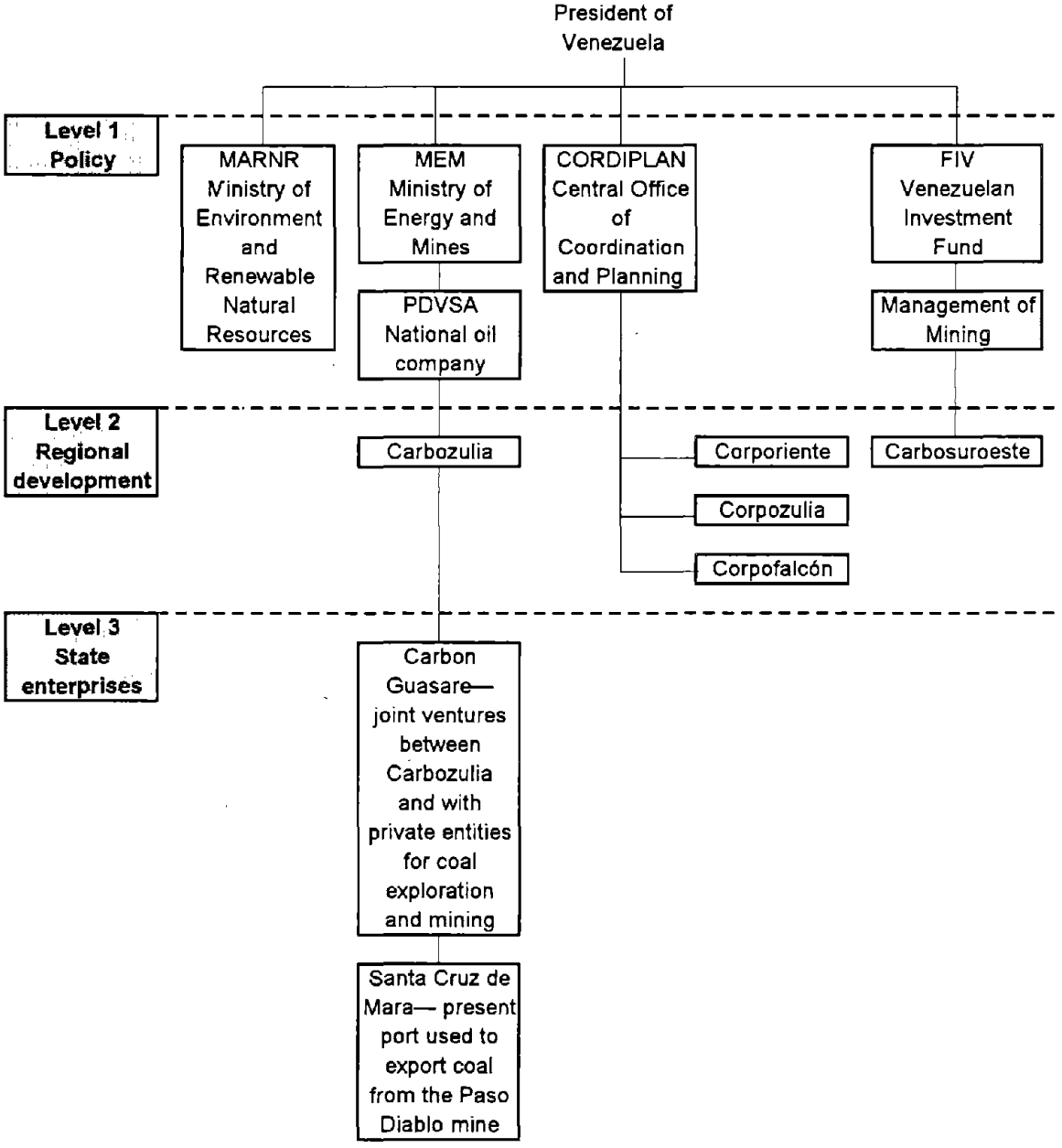
[22]National Council for Investment Promotion (CONAPRI), p. 43.

[23]Ing. Simón Antonio Baloa P., pp. 5-6.

exports of 39.1 Mmt brought in revenues of $1.5 billion, down from 1991 exports of 40.2 Mmt, valued at $1.6 billion.[24]

Figure 2.2—General hierarchy of the Venezuelan Government coal sector



Source: Ministry of Energy and Mines.

[24]U.S. Department of Energy, Energy Information Administration. Quarterly Coal Report, Oct.-Dec. 1992, pp. 138-139. The value of total U.S. coal exports in 1992, steam plus coking coal, was $4.6 billion.

Venezuela has the opportunity to increase its share of the international steam coal trade, international trade having grown steadily to 236 Mmt in 1992.[25] Venezuela's competition from the United States may moderate. Prices had weakened by September 1993 to an extent that some U.S. companies were having difficulty in the spot market.[26] Despite the weak prices, Paso Diablo sold out its 1993 capacity by September of that year.

Growth in Venezuela's coal exports helps Venezuela in two respects. First, jobs are created in socially depressed areas of the States of Zulia, Táchira, and Anzoátegui; second, export coal sales have generated revenues. As coal development increases, jobs and export revenue will increase.[27]

Coal production

Table 2.1 compares the growth of coal production in Venezuela with that of the United States. Venezuela's recent steady growth has generally paralleled the growth of the Paso Diablo mine. U.S. production has, in contrast, dropped from its 1990 high primarily because of the poor economy and a drop in exports.

Table 2.1—U.S. and Venezuelan total coal production

Mmt

	1986	1987	1988	1989	1990	1991	1992
United States	807.9	833.7	862.3	889.9	933.8	903.8	907.6
Venezuela	0.1	0.2	1.1	2.1	2.2	2.4	2.5

Source: U.S. Department of Energy, Quarterly Coal Report, Oct.–Dec. 1992; Venezuelan Ministry of Mines and Energy.

Between 1952 and 1987, most of Venezuela's coal production came from the Lobatera area, although in some years production from the Naricual basin exceeded that of Lobatera. In 1987, however, Paso Diablo began production with 150,000 mt, far exceeding Lobatera's production that year of 57,880 mt. Paso Diablo has dominated Venezuela's coal production since. Table 2.2 shows 1991 and 1992 production by the largest producers.

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[25]International Energy Agency. Coal Information 1992, 1993 Edition, p. 54.

[26]Coal Week International, Sept. 14, 1993, p. 3.

[27]Baloa P., S. A., pp. 1, 3.

Table 2.2—Venezuelan coal production by producer

mt

	1991	1992
Carbones del Guasare, S.A. (Paso Diablo)	1,605,991	2,093,846
Cavoven (Fila Maestra I)	0	160,340
Carbonar, C.A. (Pastora 1 to 9)	41,596	65,152
Coopemin Cazadero 1)	71,839	55,032
Geoconsa (Fila Maestra II)	247,682	46,194
Exmivenca (Cazadero 2)	247,857	39,814
Edgar Moreno (Capote)	4,275	7,843
Casmoca (Carbosuroeste)	6,838	5,990
Asocoque (Cazadero 2)	12,390	5,686
Maicca (Cazadero 3)	160,327	0
Tecnocarbo (Arenales)	4,604	0
	2,403,399	2,479,897

Source: Venezuelan Ministry of Energy and Mines; 1992 numbers are subject to revision.

Safety

Venezuela's Organic Law of Working Safety and Conditions (see appendix C) states that its purpose is to "guarantee...workers the safety, health and welfare conditions, in an adequate working environment." Article 2 of that law states that "it is the responsibility of the employers...to comply with the purpose." Further, in article 33, "When the employer knows that the workers run a risk by carrying out their duties and death were to occur because the dispositions ordered in the present law were not complied with he will be punished with a prison sentence of 7 to 8 years." The National Institute for Work Prevention, Health and Safety, which makes inspections, can close an operation should harmful situations exist. Workers who purposely break or remove safety devices will be fired.

Some articles in the laws affecting mining relate to safety and health. Venezuela has also adopted Agreement No. 155 and Recommendation No. 164 of the International Labor Organization, that deal with safety, health, and the working environment (see appendix C). In addition, the Ministry of Work has a regulation indicating that mining companies must give special training to mine workers. Mining companies must put forth their own local safety and health regulations and submit them for approval to the Ministry of Energy and Mines.[28]

Venezuela's national safety laws do not specify how safety management is to be done. General, not specific health and safety

[28]Abreu, Rene. Rene International C.A.

training is required.[29] At least one company provides training in defensive driving, first aid, rescue, and fire fighting. Government-owned regional development corporations, which grant concessions, may require concessionaires to abide by certain safety regulations. For example, 17, the regional development corporation for coal in southwest Venezuela, requires its concessionaire to comply with Carbosuroeste's own regulations (see appendix C).

National and regional development corporations employ inspectors. At one operation, inspectors from the development corporation that leased the concession inspected about once per week. At another operation, inspectors visited about once per month.

Safety is difficult to compare between countries because of the possibility of differing standards and interpretations. Mine safety statistics in the United States are kept by the Mine Safety and Health Administration (MSHA), Department of Laborthe Mine Safety and Health Administration (MSHA),. Table 2.3 shows injury incidence rates for all U.S. surface bituminous coal mines and just one Venezuelan surface coal mine. Incidence rate is defined as the number of injuries per 200,000 employee-hours worked.

Table 2.3—U.S. and Venezuelan injury incidence rates in surface coal mines

Number of injury occurrences per 200,000 employee-hours worked

	1991	1992
United States	4.95	4.45
Venezuela	1.87	1.58

The U.S. figures represent all surface bituminous coal mines except auger, culm bank, and dredge operations. The Venezuelan fugures are from a single surface coal mine.

Sources: United States: Mine Safety and Health Administration; Venezuela: U.S. embassy.

The reader should view the comparison with caution. First, different interpretations can be made of what is recorded as an injury. Second, the table compares the U.S. national numbers with those of a single Venezuelan mine (national numbers not being available). Third, although the U.S. numbers are for production workers, the Venezuelan numbers are for "mine"

[29]See appendix C; for example, the Organic Law of Working Safety and Conditions, chapter VI, article 19.3., and the Law Approving the Agreement No. 155, article 5.

workers; it is unknown whether the two bases are identical. Fourth, U.S. numbers are from what are called "injuries," and Venezuelan numbers are labeled "accidents"; the two terms may in reality be the same, but in the United States, a distinction is made between accidents and injuries: one might have an accident with no resulting injury.

The formulas for U.S. and Venezuelan computations are the same, with two exceptions: (1) MSHA's formula uses 200,000 employee-hours, whereas the Venezuelan formula uses million employee-hours; and (2) MSHA uses the word "injury," and the Venezuelan mine uses the word "accident." Venezuelan numbers were divided by 5 to base table 2.3 on a common 200,000 employee-hour basis.

Coal ownership

All coal is owned by Venezuela.[30] Concessions for exploration and/or production are granted by the nationally controlled regional development organizations or, if the land falls outside their purview, by the Ministry of Energy and Mines. Development organizations include Corpozulia, Carbosuroeste, Corporiente, and Corpofalcón.

Mechanization

Surface mines have modern equipment, most of which is made in the United States, although equipment from Japan and Germany is also used. Trucks that haul coal at the mine or on the highways are commonly Italian or Spanish. Underground mines are smaller and less modern than the surface mines. Coal is mined underground by pick and shovel, sometimes supplemented with jackhammers.

Labor

The Government establishes a minimum wage. In late 1992 that minimum was about $0.69 per hour,[31] compared with the U.S. minimum wagepartial of $4.25 per hour. An additional bonus raises Venezuelan wages by 30%. Fringe benefits can add another 40% to 60% to labor costs in Venezuelan industries, not counting other possible benefits such as severance pay and hospital care.[32] At one coal mine, however, benefits were found to be 80% of payroll. At another, they were two-thirds of base plus

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[30]National Council for Investment Promotion (CONAPRI), p. 9.

[31]U.S. Department of Commerce.

[32]Latin American Mining Institute, Sept. 1993, p. 392.

overtime pay. At a third, the only benefit besides the bonus was life insurance.

The Labor Ministry approves overtime, which is paid for more than 44 hours work per week, whether by salaried or nonsalaried workers. Overtime pay is 1-1/2 times normal pay during the day, 2 times at night, and 3 times normal pay on Sundays. Night work is limited to 40 hours for salaried and 42 hours for nonsalaried workers.[33] The maximum number of workdays per year is 250.

Nonmanagement workers at mines must, by law, join the union. Middle management may join, but top management are nonunion.

Coal mining can provide above-average income. Whereas the yearly income of an average Venezuelan is $1500,[34] at one mine, an average nonmanagement worker earned about $2300 per year. In contrast to the Venezuelan coal miners, U.S. surface coal miners earn about 15 times as much. Venezuelan and non-Venezuelan companies must limit their staffs to 10% non-Venezuelan, in number and in total payroll.

Absenteeism at the mines is less than 2%.

Exports

Almost all of Venezuela's coal production is exported. Exports began to be significant in 1987, with the startup in November of Paso Diablo. They grew each year from 1988 to 1992, as shown in table/chart 2.1.

Most of Venezuela's exports go to Europe, competing with U.S. suppliers. U.S. buyers have increasingly bought Venezuelan coal, 488,000 mt in 1992; and 1,178,000 mt in 1993.

Venezuela's president has the power to set the value of coal exports for successive periods of up to three years each. If such value exceeds the exporter's stated value, an additional tax must be paid on the difference.[35]

Coal quality

Export coal from Venezuela is not cleaned in preparation plants, run-of-mine quality being sufficient to be sold in international markets. Coal qualities from the Guasare region, which includes Paso Diablo, and the Carbonar mine near Naricual are shown in table 2.4.

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[33]Same page of work cited in footnote 32.

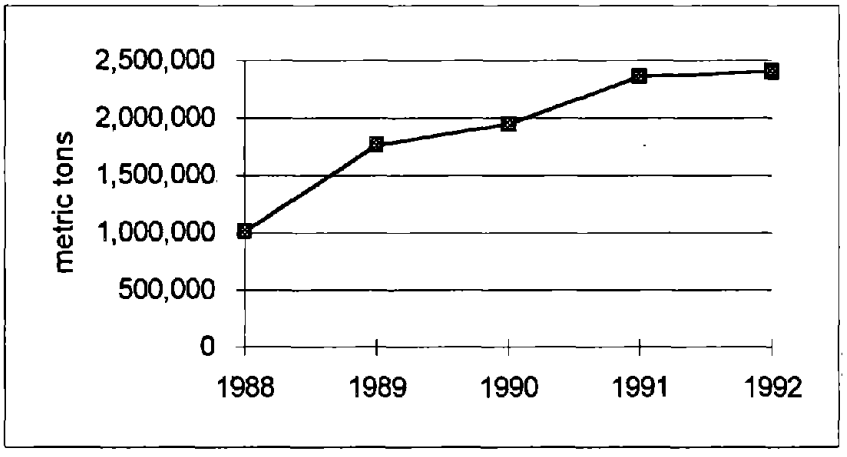
[34]The Daily Journal, Aug. 14, 1993, p. 14. Quote of Hugo Fonseca Viso, former president of the Federation of Chambers of Commerce and Industry (Fedecámaras).

[35]Latin American Mining Institute, Sept. 1993, p. 389.

Table/chart 2.1—Growth of Venezuelan coal exports

Mmt

Exporters	1988	1989	1990	1991	1992
Carbones del Guasa S.A. (Paso Diablo)	772,510	1,453,760	1,571,215	1,572,664	2,096,083
Cavoven (incl. Fila Maestra)	169,757	154,998	211,556	236,830	100,994
Exmivenca	63,759	119,230	31,089	312,524	100,577
Maicca	0	0	83,730	161,173	83,619
Carbonar	0	0	8,611	37,637	17,509
Tecnocarbo	0	0	24,875	21,337	6,000
Coopemin	0	0	11,522	0	2,607
Exprocarbo	4,300	34,568	7,193	20,644	0
	1,010,326	1,762,556	1,949,791	2,362,809	2,407,389



Source: Venezuelan Ministry of Energy and Mines; 1992 numbers are subject to revision.

Table 2.4—Selected Venezuelan coal qualities

As-received basis

	Paso Diablo	Carbonar	Lobatera
Btu/lb	12,650	13,000	11,450
Sulfur	0.6	0.85-1.05	0.94
% Moisture	7	5	
% Ash	7.5	6 to 7	18.8
Free-swelling index			4

Sources: Essis, Alfredo; Venezuelan Coal Projects; Coal Week International; International Coal Report.

Imports

Imports of bituminous coal into Venezuela were 50,100 mt in 1992, and coke and semicoke imports were 92,100 mt. Coal in the Lobatera region has coking properties, and the area has some coke-making facilities. Completion of the Carboquimica del Táchira C.A. coke plant, 80% completed and designed to produce 72,000 mt of coke per year,[36] could reduce coke imports. It has also been reported that Corpozulia is to construct a 1 Mmt/yr coking plant in conjunction with the Japanese Government and private domestic and foreign participants.[37]

In 1992, the Japanese International Cooperation Agency evaluated prospects of making coke near Lobatera.[38] The Japanese have met with the Ministry of Energy and Mines about the possibility of a 1 Mmt/yr coke plant in Táchira, using coal from southwestern Venezuela and Colombia. The coke would be sold in Latin America, Europe, and Eastern Asia.[39]

Reserves and Resources[40]

Venezuela ranks second in Latin America, behind Colombia, in coal resources, having an estimated 10.1 billion mt. Figure 2.3 shows the geographical areas of coal reserves and resources, and table/chart 2.2 shows their distribution among the States.

Guasare Basin

Venezuela's largest coal resource, first discovered in 1876, is the Guasare Basin, where measured, indicated, and inferred reserves are estimated at 2.4 billion mt. Salable reserves at the Paso Diablo mine are estimated at about 230 Mmt, and the nearby resources of Mina Norte and Socuy will likely become more economic when rail transportation becomes available. Now, transport from the area is limited to 3.5-4.5 Mmt/yr, and that capacity is dedicated to the Paso Diablo mine, which trucks coal to its port on Lake Maracaibo. Mina Norte may truck a limited amount of coal to a smaller port.

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[36]U.S. Department of State, Mar. 1993.

[37]Mining Journal, Feb. 11, 1994, p. 106.

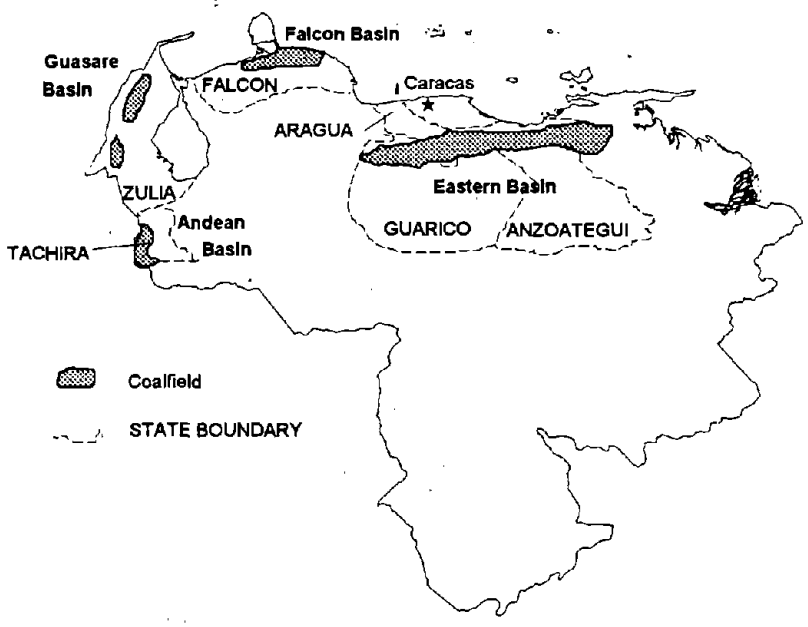
[38]Work cited in footnote 37.

[39]The Daily Journal, July 10, 1993, p. 3.

[40]Much of the information in this section is from (1) Jean Weaver. Fax; U.S. Geological Survey, and (2) Rodríguez M., S.E. Recursos Minerales de Venezuela.

Located in the districts of Mara, Páez, and Maracaibo, in northwestern Zulia, the Guasare lies just east of Colombia's important El Cerrejon coalfield. The topography is irregular with variations of some 50 m between valley floors and hilltops.

Figure 2.3—Venezuelan coalfields



Source: U.S. Geological Survey.

Elevation above sea level varies between 100 and 200 m. The most important zone of economic potential, about 50 km long (north-south) by 3 km wide, is bounded on the south by the Cachirí River and on the north by the Guasare River. Deposits are in the foothills of the Sierra de Perijá and lie in the Manuelote Syncline, whose strike is generally north-northeast. Seams at the Paso Diablo mine are in the Marcelina Formation, considered Late Paleocene and Early Eocene in age. The Marcelina is stratigraphically below the Misoa Formation and over the Guasare Formation. Cyclic beds of shale, mudstone, siltstone, sandstone, conglomerate, and coal were deposited in a brackish-to-freshwater deltaic environment.

The Paso Diablo resource is split by a reverse fault running generally north-south. The current mining area is west of the fault and contains most of the reserves; dips are less than 10°. East of the fault, dips exceed 10°.[41] Dips in this area are generally to the southeast.

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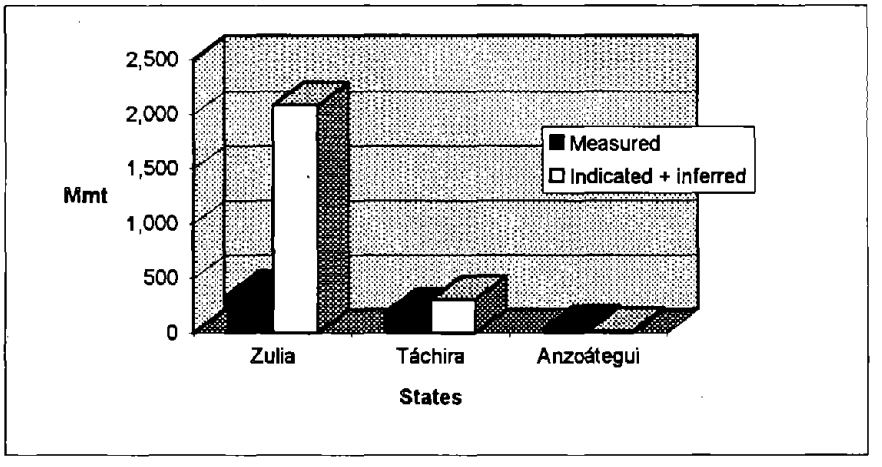
[41]Parker, T. H., G. L. Toll, T. P. Walsh, and D. A. Echter, p. 1.

Table/chart 2.2—Venezuelan coal reserves

Mmt

State and Area	Measured reserves	Indicated + inferred reserves	Hypothetical resources	Total
Zulia	353	2,083	6,053	8,489
Guasare	353	2,083	6,053	8,489
Táchira	188	306	1,047	1,541
Santo Domingo	135	145	22	302
Lobatera	3	14	6	23
Las Adjuntas	29	61	224	314
Otros	21	86	795	902
Anzoátegui	35	16	82	133
Naricual	30	7	16	53
Fila Maestra	5	9	66	80
Falcon	0	0	32	32
TOTAL	576	2,405	7,214	10,195



Source: Ministry of Energy and Mines, 1991.

Venezuelan definitions: Anuario Estadistico Minero, 1990, p. VI.

Measured reserves: Tons are calculated from dimensions and quality defined to the extent possible from outcrops, trenches, access workings, drilling, underground workings, and other such works.

Indicated reserves: Those whose quality and quantity have been defined on the basis of reasonable geological showings and interpretations.

Inferred reserves: Those whose estimates are based on generalities known from the regional geology.

Hypothetical resources: Resources not discovered, with the possibility of existing in known geological areas and in those areas that already have produced other discoveries.

Andean region

Carbosuroeste, a Government development corporation, has actively explored the Andean region in Táchira, but no major deposits have been found similar to those in the Guasare Basin. Most resources are underground and have coking qualities. Reported raw coal quality from one mine in the region is 11,400 Btu/lb, 18.8% ash, 0.9% sulfur, and free-swelling index 4. Carbosuroeste has investigated preparation plants to clean coal. Having the closest port 420 km to the north is an economic disadvantage to Andean coal in international markets. Yet in 1992, Táchira coal was sent to Europe, Cuba, and Chile. Environmental concerns, low prices, and long transportation distances have slowed coal industry development.[42]

Coal seams are associated with two Tertiary formations of the large regional extension: Los Cuervos y Carbonera. The best geologic potential for coal has been found in the areas of Lobatera (20 km north of San Cristóbal), Santo Domingo (40 km southeast of San Cristóbal), and Rubio (20 km southwest of San Cristóbal).

Other prospective areas exist, such as Las Delicias (40 km southwest of San Cristóbal), Capacho (20 km northwest of San Cristóbal), Queniquea (40 km northeast of San Cristóbal), and San Pedro (10 km north of Lobatera). Structural deformation in this region is complex.

Eastern region

The two areas of major interest are those in Anzoátegui that hold the Carbonar and the recently closed Fila Maestra mines. Both have supplied coal to home-heating and steam coal export markets. Their relative nearness to the port at Guanta adds to the economic viability of the deposits. Geologically, both areas are significantly disturbed.

The northern State of Aragua is in the preliminary geologic survey stage. Its level of reserves is projected in the 20-Mmt range, but no mining or in-depth evaluations have yet been made. The northeast portion of the State of Guarico contains coal, but no deposit evaluations have been made. The area is geologically complex and contains numerous folds and extensive faulting.

Falcón coal basin

This area has estimated resources of 32 Mmt within an area of 140,000 hectares. The coal is thought to be surface minable, although seams located to date may be thin and steeply dipping.

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[42]The Daily Journal, July 10, 1993, p. 3.

The reported quality is 12,500 Btu/lb, 5.1-6.5% ash, 4.3-7.1% moisture, and 0.3-2.0% sulfur. The port in the area can handle 20,000-dwt ships.[43]

Coal Transportation and Ports

Transportation

All export coal in Venezuela is transported between mine and port by truck. Coal haulage roads are two-lane, well-traveled, and sometimes congested. The terrain between the coal mines and ports can be hilly, and the roads pass through populated areas. The present system therefore bottlenecks any major future expansion in export coal traffic to ports. Truck transportation is unionized. Although the Paso Diablo mine originally hauled its own coal using its own union drivers, most of its coal is now hauled by drivers from the Cozogavol trucking union, which blocked the road to get the business.

Proposed is a 75-km railroad between the Paso Diablo mine and what would be a new port on the Gulf of Venezuela.[44] The basic engineering has been done,[45] and such a port could enable the mine to export via larger, more economical capesize vessels. The port is proposed at either Pararu, where the port would be dedicated to coal, or San Carlos, where the port would handle other commodities.[46] The railroad would allow Paso Diablo to expand beyond the present limit of 3.5-4.5 Mmt/yr and may also give life to Socuy (7-8 Mmt/yr), another significant coal prospect in the Guasare Basin. Rail and port have been proposed to be in place by 1996.

The proposed rail and port for the Guasare Basin is critical for Venezuela to realize its expectations of exporting 20-25 Mmt/yr by year 2000. Guasare is the only area in Venezuela that seems capable of sustained production of such an amount of export coal. That amount of coal cannot go through the present port of Santa Cruz de Mara, south of the Gulf of Venezuela, in Lake Maracaibo. Santa Cruz de Mara appears to be limited to 4.5 Mmt/yr (see the Environment section at the end of this chapter). Even with the new port, Guasare coal could still be limited to panamax vessels because of an underwater reef, La Ceiba Ridge. The reef stretches across the Gulf of Venezuela and would hinder free access of capesize ships to the proposed port locations. It

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[43]Bennett, Jennifer, p. 4.

[44]Mining Annual Review—1992, p. 57.

[45]International Coal Report, July 10, 1992, p. 8.

[46]Gellici, Janet, p. 59.

has been reported that Carbozulia is considering building a transfer station outside the Gulf of Venezuela beyond the reef, where coal loaded at the new port into small ships would be transferred into capesize ships.[47] This proposal would avoid the expensive underwater blasting of the reef. Because of the additional costs of either blasting or the proposed transfer stations, it is conceivable that capesize ships will not be feasible.

An unused railroad, built in 1957, exists between the Carbonar mine near Naricual and the Guanta port; but the urbanization developed over the years around the rail would make rehabilitation a major task. No usable rail infrastructure is available for any operating coal mine in Venezuela. The closest existing railroad to the Guasare and Táchira mines is 350 km away, to the east and northeast, respectively.

Ports

La Ceiba

La Ceiba is a private port on the eastern shore of Lake Maracaibo capable of handling self-loading handy-size ships of up to 40,000 mt.[48] Besides coal, bananas are also shipped from the port. Coal mined near Lobatera in Táchira is carried 420 km north to the port in 40-mt trucks. Exmivenca, a Táchira coal producer, is part owner of the port.[49] La Ceiba also ships coal originating in Colombia.

Santa Cruz de Mara

Santa Cruz de Mara is on the western shore of Lake Maracaibo, just north of Maracaibo, 86 km southeast of the Paso Diablo mine. This port is dedicated to the output from the Paso Diablo mine and, like the mine, is owned and operated by Carbones del Guasare. Design capacity is 3.5 Mmt/yr but the facility may be capable of 4.5 Mmt/yr. In either case, the port constrains the mine's production. Coal from the mine is hauled in 45-mt Fiat trucks, which are side-dumped onto a conveyor that carries the coal to a stockpile capable of storing more than 100,000 mt. A front end loader transfers the coal from the pile to a feeder, which drops the coal onto a conveyor belt that loads 1,500- and 2,500-mt barges. The barges ferry the coal 13 km to the deeper

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[47]International Coal Report, July 10, 1992, p. 8.

[48]From Carbosuroeste, 1992.

[49]Bennett, Jennifer, p. 4.

water of mid-Lake Maracaibo, where two floating cranes load panamax-size ships at a combined rate of 20,000 mt per day.

La Guanta

The port of La Guanta, owned and operated by the State of Anzoátegui, serves the Carbonar mine and served the Fila Maestra mine until it closed in 1993. Coal is trucked to a 60,000-mt stockpile at the port.[50] When a ship arrives, trucks move coal from the pile and dump it on the dock for loading by self-loading handy-size ships of up to 37,000 mt. The available draft for ships was deepened in 1992 to 11 m by a consortium of the port and mines. This port may be privatized.

Other ports

Inter-America Coal, N.V., ships Venezuelan and Colombian coal from two Lake Maracaibo ports. El Puerto Bajo de San Francisco is 10 km south of Maracaibo and has storage of 80,000 mt. About 5 km farther south, leased from Corpozulia, is Puerto Palmarejo la Canada, having storage capacity exceeding 200,000 mt. Both ports load 1,500-mt barges, which carry the coal from shore 2.5 km for unloading by 20,000-45,000 mt self-loading ships at a barge loading rate of 7,000 mt/h.[51]

Government Taxes and Regulations

Taxes and royalties

Taxes and royalties, discussed in some detail in appendix A, can differ depending on the area within Venezuela. For example, royalties on coal produced from concessions let by Corporiente (near Puerto la Cruz) are 5%, whereas those from Carbosuroeste (southwestern Venezuela) are 8%, and Corpozulia (northwestern Venezuela) are 10%.[52] There are, however, variations within regions. The rate may differ depending on the market in which the coal is sold. For instance, the royalty set by Carbosuroeste is 8% for export coal, but 10 % for coal sold for domestic use. Where the rate is applied can also vary, at the mine or at the ship, and rates may vary within a region. For example, a mine within one national development corporation region paid a 3% royalty, although the stated rate is 5%, possibly because the original concession was negotiated some years ago. In the past, financial incentives have been given. For example, Guasare was

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[50]Carbones del Zulia, S.A.

[51]Gellici, Janet, p. 61; Marcel Vandenberg, Inter-American Coal, N.V.

[52]From meeting with Venezuela's Ministry of Energy and Mines officials.

granted a 5-year national tax holiday and a 4½-year municipal tax holiday for agreeing that tax savings would go towards community infrastructure.

A "special advantages" contribution of 1% of the coal value at the mine for schools, roads, hospitals, etc. is to be paid subject to negotiation between the investor and the Ministry of Energy and Mines.[53] Special advantages are those provided by the investor. Some mines, for example, pay for road maintenance and others do not. The special advantages category may also include higher surface taxes or royalties. Also, coal is subject to an "exploitation tax" of 1% of the coal value at the mine,[54] a tax apparently not always paid by existing mines. A lake toll is also paid per metric ton of coal shipped through Lake Maracaibo, which would apply to coal from La Ceiba and Santa Cruz de Mara ports. The fee as of January 1993 was $0.20/mt.

Venezuela has no percentage depletion allowance, but a form of cost depletion allows acquisition costs to be amortized over the life of the mine. Acquisition costs include costs of the concession, exploration, drilling, and development.[55]

Also, no local sales tax nor equipment import taxes are levied if the company applies for and is exempted by the Ministry of Energy and Mines. A 1% tax is paid on the f.o.b. price for customs. Straight line depreciation is used. There is no depreciation schedule by type of asset. The depreciation period is derived from the expected life of the asset. For example, at one mine the depreciation term was 5 years, but at another was 7.

The United States and Venezuela are negotiating a bilateral investment agreement and a double-taxation agreement.[56]

The corporate income tax rate was reduced in 1991 from 60% to 30%.[57] Tax regimes for the mines in the United States and Venezuela used in this study are summarized in tables 2.5 and 2.6.

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[53]Resolution MEM-115, section III, is devoted to the "special advantages." They may include local technical training, property improvements, building and maintaining schools, economic financing, etc.

[54]From meeting with Venezuela's Ministry of Energy and Mines officials.

[55]International Bureau of Fiscal Documentation, Sec. 5.08.

[56]The Daily Journal, Aug. 19, 1993, p. 13.

[57]U.S. Department of Commerce, Venezuela Country Marketing Plan, Fiscal Year 1993, p. 3.

Table 2.5—U.S. Federal and State taxes and other mining charges

	U.S. Federal	Alabama	Kentucky	New Mexico	Washington	Wyoming
Income tax	34%	5%	8.25%	7.60%	None	None
Depletion	8% of gross, limited to 50% of net inc.	Cost basis only	Federal rate	Federal rate	None	None
Royalty	12.5% of gross for surface; 8% for U/G	None	None	None	None	None
Severance tax	None	$0.37/mt	4.5% of gross; $0.55/mt min.	$1.24–1.29/mt	None	8.5% of gross
Gross proceeds tax	None	None	None	None	0.484%; tax credit allowed for portion sold in-State	None
Sales/use tax	None	4% State; 2% county	6%; coal exempt	5.625%, retail	6.5%, retail	4%, retail
Ad valorem property tax	None	None	$0.58/minable acre-inch	None	Rate on land being mined is $4,500/acre	6.04% of gross
Property tax	None	65 mils State; 200 mils county	45 mils State; 53-67 mils county	225 mils county	1.2235% of fair cash value, county	6.04%, assessed at 9.5% of FMV
Lease charges	Bonus bid, nonrecoverable	None	None	None	None	None
Black lung tax	Surface: 4.4% of gross or $0.61/mt, whichever is less. U/G: $1.21/mt. (Lignite is excepted)	None	None	None	None	None
Abandoned mine lands fee	Surface: 10% of gross or $0.39/mt, whichever is less; U/G: $0.17/mt. (Lignite $0.11/mt; max. 10% of gross)	None	None	None	None	None
Permit fees	None	$1000 + $25/acre	$125 to $1000/year	None	$250/year	None
Reclamation tax	None	None	None	None	None	None
Reclamation bonding & fees	Bond amount based on engineering cost estimate for reclamation; not less than $10,000	Minimum $10,000	Minimum $10,000	Minimum $10,000	Minimum $10,000	Minimum $10,000

Note: Taxes and fees as of December 1, 1992.
U/G: underground; inc.: income; max.: maximum; FMV: fair market value.

Table 2.6—Venezuelan national, State, and municipal taxes and other charges on mining activities

	Venezuelan national	State/municipal
Income tax	20% on first 2 million Bolivars of taxable income; 30% beyond that. 3-year loss carry forward	None
Depletion	Cost of acquisition is amortized	None
Royalty	If concession is through national development corporations: Corpozulia—10% f.o.b. port; Corporiente—5% f.o.b. port; Carbosuroeste—8% f.o.b. port	None
Exploitation tax	1%of f.o.b. mine value	None
Investment tax credit	10%; available from Sept. 1, 1991, to Sept. 1, 1995	None
Severance tax	None	None
Sales/use tax	None	None
Ad valorem property tax	None	None
Property tax	None	Municipal; varies; small
License tax	None	0.25% to 10% of gross revenues; majority at 0.5% or less; can be a flat amount
Maracaibo lake fee	$0.20/mt	None
Customs tax	1% of f.o.b. price	None
Black lung tax	None	None
Abandoned mine lands fee	None	None
Permit fees	None	None
Special advantages contribution	Negotiated between investor and Ministry of Energy and Mines	None
Reclamation tax	None	None
Reclamation bonding & fees	Financial security required	None
Approved late 1993:		
Value added tax	10%	None
Corporate assets tax	1% of assets; deductible	None

Taxes and fees as of December 1, 1992, unless otherwise noted.

Regulations and controls

Some of the Venezuelan regulations pertaining to coal mining and foreign investment are set out in appendix C. Mining regulations are written only at the national level but may be locally tailored. For instance, Carbosuroeste, the national corporation responsible for developing coal in southwest Venezuela, has developed health and safety regulations for its concessionaires[58] that incorporate not only national regulations but also laws, regulations, and standards from other countries.

Regulations impeding repatriation of U.S. dollars—both dividends and capital—were significantly eased by Decree 727 of January 16, 1990 (Art. 35, 36-39). Decree 2095 (see appendix C) allows dividend distribution without approval from the Foreign Investment Superintendency. Capital repatriation is unrestricted on sale of part or all of a company's stock, except for investments by debt-equity swaps, in which case 5 years must elapse before repatriation.[59] No foreign exchange limitations exist at present.[60] Venezuela's Mining Law reforms have been under congressional consideration since 1984.[61]

Acquiring use of land

Since Venezuelan coal is Government-owned, private companies acquire the use of land for coal exploration and mining by applying to either the Ministry of Energy and Mines directly or other national Government-controlled entities, depending on jurisdiction.[62] Concessions for coal are granted for 20 years, although those for Paso Diablo were granted for 30 years. The 20-year concessions may be extended 10 years with the approval of the Ministry of Energy and Mines. Surface rights are negotiated with the owner, who might be a farmer or rancher. If the surface belongs to the Nation, there is no problem and no extra charge; an agreement must be worked out, however, with the habitants of the land.

There are three concession types. First, exploration concessions of up to 5,000 hectares are granted for 2 years at a

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[58]Carbosuroeste, 1992.

[59]Economist Intelligence Unit, para. 7.02 and 7.05.

[60]U.S. Department of Commerce, Venezuela Country Marketing Plan, Fiscal Year 1992, p. 43.

[61]The Daily Journal, Nov. 25, 1992, p. 4.

[62]Ministry of Mines' requirements for concessions and mining contracts are in Resolution MEM-115, published in Official Gazette No. 34.448 dated April 16, 1990.

cost of 30 Bolivars per hectare (about $0.30 at the time of this writing). If the exploration concessionaire wishes to exploit any parcels in the concession, application must be made before the 2 years are up. Parcels for exploitation are limited to 500 hectares of surface area, and the total area must not exceed 2,500 hectares. Second, exploitation concessions may be granted directly for separate areas of up to 500 hectares. These concessions can total up to 10,000 hectares but must have separate names. Third, concessions may be granted to exploit the remaining parcels not granted under the original exploration concession.[63]

Environment

Venezuela's Ministry of Environment and Renewable Natural Resources (MARNR) was formed in 1977, an outgrowth of the Organic Law of the Environment passed in 1976.[64] MARNR has over the years developed environmental regulations that affect the coal mining industry. The level of enforcement of these regulations, however, is said to be "low but increasing."[65] Also, since the Government invests in and promotes mining, the export products of which benefit the nation, a conflict exists, and "enforcement of environmental regulations is complicated."[66] Nevertheless, MARNR, responsible for guaranteeing reclamation and mitigation, requires the coal company to guarantee reclamation through a bank or insurance. In case the company does not perform the reclamation, the guarantee is payable to MARNR. The amount of security is determined from a project study submitted to MARNR and the size of the concession.[67]

The Paso Diablo mine production limit of 3.5-4.5 Mmt/yr is to some degree environmentally determined, and Carbones del Guasare is sensitive to environmental matters. Although Guasare owns land adjacent to its port at Santa Cruz de Mara that might otherwise be used for expansion, the company is concerned that increased throughput might cause additional coal dust, which could result in increased local complaints. Also, the environmental condition of Lake Maracaibo, the site of the port,

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[63]Ministry of Energy and Mines. Also, MacDonald, H. B., Acquiring Mineral Rights in Venezuela.

[64]White, A. L., p. 19. This article, although it does not mention mining, gives a good background of the historical development, present state, and future direction of Venezuela's environmental regulations and their enforcement.

[65]The Hazardous Waste Consultant, p. 1.3.

[66]Work cited in footnote 65, p. 1.5.

[67]Abreu, Rene. Rene International C.A.

is a national concern. MARNR's Lake Maracaibo Conservation Institute is responsible for controlling pollution in the region of the lake,[68] and in 1985, MARNR published pollution control regulations specifically for Lake Maracaibo.[69]

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[68]White, A. L., p. 37.

[69]Work cited in footnote 68, p. 39.

CHAPTER 3

COMPARISON OF BASIC MINING COSTS

This chapter compares the basic mining costs between similar U.S. and Venezuelan coal mines and identifies those factors that account for differences. "Basic mining cost" is defined as the total cost to extract 1 mt of run-of-mine coal (raw coal) delivered to the coal processing plant.

Size, geology, and mining methods of the mines are matched to the extent possible to eliminate those factors as a source of cost differences. All mines in this chapter are surface mines. To determine basic mining costs, seven mines were evaluated: four U.S. and three Venezuelan.

Mine Costing Method

The basic mining costs calculated are the average costs to extract 1 mt of raw coal over the remaining life of the mine. These costs are calculated using a discounted cash-flow rate of return (DCFROR) analysis of all capital, mine operating expenses, land, and tax costs.[70] Capital and operating costs are based on estimates of the costs required to operate the mine over its full life.

The cost estimates and economic analyses of each mine were based on mining conditions and practices in late 1992 and the relative value of the Venezuelan Bolivar to the U.S. dollar in January 1993 (1 Bolivar = US$0.0128).

The capital investment used for DCFROR analysis is the sum of undepreciated capital (as of January 1993) plus the additional capital required throughout the remaining life of the mine. Capital investments include coal acquisition, surface rights, exploration, feasibility studies, mine development, mine plant construction and equipment purchases (including required mine health and safety facilities and equipment), mine-site infrastructure, replacement of equipment and facilities, and other fees and services normally capitalized. Capital costs for cleaning plants and storage and loading facilities are excluded in the basic mine cost calculation.

Mine operating costs are separated into two components: labor, and equipment and supplies. Labor includes wages, employee fringe benefits, and Government labor and payroll-related taxes for production, maintenance, and administrative mine personnel.

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[70]The DCFROR analysis uses SMINSIM, a U.S. Bureau of Mines computer program that calculates the average mining cost over the life of the mine for specified rates of return on investments.

Equipment and supplies includes material and utilities consumed in mine operation, indirect costs for general items, general sales taxes, and insurance. Corporate overhead costs are not included in the analysis.

To a large extent, costs for complying with mine health and safety, and environmental standards and regulations are inherent in the capital investments and operating cost figures. To the extent possible, certain regulatory compliance costs were isolated, and they are compared in a separate analysis. Only mandated requirements were isolated; and these covered such items as safety devices, dust control, reclamation, miner training requirements and training facilities, and special Government fees, levies, and taxes.

Land costs include expenses to acquire the use of surface land, water, and other rights to mine the coal. Representative cost items include private and Government royalties, lease payments, and other miscellaneous fees assessed by the Federal, State, and local Governments.

Tax regimes used in this study are those in effect in both countries as of January 1993, and as outlined in chapter 2, tables 2.5 and 2.6.

Taxes are those costs paid by a mining operation to local, State, and central Government authorities. Venezuelan mines, like the mines in the United States, are subject to central Government corporate income taxes. Unlike some U.S. mines, however, Venezuelan mines are not subject to State income taxes.

Financial Analysis Approach

The economic analyses use constant January 1993 U.S. dollars and treat each mine as a separate corporate entity. Zero inflation is assumed over the life of the mine. Undepreciated capital as of January 1993 (the first year of analysis) and capital reinvestment for plant and equipment replacements are considered funded with equity capital. Reinvestment capital varies according to mine size, production life, and age of the facilities and equipment. Working capital costs were assumed to be 0.25 times the annual operating cost.

The DCFROR analysis calculates the cash-flow needed for a given rate of return. A DCFROR is defined as "the rate of return that makes the present worth of positive and negative after-tax cash-flow for an investment equal to zero."[71] At 0% return, all mining costs and invested capital are recovered, but there is no return on the investment. At 15% DCFROR, a net positive cash-flow, equivalent to a 15% DCFROR on all investments is achieved.

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[71]Stermole, Franklin J., and J. M. Stermole, p. 315.

In this study a 15% DCFROR was chosen as a return necessary to compensate for foregone earnings on alternative investments and for the inherent risks in developing coal mines.

A DCFROR analysis is a suitable way to compare the costs of mining among different operations. It identifies the effects that direct and indirect operating costs, and regulatory and other variable business costs have on the cash-flow of an operation, as well as the opportunity cost of capital invested.

The mining costs for individual Venezuelan and U.S. mines are not shown to avoid identifying specific mines and the disclosures of company-confidential information. The cost ranges shown in the tables represent the lowest and highest costs incurred in each cost category between all the mines compared. Therefore, these composite cost values, at either end of the cost range, may not add up to the total basic mining cost derived by adding the component costs for the lowest and highest cost mines. The ranges of costs are used to give a perspective on the variations in cost categories among comparable mines.

Physical and Operating Characteristics Comparison

Table 3.1 shows ranges of characteristics for the four U.S. and the three Venezuelan surface mines. There is rough comparability in the ranges between U.S. and Venezuelan mines. For all sample mines, overburden is stripped with shovels or front end loaders, and coal is removed with front end loaders, backhoes, or hydraulic excavators. Stripping ratios are generally twice as high for Venezuela mines as for the U.S. mines. The average dip of the U.S. mines is about twice that of the Venezuelan mines. The average age of the U.S. mines is four times that of the Venezuelan mines. U.S. mines have productivities clustering closely around 6 mt raw coal per person-hour, whereas productivities for Venezuelan mines have a wide range, from 0.5 to 7.1 mt per person-hour.

Financial Results

Table 3.2 compares U.S. and Venezuelan basic mining cost ranges in January 1993 U.S. dollars at 0% and 15% DCFROR. Figures 3.1 and 3.2 show the comparative ranges of major cost categories.

Total cost

There is comparability of total mine cost ranges for U.S. and Venezuelan mines at both 0% and 15% DCFROR. U.S. operating costs are at the lower range or below the Venezuelan operating costs, whereas U.S. taxes are usually higher than Venezuelan taxes.

Table 3.1—Mine operating data

	U.S. Range	Venezuelan Range
Annual production, at full capacity (metric tons raw coal)	400,000 - 3,400,000	240,000 - 10,000,000
Annual production, at full capacity (metric tons salable coal)	280,000 - 3,400,000	240,000 - 10,000,000
Number of seams	4 - 9	2 - 12
Total seam thickness, m	18 - 82	2 - 70
Average seam dip, degrees	11 - 30	8 - 15
Stripping ratio, bank cubic meters per metric ton coal	2.5 - 5.1	5.2 - 11.1
Operating days per year	246 - 250	240 - 365
Mine productivity* (metric tons raw coal per person-hour)	5.3 - 6.8	0.5 - 7.1
Total employment at full production**	36 - 360	35 - 2,031
Shift length (hours)	8 - 8	4 - 11
Number of shifts per day	2 - 3	1 - 3
Production work schedule (days on/days off)	5/2	5/2 - 6/1
Yield (salable mt/raw mt, %)	69 - 100	100 - 100

*Includes all personnel associated with the operation of the mine, including labor, supervision, and staff. Does not include any corporate or division overhead.

**Includes all personnel associated with the operation of the mine and preparation plant, including labor, supervision, and staff. Does not include any corporate or division overhead.

Table 3.2—Mine cost comparison; detailed cost summary

January 1993 US$/mt raw coal

COST CATEGORY AT 0% DCFROR	U.S. Range			Venezuela Range		
CAPITAL COST	**$1.00**	-	**$2.26**	**$0.50**	-	**$4.42**
Return of equity capital	1.00	-	2.26	0.50	-	4.42
MINE OPERATING COST	**$5.60**	-	**$10.64**	**$9.80**	-	**$15.83**
Labor	3.94	-	6.34	0.95	-	5.41
Equipment and supplies	1.66	-	4.32	8.04	-	10.42
LAND COSTS	**$1.17**	-	**$8.45**	**$0.84**	-	**$1.77**
Operating tax	0.00	-	0.00	0.44	-	0.44
Royalty	1.17	-	8.45	0.84	-	1.77
TAXES	**$0.75**	-	**$4.14**	**$0.04**	-	**$0.34**
Federal income	0.00	-	0.15	0.01	-	0.12
State income	0.00	-	0.01	0.00	-	0.00
Property and ad valorem	0.05	-	1.36	0.00	-	0.00
Severance	0.00	-	1.79	0.00	-	0.00
Black lung + abandoned mine lands tax	0.68	-	0.99	0.00	-	0.00
Municipal	0.00	-	0.00	0.00	-	0.06
Initial adjustment tax	0.00	-	0.00	0.00	-	0.18
Total cost	**$8.52**	-	**$23.49**	**$12.22**	-	**$21.03**
COST CATEGORY AT 15% DCFROR	U.S. Range			Venezuela Range		
CAPITAL COST	**$1.90**	-	**$5.36**	**$1.04**	-	**$7.56**
Return of equity capital	1.00	-	2.26	0.50	-	4.42
15% return on capital	0.62	-	3.84	0.54	-	3.14
MINE OPERATING COST	**$5.60**	-	**$10.64**	**$9.80**	-	**$15.83**
Labor	3.94	-	6.34	0.95	-	5.41
Equipment and supplies	1.66	-	4.32	8.04	-	10.42
LAND COSTS	**$1.35**	-	**$8.56**	**$0.91**	-	**$2.27**
Operating tax	0.00	-	0.00	0.44	-	0.44
Royalty	1.35	-	8.56	0.91	-	2.27
TAXES	**$0.98**	-	**$4.95**	**$0.29**	-	**$1.02**
Federal income	0.02	-	0.29	0.23	-	0.99
State income	0.00	-	0.03	0.00	-	0.00
Property and ad valorem	0.05	-	1.70	0.00	-	0.00
Severance	0.00	-	2.24	0.00	-	0.00
Black lung + abandoned mine lands tax	0.68	-	0.99	0.00	-	0.00
Municipal	0.00	-	0.00	0.04	-	0.06
Initial adjustment tax	0.00	-	0.00	0.00	-	0.18
Total Cost	**$9.83**	-	**$24.41**	**$13.06**	-	**$22.83**

The "Initial adjustment tax" was required by the new Venezuelan tax law that became effective January 1, 1993. See appendix A for details. Totals may not add because they represent the costs at an individual mine. Cost components within a column may be from several different mines to illustrate the minimum or maximum value for each cost compnent among the mines. Exchange rate used: 1 Bolivar = US$0.0128.

Figure 3.1—Mine operating costs at 0% DCFROR

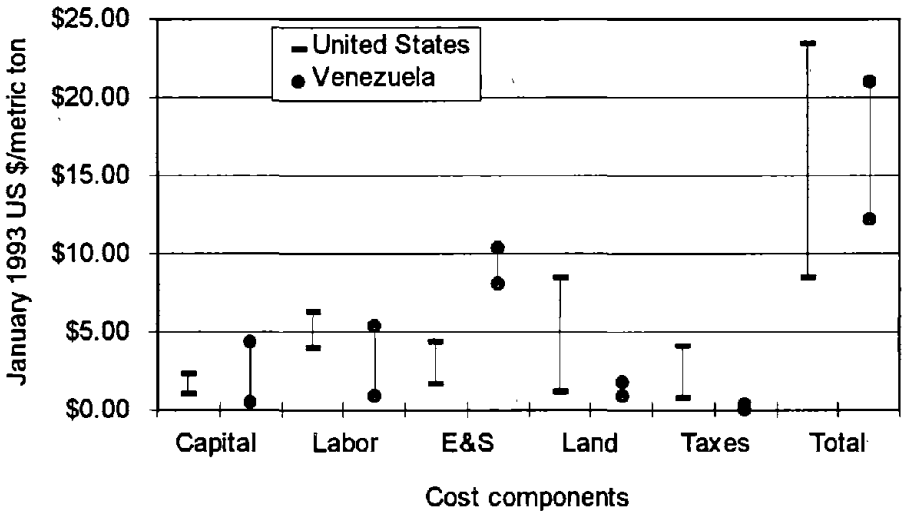
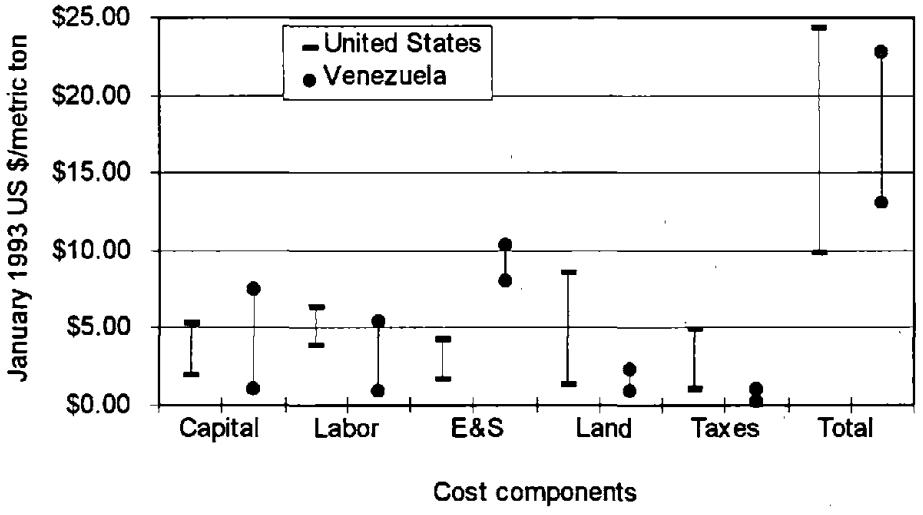


Figure 3.2—Mine operating costs at 15% DCFROR



Capital costs

At 15% DCFROR, total capital cost is the sum of equity capital (which is the same at both 0% and 15% DCFROR) and the return on that capital at a 15% interest rate. The ranges for 15% returns on capital are similar both for Venezuelan and U.S. mines.

Venezuelan equity capital costs ("return of equity capital" in the table) range higher than U.S. equity costs. The highest Venezuelan cost is almost twice as high as the highest U.S. cost, at $2.16/mt higher. This difference may be accounted for by

depreciated much of their initial investment, leaving fewer capital dollars to be recovered at this stage of their mine lives.

Mine operating costs

Mine operating costs per metric ton in Venezuela are generally higher than in the United States. Operating costs are made up of (1) labor and (2) equipment and supplies costs.

Labor The ranges of labor costs overlap, and U.S. labor costs per metric ton are generally higher than those in Venezuela. However, table 3.2 shows that in at least one case the Venezuelan labor cost of $5.41/mt at one mine is significantly higher than the lowest U.S. labor cost of $3.94/mt.

Labor cost as a percentage of operating costs vary quite a bit for Venezuelan mines, averaging between 10% and 35%. U.S. labor costs are more consistent, generally about 60% of each mine's operating costs. The Venezuelan variation can be attributed to large differences in labor productivity and, in one case, a large difference in labor rates paid.

Mines paying higher wages can compete with mines having lower labor charges if higher labor productivity offsets that higher labor cost, or if other parts of the total cost structure are less. U.S. miners earn between 8 to 12 times what Venezuelan miners earn, U.S. mines varying as much as 25% between themselves. Venezuelan labor productivity varies by much more; table 3.1 shows the mine with the highest productivity is 14 times the lowest. The range of U.S. productivity is much tighter, and its average is 60% higher than the average productivity at Venezuelan mines. Although one Venezuelan mine has a raw coal productivity of 7.1 mt/person-hour, the four U.S. mines ranged between 5.3 and 6.8, substantially higher than the other two Venezuelan mines.

Equipment and supplies U.S. mines have a distinct advantage in this cost category. The lowest Venezuelan cost is higher than the highest U.S. mine cost in this category by 86%, or $3.72/mt. Since virtually all Venezuelan mine equipment is imported, primarily from the United States, most equipment parts are imported from the United States. The cost of imported parts and supplies depends on U.S. prices, the exchange rate, plus the cost of importation. Importation (shipping, handling, etc.) can add 15-20% to parts cost.[72] Venezuela's higher equipment and supplies cost is surprising because diesel fuel in Venezuela costs one-fifth of what it costs in the United States.

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[72]Free of import duty are items thought necessary by the Executive Branch for the development and operation of mines, such as equipment, motors tools, spare parts. Latin American Mining Institute, Sept. 1993, p. 406.

Two additional factors may be active in pushing up Venezuela's equipment and supplies costs. First, Venezuela's stripping ratios are higher. Higher ratios require more rock to be moved before a unit of coal can be mined and, therefore, entail higher equipment and supplies costs. Having Venezuelan stripping ratios averaging more than twice those of U.S. mines, all else equal, the stripping operation, the major functional cost, could cost twice as much. The second factor is that Venezuela is relatively new to large-scale coal mining in complex geology. Although U.S. mines have mined coal in volume for decades under many conditions, large production is a relatively recent occurrence in Venezuela. As experience is gained and as mines mature, this factor will lessen over time for mines with long lives, and the associated costs will disappear.

Land costs

U.S. land costs are generally higher than those in Venezuela. Three of the four U.S. mines mine coal from Federal leases and must, therefore, pay a 12.5% Federal royalty on the value of the coal f.o.b. mine. Most coal in Venezuela is mined from concessions let from nationally owned regional development corporations. These corporations collect royalties at a rate generally lower than U.S. Government royalties, and they can apply the rate f.o.b. port. For this study, royalties were applied f.o.b. mine. Of the mines studied, the Venezuelan royalty rates varied from 4% to 11%. Royalties may include, for example, those paid to private concession holders who have sublet their concession to an operator and would include a national "exploitation" royalty of 1%.

Taxes

Federal income taxes are about the same at 0% DCFROR. At 15% DCFROR, taxable income is higher, and Venezuelan mines generally pay higher Federal income taxes than U.S. mines.

Income taxes imposed by States are relatively small in the United States and nonexistent in Venezuela. Other State taxes in the United States are more substantial. The sum of property and severance taxes for three of the four U.S. mines total more than $2/mt for each mine. Venezuela has no property taxes of comparable magnitude, nor does it have severance taxes.

Black lung taxes and abandoned mine lands fees are major U.S. mine costs, representing about 5% of the total cost of the U.S. mines. No similar tax costs exist in Venezuela.

The U.S. mines pay no direct municipal taxes, but they do, however, often donate funds, facilities, and services to municipalities. Venezuelan mines can pay a small municipal fee.

Effective January 1, 1993, Venezuela has a new tax law (see appendix A), which was used for this analysis. A special one-time 3% tax is payable by companies in 1993 only as part of the transition to the new tax code.

Mine safety and health, and environmental compliance costs

Selected compliance costs shown in table 3.3 cover mandatory training, fugitive dust suppression, black lung tax, mine-site reclamation, treatment of water runoff, and reclamation fee.

Table 3.3—Selected regulatory compliance costs comparison
0% DCFROR

January 1993 US$/mt raw coal

	U.S. Range	Venezuelan Range
Mine safety and health	**$0.62 - $0.78**	**$0.01 - $0.49**
Training	$0.02 - $0.04	$0.01 - $0.01
Dust control	$0.05 - $0.18	$0.00 - $0.48
Black lung tax	$0.42 - $0.61	$0.00 - $0.00
Environmental	**$0.53 - $1.36**	**$0.04 - $0.52**
Reclamation	$0.21 - $0.92	$0.03 - $0.52
Water treatment	$0.04 - $0.05	$0.00 - $0.00
Reclamation fee	$0.27 - $0.39	$0.00 - $0.00
Total	**$1.15 - $2.06**	**$0.11 - $0.53**

Total regulatory costs shown do not include costs that are indirectly affected by regulations (for example, Federal income taxes). Totals may not add because they represent the costs at an individual mine. Cost components within a column may be from several different mines to illustrate the lowest to highest values for each cost component among the mines. Exchange rate used: 1 Bolivar = US$0.0128.

Specific safety and health training is not required in Venezuela. The figures shown are either the amount the Venezuelan company must pay to the National Institute of Cooperative Education (INCE) or the estimated cost of voluntary training that the company was providing its employees.

Mine safety and health Costs of complying with selected mine safety and health regulations for the U.S. mines range from $0.62 to $0.78/mt, whereas for the Venezuelan mines the range is $0.01 to $0.49. The major difference between the U.S. and Venezuelan mine safety and health costs is the U.S. black lung tax. U.S. mines incur a black lung tax of between $0.42 and $0.61/mt, whereas the Venezuelan mines pay no comparable tax. The black lung tax accounts for 68% to 79% of the selected safety and health costs for the U.S. mines.

The black lung tax is a major regulatory compliance cost for U.S. mines. In 1978, Congress enacted legislation establishing a special trust fund to compensate miners who have become permanently disabled by pneumoconiosis (which includes black lung) or other respiratory diseases caused by inhaling coal and

rock dust. In 1985, Congress raised the black lung trust fund tax to $1.10/st ($1.21/mt) of salable coal mined by underground mines and $0.55/st ($0.61/mt) of salable coal mined by surface mines. The amount of tax for surface mines cannot exceed 4.4% of the mine-mouth value of the coal. Lignite mines are exempt from the tax.

The dust control category, wetting down roads with water trucks, shows the greatest variance. Much depends on the mine and the climate. Venezuela, for example, often has natural dust control from rain, and it is not unusual for mines to shut down vehicles due to slick roads.

Environmental The selected environmental compliance costs for the U.S. mines range from $0.53 to $1.36/mt. For the Venezuelan mines, compliance costs range from $0.04 to $0.52/mt. The major difference is that the U.S. mines incur a reclamation fee of $0.39/mt of salable coal for which Venezuela has no comparable fee. Both U.S. and Venezuelan mines must provide financial security for reclamation.

The reclamation fee in this analysis relates only to a mandated Federal excise tax imposed on U.S. mines, the abandoned mine land reclamation fee. The fee was established in 1977 by Congress as part of a surface mining and reclamation law that set national standards for reclaiming lands disturbed by surface coal mining. The fee, to be used to reclaim land and water resources adversely affected by past mining operations when no legally responsible parties are available, is $0.15/st ($0.165/mt) of salable coal for underground mines. For surface mines, the fee is $0.35/st ($0.39/mt) of salable coal, or 10% of the mine-mouth value of the coal, whichever is less. The reclamation fee for lignite is 2% of the mine-mouth value, or $0.10/st ($0.11/mt), whichever is less.

In the water treatment category, the $0.00 shown for Venezuelan sedimentation ponds does not necessarily mean no cost is involved. The cost doesn't show because of rounding, being less than $0.005/mt.

Total mine safety and health, and environmental costs Overall, the total compliance costs for the selected regulatory activities range from $1.15 to $2.06/mt for the U.S. mines and from $0.11 to $0.53/mt for the Venezuelan mines, the major cost difference due to the black lung tax and reclamation fee imposed by the U.S. Government.

Summary of Findings

- Total basic mining costs for U.S. surface mines are comparable to Venezuelan surface mines. Generally lower U.S. mine operating costs are offset by generally higher U.S. mine taxes.

- Although U.S. mines usually have significantly higher productivity than their Venezuelan counterparts, labor costs per metric ton in U.S. mines were generally higher than those for Venezuelan mines. Equipment and supplies costs, however, were significantly lower for U.S. mines. For the combined labor and equipment and supplies costs, U.S. mines have generally lower operating costs.
- Land costs for Venezuelan mines are low compared to those for U.S. mines.

CHAPTER 4

RELATIVE COMPETITIVENESS IN SELECTED MARKETS

This chapter examines the relative competitiveness of Venezuelan and U.S. coal mines producing steam coals and competing in three electric utility markets: the New England and Florida east coast markets in the United States and the Western Europe market. In recent years, some of the U.S. power companies that have tested Venezuelan coal are Florida's Gulf Power (of Southern Company), Carolina Power & Light,[73] New England Power (NEPCO),[74] Public Service New Hampshire,[75] and Central Power & Light Co. of Texas.[76]

In this type of analysis, which compares delivered costs per metric ton of salable coal, compared mines must produce salable coal having similar qualities.

Competitiveness in International Coal Markets

Competitiveness in international coal trade is difficult to define in explicit terms. Delivered price is the major factor, but other factors—such as consistent quality, security, and reliability of supply—are important to buyers. In this case study on relative market competitiveness, only delivered costs are analyzed.

Delivered cost comprises two major cost components. The first, mine-mouth cost, is the cost to produce a metric ton of salable coal up to the point where the coal is shipped from the mine site. The second is the cost to transport a ton of coal to the buyer. Transportation cost for this study includes the cost of transporting the coal to an export terminal, port terminal service charges, and the cost of ocean transport to the receiving port.

The mine-mouth cost is dependent upon a large number of factors as was shown in chapter 3. Some of these cost factors are to a degree controllable by the mine operator; others are primarily determined by coal seam geology, location of the coal deposit, and Government policies and regulations.

To a certain extent, mine management has control over capital and operating costs; but governments control regulatory

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[73]International Coal Report, July 23, 1993, p. 5.

[74]Coal Week International, Aug. 10, 1993, p. 7.

[75]Coal Week International, Mar. 16, 1993, p. 7.

[76]Coal Week International, Dec. 8, 1992, p. 4.

compliance costs and taxes. The main cost items in the latter category are Federal, State, and local regulatory requirements, taxes, royalties, and fees.

The cost of transporting coal to an export terminal is a function of the distance of the mine from the port, the mode of transportation, and the degree of existing competition. Inland transportation usually involves movement by truck, rail, barge, or any combination thereof.

Ocean shipping cost is a function of the bulk capacity of the vessel, the distance from shipping to receiving ports, the type of service contract under which the shipment is made, and to some extent the loading or unloading facilities at the coal ports. The first two factors are commonly the most significant in determining the freight rate for any particular shipment.

As most international coal purchases are made in U.S. dollars, a major factor determining the relative competitiveness of U.S. coal is the value of the dollar relative to the country currencies of competing suppliers. This competitive analysis was made using the value of 1 Bolivar equaling 0.0128 U.S. dollars.

Figure 4.1 shows end-of-year Bolivar-to-U.S.-dollar exchange rates. The Bolivar has steadily depreciated against the U.S. dollar over the past 5 years. Depreciation of the Bolivar increases the competitiveness of the Venezuelan coal industry relative to the United States, to the extent that depreciation is not offset by inflation.

Figure 4.1—Venezuelan end-of-year exchange rates

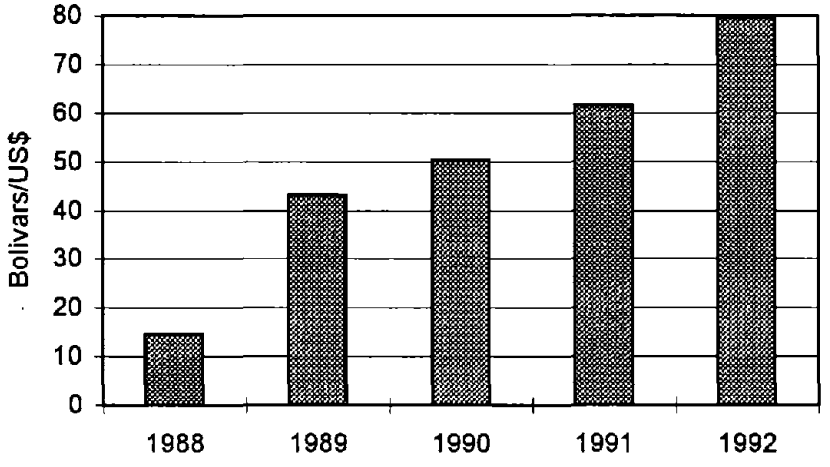
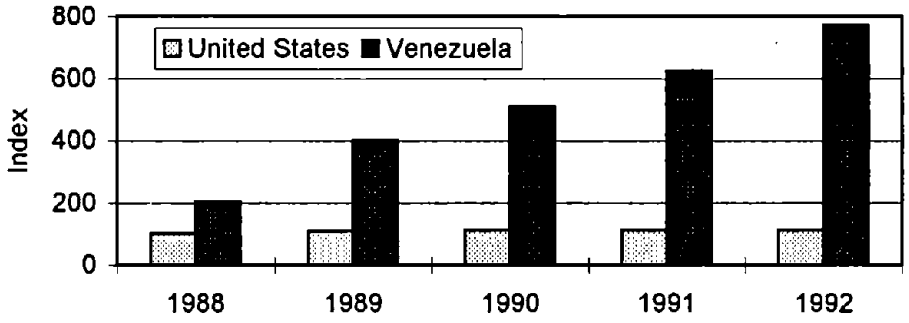


Figure 4.2 shows U.S. and Venezuelan price indexes over the same period.

Figure 4.2—Relative average annual price indexes



Source: International Monetary Fund, International Financial Statistics.
The Venezuelan index is the "Home & Import Goods" (1985 = 100);
the U.S. index is the "Producers Prices" (1985 = 100).

Method

The method for calculating the mine-mouth cost is identical to that outlined in chapter 3; but in addition, the costs of preparing the raw coal for the market are added to the basic mining cost. Preparing coal includes any crushing, sorting, or cleaning done after raw coal is dumped by the mine trucks.

These market competitiveness cases compare mine-mouth costs only at 0% rate of return. The 0% return represents a net-to-the-mine sales revenue equal to the mine-mouth cost. This cash-flow will cover all operating costs and pay back the capital invested.

Transportation costs in this study are the prices paid by the shipper and not the actual costs of the transportation service. Transport costs are based on the most economical mode and route, selected after consulting with railroad service managers, mining company personnel, shipping agents, and coal brokers and traders having expertise in the selected markets in this study. For the Venezuelan mines in this study, all coal is trucked to the port. In the mid-1990's, it is assumed that one mine will begin railing coal to the port. Shipping costs were obtained from a variety of sources: publications; site reports; truck, rail, steamship, and utility companies; terminal and mine operators.

The delivered costs in this study have to be viewed in the context of the bases used in their computation. The mine-mouth cost is the average cost over the remaining life of a mine. Transportation costs are time specific and can fluctuate substantially over short periods. Exchange rates are also time specific and subject to wide variations. Consequently, delivered costs in U.S. dollars, particularly for foreign coal suppliers, can vary substantially over time.

Analysis

U.S. and Venezuelan steam coal suppliers compete in electric utility steam coal markets in New England and the Florida coast in the United States, and in Western Europe. These three markets are examined in this section. Three U.S. mines in Appalachia are compared with three Venezuelan mines in each market. The method of mining and production capacities vary substantially among the mines.

Steam coal markets with access to international competition continue to grow more competitive. As more supplier countries enter the markets, as technology improves, and as existing mines expand to try to take advantage of expected incremental cost benefits of higher levels of production, more coal comes to market. At the same time, the demand for coal has been slowing over recent years, moderating because of environmental worries, more efficient use of coal, and a gradual slowing of industrial country growth rates compared with the 1980's. Europe is the largest market for U.S. and Venezuelan coal exporters. Imports of steam coal into the European Community (EC) stayed the same in 1992 as in 1991,[77] despite the gradual reduction in EC's production. Coal-produced electricity (the largest use for coal) in Europe dropped 3.9% from 1991 to 1992, while electricity produced by oil, gas, nuclear energy, geothermal energy, solar energy, other solid fuels, and hydro increased in each case. Coal used in Europe to produce electricity and heat is forecast to grow by an annual rate of just 0.2% between 1991 and 2000.[78] In this environment, as buyers become more price conscious and as cheaper coal becomes more readily available, high-cost suppliers are especially at risk.[79]

In each case examined below, the lowest cost U.S. mine is more expensive than the highest cost Venezuelan mine. Below are reasons for these differences:

- The U.S. mines have preparation plants to upgrade their coal, and production costs include the preparation costs. No Venezuelan mines have wash plants, so all their coal is sold virtually in the condition it is mined. Preparing coal adds capital and operating costs to production costs. In addition, since preparation plants reject a portion of the raw coal as waste, the cost per ton of

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[77]Coal Week International, Sept. 21, 1993, p. 2.

[78]International Energy Agency, Coal Information 1992, 1993 Edition, pp. 35, 36.

[79]Productivity Trends and Competitive Implications for Pacific Rim Coal Supplies, by Erik Sherer, U.S. Bureau of Mines, gives a more complete discussion of some of these issues.

salable coal (prepared coal) is higher because the costs of production plus preparation must be borne by fewer tons.

- Two U.S. mines used for the market cost comparison analysis are surface mines and one is underground. The surface mines have higher stripping ratios and thinner seams than Venezuelan mines, and these conditions, all else equal, generally result in higher costs. Underground mines are generally higher cost than surface mines.

- U.S. mines have in each case equal or larger land and tax costs. Land costs for U.S. mines range higher than land costs for Venezuelan mines. For U.S. mines, taxes range from at least 2 to 12 times higher than taxes for Venezuelan mines.

- Venezuelan mines are much newer than the U.S. mines chosen for the market case. U.S. mines average about 18 years old, about three times older than Venezuelan mines, Older mines are generally more costly to operate.

- Between mine and market, U.S. mines are generally much farther inland and dependent on long rail hauls, or must make a number of transfers to different types of transportation. Venezuelan coal is mined relatively close to ocean ports and the cheaper ocean shipping. Ton-mile rates for rail transport can be 5 to 10 times higher than ocean shipping, depending on length of hauls and ship types. Venezuelan truck transport rates are half those of U.S. mines.

- In each case below, mine-mouth costs of U.S. mines are higher than mine-to-market transportation costs. This is not the case for Venezuelan mines.

Powerplants look for cheap and reliable sources of suitable coal. Venezuelan coal, a relatively new quantity supplier in the international marketplace, has been successful in selling virtually all of the coal it has produced. This success has been used as a platform to increase its production and marketing efforts.

U.S. electric utility markets

Venezuelan coal has easy access to U.S. east coast powerplants that can handle the handy-size and panamax ships that come out of Venezuela. Three such plants took Venezuelan coal in 1991. Thirteen more plants have recently been identified as potential importers, as it is possible that some of the coastal plants now using U.S. coal could build ocean facilities to take import

coal.[80] Most of the Venezuelan cargos have been used for test burns, but Public Service of New Hampshire had a supply contract with Agip (one of the owners of the Paso Diablo mine in Venezuela) for over a year, and New England Power Company has also contracted longer term for Venezuelan coal.[81] The New Hampshire plant used to buy coal from Canada but now takes Venezuelan coal because lower sulfur coal is required to meet New Hampshire's air quality requirements. The requirements of the Clean Air Act Amendments of 1990 could also help the low sulfur Venezuelan coal in U.S. markets.[82]

Case I: New England electric utility market

Case I in table 4.1 and figure 4.3 shows that the delivered cost in the New England steam coal market is much cheaper for Venezuelan mines than for U.S. mines.

Table 4.1—Case I: New England steam coal market delivered cost summary

January 1993 US$/mt salable coal

COST CATEGORY AT 0% DCFROR	U.S. Range			Venezuelan Range		
TOTAL MINE-MOUTH COST	$31.32	-	$41.11	$12.62	-	$21.91
Production*	$29.36	-	$37.28	$10.97	-	$20.95
Land and taxes	$1.84	-	$3.83	$0.96	-	$1.84
TOTAL TRANSPORTATION COST	$18.25	-	$26.40	$13.07	-	$25.45
Trucking (from mine)	$0.00	-	$1.50	$0.61	-	$11.50
Rail	$0.00	-	$18.15	$0.00	-	$4.00
Barge	$0.00	-	$4.85	$0.00	-	$0.00
Port charges	$1.65	-	$3.10	$0.00	-	$3.70
Ocean freight	$6.60	-	$8.80	$8.50	-	$10.25
TOTAL DELIVERED COST	$49.58	-	$67.51	$33.06	-	$38.07

*Production cost includes all capital and operating costs for both the mine and mill. Totals may not add because they represent the costs at an individual mine. Cost components within a column may be from several different mines to illustrate the minimum or maximum value for each cost component among the mines. Exchange rate used: 1 Bolivar = US$0.0128.

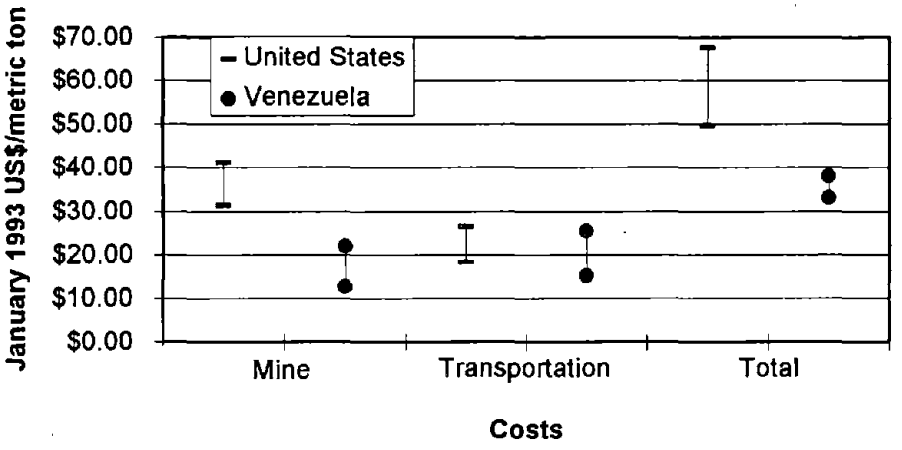
[80]International Coal Report, Nov. 27, 1992, pp. 14-21. See, also, Department of Commerce, Apr. 1985.

[81]Bennett, Jennifer, p. 4.

[82]Same page of work cited in footnote 81.

The total delivered cost of the lowest cost U.S. mine is $11.51/mt higher than the highest cost Venezuelan mine. The difference is largely accounted for by mine-mouth costs, which is the sum of production, land, tax, and any preparation costs. The advantage is distinctly in favor of Venezuelan mines. For mine-mouth costs, the highest-cost Venezuelan mine is $9.41 less than the lowest-cost U.S. mine. In every instance, taxes for U.S. mines are higher than or equal to the Venezuelan mines.

Figure 4.3—Case I: New England steam coal market delivered cost summary



Case II: Florida east coast electric utility market

Case II in table 4.2 and figure 4.4 shows an even greater difference in delivered cost than in case I. Venezuelan mines have at least a $13.50/mt advantage over the sampled U.S. mines. Again, the bulk of the difference comes from the comparative mine-mouth costs, where Venezuelan mines, as noted above, have at least a $9.41/mt advantage.

In this case, a large difference exists in the lowest transportation costs. The lowest Venezuelan transportation cost is $8.18/mt less than the lowest U.S. transportation cost. This difference is largely due to the lower ocean freight costs from Venezuela against the higher rail freight cost for U.S. mines.

Table 4.2—Case II: Florida east coast steam coal market delivered cost summary

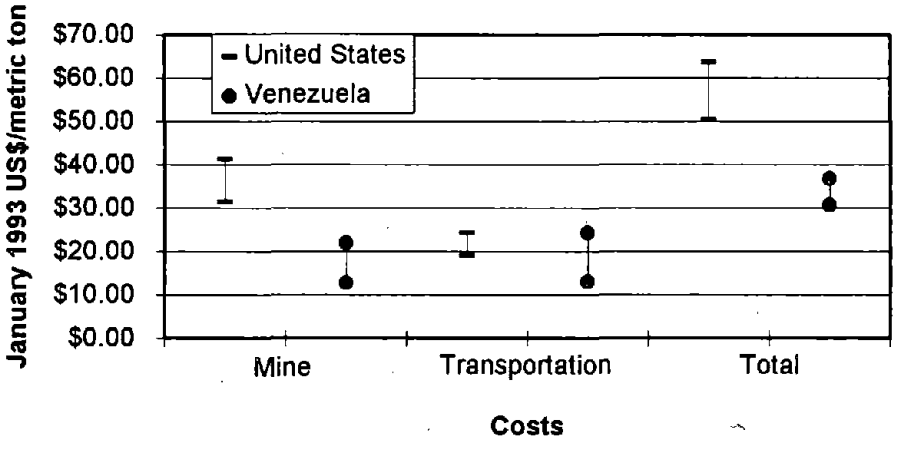
January 1993 US$/mt salable coal

COST CATEGORY AT 0% DCFROR	U.S. Range			Venezuelan Range		
TOTAL MINE-MOUTH COST	$31.32	-	$41.11	$12.62	-	$21.91
Production*	$29.36	-	$37.28	$10.97	-	$20.95
Land and taxes	$1.84	-	$3.83	$0.96	-	$1.84
TOTAL TRANSPORTATION COST	$19.00	-	$24.20	$10.82	-	$24.20
Trucking (from mine)	$0.00	-	$1.50	$0.61	-	$11.50
Rail	$17.86	-	$19.00	$0.00	-	$4.00
Barge	$0.00	-	$4.85	$0.00	-	$0.00
Port charges	$0.00	-	$3.10	$0.00	-	$3.70
Ocean freight	$0.00	-	$5.00	$6.00	-	$9.00
TOTAL DELIVERED COST	$50.32	-	$63.64	$30.56	-	$36.82

*Production cost includes all capital and operating costs for both the mine and mill.

Totals may not add because they represent the costs at an individual mine. Cost components within a column may be from several different mines to illustrate the minimum or maximum value for each cost component among the mines. Exchange rate used: 1 Bolivar = US$0.0128.

Figure 4.4—Case II: Florida east coast steam coal market delivered cost summary



Case III: Western Europe electric utility market

Western Europe is the largest export steam coal market for U.S. and Venezuelan suppliers. Between 1991 and 2000, steam coal

imports into European markets are forecast to increase 53%.[83] The traditional European coal producers are slowing production because of high costs, international pressure to reduce subsidies, and more open markets.

Case III in table 4.3 and figure 4.5 shows that Venezuelan mines hold a significant advantage in total delivered costs over U.S. export mines. The difference, however, is less than in U.S. markets. In the European market, the lowest cost U.S. mine is just $1.46/mt higher in cost than the highest cost Venezuelan mine. Venezuelan mines hold the same production cost advantage as before.

U.S. mines gain from a cheaper ocean freight rate because Venezuelan suppliers are restricted to small ships for the long haul to Europe, whereas some U.S. exporters can use larger, more economical capesize ships. However, as previously discussed, in the Guasare region, Venezuela is looking to expand its port capacity and the ship size that can be loaded.

Table 4.3—Case III: Western Europe steam coal market delivered cost summary

January 1993 US$/mt salable coal

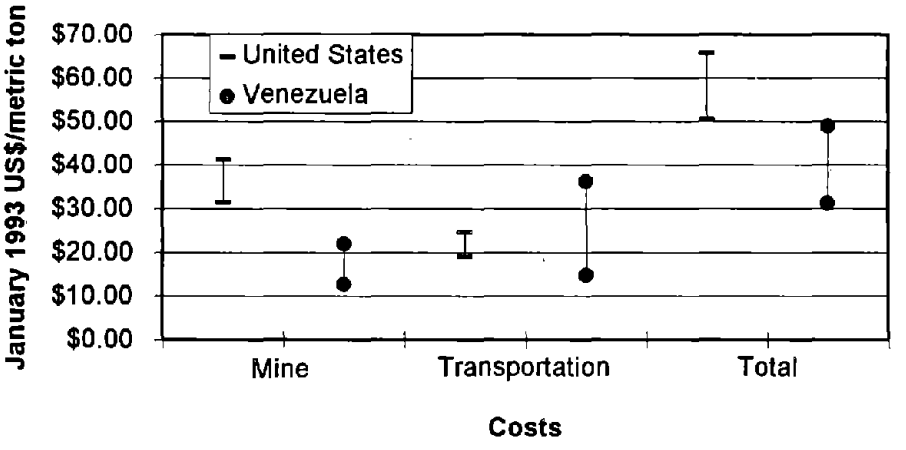
COST CATEGORY AT 0% DCFROR	U.S. Range			Venezuelan Range		
TOTAL MINE-MOUTH COST	$31.32	-	$41.11	$12.62	-	$21.91
Production*	$29.36	-	$37.28	$10.97	-	$20.95
Land and taxes	$1.84	-	$3.83	$0.96	-	$1.84
TOTAL TRANSPORTATION COST	$18.95	-	$24.60	$14.71	-	$36.20
Trucking (from mine)	$0.00	-	$1.50	$0.61	-	$11.50
Rail	$0.00	-	$18.15	$0.00	-	$4.00
Barge	$0.00	-	$4.85	$0.00	-	$0.00
Port charges	$1.65	-	$3.10	$0.00	-	$3.70
Ocean freight	$4.80	-	$9.50	$6.60	-	$21.00
TOTAL DELIVERED COST	$50.28	-	$65.71	$31.16	-	$48.82

*Production cost includes all capital and operating costs for both the mine and mill.

Totals may not add because they represent the costs at an individual mine. Cost components within a column may be from several different mines to illustrate the minimum or maximum value for each cost component among the mines. Exchange rate used: 1 Bolivar = US$0.0128.

[83]Derived from International Energy Agency's Coal Information 1992, 1993 Edition, p. 368.

Figure 4.5—Case III: Western Europe steam coal market delivered cost summary



Summary of Findings

- The relative value of Venezuelan and U.S. currencies is a significant factor in determining the cost competitiveness of U.S. coal with Venezuelan coal in U.S. and Western European markets.
- In the U.S. coastal markets examined, Venezuela has a decided delivered-cost advantage of at least $10/mt. The advantage derives largely from Venezuela's much lower mine-mouth costs.
- In the European market, Venezuelan coal also has a delivered-cost advantage, but a smaller one than in U.S. markets. The lowest cost U.S. mine is within striking distance of being competitive with the highest cost Venezuelan mine.
- Transportation costs between mine and market are similar for U.S. and Venezuelan mines. Building new rail and port facilities would reduce Venezuelan transport costs in the Guasare region.
- Should the proposed rail and port be built in Venezuela's State of Zulia, new coal exports of 15-20 Mmt/yr could come on stream by year 2000. Such an increased supply of the low-cost Venezuelan coal would put additional pressure on market shares of other international coal suppliers.

GLOSSARY

ASTM - American Society for Testing and Materials.

Auger Mining - Technique used by a surface mine after overburden becomes too thick to remove economically by normal methods. At that point, for example, an auger of 1.2 m in diameter could be used to penetrate the coal seam like a screw to a depth of 30-40 m to recover about 50% of the seam.

Bank Cubic Meter - One cubic meter of material in the ground before the material is loosened by blasting or other means.

Bituminous Coal - A coal high in carbonaceous matter, having more volatile matter than anthracite and a calorific value greater than subbituminous coal and lignite; the most commonly sold coal. Bituminous coal usually is used for steam generation, but bituminous coal with different qualities is used as metallurgical coal for conversion into coke for steelmaking. Refer to ASTM Specification D388-66 for bituminous coal.

Black Lung Tax - The tax imposed by the U.S. Federal Government to sustain the Black Lung Fund, which is used to compensate coal miners (or their estates) having pneumoconiosis (which includes black lung) or other respiratory ailments. Black lung is a respiratory impairment that can be acquired from prolonged exposure to coal dust underground.

British Thermal Unit (Btu) - A standard unit for steam coals that measures the amount of heat energy required to raise the temperature of 1 pound of water by 1° Fahrenheit. Much export steam coal is between 11,000 and 13,000 Btu/lb.

Capesize - Term describing oceangoing vessels too large for the Panama canal that must therefore travel routes around the capes of Africa or South America. Sizes for these capesize vessels can range from 125,000 to 250,000 dwt.

Capital Expenditure - A cash outlay for assets necessary to mine and process coal, including mine equipment, buildings, and working capital.

Cash-flow - Reported after-tax net income of a corporation plus amounts charged off for depreciation, depletion, amortization, and extraordinary charges to reserves. The amount of cash that flows into or out of the corporation.

Coking Coal - See metallurgical coal.

Continuous Miner - A machine that cuts coal from the coal seam by mechanically breaking or ripping the coal loose. After breaking, the "miner" loads the coal onto a conveyor or vehicle for transport to a central location within a mine. Used primarily in underground mining by the room and pillar

method, or for development of entries that will be later used for mining of coal by the longwall method.

Culm Bank Operation -"Culm" was originally an anthracite term, often signifying unmarketable, fine anthracite coal that was piled in banks and left for waste. Now, a culm bank operation can be one where refuse not only from anthracite operations but also from any preparation plant is reworked to recover coal that was earlier sent from the plant as part of the waste.

dwt (deadweight tons) - The capacity in long tons of cargo, passengers, fuel, stores, etc., of a vessel: the difference between the loaded and light (empty) displacement tonnage of the vessel. A long ton is equal to 2,240 pounds.

Depletion - The amount of tonnage produced plus the tonnage lost during mining (for example, from dilution or the unrecoverable amount that had to be left behind in pillars); also, a tax-related term for a bookkeeping deduction taken just prior to calculating taxes. The purpose of a depletion allowance is to provide investment for future reserves discovery and acquisition because mining reserves are nonrenewable.

Depth - Vertical distance (in feet or meters) of overburden covering the coal seam. Overburden must be removed before a coal seam can be mined by surface mining methods.

Dip - The angle at which a seam, stratum, or vein is inclined from the horizontal.

Discounted Cash-Flow Rate of Return (DCFROR) - The rate of interest that will equate discounted cash outflows (for investment or losses) to discounted cash inflows over the life of the project. For example, if money is deposited into a bank, the bank pays the depositor interest on the money. If money is invested in a mine, the mine generates cash to pay the investors interest on their money. Depositors and investors seek out the bank or investment, respectively, that yields the highest rate of interest, or rate of return. A mine may actually last 30 years generating net cash inflows (or outflows, if it loses money) over that future period. The prospective investor, however, must calculate an expected rate of return today. To reflect the fact that a dollar next year is normally worth less than a dollar today, future investment outflows (for example, expenditures) and cash inflows must be "discounted." The rate used to discount future money flows is the interest that the investors require for a particular project, taking into account the cost of getting the money they may invest, plus an amount for various risks. A riskier environment requires a higher rate of return to compensate for the

greater possibility of failing to meet financial projections.

Dredge Operation - An underwater excavation using a dredge, an apparatus that removes material containing coal from ponds associated with preparation plants.

Entry - An opening in an underground coal mine that is generally cut by a continuous miner. The opening may be of various sizes, the height of which is generally the thickness of the coal seam. A typical size could be a rectangle 2 meters high by 6 meters wide. The length of an entry could be several thousands of meters.

f.o.b. - Free on board. The cost of a ton of coal on board a truck, rail car, or ship. Cost "f.o.b. mine" would be the summation of all costs up to the point where coal is taken away from the mine, including the cost of loading the coal into the truck or rail car. Cost "f.o.b. port" would be the summation of all costs to the point where the coal is loaded into the ship.

Handy-size - Ocean-going vessels of less than about 40,000 dwt capacity.

High-Volatile A Bituminous Coal - Nonagglomerating bituminous coal having less than 69% of fixed carbon (dry, mineral-matter-free) and more than 31% of volatile matter (dry, mineral-matter-free) and 14,000 or more British thermal units (moist, mineral-matter-free). See ASTM D388-38.

High-Volatile B Bituminous Coal - Nonagglomerating bituminous coal having 13,000 or more but less than 14,000 British thermal units (moist, mineral-matter-free). See ASTM D388-38.

Infrastructure - Includes roads, railroads, airports, electrical supply, telephone or other communications networks, water and sewage facilities, housing, and medical, teaching, and recreational facilities. In general, the necessary transportation, communication, and support facilities that a mine needs to function.

Interburden - The material, rock and soil, that separates the coal seams of a surface deposit.

Longwall Mining - An underground method for mining coal, usually in deep seams. The coal is most commonly cut by a shearing machine (or, alternatively, a "plow") that has one or two large rotating cylinders, each studded with many cutting bits. The shearer moves back and forth across a face of coal that might typically be 200 m long, cutting a swath of about 2/3 m with each pass along the face. The cut coal drops onto a steel conveyor, called an armored face conveyor, which carries the coal away. After the shearer

takes a cut of coal, heavy hydraulic supports move forward to support the newly exposed roof to protect the miners and equipment.

Mine-Mouth Cost - Total capital, operating, and other direct and indirect costs of coal, on a cost-per-ton basis, delivered to the point of shipment from a mine. Mine-mouth cost is equivalent to an f.o.b. mine cost.

Netback cost - The cost at any point along a product's chain that is calculated by subtracting the intervening costs between point B and point A. For example, given the delivered cost of export coal to a market's port, the netback cost (or "value") at the mine would be calculated by deducting (or netting out) all costs between the mine and the market port, which might include costs of ocean transportation, outgoing port, and transportation between the mine and the outgoing port.

Overburden - The noneconomic material (for example, rock and dirt), or burden, that must be removed as part of removing the coal.

Operating Costs - Cash outlays for recurring costs such as labor, parts, and supplies.

Panamax - Term used to describe oceangoing ships having dimensions small enough to fit through the Panama Canal with maximum cargo loading. Maximum ship dimensions are 275 meters length, 32.5 meters beam (width), and 11.3 meters draft (depth below water line). A panamax-size ship is also used on routes that do not pass through the Panama Canal. Typical maximum cargos are 60,000 to 70,000 dwt.

Parting - Material that separates ("parts") coal layers. Usually less thick than overburden. The term is used in both underground and surface environments.

Preparation (or Wash or Cleaning) Plant - The place, usually at the mine site, that removes impurities from the raw coal. The decision to wash coal is an economic one. Capital and operating costs are incurred, and fewer salable tons of coal remain after removing impurities; but the higher quality coal is often worth more in the marketplace.

Productivity - A measure of output per unit of time; a measure of efficiency. For the mining industry, productivity is often measured in terms of tons per worker-shift (total tons produced in 24 hours divided by the number of employees who work on the property). Frequent variations include using raw or clean coal tonnages, using production people only or all people who work on the property, and using hours or years as the time factor.

Quality, Grade, or Rank - Refers to individual measurements such as heat value; fixed carbon; moisture; ash; sulfur; phosphorus; major, minor, and trace elements; coking properties; petrologic properties; and particular organic constituents. The individual quality elements may be aggregated in various ways to classify coal for such special purposes as metallurgical, gas, petrochemical, and blending uses. These characteristics can be important in determining the economic value of coal.

Raw Coal (Run-of-Mine Coal) - Coal extracted from the seam but not processed, washed, crushed, or sized.

Reclamation Fee - Fee imposed by the U.S. Federal Government per ton of coal produced to pay for reclamation of previously abandoned mined lands.

Regulatory Costs - Expenditures required by Government regulations. These may be direct costs, such as Government-imposed royalties per ton of coal mined, or indirect costs. Indirect costs are often hard to determine and include such items as the requirements of topsoil handling and dust limits. Regulatory costs often include the cost of reduced productivity due to Government regulation.

Reserves - The number of tons estimated to be economically recoverable with the technology and prices prevailing at the time of determination.

Run-of-Mine Coal - See Raw Coal.

Salable Coal - Coal sold to a customer. Salable coal is raw coal that may have been washed or processed to remove impurities, crushed, and sized to meet customer specifications. If the quality of raw coal meets customer requirements, no washing is necessary.

Steam Coal - Coal used by electric power utilities and industry to generate steam and electricity.

Subbituminous Coal - A dull-black, solid fossil fuel ranking between lignite and bituminous coal in heat value, mined in the United States chiefly in Montana and Wyoming. Very little is exported because the low heat value often cannot justify the cost of transportation to distant markets.

Sulfur Content - The percentage of total sulfur, on a weight basis, contained in a coal.

Thermal Coal - See steam coal.

Volatile Matter - Those products, exclusive of moisture, given off as gas and vapor, determined by methods described in ASTM Designation D271.

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APPENDIX A—VENEZUELAN TAXES AND ROYALTIES

Information here supplements the information in the body of the report.

The corporate tax rate of 20% is applied to taxable income of 2 million Bolivars or less, and a rate of 30% is applied to taxable income over 2 million Bolivars. Deductible items from gross income are business expenses related to operations, depreciation, cost depletion, interest, royalties, insurance, and net operating losses. Net operating losses can be deducted from income over a 3-year period following the year in which the loss occurred. Any municipal, State, or local taxes are also deductible from gross revenue.

The methods of depreciation available are straight line and unit of production. There is no depreciation schedule by type of asset. The length of depreciation is derived from the expected life of the asset. Since December 31, 1992,[84] nonmonetary assets (land, construction, machinery, vehicles, installations, inventories, and some investments) and liabilities must be adjusted for inflation, determined by the difference between the Consumer Price Index on the month of purchase and the Consumer Price Index on the month of the initial adjustment. The initial adjustment, the difference between the original cost and the adjusted cost basis, will be taxed at the rate of 3%. The asset and the adjusted amount can be depreciated over the usual life of the asset. The remainder of the depreciation before adjustment will be deductible from gross income. Subsequent adjustments are to be made on an annual basis.

An investment tax credit is available for new fixed assets used in mining. The credit amount is 10% of the capital expenditure. The investment credit is available from September 1, 1991, to September 1, 1995.

Local land and real property taxes are levied by municipalities. The property taxes vary by municipality; however, the taxes are usually small.[85]

Municipalities levy a license tax on industrial enterprises operating within the municipalities' jurisdictions. The tax rate varies from 0.25% to 10% of gross revenues, or can be a flat amount. The majority of industries are taxed at 0.5% or less.[86]

To promote coal development, Venezuela has set up a number of development corporations, which can grant concessions. Royalties

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[84]Latin American Mining Institute, Dec. 1991, p. 403.

[85]Yost, G. J., III. p. V-11.

[86]Same page of work cited in footnote 85.

charged by these development corporations, payable f.o.b port, are Carbosuroeste, 8%; Corporiente, 5%; Corpozulia, 10%.[87]

Approved November 26, 1993, was a corporate assets tax of 1% per year to take effect December 1, 1993. The business tax would be 1% of the paid-up capital of businesses and would not be applied until after the first 2 years of new investments.[88]

Also new in 1993 is a value added tax (VAT). The first phase became effective October 1 when it was imposed on importers and wholesalers. The second phase became effective January 1, 1994, when the 10% VAT took full effect and was imposed at the consumer level.[89] Some exemptions from the tax are hydrocarbons and its derivatives (gasoline, diesel fuel, crude oil, etc.); books, magazines, and newspapers; medical assistance programs; intranational land, sea, and river passenger transport; and some basic food items.[90] Rafael Caldera, elected President of Venezuela on December 5, 1993, has promised to repeal the VAT and replace it with taxes on the rich and income tax reform.[91]

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[87]Meeting with Ministry of Energy and Mines, Nov. 1992.

[88]The Daily Journal, Nov. 28, 1993, p. 3.

[89]The Daily Journal, Dec. 18, 1993, p. 4.

[90]The Daily Journal, Jan. 6, 1994, p. 3.

[91]The Daily Journal, Nov. 29, 1993, p. 3; Dec. 10, 1993, p. 3.

APPENDIX B—U.S. FEDERAL AND STATE TAXES AND BONDING REQUIREMENTS FOR COAL MINING OPERATIONS

U.S. Federal Taxes

The U.S. Federal corporate income tax is a graduated rate with a maximum of 34% on taxable income over $335,000. Taxable incomes less than $335,000 are taxed at incremental rates shown in the table below. Taxable income between $100,000 and $335,000 is taxed at the rate of 34% plus an additional 5%. Even with the effective 39% rate, average tax in this bracket is less than 39% because of the incremental lower rates up to that point. Taxable incomes over $335,000 cannot use the lower rates for that amount of taxable income between $0 and $335,000. The graduated amounts are as follows:

Tax rate	Minimum taxable amount	Maximum taxable amount
15%	$0	$50,000
25%	$50,000	$75,000
34%	$75,000	$100,000
39%	$100,000	$335,000
34%	$335,000	

Mining companies, for purposes of determining Federal taxable income, are permitted to deduct from revenues all operating costs and capital costs relating to interest on debt, as well as depreciation on equipment and real property, and percentage depletion. Operating costs include mining and milling costs, marketing and transportation costs, on-property exploration and certain development costs, municipal taxes, private royalties, and general administrative charges.

Under Federal law, for property placed in service after 1986, the modified accelerated cost recovery system is the applicable depreciation method with respect to equipment, that is, property with 3-, 5-, 7-, or 10-year lives:

(1) The 200% declining balance method,

(2) Switching to the straight line method for the first taxable year for which using the straight line method with respect to the adjusted basis as of the beginning of such year will yield a larger allowance.

In the case of 15- and 20-year property, a 150% declining balance method is used. For nonresidential real property, which has a recovery period of 31.5 years, the straight line depreciation method applies. Assets used in mining have a recovery period of 7 years. Over-the-road ore trucks have a recovery period of 5 years.

Percentage depletion for coal and lignite mines under U.S. Code in 1988 was 10%. However, for tax years beginning after 1986, the corporate percentage depletion deduction for coal (including lignite) was reduced by 20%, resulting in an effective corporate percentage depletion rate of 8%. The depletion rate is applied to the gross income from the property excluding from such gross income an amount equal to any rents or royalties paid or incurred by the taxpayer in respect of the property. The percentage depletion allowance may not exceed 50% of the taxpayer's taxable income from the property, computed without allowance for depletion.

For corporations subject to the reduced (by 20%) percentage depletion rate for coal, only 71.6% of this preference before such reduction is to be included in the minimum tax base for calculating alternative minimum tax.

Corporations may be subject to the alternative minimum tax in such instances when the alternative minimum tax payable exceeds Federal income tax payable. The alternative minimum tax rate is 20% of the corporate taxpayer's alternative minimum taxable income, calculated by adjusting Federal taxable income, adding preference items, and deducting an exemption of $40,000. The exemption amount is reduced by 25% of the alternative minimum taxable income exceeding $150,000. The exemption amount is reduced to zero for alternative minimum taxable income over $310,000. Preference items are the excess of percentage depletion over cost depletion and the excess of the 200% declining balance depreciation over that of the 150% declining balance method with switch to straight line method.

Under Section 59A of the Internal Revenue Code, an environmental tax, in effect for tax years beginning January 1, 1987, is imposed on the alternative minimum taxable income of all corporations. The environmental tax of 0.12% is applied to the amount in excess of $2 million of alternative taxable income, regardless of whether the corporation pays the alternative minimum tax or the regular corporate tax.

Coal mines located on Federal lands are also responsible for the lease rental on the acreage mined including a lease bonus bid for the right to the property and a royalty of 12.5% of the mine-mouth value of coal extracted from strip mines.

Foreign corporations are subject to a withholding tax of 30%, except those corporations engaged in trade or business within the United States, in which instance, the foreign corporation is subject to the same corporate taxes as domestic corporations. For the purposes of this study, the withholding tax was not considered.

The Social Security withholding rate for employers is 6.2% of an employee's wages, limited to the first $55,500 of an employee's wages earned in 1992. The withholding rate for

Medicare is 1.45% of an employee's wages, limited to the first $130,200 of an employee's wages earned in 1992. In the analysis, Social Security costs are treated as labor costs.

The Federal Government levies the black lung tax, a special excise tax on every ton of coal mined. The proceeds of this tax go to a special Black Lung Disability Trust Fund, which is used to compensate miners for total permanent disability caused by pneumoconiosis (black lung) and other industrial respiratory diseases caused by the inhalation of coal and rock dust. This fund was established in 1978 to compensate those miners suffering as a result of these occupational health hazards. Public Law 99-514 raised the level of payments to this fund, beginning April 1, 1986, to $1.21/mt of coal mined underground and $0.61/mt of coal from surface mines. However, the amount of tax may not exceed 4.4% of the price at which the underground or surface producer sells the coal. Lignite is exempt from the tax.

Another charge levied on every ton of coal mined in the United States is the abandoned mine lands reclamation fee. Proceeds go into the Abandoned Mine Reclamation Fund, administered by the Secretary of the Interior. The fund is used primarily for the reclamation of land and water resources adversely affected by past coal mining. The fee is set at $0.39/mt of coal produced by surface coal mining and $0.17/mt of coal produced by underground mining or 10% of the value of the coal at the mine, whichever is less. The reclamation fee for lignite coal is 2% of the value of the coal at the mine, or $0.11/mt, whichever is less.

The Surface Mining Control and Reclamation Act of 1977 (SMCRA-Public Law 95-87) was enacted to ensure the adequate reclamation on all areas disturbed by surface coal mining operations. At the time of its passage, many abandoned, unreclaimed surface and underground mines existed in the United States and posed both health and safety hazards to surrounding communities.

Some of the more important provisions of the SMCRA include the requirement that a reclamation plan must be filed by the coal operators and that the operators must post a reclamation bond to ensure that the reclamation work will be done, either by the operator or by the State if necessary. Under the concept of primacy, individual States can set their own reclamation standards and bonding requirements, as long as those standards are approved as part of the States' surface mining program and are consistent with 30 CFR[92] 800.14(a).

Almost all of the coal-producing States have developed their own reclamation standards and bonding requirements. Under Federal codes, the State regulatory authority may adopt reclamation standards and bonding requirements that differ from

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[92]The U.S. "Code of Federal Regulations."

the Federal regulations, as long as those State programs have been approved. Alternate bonding requirements and levels are also allowed as long as (1) the alternative assures that the regulatory authority will have available sufficient money to complete the reclamation plan for any areas that may be in default at any time and (2) the alternative provides a substantial economic incentive for the permittee to comply with all reclamation provisions. The Federal Office of Surface Mining Reclamation and Enforcement is the regulatory authority for Tennessee, Washington, Federal lands in Kentucky, and Indian reservations in Arizona and New Mexico.

Section 507 of the SMCRA requires each applicant to submit, as part of the permit application, a reclamation plan of sufficient detail to demonstrate compliance with State or Federal standards for reclamation. Section 509 requires that a bond be filed in sufficient amount to cover the cost of reclamation in accordance with the approved plan if such reclamation had to be performed by the regulatory authority in the event of forfeiture. Bonds must be filed with the regulatory authority after a coal mining permit application has been approved but before the permit is issued. The amount of the bond is set by the regulatory authority, either State or Federal, and is based on an analysis of the applicant's estimated cost of reclamation and the requirements of the approved reclamation plan.

The Federal guidelines for determining bonding amounts use standard engineering cost-estimating procedures to develop site-specific costs for each reclamation activity. Bonds calculated in this fashion account for differences in mining site conditions and in postmining land use. States are not bound to use the Federal guidelines for determining bond amounts if they have approved surface mining programs.

Federal regulations on reclamation bonds specify a minimum bond of $10,000 per permit area, as well as provisions that the operator must carry liability insurance for bodily injury and property damage caused by mining operations with a minimum coverage of $300,000 for each occurrence and $500,000 aggregate.

An administrative completeness review fee of $250, a $2,000 decision document fee, and a technical review fee of $1,350 are applied to all new permit applications. An additional sliding-scale acreage fee is charged at the rate of $13.50 per acre for the first 1,000 acres, $6.00 an acre for the second 1,000 acres, $4.00 per acre for the third 1,000 acres, and $3.00 per acre for every acre in addition to the first 3,000 acres.

Alabama State Taxes

State corporate income tax

Federal taxable income is not used as the basis for State income tax calculation. Alabama allows Federal depreciation allowances but does not allow Federal depletion. Federal income tax is deductible for State tax purposes.

Corporate income tax is 5.0% of taxable income. Net income is gross income less allowable deductions for business expenses, interest on debts to acquire securities whose interest is exempt, taxes paid or accrued for special assessments and State income taxes, Federal income taxes paid or accrued, "reasonable" allowance for depreciation and cost depletion, charitable contributions, contributions to employees' trust or annuity plan, and investments in pollution control devices. A 15-year net operating loss carry forward is permitted, but no carry back is allowed.

Severance taxes

Excise and privilege tax on coal severed in Alabama is $0.15/mt. In addition to the coal excise and privilege tax, every person severing coal or lignite is subject to a severance tax of $0.22/mt of coal or lignite. The total severance tax is $0.37/mt.

Property tax

Mine property, classified as class II property, is assessed at 20% of fair and reasonable market value. Market value of land and above-ground improvements is based on the depreciated cost method. Equipment is assessed on the reported value. The State property tax rate is 0.65%. The 1992 property tax rate for Walker County is 1.4% and for Tuscaloosa County is 2.0%.

Sales and use tax

Alabama has a gross receipts sales tax on machines and parts used in mining and quarrying of 1.5%. The general sales and use tax rate is 4.0% of gross receipts from retail sales of goods and services. Walker County has a general sales tax of 1% and a machinery sales tax of 0.5%. Tuscaloosa County's general sales and use tax rate is 2.0%, and the motor vehicle tax rate is 0.5%. These taxes are assigned to capital costs for the purchase of mine equipment and to operating costs for repair parts.

Corporate franchise (license tax)

Alabama applies a corporate franchise tax on domestic and foreign corporations. Domestic corporations are taxed on the amount of capital stock, and foreign corporations are taxed on that portion of total capital employed in Alabama. Foreign capital includes outstanding capital stock, surplus and undivided profits, bonds, notes, and other evidence of indebtedness. The rate of tax for domestic corporations is $10 per $1,000 of capital stock; the minimum tax is $50. Foreign corporations are taxed $3 per $1,000 of capital employed in Alabama, or a minimum of $25. All corporations must file an annual report, having an annual fee of $10.

Domestic and foreign corporations also pay an annual corporation permit fee on the basis of the corporation's paid capital stock. Domestic fees range from $10 to $100 per year, and foreign fees range from $5 to $100 per year.

Permit and application fees

Permits are required of all domestic and foreign corporations. The permits must be renewed annually. The fees range from $10 to $100 for domestic corporations and from $5 to $100 for foreign corporations. Fees are based on the amount of corporate capital assets employed within the State. Mining license applications must be submitted to obtain a mining permit from the State. The mining license fee is $1,000. There is also a $25 fee per acre. A reclamation performance bond is also required to obtain a mining permit.

Reclamation bonds

Alabama requires that reclamation bonds be set at a minimum of $10,000. The total bonding requirement is set by officials of the State of Alabama's Environmental Management Department. The bond must cover the entire estimated cost of reclamation for the affected area. The estimated costs of reclamation must be submitted by the permittee in accordance with established rules. Liability for reclamation continues for a minimum of 5 years after the last year of reclamation work. Surety bonds, collateral bonds, and self-bonding are acceptable, given that State regulations on bonding are followed. Collateral bonds, if in the form of securities or other collateral, must be at market value; other forms of collateral such as certificates of deposit or letters of credit must be in accordance with established regulations.

Unemployment insurance

The maximum unemployment insurance tax rate for employers is 6.04% of wages; the minimum rate for an employer with a positive balance is 0.44%. The rates do not include the 1993 special assessment of 0.06% and shared cost assessment of 0.09%. Employers with sufficient experience in the mining industry may qualify for an experience rating. The State's absolute minimum is 0.20%. The taxable basis is limited to the first $8,000 of an individual's yearly wages. The State provides for an increase of the taxable limit in the event that the Federal taxable limit is set at a higher rate than that of the State. Voluntary contributions are not permitted.

Workers' compensation

Coal producers can obtain workers' compensation insurance through several insurance companies or through the National Council on Compensation Insurance. Insurance company rates vary for individual coal producers. The National Council on Compensation Insurance has an assigned-risk plan for coal producers. The assigned-risk rate for surface mines is $11.21 per $100 of payroll; the rates for underground coal mines are $21.95 for traumatic coverage and $13.08 for disease coverage, or a total of $35.03 per $100 of payroll.

Kentucky State Taxes

Corporate income tax

Kentucky State taxable income is determined according to Federal taxable income regulations. Federal income tax paid is not deductible for State tax purposes. If a corporation does not claim any Federal deduction for percentage depletion, 50% of gross income earned from sales of coal is excluded from the income tax base. Corporations may elect the Federal modified accelerated cost recovery system to depreciate assets placed in service after December 31, 1989. The 1993 tax schedule has graduated rates based on the varying levels of annual taxable income.

Taxable income	Tax rate
$0–$25,000	4.00%
$25,001–$50,000	5.00%
$50,001–$100,000	6.00%
$100,001–$250,000	7.00%
$250,000+	8.25%

Property tax

All real and personal property—tangible and intangible—are taxable unless exempt. Machinery and products used in the process of manufacturing, including raw materials on hand and air, water, or noise pollution control facilities, are subject to State property tax only. All property is assessed at its fair cash value. The State tax rate that is applied to the value of real property is $0.184 per $100 of assessed value; the State tax rate for tangible personal property is $0.45 per $100. The 1992 real property tax rate for Harlan County is $0.657 per $100 of assessed value, and the tangible personal property tax rate for Harlan County is $0.6743 per $100 of assessed value. The 1992 real property tax rate for Perry County is $0.528 per $100 of assessed value, and the tangible personal property tax rate for Perry County is $0.5611 per $100 of assessed value.

Ad valorem property tax

Producing coal properties are valued at $0.58 per minable acre inch. Nonproducing coal properties that have been permitted are valued at $0.22 per minable acre inch, and coal in place that has not been permitted is valued at $0.18 per minable acre inch. Unmined coal is subject to State tax only. The State tax rate for unmined coal is $0.189 per $100 of assessed value. The county real property tax rate is applied to the assessed value of producing and nonproducing, permitted coal properties.

Severance tax

Severance tax is imposed on gross value of all coal severed and/or processed. Gross value is the amount received for severed or processed coal. For coal not sold, the value is determined by contract price or fair market value for grade and quality of coal. Tax rate is 4.5% of gross value. The minimum severance tax is $0.56/mt of coal severed.

Sales and use tax

A sales and use tax is imposed at the rate of 6% on gross receipts from retail sales of personal property. Coal used to produce electricity and fuel used in manufacturing are exempt from sales tax.

Corporate franchise (license tax)

A corporate license tax assessed on foreign and domestic corporations is based on the total capital employed in the business. The amount of capital employed in the State is determined according to liabilities and equity listed on the corporate balance sheet at the end of the accounting period.

Capital consists of issued and outstanding capital stock, surplus, advances by affiliated companies, intercompany accounts, borrowed money, or any other accounts representing additional capital used and employed in business. Corporations having gross income of not more than $500,000 receive a credit of $1.40 per $1,000 of the initial $350,000 of capital employed in the business. The tax rate is $2.10 per $1,000 of capital. There is a minimum tax of $30.

Permit/application fees

A minimum annual licensing fee is $125 for surface coal mines. There is an additional fee of $25 for each 100,000 st of coal in excess of 100,000 st of surface mined coal produced in a calendar year. The maximum license fee is $1,000. The annual license fee for an underground coal mine with one working section is $125, with an additional fee of $25 for each additional working section. The maximum license fee is $1,000.

Reclamation bonds

The minimum reclamation bond is set by law at $10,000 unless the operator is covered by the Kentucky bond pool, an alternative bonding option. Single or incremental bonding methods may be used. The bond must cover the entire permit area; it continues for at least 5 years past the date of final reclamation activities. The total bond amount is based on the estimated cost of reclamation submitted by the operator, plus additional costs that may be incurred by the State if it is forced to do the reclamation work. There is a reclamation processing fee of $375.

Surety bonds, collateral bonds, or a combination thereof are acceptable, provided State regulations on bonding are followed and the form of the performance bond is approved by the State Natural Resources and Environmental Protection Cabinet. Collateral bonds, such as certificates of deposit or letters of credit, must be in accordance with established regulations.

Alternative bonding is available through the Kentucky bond pool. Applicants are not automatically admitted to the pool; they must be accepted to the bond pool after they are screened for financial stability and past reclamation performance. Initial membership fees range from $1,000 to $2,500 depending on the rating of the applicant. The pool members must meet certain reporting requirements. Bonding requirements for the area are met using fees based on the tonnage of coal produced; the fees are $0.08/st of surface-mined coal and $0.01/st of coal mined by underground methods. Tonnage fees may be suspended if the pool fund reaches specified levels and individual members have made the required number of payments.

Release of reclamation bonds entails public notice, notice to specific interested parties, and inspection of the property. The notices must summarize the reclamation plan, the date and nature of work performed, and describe the results of the reclamation work. Objections and request for a public hearing may be filed with the cabinet. The cabinet must inspect the property within 30 days and render a public decision within 60 days of the completed application or 30 days after the close of the public comment period, whichever occurs last.

Unemployment insurance

The State of Kentucky has a minimum rate of 0.30% for unemployment insurance. The State may make voluntary contributions to the State unemployment fund. The insurance rate is applied to the first $8,000 of an employee's wages. New employers with insufficient experience to qualify for a rating must contribute 3% of employees wages.

Workers' compensation

Kentucky's Workers' Compensation Insurance Plan provides coverage for both traumatic and disease risks. The rate schedule for surface and large, small, and new underground mines follows:

RATES	Surface	Underground Large	Underground Small	Underground New
Traumatic	$6.12	$14.14	$23.61	$9.46
Disease	2.25	8.47	8.47	8.47
TOTAL	8.37	22.61	32.28	17.93

The applicable rate is applied to each $100 of the coal producer's total payroll.

New Mexico State Taxes

State corporate income tax

New Mexico State taxable income is based on the Federal taxable income. Federal depreciation and depletion are allowable deductions, but Federal tax is not allowed as a deduction from gross income. The corporate tax rate is a sliding scale:

Net income range	Tax rate
$0–$500,000	4.8%
$500,000–$1,000,000	6.4%
$1,000,000+	7.6%

Severance tax

An excise tax is imposed on taxable value of coal at the time of sale or transportation of the coal out of State. The rate for surface-mined coal is $1.29/mt; the rate for underground coal is $1.24/mt. The severance tax rate includes a surtax of $0.66/mt for surface coal and $0.64/mt for underground coal. The surtax is calculated annually to adjust for inflation.

A resource or processor's tax is assessed on the taxable value of natural resources severed or processed in New Mexico. The rate is 0.75% of the taxable value of coal. A conservation tax of 0.18% is also assessed on the taxable value of coal.

Property tax

All real and personal property is valued at market value and assessed at 33 1/3% of the market value. Mineral property, which includes reserves, mineral lands, interests, and severed mineral products, is valued at 300% of the net annual production value and assessed at 33 1/3% of the value. The 1992 property tax rate for San Juan County was 2.2506%.

Sales tax

The sales tax is applied to gross receipts from retail sales at the rate of 5%. Counties and municipalities are authorized to impose sales excise taxes. The combined State and county sales tax is 5.625% for San Juan County.

Corporate franchise (license tax)

Domestic and foreign corporations that are franchised within the State or engaged in income-producing activities within the State are subject to a franchise tax. The annual rate of tax is $50. Every nonexempt domestic and foreign company must file a biannual report, having a filing fee of $20.

Permit/application fees

The New Mexico Bureau of Permitting issues mining permits. The annual fee for the permit is $1,000 plus an additional $15 per acre.

Reclamation bonds

The reclamation bond amount is determined according to the number of acres disturbed, depth of the pit, volume of material moved in cubic yards, top dressing, and permanent seeding. The bond amount is $1,000 plus $10,000 per acre disturbed. Minimum amount of bond is $10,000.

Unemployment insurance

Employers having a negative balance in the State unemployment account contribute 5.4% of taxable wages to the State unemployment fund. Employers having a positive balance contribute from a minimum of 0.6% to a maximum of 3.6% of their taxable wages. The rates include any applicable subsidiary and penalty rates. The unemployment taxable wages are limited to the first $12,100 of an employee's wages. Employers with sufficient experience in the mining industry may qualify for an experience rating. The State's absolute minimum rate is 0.1%. Employers may make voluntary contributions to the unemployment fund.

Workers' compensation

Employers may provide unemployment insurance either by purchasing an insurance policy or by contributing to an individual fund set up for their own employees. The rate of contribution is determined according to previous compensations paid to employees in the mining industry. For surface mining, the rate for assigned-risk pools is $5.33 per $100 of payroll. Coverage for State benefits only is $2.09 per $100 of payroll, and coverage for Federal benefits only is $1.06. The voluntary market rate is $3.95 per $100 of payroll, $0.78 for Federal benefits only, and $1.50 for State benefits only. There are no underground insurance rates.

Washington State Taxes

State corporate income tax

There is no Washington State income tax.

Severance tax

There is no severance tax on the production of coal.

Business and occupation tax

A business and occupation tax is assessed on the value of production plus the value of any byproducts. The rate of the business and occupation tax for the mining industry is 0.484%. A

tax credit in the amount of the occupation tax paid is available for producers extracting coal sold in Washington State.

Property tax

All real property and tangible personal property is subject to property tax. Property is assessed at 100% of fair cash value. The property tax rate for Lewis County, for improved property, is 1.366%. The property tax rate for King County is 1.2235%. Coal mineral rights are valued at $2.00 per acre. The property value on the portion of land being mined is $4,500 per acre.

Sales and use tax

All retail sales of tangible personal property and services, unless exempt, are subject to a retail sales tax of 6.5%. A tax exemption is available for sales made to nonresidents of goods used outside the State.

Corporate franchise (license tax)

An annual license is required of every foreign and domestic corporation operating within the State of Washington. The annual license fee is $50 for foreign and domestic corporations. Foreign and domestic corporations must also file an annual report, having an annual filing fee of $10.

Permit/application fees

The State of Washington requires mining companies to obtain a mining permit, having an annual fee of $250.

Reclamation bonds

The Federal Office of Surface Mining regulates, controls, and administers coal mine reclamation in the State. Bonding requirements are governed by Public Law 95-87, Surface Mining Control and Reclamation Act of 1977. The largest coal mine bond in the country is in Washington for $101 million. The payee of the bond is the Office of Surface Mining.

Unemployment insurance

The maximum unemployment insurance tax rate for employers is 5.4%; the minimum rate for employers is 0.48%. The rates include any applicable subsidiary and penalty rates. In addition to the unemployment rates, there is a 0.02% rate for the State Employee Assistance Program. Employers with sufficient experience in the mining industry may qualify for an experience rating. The taxable basis is limited to the first $18,500 of an employee's yearly wages. Voluntary contributions are not permitted.

Workers' compensation

The composite rate for workers' compensation insurance paid by coal mining operators is $2.6155 per employee-hour worked. The rate is multiplied by the total number of employee-hours worked during a calendar quarter.

Wyoming State Taxes

State corporate income tax

There is no corporate income tax in Wyoming.

State severance/business occupation tax for coal

The basis of the State severance tax is the gross value of the coal extracted. The point of determination is where underground coal reaches the surface or the top of the ramp exiting the surface pit. The taxable value is the sales price, less royalties paid to Federal, Indian, or State Governments, multiplied by the same proportion that direct mining costs are to total direct costs. The applicable severance tax rates are 5.25% for coal recovered by underground mining and 8.5% for coal recovered by surface mining. For coal sales agreements negotiated between March 31, 1987, and March 31, 1995, the coal is exempt from any coal severance tax in excess of $0.80 per ton of coal sold.

Property tax

All lands for mines or mining claims are exempt from property taxes. Property tax is based on the county's assessed value of all buildings and equipment. Industrial assets including mining equipment are assessed at 11.5% of fair market value, and other property is assessed at 9.5% of fair market value. The 1992 property tax rate for Campbell County was 6.0376%. The 1992 property tax rate for Lincoln County was 6.3391%.

Ad valorem property tax

The gross mineral and mine products tax (ad valorem tax) is assessed in lieu of property tax on mining lands. The basis of the tax is 100% of the gross value of the coal as determined for severance tax purposes. The tax rates are the same rates as those used to determine property taxes.

Sales and use tax

A sales and use tax is imposed on gross receipts from retail sales at the rate of 3%. Campbell County and Lincoln County

impose an additional 1% sales and use tax on the same items subject to the State sales and use tax.

Corporate franchise (license tax)

An annual license tax is assessed on domestic and foreign corporations having the right to do business in Wyoming on the basis of the corporation's property and assets located and employed in Wyoming. The rates range from $10 to $50 for assets valued under $500,000. A rate of $100 is assessed for assets valued over $500,000 but less than $1,000,000. An additional $100 is assessed for every $1 million worth of assets, or fraction thereof.

Reclamation bonds

Wyoming reclamation bonding levels are set by law at a minimum bond of $10,000. The bond must cover the entire cost of reclamation and the cost to restore any groundwater disturbed by insitu mining, based on the coal operator's estimates. Guidelines for estimating the total bonding amounts have also been published.

The bond is held for a period of at least 5 years past the final reclamation activities. The area must be inspected and approved before the entire bond may be released. Partial release of the bond is possible with approval of the land owner and the administrator of the Land Quality Division of the Department of Environmental Quality.

Surety bonds, collateral bonds, or self-bonding are acceptable, provided Wyoming State regulations on bonding are followed. In some instances the land owner may also be required to sign the surety bond. Collateral bonds must be either cash, a first lien on real property in the State of Wyoming, investment-grade securities, certificates of deposit, or letters of credit and must be in accordance with established regulations. Self-bonding may be accepted without separate surety if the applicant demonstrates to the satisfaction of the administrator the existence of a suitable agent to receive service of process and a history of financial solvency and continuous operation sufficient for authorization to self-insure.

Unemployment insurance

The maximum unemployment insurance tax rate for employers is 9.52%; the minimum rate for an employer with a positive balance is 1.02%. The rates include any applicable subsidiary and penalty rates. Employers with sufficient experience in the mining industry may qualify for an experience rating. The State's absolute minimum is 0%; however, the effective minimum rate is greater than 0% because of State adjustments and

surtaxes. The taxable basis is limited to the first $10,900 of an employee's yearly wages. Voluntary contributions are not permitted.

Workers' compensation

Mining companies contribute to the Wyoming Workmen's Compensation Fund at a rate that is determined for the area in which the mine is located. The rate in Campbell County for 1992 is 1.47%, which is applied to the total gross salary.

APPENDIX C—VENEZUELAN LAWS AND REGULATIONS

This appendix describes portions of the following laws and regulations:

- Regulation of the Mining Law of Venezuela, December 28, 1944;
- Organic Law of Working Safety and Conditions, July 2, 1986;
- Law approving the Agreement No. 155 and Recommendation No. 164 on Occupational Safety and Health and the Working Environment, January 10, 1984;
- Criminal Law of the Environment, January 3, 1992;
- Partial Regulation of the Organic Law of the Environment on the Environmental Impact Studies, Decree No. 2211 of April 23, 1992;
- Norms to Regulate the Management of the Renewable Natural Resources Associated with the Exploration and Extraction of Minerals, Decree No. 2216 of April 23, 1992;
- Foreign Investment Code, Decree No. 2095;
- Mining Health and Safety Regulations, Carbosuroeste (Carbones de Suroeste, C.A.), March, 1992.

Additional laws, decrees, and resolutions affecting coal mining are listed at the end of this appendix.

Regulation of the Mining Law of Venezuela, December 28, 1944

This regulation contains the following provisions, in addition to others:

- A permit is required for exploration.
- Concessionaires, operators, or mining companies may apply for relief from fees levied against imports of machinery, supplies, materials, instruments, medicines, chemical products, etc.
- Mining enterprises are responsible for their mistakes.
- Mine employees should have knowledge of and comply with the regulations.
- Underground workings should be designed to handle rescue operations.
- Every mining operation will record the purchase and use of explosives, and the records will be open to local and national authorities.
- Concessions should be operated in conformity with economic principles, so that the mining is done efficiently, with the

greatest yield and until all the mineral has been extracted, if possible.

- Mining enterprises and concessionaires must furnish the Ministry of Mines and Hydrocarbons (now the Ministry of Energy and Mines, hereafter "Ministry") any data it solicits for general statistics on the mining industry.
- In regard to accidents, preventive action can be taken by inspectors, when unforeseen circumstances oblige them to do so, and any public authority or employee of the mine in case of imminent risk.
- Individuals have the duty to put all means within their reach to avoid an accident.
- The inspector will be warned immediately when there are indications of a hazard in a mine.
- Every accident should be reported to the inspector and the highest civil authority of the locality in the shortest amount of time.
- When the mineral is to be exported, the custom agents will verify the quantity and place of origination.
- If the expiration of a concession were to be declared, the Minister of Mines would take all the reports he deemed necessary, and the enterprises will furnish their accounting books, workers' payroll, the account of the jobs done and every other document which the Minister believed to be necessary.
- When public employees are not present in a mine, the engineers of the enterprise or the foremen of the work crews would assume their capacity, in respect to public order. The attributes of the employees who are in charge of the preservation of the public order in the mines, include (1) impeding any abuse, disorder or offense which is attempted in the mine and, with the authority with which they are invested, expel from the mines the instigator or instigators of the act, or criminal or pernicious intention, and (2) turning over to the civil authority those apprehended and, in every case, initiating an indictment sending it immediately to the President of the State or Governor of the District or Federal Territory, depending on the jurisdiction.

Organic Law of Working Safety and Conditions, July 2, 1986

Chapter I—General dispositions

Article 1.—The purpose of the present Law is to guarantee both permanent and temporary workers the safety, health and welfare conditions, in an adequate working environment.

Article 2.—It will be the responsibility of the employers, contractors, subsidiaries or agents to comply with the purpose.

Article 3.—The State will guarantee the mitigation of the risks through the monitoring of the environment of the work places and the related conditions so that the purpose is achieved.

Article 5.—The working environment is understood to be:

1. The place of work.

2. The sociocultural circumstances and physical infrastructure immediately encompassing the relationship of person to work, and which condition the quality of life of the workers and their families.

3. The properties around an enterprise or exploitation, which form part of them.

Article 6.—The work should be carried out under conditions which adequately take into consideration the physical and mental capacity of the workers and therefore:

1. Guarantee all the basic sanitary elements.

2. Offer the workers all protection and security for their health and life against all risks associated with their jobs.

3. Assure the workers the benefit of a normal state of physical and mental health and the adequate protection of women, minors and people with special conditions.

4. Guarantee immediate aid to the injured or sick worker.

5. Permit the availability of free time and the necessary commodities for the nourishment, rest, relaxation and recreation, as well as the technical and professional training.

Paragraph One: No worker can be exposed to physical agents, bio-technological conditions, psycho-social risks, chemical, biological or any other agents, without being warned in writing and by any other suitable form, of their nature, how they may adversely affect the health, and instructing them on the preventive measures.

Paragraph Two: Whoever should conceal from the workers the risks they are taking, given the conditions and agents mentioned in the previous paragraph, or try to minimize them, thereby creating a false sense of security, or in some manner induces the worker towards unsafe practices, is liable for the respective penal responsibilities with a motive of intentionality and with the aggravating circumstances of the purpose of profit.

Chapter III—On the National Council for Work Prevention, Health and Safety

Article 8.—The National Council for Work Prevention, Health and Safety is created as an advisory committee of the National Executive Office. Its fundamental objectives will be:

a) The development of a national policy in the areas of working conditions and environment which relates to the prevention, health, security and welfare of the workers.

b) Watch that all the standards contained in this law and its regulations are complied with.

Article 9.—The Council will be made up of a President and representatives of the Ministries of Health and Social Assistance, Employment, Environment and Renewable Natural Resources, Development, Urban Development, Agriculture and Breeding, National Agrarian Institute, Venezuelan Institute of Social Security, Central Office of Coordination and Planning of the President of the Republic of Venezuela, the Venezuelan Confederation of Workers, the Venezuela Rural Workers Federation, the Medical Federation of Venezuela, I.V.I.C., National Council of Scientific Investigations (CONICIT), and the Director of the National Institute for Work Prevention, Health and Safety foreseen by this law, who will act as the Technical Secretary.

Chapter VI—On the obligations of the employers and workers

Article 19.—The employer's obligations are:

1. Guarantee the workers the prevention, health, security and welfare conditions at work, in the terms provided by the present law and in the regulatory dispositions which were to be established.

2. Announce to the National Institute for Work Prevention, Health and Safety, the professional illnesses, work accidents and any other pathologic condition which occurred within the working environment as foreseen by this law.

3. Instruct and train the workers on the prevention of professional accidents and illnesses, as well as that which regards the use of personal security and protection devices, everything according to that established by the 6th article of this law.

4. Organize and maintain the medical services and the agencies of work safety as foreseen in this law.

5. Actively incorporate themselves in the hygiene and safety committees established by this law.

6. Listen to the arguments of the workers and take down in writing the declarations they formulate with respect to the

working conditions and environment. Take the necessary steps which the case requires. In no case can the boss dismiss a worker or apply another type of sanction for having made use of the rights consecrated in this law.

7. Place on bulletin boards, which are located in visible places of the enterprise, each successive quarter, the lists and statistics of professional accidents and illnesses in the given time period.

Article 20.—The obligations of the workers are:

1. Exercise the specific functions derived from their work contract relating to the risks associated with their job, not only in defense of their own health and security but also with respect to that of other workers.

2. Immediately inform the next superior or one of the members of the Hygiene and Safety Commission, of any situation which constitutes an unsafe condition which threatens the physical integrity or health of the workers.

3. Use obligatorily, claim, accept and maintain in good conditions the personal safety equipment, informing immediately the person responsible for its dispatch, the loss, deterioration, or its expiration. The worker should inform the Industrial Hygiene and Safety Commission when, with founded reasons, the equipment referred to in this disposition does not correspond with the risks they are trying to mitigate.

4. Correctly use and take care of the basic, industrial and farming sanitary facilities; as well as the relaxation, recreational, cultural activities, sport, eating facilities and in general all the installations for social service.

5. Follow the instructions, warnings and teachings on hygiene and industrial security which are given.

6. Respect and make others respect the signs, notices and warnings which are located in different places, installations, machinery in your work area, corresponding to health and safety.

7. Follow the dispositions of the medical service and the department of work safety of the enterprise, corresponding to prevention, treatment and rehabilitation of professional or nonprofessional illnesses and of work accidents.

8. Actively participate, directly or through the election of representatives, in the Hygiene and Safety Commissions, and other committees which promote social services and other joint and tripartite organizations which are created for these purposes.

9. The foremen, leaders and heads of work groups or teams, and in general every person who permanently or occasionally acts as a leader of a group, team, or industrial or farming production line, is obliged to monitor that all personnel under their

direction comply with the safety procedures and solicit from their immediate superiors the corresponding measures.

10. The foremen, leaders and heads of groups and teams and, in general, all those people who either permanently or occasionally act as leaders of groups, teams or industrial or farming production lines, which observe or know of conditions which are insecure or obviously threaten the health or life of the workers, will immediately inform this to any of the members of the Hygiene and Safety Committee and his immediate boss, abstaining from carrying out the proposed job, until judgment is passed on the convenience or not of its execution.

11. Announce before the competent authorities, any violation of the working conditions and environment, when the situation so requires it or in any case when the employer does not opportunely correct the denounced deficiencies.

Chapter VII—On labor safety and hygiene

Article 21.—The plans, construction, operation, maintenance and repair of the work means, procedures and positions, should be conceived, designed and executed with strict adherence to the labor hygiene and safety standards.

Article 23.—The national construction and importation of machinery and equipment for industry, farming or services are subject to the State's approval and control of their conditions and safety devices.

Article 25.—It is obligatory that the enterprises and work centers observe the technical standards of engineering and architecture related with industrial hygiene, bio-technology and basic sanitation, which aid to keep the labor risks below the thresholds of established damages.

Chapter VIII—On sicknesses and other professional accidents

Article 29.—For those professional sicknesses of special progressive character, in which the pathological process does not stop, even when the worker is separated form his work environment, it is still the employer's responsibility, until its stationary character can be established and a definitive evaluation were made. This responsibility is not extended in the case that the pathological state is complicated or aggravated by current illnesses, unrelated to it, or if death were to occur due to circumstances equally alien to the given condition.

Article 32.—Work accidents are understood to be all the functional or bodily lesions, whether permanent or temporary, immediate or posterior, or death, resulting from the violent action of an external force which can be determined or happened during the course of the work, in the work itself or because of

the work; it will be equally considered as a work accident, every internal injury determined by a violent force, happening under the same circumstances.

Chapter IX—On the sanctions

Article 33.—When the employer knows that the workers run a risk by carrying out their duties and death were to occur because the dispositions ordered in the present law were not complied with, he will be punished with a prison sentence of 7 to 8 years.

When the employer acting under the same circumstances has caused:

1. The absolute and permanent disability of the worker, the sentence will be 6 years in prison.

2. The absolute and temporary disability, the sentence will be 5 years in prison.

3. The partial or permanent disability, the sentence will be 4 years in prison.

4. The partial or temporary disability, the sentence will be 2 years in prison.

First Paragraph: Given the circumstances contemplated in this article and in the thirty first of this law, when the death of the worker were to occur, the employer is obliged to pay the relatives of the deceased person which appear in the article 148 of the Labor Law and in the same order as established in the cited disposition, an indemnity equivalent to the salary of five (5) years, counted as continuous days.

Fourth Paragraph: When the employer is a corporation, the person who is responsible and had acted as a legal representative, administrator, proxy, commander or manager of the employer will be penally judged for the criminal act typified in this article.

Sixth Paragraph: Independently of the penalties established in the present article, whenever there is imminent danger or harmful situations subsist, which should be corrected, the National Institute for Work Prevention, Health and Safety can adopt the following measures:

1. Temporary or definitive closure of the enterprise.

2. Imposition of fines on the employer, the sum of which should vary between five thousand and five hundred thousand Bolivars.

Ninth Paragraph: The workers which do not follow the dispositions of Hygiene and Industrial Safety such as not using the personal safety equipment, will have their attention called by the Hygiene and Industrial Safety committees. When they

purposely break the personal safety equipment which are supplied by the enterprise, remove or take off safety devices of different machinery, equipment and other protective devices, will be fired from their jobs according to article 31 of the operative labor law.

Chapter X—Special dispositions

Article 34.—Industrial exploitations, enterprises and establishments should organize their own medical service or incorporate themselves into a common or interenterprise medical service.

Article 35.—In compliance with the article 2 of the present law, every industrial or farming establishment, enterprise or exploitation should form Hygiene and Safety Committees. The duties of these Committees will be: monitor the working conditions and environment, subject of this law, assist and advise the employer and the workers on the execution of the program for the prevention of accidents and professional sicknesses. These committees will be made up of representatives of the workers, the employers and the technicians of industrial safety.

Article 37.—Up to three workers which are members of the Hygiene and Safety Commission of the enterprise, referred to in the article 35, will be protected by immobility which is covered by the article 204 of the present labor law, while they are exercising their positions in the Committee and during the three months following the loss of this character.

Article 38.—The National Institute for Work Prevention, Health and Safety will make inspections in order to supervise the compliance with the present law.

Article 39.—After having made the inspection and proving some infraction to the standards on the conditions and environment, the National Institute for Work Prevention, Health and Safety will order the citation of the employer.

Law Approving the Agreement No. 155—Concerning Occupational Safety and Health and the Working Environment

All of the Agreement No. 155, adopted at the 67th meeting of the International Labor Organization, which took place in Geneva, June 22, 1981, is approved for Venezuela. This approval and the text of the Agreement is contained in Venezuela's Official Gazette, January 10, 1984.[93] The Agreement includes the following:

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[93]Texts are also available from the International Labor Organization.

Article 4.—The aim of the national policy shall be to prevent accidents and injury to health arising out of, linked with or occurring in the course of work, by minimizing, so far as is reasonably practicable, the causes of hazards inherent in the working environment.

Article 5.-The policy shall take account of the following:

- relationships between the material elements of work and the persons who carry out or supervise the work, and adaptation of machinery, equipment, working time, organization of work and work processes to the physical and mental capacities of the worker;
- training, including necessary further training, qualifications and motivations of persons involved, in the achievement of adequate levels of safety and health.

Article 9.—The enforcement of laws shall be secured by an adequate system of inspection and provide for adequate penalties for violations.

Article 16.—Employers shall be required to ensure that (a) workplaces, machinery, equipment and processes are safe and without risk to health and (b) chemical, physical and biological substances and agents under their control are without risk to health when the appropriate measure of protection are taken. Employers shall be required to provide adequate protective clothing and protective equipment to prevent, so far as is reasonably practicable, risk of accidents or of adverse effects on health.

Article 18.—Employers shall be required to provide for measures to deal with emergencies and accident, including adequate first-aid arrangements.

Article 19.—There shall be arrangements under which workers are given appropriate training in occupational safety and health.

Article 21.—Occupational safety and health measures shall not involve any expenditure for the workers.

Law Approving Recommendation No. 164—Concerning Occupational Safety and Health and the Working Environment

All of Recommendation 164, adopted at the 67th meeting of the International Labor Organization, which took place in Geneva, June 22, 1981, is approved for Venezuela. This approval and the text of the Recommendation is contained in Venezuela's Official Gazette, January 10, 1984.[94]

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[94]Texts are also available from the International Labor Organization.

Much of this Recommendation seems to incorporate and expand on Agreement No. 155. It specifically addresses the following, under "II. Technical Fields of Action":

(b) lighting, ventilation, order and cleanliness of workplaces.

(d) design, construction, use, maintenance, testing and inspection of machinery and equipment liable to present hazards.

(e) prevention of harmful physical or mental stress due to conditions of work.

(g) use of electricity.

(h) transport, storage and use of dangerous substances and agents.

(j) prevention and control of, and protection against, occupational hazards due to noise and vibration.

(k) control of the atmosphere and other ambient factors of workplaces.

(m) prevention of fires and explosions.

(n) design, manufacture, supply, use, maintenance and testing of personal protective equipment and protective clothing.

(p) first-aid treatment.

(r) supervision of the health of workers.

Environmental Law and Regulations

An article by A. L. White, "Venezuela's Organic Law," in Environment, September 1991, gives a good account of the organic law, which founds Venezuela's environmental legal structure.

Criminal Law of the Environment, January 3, 1992

This law sets out which actions that affect the environment are considered criminal and the penalties against those responsible for such acts. It also sets out restorative measures to mitigate acts that harm the environment. It prohibits, for example, the following:

- unauthorized water flow changes and sedimentation.
- pollution of waters.
- unauthorized construction or utilization of works that pollute water beyond technical norms.
- deterioration of the soils or their plant coverage.
- degrading the topography or scenery through mining.
- contamination by transport units.

- damages to monuments and past cultural remains.
- omission of the essentials of environmental impact.

Partial Regulation of the Organic Law of the Environment on the Environmental Impact Studies—Decree No. 2211 of April 23, 1992

This regulation establishes the basic principles, requirements, and procedures for the preparation, evaluation, and execution of Environmental Impact Studies (EIS), in order to control and correct activities that could degrade the environment (Article 1). Extraction and processing of solid fuels require an EIS (Article 5.1.c.). Although exploration for solid fuels is not mentioned (exploration for petroleum is), it could fall under Article 6, which says that any activity not mentioned, which might affect resources, could require an EIS, if such activity falls within the Basic Environmental Questionnaire in the regulation.

Entities seeking to do activities that could degrade the environment should complete the Basic Environmental Questionnaire and submit it to the Ministry of Environment and Renewable Natural Resources (hereafter "MARNR"). The questionnaire (Article 5) requires such items as the project's objective, total investment, description of the area, types of vegetation, and maps. The actual EIS is much more detailed (Article 20).

The EIS is public, and MARNR may sanction public hearings so that interested parties can offer their views (Article 13). MARNR may require EIS modifications (Articles 14, 15). Environmental consultants should be registered with MARNR (Article 24).

When necessary, an environmental inspector will be named and coordinate with the appropriate office of Environmental Surveillance and Control. The inspector will follow-up the implementation of the environmental mitigation measures (Article 25).

Financial security to ensure carrying out the environmental measures will be solicited by MARNR (Article 29).

Norms to Regulate the Management of the Renewable Natural Resources Associated with the Exploration and Extraction of Minerals—Decree No. 2219 of April 23, 1992

This regulation establishes authorization requirements for exploration and extraction activities that would affect renewable natural resources. It also establishes guidelines for control of these activities to reduce possible environmental impacts (Article 1).

The parties are obliged to take preventive, mitigative, and corrective environmental measures (Article 10). Authorizations

are granted in parallel with the exploration or extraction plan approved by the Ministry of Energy and Minerals (Article 11).

For exploration, application is made to the appropriate regional office of the Ministry of Environmental and Renewable Natural Resources (hereafter, "MARNR"). The application will include such items as types and amounts of soil to be affected, jobs, and infrastructure to be built (Article 13).

For extraction, the application requires more detail and is also made to the appropriate MARNR regional office (Article 14). The application usually requires a declaration of environmental impact; if such a declaration is deemed unnecessary, additional submissions are required (Article 15). Accompanying the application to extract are such items as the reforestation and reclamation plans, and maps (Article 6).

For mining outside stream bed areas, where natural drainage is modified, an alternate drainage system should be established that does not erode soil or degrade water quality (Article 22).

For mining along stream bed areas, mining that will affect renewable resources must be more than 500 meters upstream or downstream of tributary junctions (Article 26), unless it is shown that mining will not cause irreversible damage (Article 31). Sterile and commercial materials should be disposed of in a way that do not affect free flow of the waters drained or lead to large amounts of sedimentation in the stream beds (Article 34).

The area will be recovered from environmental degradation before being returned to the State (Article 35). Extraction cannot affect aquifer systems. Waste disposal will not alter the quality and natural flow of the water and landscape (Article 38).

The authorization duration depends on capital invested and the mining plan, which are based on proven reserves. The operation will submit annual compliance reports to MARNR (Article 41). Financial security is required by the Ministry to guarantee reclamation and mitigation during the extraction period (Article 42).

Foreign Investment Code, Regulation of the Common Regime for Treating Foreign Capital, Decree No. 2095

This decree, dated February 13, 1992, is in the Official Gazette of the Republic of Venezuela, March 25, 1992. The regulation includes the following:

- Foreign investments in hydrocarbons, iron ore, banking and insurance activities shall be governed by this regulation and by the corresponding special law.
- The Superintendency of Foreign Investments within the Finance Ministry is the authorized national entity for all matters

regarding Decisions 291 and 292 of the Commission of the Cartagena Agreement.

- The Ministry of Energy and Mines shall exercise the functions of the authorized national entity described in Decision 291, with respect to companies operating or making foreign investments in the carboniferous and mining sectors, as well as in the hydrocarbon and related sectors such as technical support services for exploration and mining of deposits, extraction, operation, marketing of hydrocarbons, which are carried out in compliance with the Organic Law that reserves the industry and marketing of hydrocarbons to the State.
- The Superintendent of Foreign Investments will register the investments made by incorporated foreign companies which establish branches in the country and determine whether a subsidiary or affiliate relationship exists among companies for the purpose of applying these regulations.
- The Superintendent will have an advisory committee with members from the Ministry of Foreign Affairs, Ministry of Finance, Ministry of Development, Ministry of Energy and Mines, Central Office for Coordination and Planning of the Presidency of the Republic, Institute of Foreign Trade, National Council of Scientific Investigations (CONICIT), Venezuelan Central Bank, Venezuelan Investment Fund, and Venezuelan Tourism (CORPOTURISMO).
- Foreign investors shall have the same rights and obligations to which domestic investors are subject with the sole exception of the special laws and limitations contained in this Decree.
- Foreign investors and companies must annually submit financial statements.
- Companies may, after payment of corresponding taxes, distribute to their investors for transfer out of Venezuela, the total profits obtained upon the closing of each year, the dividends or profits corresponding to the share, quotas, participations, or the rights which are owned by the investors.
- Owners of a direct foreign investment shall be entitled to transfer abroad the proceeds of the sale of shares, equity or rights, as well as the amounts resulting from capital reduction or company liquidation.
- Contracts concerning the importation of technology must be submitted for registration at the Superintendency of Foreign Investments within 60 days following the execution of the contract.
- Whenever applicable, the contracts must contain the obligation of the supplier to train the required domestic personnel for

the better use of the contracted technical know-how for which a training program shall be prepared.

Mining Health and Safety Regulations, Carbosuroeste (Carbones de Suroeste, C.A.) March 1992

Carbosuroeste is a nationally owned regional development organization that, among other duties, lets coal concessions in the area surrounding San Cristóbal, in the State of Táchira. The lessee must abide by Carbosuroeste's regulations, which were drawn up after consulting 35 standards, including, for example, Venezuela's Mining Law and its Regulations; UK's Surveying Practice, Codes and Rules, National Coal Board, 1973; and Evacuation Training, Level I, by Cape Breton Development Corporation Canada, 1985. Carbosuroeste's regulations contain 395 articles.

Additional Laws, Decrees, And Resolutions Affecting Coal Mining in Venezuela[95]

- Mining Law, Official Gazette No. 121 Extraordinary, January 18, 1945.
- Decree No. 727, January 7, 1967, by means of which is created the Evaluation Commission of Naricual Coal.
- Law of the Development Corporation of the Zulia Region [Corpozulia], November 20, 1969.
- Law of the Development Corporation of the Northeast Region 1970.
- Law of Export Incentives, Official Gazette No. 30.217, September 28, 1973, where fiscal credits cannot be enjoyed for mineral products that are not processed or transferred.
- Decree No. 386, September 3, 1974, by means of which is created the National Council of the Coal Industry, a consultative organ for establishing basic standards for the best use of coal resources.
- Partial reform of the Law of Export Incentives Decree No. 881, April 29, 1975, Official Gazettea No. 1.747 Extraordinary, May 24, 1975.

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[95]Ministry of Energy and Mines, Estudio de Mercado del Carbon (Tomo II), pp. 298-300.

- Decree No. 887, April 29, 1975, related to the creation of the National Council of Energy, whose objective is to advise the National Executive on energy matters.
- Decree No. 339, August 13, 1976, related to the elimination of import restrictions of any nature, including bituminous materials originating in member countries of the Cartagena Agreement.
- Decree No. 1.337, January 1, 1976, declaring the development of the coal program in Zulia to be work of national interest and public benefit.
- Decree No. 1.045, July 26, 1972, which reserves coal exploration and development in the whole National Territory.
- Decree No. 2.039, February 15, 1977, in which the State reserves exploration and development of all minerals referenced in article 2 of the Mining Law, which had not been set aside previously.
- Resolution No. 39 of the Ministry of Energy and Mines, October 20, 1978, which establishes in this ministry the Office of Coordination and Control of the Carboniferous Resources of the subregion of southeast Andina.
- Resolution No. 148, January 21, 1978, relative to the regulation of the granting of the mineral concessions (permission to prospect and develop) remaining to the Venezuelan State, charged with all activities relating to the development, control, and inspection of the national coal industry.
- Decree No. 642, May 29, 1985, by means of which is established the Unit of Special Programming for the Integral Development of Southwest Venezuela, having the capacity of self-sufficiency.
- Decree No. 1.058, April 2, 1986, in which is exempted the payment of tax on income on the net economic benefits arising from new investments for development and production (exploitation), industrialization, and commercialization of coal.
- Law Reforming the Decree Law No. 642, May 29, 1985, Official Gazette No. 34.036, September 24, 1988, refers to the creation of the Venezuelan Corporation of the Southwest [Carbosuroeste].

APPENDIX D—VENEZUELAN COAL MINING AREAS

This appendix provides additional information on the coal mining areas within the States of Zulia, Táchira, and Anzoátegui.

Zulia

Guasare Basin is Venezuela's major coal resource area, holding the country's largest coal mine, Paso Diablo, and two large prospective mines nearby, Mina Norte and Socuy. Additional infrastructure is necessary before a major expansion of production occurs.

Infrastructure

Production from the Guasare Basin is constrained by lack of transport and port capacities. The capacity of Guasare del Carbones' (the owner/operator of the Paso Diablo mine) port of Santa Cruz de Mara, on Lake Maracaibo is not more than 4.5 Mmt/yr, and expansion of this port is unlikely due to local environmental concerns. Also constrained are the Mina Norte and Socuy projects, near Paso Diablo, which await infrastructure before developing into large export mines.

A new railroad and port facility is proposed between the projects in the Guasare Basin and the Gulf of Venezuela. The construction is expected to take 3 years, and as of late 1993 the decision to build had not been made, although most of the design work has been done. The final locations of the port and, therefore, the connecting rail are still pending. Two port sites are under consideration, both on the west side of the Gulf. One is on the island of San Carlos, at the southern limit of the Gulf, where commodities in addition to coal would be handled. The other is about 50 km north of San Carlos near Paraguaipoa, at Pararu. Here the port would be dedicated to coal. Cost of the new infrastructure may be upwards of $1 billion.

The cost is thought to be justified only at an annual regional export rate of 15 Mmt/yr. With Paso Diablo's maximum mine capacity of 10 Mmt/yr, financial help has been sought from the Mina Norte (2 Mmt/yr) and Socuy (8 Mmt/yr) properties, which could add another 10 Mmt/yr to the region's production. Because such a large infrastructure investment is needed, however, those two properties would be reluctant to finance the infrastructure without firm markets. With the current plentiful supply of worldwide export coal, the sought market firmness is elusive. Thus the new mines are not viable without the infrastructure, yet the infrastructure is not viable without the new mines having a stream of income. Mina Norte may open a small combined underground and surface operation (see below) and truck the coal

to El Puerto Bajo de San Francisco, south of Maracaibo, for shipping.

Adding uncertainty to the infrastructure decision is that Agip may be selling its 48% share in Guasare del Carbones. The pending sale would cause Agip to resist investing in new infrastructure. Agip's major partner in Guasare del Carbones is Carbozulia, which wants the new infrastructure not only for Paso Diablo but also for Mina Norte and Socuy, in both of which Carbozulia holds significant equity. Peabody Holdings (the largest coal producer in the United States), RTZ Corp., and Broken Hill Proprietary Co. Ltd. have each shown interest in Agip's share.

Last, the market for Venezuelan coal and, therefore, the uncertainties associated with the new infrastructure may be affected by what happens in neighboring Colombia. Not only might its largest mine, Cerrejon North, expand its export capacity from 15 Mmt/yr to 21 Mmt/yr, but additional Colombian sources are also coming on stream.

Paso Diablo

Paso Diablo has recoverable reserves of about 200 Mmt, and maximum production is expected to be 10 Mmt/yr. Seam thicknesses range from less than 1 m to 15 m. Over a total vertical section of 400 m, coal exceeds 50 m. Interburdens range from 5 m to 45 m thick. The deposit is extensively drilled. The major portion of the coal is suitable for thermal applications, but there is some coking potential in the lower seams. According to the American Society for Testing and Materials (ASTM) classification system, the upper seams are high-volatile type B bituminous and the lower seams are high-volatile A. The coal can be used for steam, cement, and metallurgical applications.

At a production rate of 6.5 Mmt/yr, an average stripping ratio of 6.4 m^3/mt is expected. Topsoil is removed using dozers, front end loaders, and trucks. Stripping is by truck and shovel of blasted material. Coal is mined with a large hydraulic excavator, dumped into rear-dump trucks, and hauled to a crusher, after which it is stockpiled and loaded into highway trucks for delivery to port. The course of Paso Diablo Creek was changed for initial mining and for construction of sedimentation ponds.

Other deposits

Mina Norte adjoins the northern boundary of Paso Diablo. A 10-month exploration program included 9,500 m of drilling, and reserves are estimated at 66 Mmt. The feasibility study for a 2 Mmt/yr surface mine was finished in March 1993. The project's equity holders at that time were Carbozulia (36%), A. T. Massey

(32%),[96] and Cavoven (32%).[97] Later in 1993, Mr. Morgan Massey bought A. T. Massey's interest, and the partners are now planning pilot underground and surface mines, scheduled to begin operation in April 1994. Initial underground work would focus on the high-quality metallurgical coal of the bottom seam. Coal would be blasted and then loaded using a load-haul-dump scoop for removal. The surface mine would strip overburden, after some blasting, using a Caterpillar 992 front end loader and two or three Caterpillar 777 trucks. Surface mining of coal would be contracted, as would haulage of coal to the port. Initial production would be limited to 50,000 mt per month, the limit imposed because of high road traffic. Coal is to be hauled 130 km to El Puerto Bajo de San Francisco, 10 km south of Maracaibo. The mine is 35-40 km from the Limón River, a possible future transportation alternative. Barges could be loaded there to carry coal to deeper waters where it would be reloaded into panamax ships.

Socuy, 15 km south of Paso Diablo, has completed its exploration program. A large surface mine of 7-8 Mmt/yr is anticipated. Reserves are on the order of 200 Mmt. Socuy is owned by Carbozulia (49%), Shell Coal International (24%), Veba Coal (24%),[98] and 3% is left available for public investors.[99] Shell is doing market studies for its share of production.

Cachirí is about 15 km south of Socuy at the southern end of the Guasare Basin. In 1992, Cyprus Coal Company[100] participated in exploration of the prospect.

Táchira

New surface mines are not expected in Táchira, as most surface minable coal is thought to have been mined. Underground mines are small, and their production is often collected at a central point for trucking to markets.

One underground mine has about 10 operating sections with two miners per section. Coal and a rock parting between the two coal layers are hand-picked and then hand-shoveled into a wheelbarrow. When full, the wheelbarrow is wheeled from the mine to a stockpile for truck loading. Permanent roof control is by timber

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[96]A U.S. company.

[97]19% Mitsubishi (Japanese conglomerate), 81% Vencemos (large Venezuelan industrial company).

[98]Veba Coal is part of the German Veba Oil.

[99]U.S. Department of State, Aug. 1991.

[100]Now Cyprus-Amax Coal Company, a subsidiary of Cyprus-Amax Minerals Company.

sets. The adit mine is 20-30 m below the surface and is ventilated naturally. Production is about 6,000 mt/yr.

Carbosuroeste, the nationally owned regional development company, has developed plans for a larger underground mine for Concession #12. Production would be 100,000 mt/yr, and, as of 1992, total investment would be about $0.5 million. Carbosuroeste, in late 1992, was looking for interested investors, and it could finance a portion of the project.

Anzoátegui

Anzoátegui has two major mines: Fila Maestra and Carbones Naricual.

Fila Maestra, about 100 km west of Puerto La Cruz, closed in 1993.

Carbones Naricual is near the town of Naricual, one of the oldest coal mining areas in Venezuela. The mine is a combination of surface and underground operations. In 1992, the surface mine stripped to a marginal stripping ratio 25 bcm/mt,[101] but in 1993 mines only coal that can be taken at lower, more economical ratios. The 1- to 3-m-thick seams dip at 45°, and the highwall is carried at 55°. A Caterpillar 992 front end loader, two backhoes, and Euclid trucks are used. The underground mine uses jackhammers to loosen the coal. In 1957, a German firm spent $200 million to build the plant and the rail to the seacoast, and much of that plant is still used. The rail, however, has been crowded out by civilization and is not used. The coal has been sold in European markets. Peabody Resources[102] investigated the property in 1992. The mine is owned by Carbonar, which is owned by the Young Group PLC, of England.

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[101]Bcm/mt = bank cubic meters of overburden per metric ton of coal mined.

[102]Part of Peabody Holdings, the largest U.S. coal producer.

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