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**ENERGY PRICE REFORM  
BULGARIA**

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**U.S. EMERGENCY ENERGY PROJECT FOR EASTERN & CENTRAL EUROPE**

**U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT  
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## TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	i
CHAPTER 1: INTRODUCTION: ECONOMIC AND POLITICAL BACKGROUND	1
A.    Changing Energy Price Relationships with the USSR	1
B.    Fuel Use and Import Dependency	4
C.    Political and Organizational Perspective	7
CHAPTER 2: ENERGY PRICE REFORM TO DATE	12
A.    Petroleum Products	13
B.    Coal	17
C.    Natural Gas	19
D.    Electric Power	21
E.    District Heat	23
F.    Summary of Price Adjustments	24
CHAPTER 3: CRITICAL PRICING REFORM ISSUES	29
A.    Petroleum Product Pricing and Policy Issues	29
1.    The Formula for Capping Allowable Sales Prices	29
2.    Structural Problems and Corrective Steps	37
3.    Efficiency Goals and Broader Policy Objectives in Petroleum Pricing	41

B.	Pricing and Policy Issues for Non-Petroleum Fuels	43
1.	Natural Gas	43
2.	Electricity and District Heat	49
3.	Coal	53
CHAPTER 4:	PRICE ANALYSIS CAPABILITIES AND MODELING SERVICES DELIVERED	55
A.	Energy Price Modeling Capabilities in Bulgaria	55
B.	The Petroleum Sector	56
C.	Delivery of Petroleum Product Pricing Model	59
D.	Modeling Capabilities in Other Fuels	60
CHAPTER 5:	SUMMARY AND RECOMMENDATIONS FOR FURTHER ANALYSIS	62
A.	Policy and Price Reforms Implemented to Date	62
B.	Recommended Studies	64
1.	Petroleum Sector	65
2.	Commercial Price Hedging Strategies (Oil & Gas)	66
3.	Other Fuels	69

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**ANNEXES:**

- A. SUMMARY OF TECHNICAL ASSISTANCE RENDERED
- B. KEY DOCUMENTS AND REPORTS PREPARED
- C. LIST OF ATTENDEES TO ENERGY PRICING SEMINAR
- D. LIST OF ATTENDEES TO KEY NATURAL GAS PRICING ISSUES FOR BULGARIA:  
MANAGEMENT TRAINING AND STRATEGY WORKSHOP
- E. NATURAL GAS MARKET DATA
- F. USER'S GUIDE FOR BURGAS REFINERY PRICE ANALYSIS MODEL (BREF)

## LIST OF EXHIBITS

<u>NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>
1.	Current Organization of the Energy Sector	10
2.	Maximum Petroleum Product Sales Prices	16
3.	Bulgarian Energy Prices: 1989-1992, Natural Gas vs. Mazut	20
4.	Methodology for Determining Maximum Allowable Petroleum Product Sales Prices	30
5.	Bulgaria's Petroleum Product Consumption Trends	32
6.	Bulgaria's Crude Input vs. Product Use	34
7.	Bulgaria's Natural Gas Deliveries	48

## LIST OF TABLES

<u>NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>
1.	Bulgaria: Summary Energy Supply Balances: 1990	5
2.	Summary Macroeconomic Indicators for Bulgaria	6
3.	Petroleum Product Price Increases in Bulgaria June 1990 - June 1991	15
4.	Brown Coal Price Increases in Bulgaria	18
5.	Natural Gas Price Increases in Bulgaria	21
6.	Electricity Generation by Fuel in Bulgaria: 1990	21
7.	Average Electricity Prices in Bulgaria: June 1990 - June 1991	23
8.	District Heat Prices in Bulgaria: June 1990 - June 1991	24
9.	1989 Natural Gas Balances in Bulgaria	47
10.	Electricity Rates in Bulgaria: 1992	51
11.	Recent Average District Heat Prices by Customer Class	52

## EXECUTIVE SUMMARY

One of the principal areas of emphasis in the U.S. strategy to aid the new democracies in Eastern and Central Europe (ECE) is in assisting the transition to market economies. The U.S. Agency for International Development (USAID) recognized that instituting rational pricing and taxation systems is of critical importance in energy and other economic sectors. Under the former centrally-planned economic system in the ECE region, energy prices were heavily subsidized and did not reflect world price levels or the economic costs of production. This resulted in widespread distortions in energy resource allocation, consumption and energy inefficiency. In addition, with the declines in Soviet oil deliveries, higher international oil prices, and the switch to hard currency payments for Soviet oil and gas in January 1991, the ECE countries are faced with difficult decisions on the nature and rate of price reform.

In order to support the ECE countries in their efforts to rationalize and reform their energy pricing systems, USAID developed technical assistance for *Energy Price Reform Program* (Component 4) under the USAID-funded Emergency Energy Project in Eastern and Central Europe. The objectives were to: 1) assess the current pricing regime, 2) identify critical issues confronting the governments of ECE nations, 3) evaluate the analytical resources available to the recipient governments to assess the impact of energy pricing reforms, and 4) provide training to improve the Government's analytical capabilities on pricing issues.

International Resources Group (IRG) was selected as the prime contractor to conduct this energy price reform assistance in Bulgaria and Poland. In carrying out this assignment, IRG undertook a variety of assessment, technical assistance, training, and analytical activities in each country. IRG worked in cooperation with key government officials, typically at the Ministry of Industry and Trade, the Ministry of Finance and the appropriate regulatory bodies and companies involved in the production, transmission and distribution of electric power, district heat, coal, gas, oil and other regulated energy sources. Assisting IRG on specific assignments were its selected subcontractor firms and consultant experts in the commercial

and regulatory aspects of specific fuels, energy pricing and related reform objectives.

The energy price reform activities undertaken by the IRG team in Bulgaria started with an assessment mission identifying the key policy makers, government and organizations, pricing policies, regulatory regimes and beneficial focus of follow-on seminars and directed technical assistance for an audience of government, state-owned and private industry officials. IRG evaluated the host-country pricing policy decision process, organizational responsibilities and principles adhered to, as well as the reform measures under consideration or in process. The key price reform issues and fuel sectors of interest to the host-country institutions were identified, and in-country seminars were conducted to address these issues with appropriate audiences. Topics covered included petroleum pricing policies, regulatory models and principles of free or partially regulated pricing systems for policy-makers to consider as Bulgaria evolved towards price decontrol and de-regulation. Also presented were broader principles of efficient energy pricing and resource allocation, appropriate for all fuels, but with specific application to regulated electricity, heat and coal pricing regimes. Pricing principles such as marginal cost pricing, taxation to generate net fiscal gains, pricing to recoup re-investment requirements, environmental costs and encourage energy efficiency and inter-fuel objectives, were presented and emphasized in the context of fuels pricing and rate-making for oil, natural gas, coal and electricity.

Because natural gas was recognized as a currently under-utilized energy source with limited institutional knowledge of pricing and rate-making principles, a follow-on management and training workshop was undertaken on key natural gas pricing and market issues. This session examined the basic tools for analyzing gas markets, including pricing and supply/demand forecasting models. Factors affecting gas demand growth, supply and physical access alternatives under various capital investment projects which may develop for Bulgaria were also presented. The training's primary focus was on pricing strategies and contractual terms and conditions for both long-term and spot gas supply and transportation agreements. Western models were reviewed in order to convey some of the key commercial aspects of gas pricing and rate-making procedures which the Government, through its gas production, transportation and distribution activities may seek to adapt as it develops commodity and rate-making policy.

The final area of focussed technical assistance was in support of petroleum pricing policy, where IRG provided technical assistance to the state's joint-stock refining company in developing a modeling capability to evaluate the impact of various, supply, demand and pricing scenarios on the consumer demand, refinery operations and fiscal objectives. This menu-driven spreadsheet system was developed and delivered to Neftochim in order to extend their capability to evaluate the impact of various excise tax, fee and domestic vs. international supply economics on not only the refinery's economics, but also government revenues, and consumer demand. Such objectives as pricing to achieve capital re-investment needs, environmental and social policy objectives can more readily be evaluated using such an automated tool. The delivery of such a capability is particularly critical to Bulgaria because petroleum is now the primary fuel source and largest import commodity for the Bulgarian economy. Heretofore, Bulgaria's petroleum policy and commercial sector had made limited use of quantitative tools for evaluating the impact of government pricing and tax policy decisions in the petroleum sector. Neftochim has a direct consultative input to the Pricing Commission and the Council of Ministers, in concert with the Ministry of Industry and Trade. Owing to the importance of petroleum in the Bulgarian energy economy, the primary focus of this IRG final report on the Energy Price Reform Program was on the petroleum sector. The key observations, recommendations and conclusions from this report follow.

Historically, Bulgaria had functioned under a system of subsidized and regulated prices, of both domestic and international supplies, which in turn subsidized its energy-intensive domestic and export industries. With the end of the Soviet-supported Comecon price subsidies and the onset of democratic reform (Bulgaria's transition government was functioning by early 1990), all prices were eventually decontrolled by late 1990 with the exception of energy prices. Owing to their importance to the domestic economy and severe degree of subsidization, relative to international levels, the domestic political-economy was viewed as incapable of absorbing the dramatic energy price increases necessary to achieve world market or true "cost-recovery" levels. As a result, fuel prices were adjusted in various steps, with the first major step occurring in June 1990, the second in February 1991, and the third in June 1991 (see Table 3, Chapter 2). Since June 1991, adjustments to oil and natural gas prices largely reflect inflation and currency devaluation. Indeed, in November 1991,

following the election of the new government, petroleum product prices effectively linked to world price levels via a formula which adjusts every two weeks.

The degree of price subsidization and the rate of increase in various fuel prices has varied greatly across fuel group and by consumer class. For example, between June 1990 and June 1991, gasoline prices rose by 200-to-400 percent in dollar terms, and roughly twice this amount in when measured in leva. The greatest increases applied to the industrial sector, which formerly was subsidized relative to household or general consumers. Retail natural gas prices originally increased some 10-to-12 times above their June 1990 levels, measured in leva, but have declined from their peak 1991 levels since being linked to the price of high sulfur fuel oil in October 1991. By contrast, brown coal prices have increased by over 15-to-30 times their early 1990 levels in leva, but remain some 40-to-60 percent below true production costs. Again, the cross-subsidy has shifted from the industrial to the household consumer class, owing to the political reality of rising energy prices biting into already austere personal income, and the ability of industrial users to pass on some of their higher fuel costs. Electricity prices have, similarly, been increased more rapidly for industrial than household consumers, but the degree of escalation has been less severe, rising by four (household) to five (industrial) times their June 1990 levels when measured in leva, and roughly half this amount in dollar terms. Perhaps the most heavily subsidized fuel, however, is district heat to the home consumer. District heat accounts for nearly 25 percent of Bulgaria's total final energy consumption, and much of this household use is un-metered. As a result, heavily subsidized household rates (based on fixed-unit space measurements) remain heavily subsidized, at an estimated 2-to-3 times actual cost (roughly 50-to-70 percent) for households, and roughly 20-25 percent for industrial consumers.

Although petroleum product prices are now largely (completely for gasolines and diesel fuels) linked to world market level, retail domestic pricing policy and cross-subsidy patterns are effected through varying excise taxes, with certain "priority" customer classes exempt from excise taxes altogether. This variable tax application, and the limited enforcement capability to collect taxes (excise and income) and customs duties, makes the domestic petroleum market potentially ripe for abuses, particularly by importers willing to mis-certify or not report transactions for purposes of tax avoidance. The tax exempt user

categories should be ceased in order to reduce some of the opportunity for such abuse, and the Government should evaluate other tax and collection strategies to help eliminate this lingering counter-productive black market in petroleum trade within Bulgaria.

We also recommend that all efforts to control petroleum prices be eliminated over time, along with the differential taxes (or subsidies) to various consumer classes. The GOB should evaluate the impact of alternative tax structures and fee levels on both revenue and internal pricing or social objectives, such as recouping environmental costs and encouraging investment. The broader objective of encouraging foreign investment through joint venture, privatization and various investment tax credits should also be evaluated, in concert with efforts to privatize Bulgaria's state monopolistic refining and marketing/distribution companies. In order to encourage foreign investment the GOB will need to establish terms for venture or direct investments which provide reasonable guarantees for such fundamental concerns as supply access, profit repatriation, balanced tax and regulatory treatment, etc. This groundwork should be established simultaneous with a move towards greater uniformity of tax treatment and enforcement, and decontrol of the pricing process.

In natural gas, price reform needs to focus on the development of rate structures which more sensitively reflect both the cost of gas and transportation/distribution services. Domestic prices should be linked to international levels, rather than tied directly to fuel oil prices, and high priority should be given to diversifying international supply sources and contracts in order to increase gas-to-gas competition. Initially, this effort could focus on exchange arrangements, but over the long-run Bulgaria will need to make investment decisions to participate in one or more major regional pipeline projects in order to diversify its natural gas supply sources.

In the electricity sector, the GOB needs to continue its effort to raise and rationalize its rate structure, including increased use of variable rate structures in order to encourage conservation, demand side management practices, and eventually to price energy supply to encourage new capacity additions of low cost energy sources. In the district heat sector, rate-based incentives and investment incentives are needed to increase the use of metering and usage-based billings. As with electricity and coal, prices should be gradually raised to

close the real price gap with full marginal production costs, and incentives should be employed to encourage coal mine consolidation. Revised depreciation rules, and credits for fuel efficiency and environmental technology investments should be combined with a change in depreciation accounting in order to encourage investment and effective rate-making or pricing.

From an organizational perspective, the GOB suffers from multiple organizations, including ministries, commissions, government companies and other interests involved in the energy pricing policy, with the actors differing for each fuel group. Therefore, both the policy formulation and regulatory functions need to be streamlined, and possibly separated in order to de-politicize the process. The maintenance of government controls over energy pricing in Bulgaria, particularly the natural monopolies of electricity, gas and district heat, reflects the political and economic reality of gradually phasing higher energy prices through the economy. As is the case throughout the ECE region, household incomes, public budgets and industrial/commercial sector economics have been severely strained by the 2-to-10 fold increase in real energy prices over the past two years. Thus, the need to phase in efficient pricing practices is necessitated by both political and economic stability. On the other hand, efforts to maintain momentum towards full decontrol in non-monopoly fuels, and rationalization of the rate structure in the natural monopolies, simultaneously encouraging competition and investment in energy efficiency and production technologies, need to be maintained.

## CHAPTER 1

### INTRODUCTION: ECONOMIC AND POLITICAL BACKGROUND

#### A. Changing Energy Price Relationships with the USSR

At the outset of this project in February 1991, the ECE nations were in the midst of transition from a centrally-planned to a market-driven economy. The adjustment to market-based energy prices was and remains a central component of this economic adjustment process. The economies of the ECE countries have been based historically on the export of finished products, largely industrial and agricultural goods for which energy is often a significant cost component. As energy prices increased it became increasingly difficult to:

- maintain the competitiveness of the export sector,
- limit the inflationary impact of rising energy prices on the economy, specifically the indigenous purchasing power and growth rates, and;
- force consumers, and more broadly the macro economy, to value energy at its true costs, thereby providing efficient price signals to guide the allocation of scarce national (and foreign capital) resources.

The severity of the energy pricing and supply problems imposed on the ECE economies is evidenced by both the magnitude of the energy price increases and general inflation levels from early 1991 through mid-1992, and by the degree to which further price increases will be necessary to achieve such desirable policy objectives as:

- reaching "free," world market, or border price parity levels;
- fully recovering energy production costs, including the cost of capital;
- inducing investment capital, including energy efficiency investments;
- recovering environmental costs (albeit difficult to calculate), and;
- reducing cross-fuel and direct labor, or "income" subsidies, built into current fuel price or tariff rates.

The primary motivating event for the emergency attention given to energy price reforms was the breakdown of the Communist Bloc, and particularly the end of Soviet fuel

price subsidies to its COMECON trading partners. The Soviet move to price its oil and gas supplies at free market levels and the requirement to pay in hard currency became effective in January 1991. However, the impact of this policy change became evident by early 1990, as political change and breakdown of the Soviet Bloc gained momentum. Dire economic conditions within the USSR necessitated this change in policy, as declining crude oil production and inefficiency created by the system of subsidized or otherwise "controlled" price levels eroded the productivity of natural resource development both in real terms, and relative to the free world. Having lost the political cohesion of the Bloc, the economic cohesion underpinned by elaborate cross-subsidy and barter terms lost much of its purpose. In short, the former Soviet bloc needed to realize the free market value for their resources in order to improve their own economic conditions.

In addition to political and economic disintegration, pressure to price crude oil (and natural gas) at free market levels was accelerated by the huge oil price increases and temporary decline in crude oil supplies in the aftermath of Iraq's invasion of Kuwait. World oil prices rose from less than \$20/barrel in July 1990 to nearly \$40/barrel in October 1990. Thus, the opportunity cost of not moving to free market levels was increasing, and indeed a number of supply and pricing arrangements were re-negotiated prior to the official change in energy price levels effective in January 1991. As a result, the starting point for evaluating recent energy price reforms in the ECE countries is usually set as 1989, with energy prices typically lagging inflation rates over the period 1990 through mid-1992.

The focus on oil price policy as a critical domestic energy policy issue, and as the primary external motivator to the USAID emergency assistance program, is appropriate despite the relatively small role that oil may play in the total energy mix for certain countries (e.g., Poland). As the value of oil and energy was re-defined, the value structure underlying most barter arrangements similarly required restructuring. Oil, as the primary Soviet export commodity, effectively served as a primary value reference or surrogate currency for COMECON trade. Moreover, although oil may be secondary to coal or other fuels in a nation's total energy consumption, oil's multiple product uses, availability, and role as a competitive or substitute fuel across most consuming sectors of the economy gives it the status of perhaps the primary international price leader among energy sources. As the key

marginal fuel, oil influences the price of other fuels directly through inter-fuel competition and indirectly through the costs of economic activity in each sector (e.g., transportation, manufacturing, commercial and residential heating, etc.). Indeed, this leadership role of oil is recognized by the Russia through its policy of pricing natural gas in reference to oil prices.

The direct impact from the loss of subsidized energy from the USSR was an immediate deterioration in the terms of trade for the COMECON countries with the ex-USSR. The loss of energy price subsidies eliminated much of the export price advantage to non-bloc nations. As a result, the COMECON nations suffered a loss of export volumes, revenues and access to hard currency. The loss of hard currency was compounded by the requirement to pay for oil in hard currency at a substantially higher nominal and real price than under the subsidized terms contained in the "Bucharest Agreement" and as effected through various complex barter arrangements. Typically, these arrangements establish a basket of equipment, finished goods or other commodities (e.g., machinery, medicine, agricultural products) to be exchanged for oil and gas exports. The terms of trade, hence the real price for the exported fuel, depended on the relative value assigned to the basket of bartered goods, as well as payment terms and the implicit exchange rates built into the calculation.

The Bucharest Agreement established the principle of pricing Soviet crude oil on the basis of a five-year moving average in response to the oil price turmoil/escalation first experienced in the 1970s. This principle, however, was executed under a variety of pricing terms, with barter values and the value of the ruble (i.e., the deemed official rate vs. the black market rate) determining the real value of the oil. Thus, if the five year average oil price was defined at 300 rubles per barrel, based on a "deemed" official ruble exchange rate of 20 rubles/\$, a \$15/barrel price equivalent results. On the other hand, valued at a "market" rate of 30 rubles/\$, a real price of \$10/barrel results. Similarly, barter terms may have over-stated the relative value of the oil-recipient's goods (relative to oil), or perhaps valued those goods at an understated (official) exchange rate relative to hard currencies, thereby effectively lowering the oil price. Transportation discounts, payment terms and a variety of other modifications to the transaction price also affected the real cost of oil, gas, coal and other imports from the USSR.

## B. Fuel Use and import Dependency

Bulgaria has a relatively high intensity of energy use per unit of gross domestic product: estimated at roughly 35 percent higher than average Western European levels<sup>1</sup>. This reflects Bulgaria's relatively sizeable industrial base, which in turn was largely based on subsidized energy and other raw material costs under the CMEA (Council of Mutual Economic Assistance) system which encouraged the export of finished goods to the USSR. Bulgaria's industrial sector was estimated to account for 48 percent of its Gross Domestic Product (GDP) and roughly 60 percent of energy consumption in 1990<sup>2</sup>. This compares to an average industrial sector contribution of just 34 percent of GDP in OECD Europe.

Overall Bulgaria is roughly 80 percent dependent on imported energy, largely petroleum and natural gas. This compares to an overall import dependency of perhaps 30 percent on average for primary energy use (including electricity) throughout the ECE region. Domestic oil production provides less than 1 percent of total crude oil supply. Bulgaria's fuel consumption and import dependency is skewed heavily to oil (around 40 percent of fuel needs satisfied from imported oil), with direct coal satisfying just 14 percent of energy needs in 1990 (see Table 1).

Bulgaria's greater proportional reliance on imported oil and gas, particularly in the industrial sector from which exports are largely based, caused it to suffer a more pronounced decline in GDP over the past two years, corresponding to the oil price shocks of 1990-1991. Bulgarian GDP was reported to have declined by 10 percent in 1990, and then by 26 percent in 1991, compared to reductions in industrial output of 16 percent in 1990, and around 24 percent in 1991<sup>3</sup>.

Energy is a large percentage of Bulgaria's total import mix, around 23 percent in 1990

<sup>1</sup> Recent World Bank estimate.

<sup>2</sup> Ibid.

<sup>3</sup> U.S. Department of Commerce, International Trade Administration

according to the World Bank. This suggests that Bulgaria's economy is more directly affected by higher imported energy costs, since these costs more directly affect its terms of trade and comparative cost standing compared to less import and export-intensive nations. Export prices had previously imbedded the large Soviet energy and related material cost subsidy. The impact on Bulgaria was particularly severe given that exports, in 1989, were estimated to account for 15 percent of Bulgaria's Gross Material Product (GMP) valued at official exchange rates, and up to two-thirds of total GMP at "market" exchange rates<sup>4</sup>. Moreover, Bulgaria relied on COMECON countries for 84 percent of its trade surplus, such that the combined loss in comparative price advantage and the declining demand from other COMECON nations had a reinforcing negative impact on Bulgaria's exports. Indeed, Bulgaria's exports fell from \$11.1 billion in 1989 to \$8.5 billion in 1990 and \$4.7 billion in 1991<sup>5</sup>.

**Table 1**  
**Bulgaria: Summary Energy Supply Balances for 1990<sup>6</sup>**  
(in thousand of barrels of oil equivalent)

<u>Fuel</u>	<u>Total</u> <u>Input</u>	<u>Total Final</u> <u>Consumption</u>
Coal	2,495	877
Oil	2,967	2,617
Natural Gas	1,493	948
Hydro & Nuclear	1,180	0
Electricity	93	872
<u>Heat</u>	<u>77</u>	<u>1,164</u>
Total	8,326	6,477

Despite Bulgaria's greater reliance on imported energy and its transitional

<sup>4</sup> Report of Energy and Environmental Discussions, Sofia, Bulgaria, December 1990, Samuel Hale, Jr., International Resources Group.

<sup>5</sup> U.S. Department of Commerce, Bulgaria, Fact Sheet.

<sup>6</sup> World Bank, Bulgarian Energy Strategy, April 30, 1992.

government, restrictive monetary and trade finance policy functioned to limit internal price inflation compared with countries which followed a more liberal monetary and trade policy, such as Poland. Bulgaria suffered a severe devaluation in its currency between 1989 and 1991, with the lev declining from 7 lev/\$ to roughly 22 lev/\$ at year's end. This decline in currency value resulted in substantial nominal price inflation, but less pronounced real price inflation, measured in hard currency. The deterioration in overall economic conditions, as measured in gross domestic product (GDP), restrained inflation. Bulgaria's per capita GDP declined from \$7,303 in 1989 to \$6,802 in 1990 (-7 percent), and to \$5,033 in 1991 (-26 percent)<sup>7</sup>. A summary of Bulgaria's key macroeconomic indicators is provided in Table 2.

**Table 2**

Summary Macroeconomic Indicators for Bulgaria<sup>8</sup>

<u>Economy:</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
GDP (bn \$)	63.9	58.5	43.3
GDP Growth (%)	1	-10	-26
GDP Per Cap. (\$)	7,303	6,802	5,033
Gross Debt (bn \$)	8.9	10.6	12.2
Exchange Rate (lev/\$)	n/a	7	23 (market)
Wages (lv/mo.)	Avg. n/a	434	583
	Min. n/a	191	450
<u>Trade:</u>			
Global Exports	11.1	8.5	4.7
Global Imports	13.4	10.8	5.9

<sup>7</sup> U.S. Department of Commerce, International Trade Administration, Bulgaria Fact Sheet.

<sup>8</sup> U.S. Department of Commerce, International Trade Administration, Bulgaria Fact Sheet.

### **C. Political and Organizational Perspective**

Political considerations in energy and economic policy are crucial, particularly in an economy undergoing massive structural change. Special sector interests, managerial capabilities, organizational structures and "turf battles" always influence economic decisions and energy pricing policy. At the outset of this project (February 1991), transitional government was in place in Bulgaria, unlike the other ECE nations. This political context is very important because the government's organizations, ideology and power balances provide the framework around which any evaluation and modification of energy or other government policy must be structured.

In Bulgaria a caretaker government was still in place at the outset of this contract, consisting of a coalition of ex-Communists and democratic or reform-minded individuals. Plans for a national election to be held in June 1991 were eventually delayed until October 1991, at which point the new "reformist" or democratic leaders were elected. In the interim, however, the tenuous leadership was faced with a difficult task of managing a rapidly deteriorating economy, without political consensus or the experience to deal with an unprecedented set of economic problems. The state lacked a conceptual or practical framework of experience, managerial and technical expertise, as well as institutions to restructure the economy.

By December 1990, the caretaker government had taken a number of steps to improve economic conditions, particularly with respect to the energy sector. Perhaps most importantly it suspended foreign currency debt payments, essentially putting a moratorium on foreign banking. The monopoly status of the sole state trading company, Chimimport, was broken, opening up the markets to private and other government-owned participants. Fuel price increases were initiated, at first modestly, then accelerated in early 1991, most notably for oil products. Since Bulgarian prices were still well below world levels, the government implemented a program of fuels rationing in order to prevent shortages. Citizens were allocated gasoline at 30 liters/month. Price increases were more than offset by the devaluation of the lev: from 7 lev/\$ at end-1990 to 22 lev/\$ at end-1991, according to the U.S. Department of Commerce.

As a result, a substantial black market appeared, with a cottage industry of traders emerging to deal in petroleum product imports, exports and mis-certification, excise tax and customs duty avoidance. These black market players took advantage of the more favorable price and financing terms available to those who could trade oil in hard currency. Indeed, the Government of Bulgaria (GOB) encouraged exports temporarily by allowing exporters to keep 50 percent of their hard currency earnings to finance imports. However, the greater inducement was to remain outside of official controls and import petroleum products for resale on the black market. As detailed in Chapter 2's analysis of petroleum pricing policy, a number of elements worked against Neftochim Burgas' capability to compete with imported product in a shrinking market,<sup>9</sup> and the refinery experienced a sharp decline in its utilization levels and profitability. At the center of the problem was the lack of hard currency earnings or credit from the National Bank to finance crude oil imports. This problem was compounded by uncertain returns on domestic sales, owing to the effect on changing prices, volumes, currency values, and tax and customs conditions on the profitability of product sales in the domestic market.

With the October 1991 election of the democratic reformist party, economic and energy pricing policy began to develop more rapidly. First, the exchange rate was allowed to float. Second, price controls were ended with the exception of the energy sector. Within the energy sector efforts were immediately made to adjust oil and gas prices to more closely reflect world market levels. At the same time, the Committee on Energy has taken steps to rationalize energy price and tariff rates, to reduce subsidies contained in coal and electricity prices (most immediately to the industrial sector), with plans to reduce the household sector's subsidy over time.

The difficulty in coordinating pricing policy among fuels, various government agencies and government-owned operating companies presents a major hurdle to implementing effective energy pricing policies, particularly in a time of tumultuous political, institutional and economic change. In Bulgaria energy pricing policy influence is spread among a number of

<sup>9</sup> Bulgarian petroleum demand declined by 19% in 1990, and an estimated 20-25% in 1991, according to recent World Bank figures.

government ministries and state-owned companies. As a result, policy is developed on many levels, without a single centralized analysis and policy body to coordinate the process. However, the importance of energy pricing to overall government policy is reflected in the fact that final policy decisions are made at the highest level, by the Council of Ministers.

The basic structure of the Bulgarian energy sector is shown in Exhibit 1. The key feature of this structure is the influence of various groups over the decisions ultimately made by the Council of Ministers (COM). The COM consists of representatives from government, manufacturing and the national labor unions. As a "trilateral Commission" it provides the only integrating forum for assessing the economic and social impact of price changes. As a result, it is the central institution around which an analysis of the relationship between pricing, macroeconomic trade and welfare policy might be developed. Unfortunately, as a high-level entity, it is not staffed to conduct such activity in detailed fashion; rather, it relies on the input from the various other price policy-making bodies, primarily the Commission on Prices for oil and natural gas, and the Committee on Energy for coal, electric power and district heat.

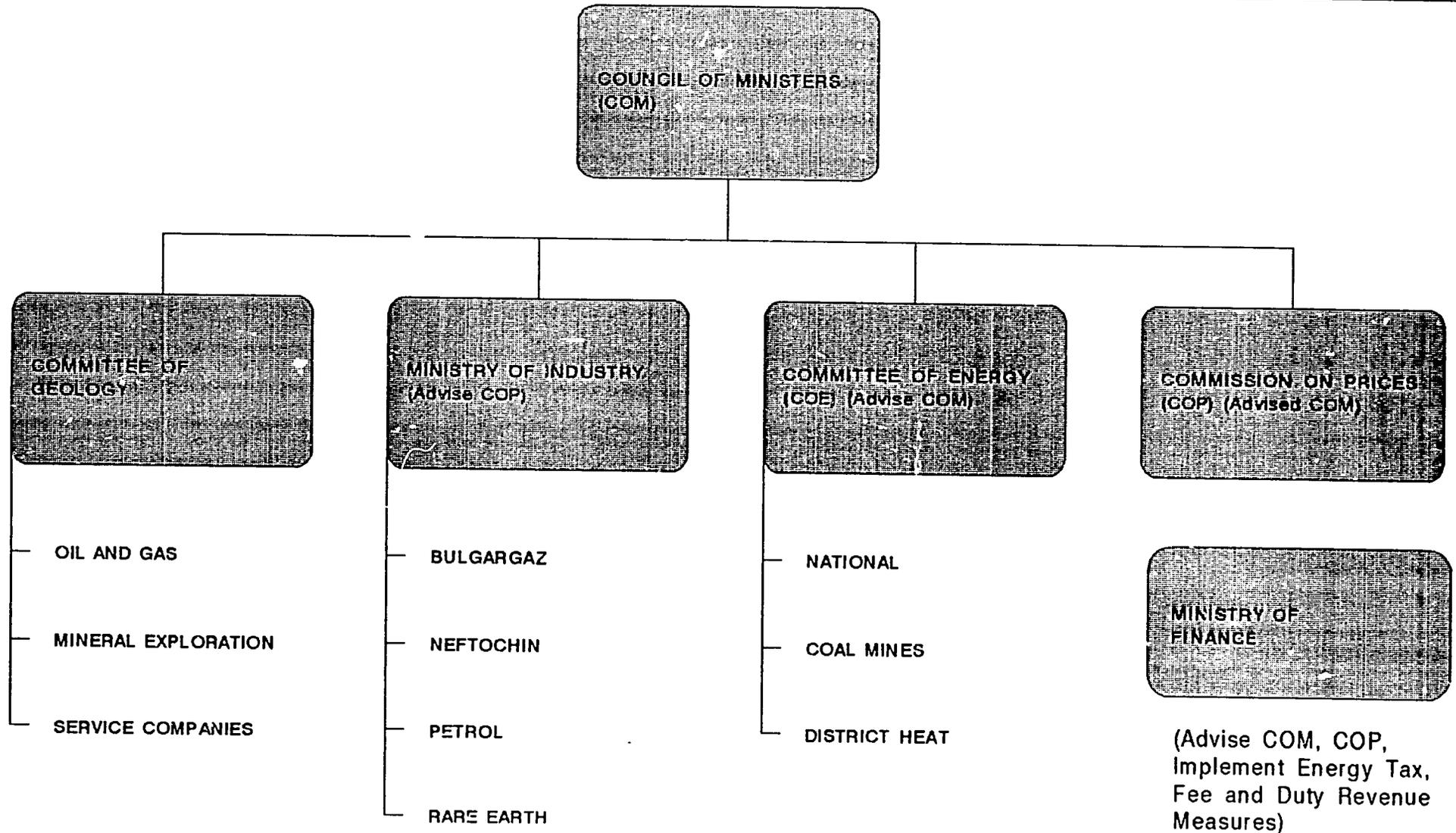
The Pricing Commission evolved from the Energy Pricing Committee, which functioned as the price planning group under the Communist government. This group provided a forum for labor, manufacturers and local authorities to lay out and debate their pricing proposals. The Commission remains influential and apparently has added to their analytical capability over the past year. As a result, it exerts substantial influence over pricing policy, particularly oil and gas, and utilizes the input of experts from the various operating companies as well as the Ministries of Industry and Finance. The latter plays an active role in energy pricing policy owing to the major contribution of energy sector tax (excise, profit, etc.) and custom fees on government revenues. The excise taxes on petroleum products alone (recently 35 percent on motor gasoline and 25 percent on diesel fuel) provide 7-to-8 percent of the GOB's revenue.<sup>10</sup>

The Committee on Energy has responsibility for coal, electricity and district heat

<sup>10</sup> Based on recent World Bank estimates.

# Exhibit 1

## Current Organization of the Energy Sector (and Pricing Policy Bodies)



pricing. It makes recommendations on appropriate mine-mouth price levels for coal, coal transportation rates and the electricity tariff structures, including the transfer prices from suppliers to power plants. The Ministry of Industry includes specialists who oversee specific energy production and processing activities, such as Neftochim and Bulgargaz. Their input is largely to convey the problems of its respective industries. Indeed, it is not uncommon for the industry groups to provide information directly for the use of the Pricing Commission, as both the analytical expertise and data access often resides at the company level.

A central problem with Bulgaria's energy pricing policy development is the lack of coordination among the various policy-making groups (e.g., between the Pricing Commission and the Committee on Energy), and the apparent lack of centralization of the policy analysis and regulatory function.

## Chapter 2

### ENERGY PRICING REFORM TO DATE

Prior to the political and economic changes in late 1989, virtually all fuels in the ECE nations were subsidized by virtue of the below-market imported fuels prices from the USSR. The degree of this aggregate subsidy is difficult to calculate precisely and to generalize from one country to another. Real price levels were largely concealed in the terms of trade contained in elaborate barter and related energy "currency" valuations. Broadly speaking, the world price of oil during the late 1980s averaged between \$18-\$20/barrel. Indications from discussions, as well as the degree of subsequent price escalation seen in the ECE nations, suggests that oil prices (and similarly gas and coal) ranged between a "real" dollar-denominated price of perhaps as low as \$3/barrel to as high as \$10/barrel. In short, the degree of the direct USSR energy price subsidy appeared to be at least at a factor of two and perhaps as high as six times (i.e., priced at one half to one sixth) real world market levels.

In addition to this direct subsidy, the ECE nations were involved in their own internal subsidization of energy prices and tariff rates, in part to maintain a comparative cost advantage, and in part because the principles of efficient resource pricing, particularly the concept of pricing at no lower than long-run marginal costs, had been ignored or conceded to immediate political and economic pressures. The degree of subsidization apparent at the outset of this project varies depending on a number of assumptions, such as:

- the long run marginal and average costs of production;
- the resource depletion cost to that nation (i.e., how increasing energy dependence is assessed);
- the opportunity cost or marginal value of resources used to produce and deliver energy;
- the domestic currency value (exchange rate) compared to primary hard currencies;
- the impact of inflation on input costs, alternative resource values, and;
- the degree to which prices do not recover environmental externalities compared to regional or world norms.

Therefore, in estimating nominal price increases and their implication for closing the apparent subsidization gap, these issues must be considered and indeed quantified in an increasingly rigorous analysis.

In Bulgaria three major periods of energy price escalation over the period 1990-1992 can be identified. The first major price increase occurred in July of 1990, as the provisional government took the first major step towards rationalizing Bulgaria's energy prices to western or "border" price standards. The second major increase occurred six months later, primarily in response to the USSR's formal decision to require payment in hard currency at world market levels, but also in response to escalating world petroleum price levels in the wake of the Iraq-Kuwait war. The third major increase occurred in June of 1991, reflecting the need to maintain a schedule of price increases which would achieve the general objective of not only keeping pace with inflation, but also to approach real (hard currency denominated) world price and production cost levels within a reasonable time period. Since June of 1991, additional price increases have occurred, but the pace of escalation has not been as severe, since petroleum and natural gas are priced largely at market levels or cost, and the subsidy gap in coal and electricity had been substantially narrowed by June 1991. A review of energy price increases by fuel group follows.

#### **A. Petroleum Products**

In early 1990 price of regular grade gasoline was less than \$0.50/gallon at the pump, or more than 50 percent below U.S. pump prices and anywhere from 5-to-10 times less than Western European standards. The price to "subsidized" industrial users was one-third this level. Diesel fuel pump prices were 25 percent below the level of regular gasoline, and fuel oil prices were below \$7/barrel to the final end-user, or roughly 2-to-3 times less than western levels. By mid-1990, rising internal inflation, the expected loss of the USSR's oil price subsidy, and pressures to bring Bulgarian oil prices in line with free market or western European-equivalent levels started the adjustment process. In Bulgaria, the official recognition of the principle of linking oil prices to free market levels was first implemented in July 1990. As Table 3 indicates, the resulting one-month increase from June 1990 levels was nearly 100 percent, even before the extreme price escalation resulting from Iraq's invasion of

Kuwait. At the start of the USAID Emergency Energy Project, Bulgaria and the other ECE countries were in the midst of sharp price increases. Table 3 summarizes the initial petroleum product price increases in Bulgaria over the period June 1990 - June 1991.

A monthly extension of this table is provided in Exhibit 2, which plots both lev-denominated (nominal) and dollar-denominated (real) maximum allowable petroleum product prices for household consumers (i.e., non-subsidized) from July 1990 through March 1992. In both leva and dollar terms retail prices for gasoline had peaked by June 1991. Measured in leva, gasoline prices have been rather stable over the past six months. The decline in gasoline prices in the summer of 1991 reflects a reduction in the excise tax (i.e, from 50 percent in June 1990, declining to 35 percent thereafter). Since mid-1991, the dollar-denominated prices (lower half) have responded to the movement of petroleum product prices in the world market. Beginning in October of 1991, the new GOB formalized the petroleum products pricing process by establishing a formula linking allowable price levels with an 11-day moving average of Mediterranean spot prices (fully described in Chapter 3). To this base price is added the excise and profit taxes, duties and a fixed mark-up for transportation, distribution and marketing margins. Thus, the wholesale or border prices for petroleum products now closely reflect world market levels.

As seen in both Table 3 and Exhibit 2, the degree of escalation in petroleum products prices from 1990 levels was extreme by early 1991, at the peak of the Iraq-Kuwait crisis, before subsiding and then increasing again in June 1991. Between February 1991 and June 1991 the excise tax for gasoline increased from 3140 leva/ton to 5030 leva/ton. The excise tax for diesel fuel rose from 1550 leva/ton to just 1597 leva/ton over the same period. Table 3 adjusts the nominal price increases to real price increases based on the leva/\$ exchange rate assumptions shown (underlined). Note that the leva/\$ exchange rate devalued from an estimated rate of 10 lv/\$ in June 1990 to 16 lv/\$ one year later. The result is that nominal price increases convert to a hard currency-based escalation rate of roughly 60 percent of the nominal levels shown in Table 3.

**Table 3**  
**Petroleum Product Price Increases in Bulgaria:**  
**June 1990 - June 1991**  
**in leva/ton and in (\$/gal. or \$/bbl.)**

Month: Year:	June	July	Feb.	June	Percent Change From June 1990 to:	
	<u>1990</u>	<u>1990</u>	<u>1991</u>	<u>1991</u>	<u>Feb.</u>	<u>June</u>
					<u>1991</u>	<u>1991</u>
<b>Product:</b>						
Gasoline A-86: Industrial Use*	420	580	2150	4715	412	1023
(in \$/gal. @ ___leva/\$)	0.12	0.14	0.43	0.83	258	592
	<u>10</u>	<u>10</u>	<u>14</u>	<u>16</u>		
Household Use*	1240	2200	4950	9430	299	660
(in \$/gal.)	0.35	0.62	0.99	1.65	183	371
Gasoline A-93: Household Use**	1350	2440	5150	9820	281	627
(in \$/gal.)	0.38	0.68	1.03	1.72	171	353
Diesel Fuel: Household Use**	815	1450	3630	5080	345	523
(in \$/gal.)	0.27	0.48	0.86	1.05	219	289
Fuel Oil 3.5%: Industrial Use**	175	300	1130	1575	546	800
(in \$/bbl.)	2.82	4.84	13.02	15.88	362	463
Propane-Butane: Industrial Use*	250	650	2650	5760	960	2204
(in \$/gal.)	0.05	0.13	0.39	0.75	680	1400
Household Use*	315	1000	3000	6400	852	1932
(in \$/gal.)	0.06	0.21	0.44	0.83	633	1283

\* Recent World Bank estimate

\*\* IRG estimate for June 1990 only, rest as reported by the Pricing Commission

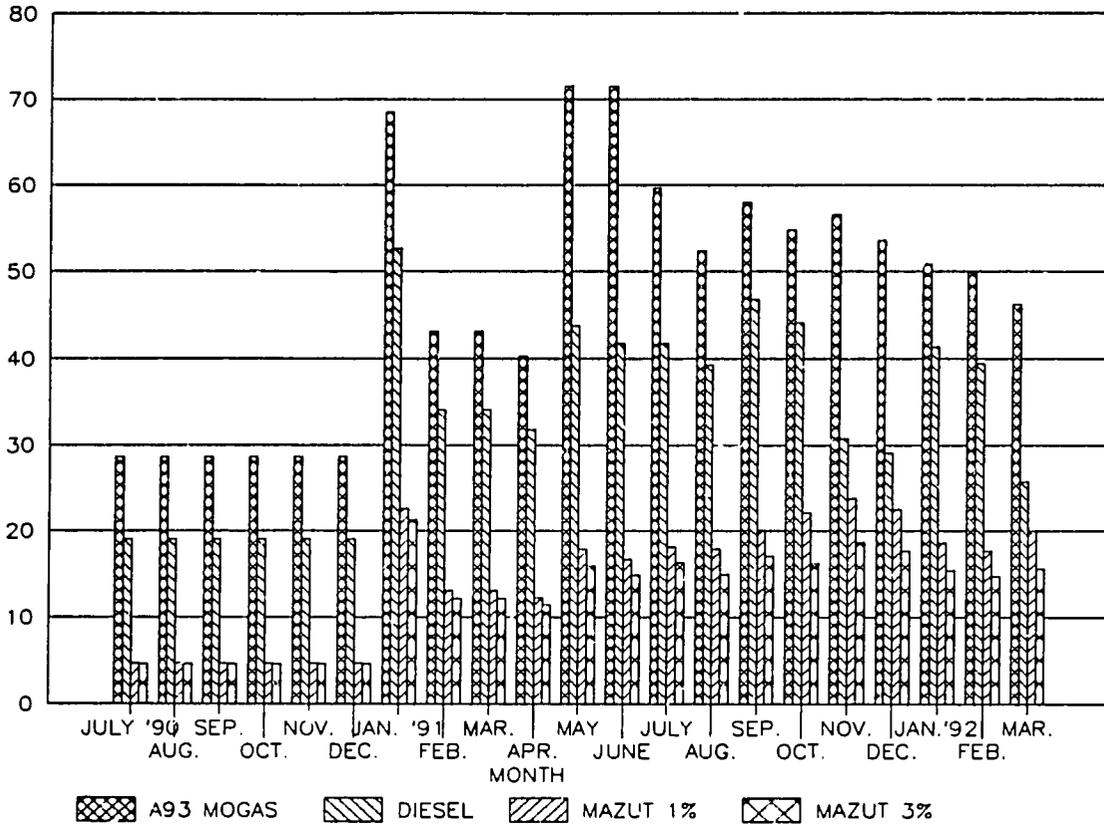
For comparative purposes note that the degree of price escalation for industrial uses (of gasoline, fuel oil and LPGs) was more pronounced than the increase in household prices on a percentage basis, but less so on an absolute basis. This reflects the extreme degree of

Exhibit 2

MAX. PETRO PRODUCT SALES PRICES: IN \$

IN BULGARIA: JULY '90-MAR.'92

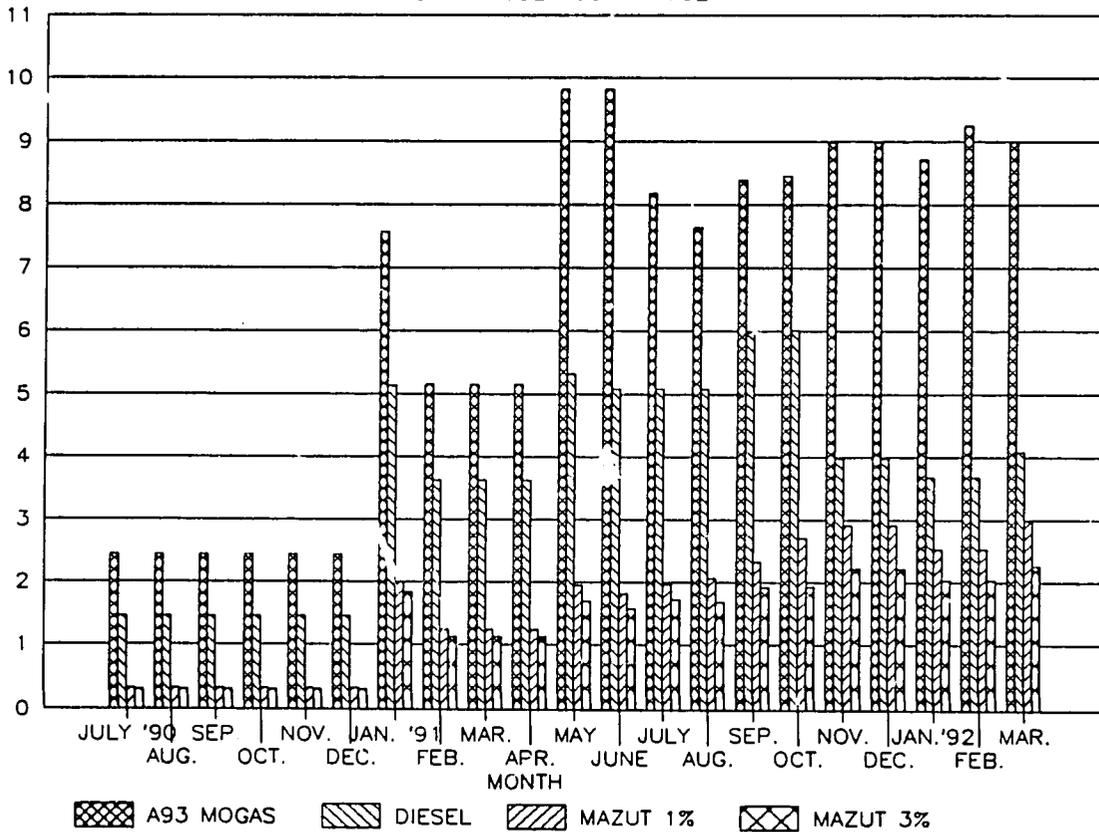
U.S. \$/BBL.



MAX. PETRO PRODUCT SALES PRICES: LEVA

IN BULGARIA: JULY '90-MAR.'92

leva/ton  
(Thousands)



price subsidy offered to the industrial sector. The difference between household and industrial prices is reflected primarily in the excise tax, applicable only to the household or "non-exempt" consumer. This substantial degree of cross-subsidization has resulted in a commensurate degree of tax avoidance or fuel mis-certification, particularly given the economic incentive to engage in such activity, and the lack of thorough data collection and tax enforcement manpower, data collection and information systems in the midst of these onerous price increases.

In general, it can be said that the GOB has pursued many of the principles of a rational petroleum pricing strategy. For example, by late 1991 wholesale prices for gasoline and diesel fuel had risen to the equivalent of free world level (ex tax). Since late 1991 the adjustment process has been smooth, as prices have officially been linked to a moving average of world levels. Through selective tax incidence the hardship of this adjustment process was substantially lessened for certain exempt consumer classes, and certain industrial or utility fuels (e.g., residual fuel oil) remained subsidized. While these exemptions softened the macroeconomic adjustment, they carry a fairly high cost in the form of inefficient price signals to guide investment decisions, and distortions in relative prices which inhibit optimal investment in low cost energy alternatives, including fuel efficiency and fuel substitution measures.

## **B. Coal**

Nearly 95 percent of Bulgarian coal is lignite or brown coal. The balance is compressed slack and small quantities of black and anthracite coal. Coal prices have historically been subsidized at extremely low levels relative to their production costs, in part because price determination historically was made at each production complex. Brown coal prices have been increased by over 10 times since mid-1990, but still have not reached either their production cost or free market equivalent. Average production costs were estimated at around 950 lev/ton in mid-1991, or roughly double the concurrent industrial price, and 2.5 times the household price. Since June 1991, brown coal prices have increased another 25 percent for industrial users and 35 percent for household users. With these increases the price of coal has probably done no better than to keep pace with the

level of inflation. Substantial reductions in production costs will be necessary before this rate of inflation adjustment begins to eliminate the imbedded subsidy between price and production costs.

Prior to 1991 coal prices to industrial users, including utilities, were subsidized relative to household consumption. In 1991 this subsidy was reversed, with household prices subsidized relative to industrial users. This reversal reflects the political pressure to relieve the energy cost burden on household consumers as their income levels are not able to keep pace with rapidly escalating price levels, especially energy prices. As illustrated below, the percent rate of escalation for industrial users was roughly double that of household users. Overall, coal's large price increases exceeded the percentage increases for petroleum products, but remains low relative to production costs and international standards, particularly for the household sector.

**Table 4**  
Brown Coal Price Increases in Bulgaria<sup>11</sup>  
(in leva per ton and \$/ton)

Month: Year:	June	July	Feb.	June	May	Percentage change from June 1990 to:		
	<u>1990</u>	<u>1990</u>	<u>1991</u>	<u>1991</u>	<u>1992</u>	<u>Feb.</u>	<u>June</u>	<u>May</u>
						<u>1991</u>	<u>1991</u>	<u>1992</u>
Industrial Use: leva/ton	20	20	285	485	606	1325	2325	2930
\$/ton @ assumed lv/\$ ex. rate of	2.22 9	2.22 9	20.36 14	30.31 16	26.35 23	817	1265	1087
Household Use: leva/ton	28	28	210	375	506	650	1239	1707
\$/ton @ assumed ex. rates, above	3.11	3.11	15.00	23.44	22.00	382	654	607

<sup>11</sup> World Bank and Bulgarian Committee on Energy

### C. Natural Gas

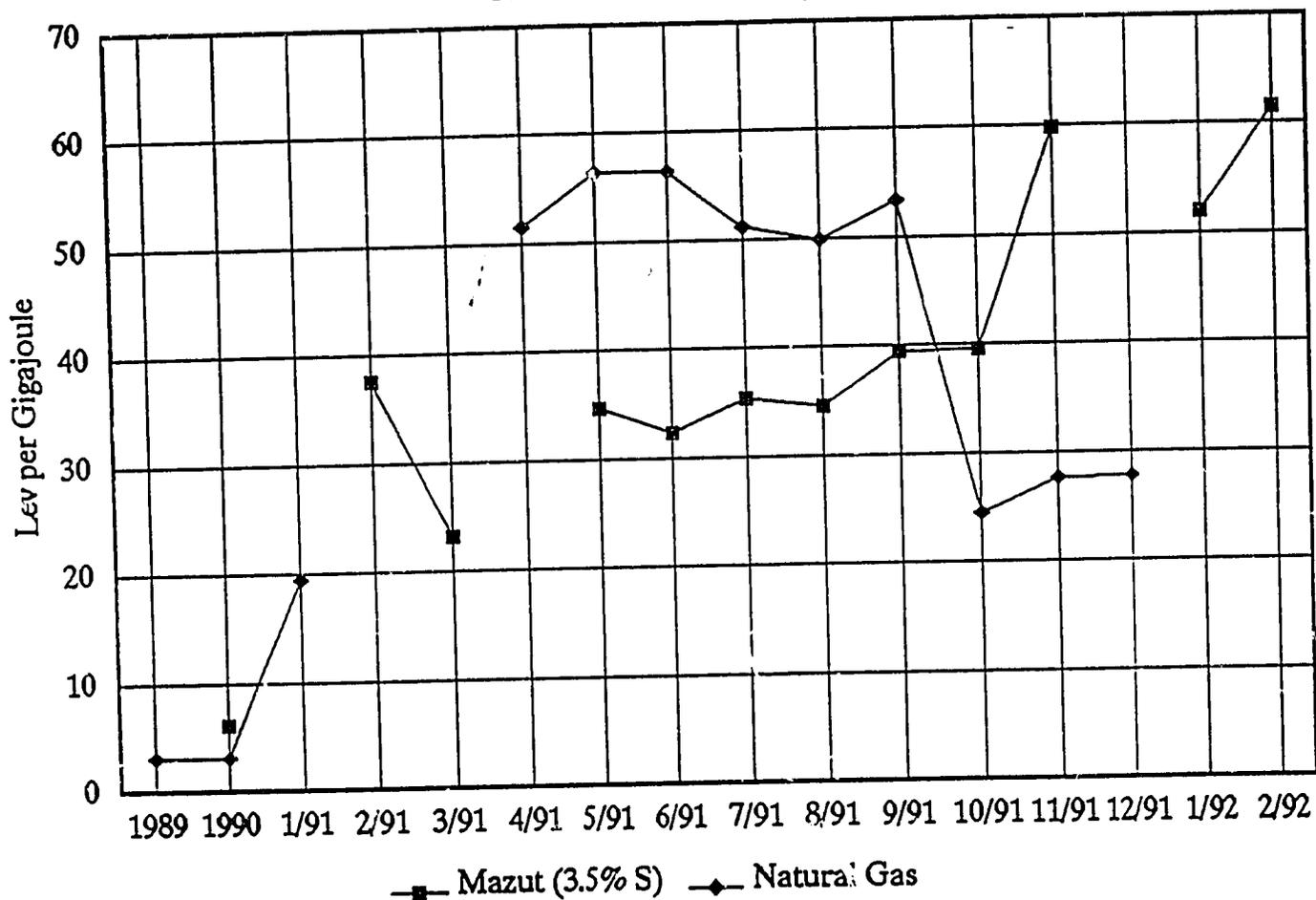
Natural gas pricing in Bulgaria is under the control of the Commission on Pricing. Prices are currently set at roughly 90 percent of the price of 3.5 percent sulfur No. 6 fuel oil (also known as mazut). This price reflects only a portion of the gas supply price from Russia, that which is linked to the combined price of gasoil and fuel oil. The balance of Russian gas supplies are priced under the terms of still active barter trade agreements (known as the Orenburg and Yamburg agreements), as well as a price add-on intended to recover pipeline construction costs. Under these arrangements, the current estimated retail delivered cost of gas is just \$1.44/MMBtu (million British thermal units), or 1170 leva per thousand cubic meters (km<sup>3</sup>).

Gas, like other bulk fuels, was traditionally priced well below its free market equivalent by Bulgargaz, the state monopoly transmission and distribution company. The degree to which this subsidized price was below free market equivalent levels is difficult to estimate owing to the lack of a free market alternative for Russian gas. However, a reasonable estimate would place the subsidy at a factor of at least 500 percent, or five times its price in 1990, and as much as ten times a reasonable market price equivalent (see Table 5). The average price for natural gas charged by Bulgargaz was reported to average 112.36 leva per km<sup>3</sup> in 1990, or roughly 3.18 leva/MMBtu. At nine leva/\$, this translates to \$0.35 per MMBtu. By comparison, high sulfur fuel oil (3.5% mazut) averaged around \$0.47/MMBtu at that time. By January 1991, natural gas prices had been raised to 700 leva per km<sup>3</sup>, or roughly \$1.65/MMBtu, assuming an exchange rate of 12 leva/\$ in January 1991.

Between January and September 1991, natural gas prices rose both absolutely and relative to other fuels (see Exhibit 3). For example, natural gas prices peaked at around 57 leva/giga joule, or \$3.75/MMBtu-equivalent in May 1991. At that time heavy fuel oil (mazut 3.5% sulfur) prices were only 35 leva/giga joule, or about \$2.30/MMBtu. In October 1991 the new government dropped natural gas prices both absolutely and in relation to fuel oil. The appropriate ratio of natural gas to fuel oil prices is an issue currently under debate in Bulgaria, and one which will be driven in part by the underlying incentives to encourage natural gas use, but also by the effective border price under Bulgaria's relatively complex

# Bulgarian Energy Prices: 1989–1992

Natural Gas vs. Mazut (3.5% S)



mix of gas supply contract terms. Such incentives, in turn, will be motivated by the future international price pressures and availability of natural gas, as discussed in Chapter 3.

**Table 5**

**Natural Gas Price Increases in Bulgaria**

Month: Year:	June <u>1990</u>	Jan. <u>1991</u>	June <u>1991</u>	Dec. <u>1991</u>	Percent change from June 1990 to:	
					June <u>1991</u>	Dec. <u>1991</u>
Consumer Price: leva/km <sup>3</sup>	112	700	1841	999	1544	792
\$/MMBtu @ assumed lv/\$ ex. rate...	0.35	1.65	3.26	1.49	831	326

Source: Bulgargaz

**D. Electric Power**

Electricity prices have been increased by roughly the same factor as petroleum prices, although only by coincidence since oil's use in power production is negligible. In 1990, total electricity generating capacity was 42,130 million kilowatt hours (KWh), with electricity generation by fuel type broken down as follows:

**Table 6**

**Electricity Generation by Fuel in Bulgaria: 1990  
(in million KWh)**

		<u>% Total</u>
Total Electric Generation	42,130	100
Thermal	21,863	52
Nuclear	14,665	35
Hydro	1,851	4
Industrial Power Plants	3,751	9

Source: World Bank

As is the case for other fuels, the increase in the electricity prices has been slightly more severe for the industrial user in comparison to household. This reflects a political balance with economic reality, since industrial consumers of electricity can normally be serviced at a lower cost than household consumers. Industry accounts for roughly 45% of total electricity consumption, with the balance split rather evenly between residential and communal and other uses, including light commercial, transmission losses and power plant usage. Average tariffs by user class are shown in Table 7. Note that the household user's subsidy has been maintained and even increased in absolute and percentage terms. These average rates mask a now multi-tier rate structure, including:

- for industrial users - a peak, day and night tariff
- for household users - a day vs. night tariff for metered units  
- a single average rate for un-metered units
- for all users - summer vs. winter rates

Both the Committee on Energy (COE) and the Pricing Commission are involved in structuring tariffs. Over the past year (effective June 29, 1991) the tariff structure has become far more sensitive to costs of service, and have built in more incentives for saving energy. However, overall rates remain below both marginal and average cost levels, particularly for the household sector. The average cost of electric power was estimated at 550 lv/1000 KWh in early 1992<sup>12</sup>. In the first quarter of 1992 the average daily household rate was reported at 284 lev/thousand KWh, relative to a 476 lev/thousand KWh for industrial users.<sup>13</sup> The average night rate was reported at just 140 lev/thousand KWh for households, compared to 204 lv/ thousand KWh for industrial users. In general, the degree of the subsidy to the household sector is estimated at a level of roughly 100 percent of costs on average (i.e., half the household costs subsidized based on mid-1991 rates). This suggests that average costs of service to the household sector are around 3.5¢/KWh. The rate history shown below reflects only average costs of service. A more complete discussion of the rate structure and levels is provided in Chapter 3.

<sup>12</sup> Recent World Bank estimate

<sup>13</sup> Based on figures provided by the Committee of Energy.

**Table 7****Average Electricity Prices in Bulgaria:  
June 1990 - June 1991**

(leva/1000 KWh and \$/1000 KWh)

Month: Year:	June <u>1990</u>	July <u>1990</u>	Feb. <u>1991</u>	June <u>1991</u>	Percent change from June 1990 to:	
					Feb. <u>1991</u>	June <u>1991</u>
Use:						
Industrial:						
(leva)	52	52	271	461	421	787
(\$ @ lev/\$	5.8	5.8	20.9	28.8	260	397
ex. rate of...	9.0	9.0	13.0	16.0		
Household:						
(leva)	38	38	167	284	339	647
(\$)	4.2	4.2	12.8	17.8	205	324

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Source: World Bank and Bulgaria's Committee on Energy

**E. District Heat**

District heat accounts for nearly 25 percent of Bulgaria's final energy consumption. Roughly 20 percent of household heating (mostly hot water) and 60 percent of industrial heating requirements (steam and hot water) are supplied by district heat. Historically household use of district heat has been heavily subsidized relative to industrial use, by a factor of roughly two times. Despite large price increases to both sectors in early 1991, heat prices still remain well below production costs and the degree of the cross-subsidy from industrial for household users has increased, as shown in Table 7.

The degree of the subsidy depends again on the calculation of average and marginal costs. Bulgarian procedures under-price fuels, in part because the allowable depreciation cost base is undervalued and not escalated to keep pace with inflation. Thus, the estimated average heat service cost of 266 lv/Gcal (eff. early 1991) compares to a full cost of perhaps

300-325 lv/Gcal<sup>14</sup>, suggesting a subsidy on the order of 2-to-3 times actual cost for households, and 20-25 percent for the industrial sector.

**Table 8**

District Heat Prices in Bulgaria:  
June 1990 - June 1991  
(leva/1000 kcal)

Month: Year:	June 1990	July 1990	Feb. 1991	June 1991	Percentage change from June 1990 to:	
					Feb. 1991	June 1991
Use:						
Industrial	18	18	165	281*	817	1461
Household	10	10	50	85**	400	750

\* Includes both steam heat and hot water heat for industry, with hot water heat recently priced at approximately 128 lv/Gcal, vs. 343 lv/Gcal for steam heat.

\*\* Largely hot water heat.

Source: World Bank

A major problem with district heating is the lack of metering equipment and incentives to reduce consumption. Households are not equipped with meters, and are simply billed on a square footage and assumed usage basis. Many small industrial facilities also are not metered. Clearly, price metering equipment should be provided coincidentally with price incentives for reducing use.

#### **F. Summary of Price Adjustments**

In the two years since the GOB has initiated energy price reforms and major adjustments in price levels, a great deal of progress has been made. Petroleum product price levels are now roughly equivalent to world levels at the wholesale or refinery gate stage of distribution. They remain below most European equivalents at the retail level, however,

<sup>14</sup> World Bank estimate and Bulgaria's Committee on Energy

owing to relatively low tax rates. In addition, the GOB's policy of allowing certain customer classes tax exempt status (e.g., unions, schools, essential services, etc.) the average price level is distorted downwards, and the system opens itself to substantial tax abuses through mis-certification. Similarly, lack of enforcement capability over collection of customs duties and verification of fuel quality specifications opens the domestic market to substantial abuse from non-reporting imported supplies, or perhaps blended domestic supplies. Overall, average price levels have risen by a factor of roughly 5-12 times (depending on the fuel and exchange rate utilized) for transportation fuels, and roughly 2-3 times for fuel oils. This increase approximates the degree of the petroleum product price subsidy in effect prior to 1990.

In the case of coal, nominal price levels have been increased by as much as 30 times their pre-1990 levels for industrial/utility users, and roughly 17 times for household consumers. In dollar-denominated terms, these increases were roughly a factor of 10 and six times, respectively. Despite this, average coal prices remain subsidized below real production costs by perhaps 40 percent for industrial buyers, and as much as 60 percent for household users. In short, the degree of the subsidy in brown coal was more pronounced even than the oil price subsidy, in part reflecting a need to support an indigenous industry by providing an inducement for the energy economy to utilize coal at the expense of more costly, albeit cleaner alternatives, mostly imported gas, oil, and electricity. As Bulgaria diversifies its energy supply alternatives, top priority should be given to simultaneously: 1) reducing coal production costs, primarily by closing inefficient mines and removing or transferring the work force, 2) increasing the price of coal to reflect real production, transportation and environmental costs, and 3) pursuing cleaner energy substitutes for coal by offering investment credits for fuel conversions by targeting investment capital on projects which expand the "deliverability" of alternative fuels, particularly natural gas.

Natural gas prices have similarly undergone a nominal price increase of some 1000 percent or more, depending on the end-point utilized. However, both the commodity pricing procedures and the transmission/distribution rate structure is in need of substantial rationalization. Most gas is sold to industrial, commercial or power production facilities. As a result, the GOB (through Bulgargaz) has not developed a multiple rate structure, reflecting

the actual cost of service by customer class. In addition, gas prices do not truly reflect the commodity price paid (to the Russians), but are set at a discount to the monthly price of 3.5% fuel oil (i.e., mazut), since this is the price reference largely used in the international market and the immediate alternative boiler fuel. This price link to fuel oil may or may not provide an acceptable (un-subsidized) operating margin to Bulgargaz, depending on the full price terms of the Russian supplies. Moreover, when oil prices rise, the industrial gas users are harmed by a rising cost structure, although the commodity cost to Bulgargaz may not change at all. In addition, the direct link to fuel oil may discourage fuel switching for environmental or reliability reasons.

As long as imported gas prices remain somewhat opaque, and subsidized by the GOB, the incentive for the GOB to establish gas prices at a true commodity cost may be lacking. The motivation needed to rationalize gas pricing and rate-making may only develop through the availability of alternative sources of gas supply, including either a new pipeline project, or the ability to effect exchanges from other international suppliers through the single existing gas pipeline into Bulgaria, via Romania. As a result of these pressing strategic issues, a follow-on assistance seminar was dedicated to the topics of gas tariff or rate-making procedures, and the structure of gas supply contracts. Bulgaria needs to develop gas supply alternatives in order to create gas-to-gas price competition through supply diversification, but also to increase gas consumption and rationalize its pricing to end-users.

The electricity rate structure in Bulgaria has undergone substantial rationalization, and now includes multi-period rates which more accurately reflect marginal seasonal service costs, including transmission cost by line voltage rates (high, medium & low) and intra-day peak vs. day and night use load management pricing incentives to both industrial and household consumers. This effort was motivated by Bulgaria's need to manage its limited peaking capacity with price incentives, a situation aggravated by the loss of the two units at the Kozloduy nuclear plant, which accounts for nearly 35 percent of Bulgaria's previous electricity production capacity. Nevertheless, the absolute tariff levels remain well below both average and marginal service costs by an estimated 10-60 percent (assuming a more reasonable estimation of depreciation costs), with the household sector enjoying the cross-subsidy. As in the case of district heat, lack of metering equipment is a major problem in

the household sector, although now the Committee on Energy has enacted a relatively high flat rate (782 lv/000 kWh) for un-metered users. In addition, the relatively high peak hour rate for industrial users (952 lv/thousand kWh) has helped to both reduce peak consumption and equalize service costs to the overall rate structure.

By early 1993 the COE is expected to be granted permission (by the Council of Ministers) to begin raising prices to household users to reflect actual cost of service and full fuel cost pass-through. No formal schedule of expected rate adjustments has been announced yet. However, the acceptance of this principle (fuel adjustment clauses/pass-through) signals a major breakthrough in rate-making procedures and the overall principle of pricing energy to reflect long-run marginal costs. Most importantly, it would open up the electric utility system to greater inter-fuel competition. Other measures which are expected to be taken include further rationalization of rate structures, and a new emphasis on demand side management efforts to reduce pressure on Bulgaria's severely strained peaking capacity.

District heat prices remain the most extremely subsidized form of energy, and perhaps the most wasted owing to a lack of metering capability at the household and commercial levels. All industrial users are metered, but the majority of household and commercial buildings (e.g., apartment houses) are not. Most of the latter are private, and little incentive exists to install metering equipment owing to the heat price subsidies and the equipment cost. As a result, non-metered users are charged a rate based on space (e.g., cubic meters). Clearly, this sector offers tremendous potential for energy savings, as much of the heat is not delivered on a temperature-sensitive basis, and no incentive exists to reduce consumption under a fixed-space fee structure.

The COE estimates that steam heat prices to industry cover production costs, but again using an unrealistically low depreciation cost base. A third class of customers includes public buildings, for which the rate structure is slightly higher than households, but remains perhaps 60-70% below recently estimated average costs of service of 450 lv/Gcal, according to the COE. In order to effectively eliminate this subsidy over time without causing unacceptable economic hardship, the GOB needs to coordinate efforts to encourage the

installation of metering equipment, simultaneously with price incentives to reduce consumption and waste. These efforts could take the form of billing credits to parties which install meters, and which subsequently demonstrate a decline in usage (i.e., from the assumed average per-unit space estimate). Investments to improve the energy efficiency of the delivery system could also be financed from both higher rates and energy loss reductions. Finally, the GOB should encourage a more complete recovery of these investment costs by staging in a higher depreciation cost base.

## CHAPTER 3

### CRITICAL PRICING REFORM ISSUES IN PETROLEUM AND OTHER FUELS

#### A. Petroleum Product Pricing and Policy Issues

Bulgaria's petroleum pricing policy is a highly visible and important element of the nation's movement to free market principles. Petroleum is a competitively priced commodity on world markets, to which Bulgaria is extremely accessible. From the consumer's perspective, the impact of petroleum price policy is most evident through retail gasoline prices. However, the pricing of residual fuel oil (mazut), as the most voluminous single petroleum product consumed in Bulgaria (largely to the industrial sector), is equally as important to the macro economy, particularly since natural gas prices are currently linked to fuel oil prices. Because Bulgaria is nearly 100 percent dependent on crude oil imports, the petroleum industry in Bulgaria lacks the established producing interests associated with coal and other indigenous fuels with vested domestic producer interests. As a result, the petroleum sector offers excellent prospects for developing a dynamic competitive fuels market in Bulgaria, inclusive of foreign participation and hopefully an expanding domestic output base, supplemented by natural gas. Bulgaria's location advantage along major vehicular transportation and petroleum trade routes, also stimulates interest in foreign participation. However, the degree and type of foreign investment made in Bulgaria's petroleum sector will be highly influenced by Bulgaria's pricing policies, including tax, customs and supply access policies.

#### 1. The Formula for Capping Allowable Sales Prices:

Effective in November 1991, following the election of the new democratic government, domestic petroleum product prices have been capped according to a government formula which establishes allowable price ceilings on the basis of the recent average Mediterranean market's spot price, plus estimated delivery, customs, excise tax, distribution and marketing expenses to the final end-customer. Exhibit 4 details the maximum allowable price calculation process for gasoline, diesel fuel, fuel oil and LPGs. The initial Mediterranean prices shown are simply representative, not actual levels. In practice, the Pricing

EXHIBIT 4

METHODOLOGY FOR DETERMINING MAXIMUM ALLOWABLE PETROLEUM PRODUCT SALES PRICE

NATIONAL GOVERNMENT PRICING COMMITTEE  
OF BULGARIA

Cost Component:	Product: Gasoline (e.g., A-96)	Diesel	Fuel Oil (e.g., 1% S)	LPGs
1. Mediteranean Spot Price ...e.g., (\$/metric ton)	230.0	170.0	80.0	160.0
2. Freight to Burgas (Black Sea) (\$/ton)	10.0	10.0	10.0	50.0
3. Cargo Insurance (e.g., 2-3% of 1+2)	4.8	3.6	1.8	6.3
4. Customs Duty (e.g., 5% of 1+2)				
5. Landed Cost (\$/ton)	244.8	183.6	91.8	216.3
Landed Cost (\$/barrel)	28.80	24.81	14.12	19.66
@ barrel/ton conv. rate of:	8.5	7.4	6.5	11.0
6. Per Ton Price in lev at 23 lev/\$	5630.4	4222.8	2111.4	4974.9
7. Trade Discount, or Distribution/Marketing Margin ( $\leq$ 8% in lev/ton)	450.4	337.8	168.9	398.0
8. Excise Tax on 6+7 (lev/ton) (e.g., @ 35% gasoline, 20%, others)	2128.3	912.1	456.1	1074.6
9. Retail Mark-up on Total (e.g., @ 5%, mogas & diesel only)	410.5	273.6	0.0	0.0
10. Selling Price (lev/ton)	8169.1	5408.6	2567.5	6049.5
11. Selling Price (lev/liter)	6.05	4.60	2.48	3.46

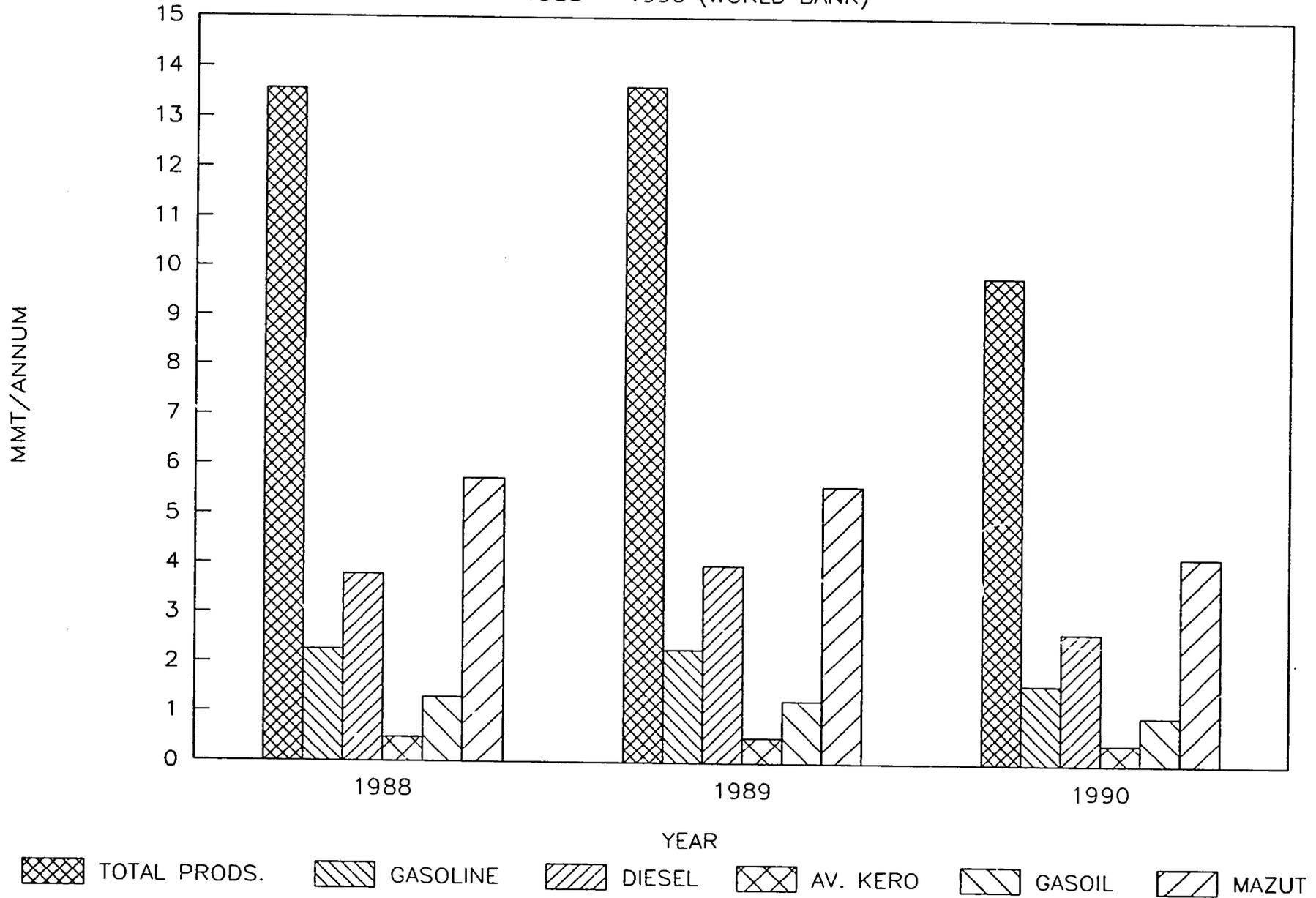
Commission calculates the average spot Mediterranean price (basis Genoa, Italy) for the first 11 days of the month, as reported by Platt's European Marketscan. This price serves as the world market price base for the calculation of the maximum allowable Bulgarian sales prices in effect from the 16th to the 26th of the same month (i.e., beginning five days after the 11 day average has been calculated). The average for the 16th through the 26th of the month then serves as the base world market price for calculating the maximum allowable price from the 1st through the 11th of the following month (again, approximately five days after the averaging period). In this manner, allowable domestic prices remain fairly closely linked to world price levels, one principal of efficient energy pricing strategy. In addition, price adjustments are smoothed somewhat, reflecting a balance between the objectives of responding to free market levels and smoothing the adjustment process for consumers.

For products not actively quoted on the Platt's spot market report, substitute base price calculation procedures are utilized. For example, for gasolines with unusual octane levels, an adjustment of \$1.50/ton per octane number is made from the base or "par" value octane. The price of gasoil for off-highway (typically space heating) use is linked to the price of high sulfur (3.5 percent) fuel oil times a multiple of 1.59 to 1.80, depending on seasonal factors and other market conditions. The allowable final sales price for 1 percent sulfur fuel oil is set at \$6/ton over the reported Mediterranean spot price average, while straight run fuel oil (e.g., Russian E-4) is priced at a multiple of high sulfur fuel oil (like gasoil), with the multiple adjusted to reflect market conditions. In addition, all fuel oil prices are subject to up to a five percent premium for purposes of inducing additional imports, as Bulgaria remains highly dependent on fuel oil imports. The intent of these shadow pricing standards is to encourage sufficient supply while limiting, on a relative price basis, the allowable sales prices for specific fuel grades. Because the reference price levels float with the market price, this sort of administered limit on less widely traded petroleum products does not normally introduce excessive distortions. Nevertheless, it represents a second-best solutions to an otherwise un-encumbered free market pricing regime, and reflects the continued concern with inadequate supply access, market manipulation and potential distortions introduced between world market wholesale prices and final or retail prices in Bulgaria.

Exhibit 5 illustrates the 1988-1990 trend in annual Bulgarian petroleum product

# BULGARIAN PETROLEUM CONSUMPTION TRENDS

1988 - 1990 (WORLD BANK)

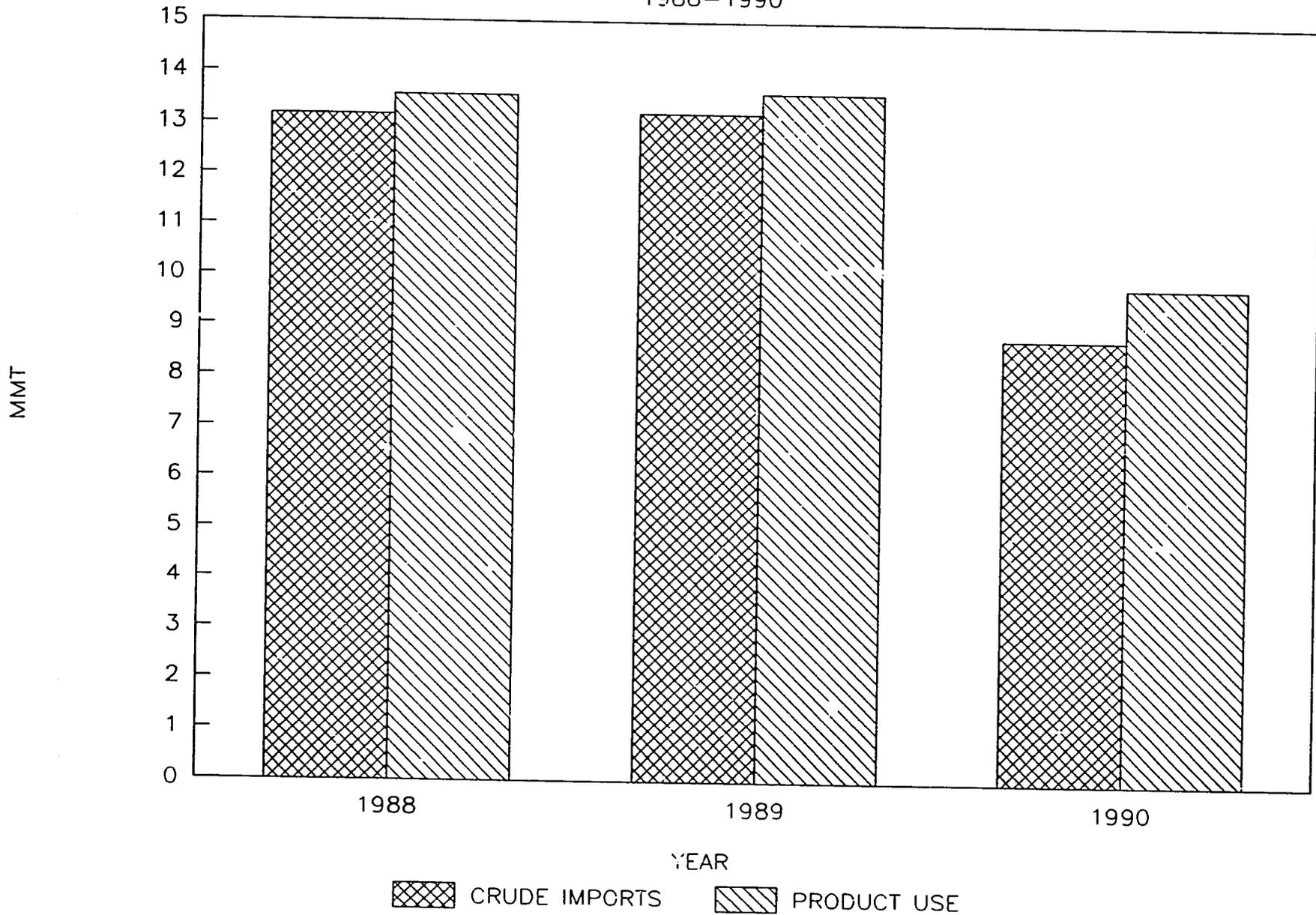


consumption. Total product consumption fell a reported 26 percent from 1989 to 1990, with fuel oil (mazut), diesel and gasoline sharing the decline fairly equally. Preliminary data suggest that a further 20 percent decline may have occurred in 1991, dropping total annual product consumption below eight MT (approximately 160 MB/D). As seen in Exhibit 5, at over four MT/annum fuel oil remains the dominant product, largely for industrial power and heating purposes. Corresponding to the overall decline in consumption has been a marked increase in import dependency. As illustrated in Exhibit 6, the sharp decline in product demand was associated with an even more severe decline in crude oil imports. The net result was that domestic refinery output of petroleum product declined and net import volumes increased. This trend became even more pronounced in 1991, as throughput at the Burgas refinery averaged less than 100 MB/D, and product import volumes accelerated in response to the price, tax and related market incentives created by the liberalization of petroleum trade and, the loopholes in the GOB's tax, customs and related petroleum pricing policies affecting domestic and imported supplies, as discussed below.

Returning to Exhibit 4's price ceiling methodology, several revealing features should be noted. First, the price "build-up" process only serves to establish a cap on price levels. Actual sales prices may be much lower than the levels shown, but only if encouraged by competition. The ceiling prices established may in effect "bite" if suppliers are either operating under a cost structure which equals or exceeds the assumed levels shown in the exhibit, or if competition is not sufficiently robust to prevent a supplier from charging the full allowable price without fear of losing market share to a competing supplier. Because Neftochim Burgas refinery has historically been the dominant supplier to the domestic Bulgarian market (through Petrol, the state monopolist distribution/marketing company), the incentive to price at a discount to this cost structure has only recently been provided by importers. Now, ironically, as import competition has increased, the price structure provided may not fully cover the domestic refining and distribution costs, particularly to the extent that per-unit costs have risen as capacity utilization rates have declined, and as the costs of finance have increased with inflation and progressively worse payment terms (in leva) from traditional customers, particularly the depressed industrial sector. Thus, from the domestic refiner's perspective, the actual level of prices set by import competition may not be sufficient to cover the costs of investments to build or upgrade infrastructure needed

# BULGARIA CRUDE INPUT VS. PRODUCT USE

1988-1990



to meet future demand levels. This investment requirement also should be pursued by the GOB by encouraging joint venture activities with outside investors and privatization of its domestic petroleum refining, distribution and marketing industry.

Indeed, many of the assumptions built into the price "ceiling" calculation are somewhat rigid and not reflective of the dynamics of the marketplace. For example, the assumption of a fixed transportation cost to Burgas (on the Black Sea) is often not representative of real transport costs, which vary greatly by source, vessel size and charter arrangements. Recently, for example, delivery via barges along the Danube have increased, and much of the product ostensibly imported to Bulgaria simply reflects the refinery buying back product which it produced under a processing agreement. The customs duty of five percent provides an additional cost cushion to the domestic producer. However, many importers are reportedly able to avoid the fee either by evading the customs agents or utilizing an exempt customer to front the import. The trade discount, or distribution and marketing margin (line 7), also leaves substantial room for variation depending on the region served, and logistic steps involved in actually effecting delivery. Thus, while the pricing structure is intended to provide an adequate return on investment for the domestic industry, the actual (lower) competitive price levels do not guarantee such a price.

The most important pricing variable is the excise tax, currently set at 35 percent for gasoline and 20 percent for diesel fuel. However, lack of full enforcement has resulted in a number of schemes to avoid paying this tax. These strategies include simply not reporting product sales, the use of tax exempt "end-users" to function as middlemen, who then resell the product to other (non-exempt) end-users at a tax-free, or below-market price. The continued allowance of tax-exempt status for certain "high priority" users is a particularly counter-productive vestige of the previous system because it encourages suppliers to mis-certify product in order to avoid the excise tax, and complicates already strained tax collection and enforcement resources. The tax exemption policy should be ceased and alternative methods found to insure supply at affordable prices or otherwise subsidize fuel costs only for the critical public service activities of bona fide high priority users.

Despite the rigidities of the "ceiling price determination system", it should be

emphasized that the procedure provides only a theoretical maximum price for purposes of controlling market abuse and inflation. Because price levels are based roughly on a recent two-week average Mediterranean spot level, the system is certainly more market-responsive than regulated systems that adjust less frequently to free market prices (e.g., as in Poland, where price ceilings are set quarterly). Nevertheless, to the extent that market prices move rapidly in less than two weeks time, it is quite possible that immediate market price levels will exceed the ceilings allowed under this structure. This would tend to discourage the desired market response: namely, higher prices to discourage demand and to encourage new supplies. Indeed, under a rising market the incentives to mis-certify or not report sales to avoid paying the excise tax or customs duty would be that much greater. In a short period of time the allowable Bulgarian price would likely catch up with world market levels, so that the ceiling does not function as a long-term buffer against rising world market prices. If pure commodity price protection is a desired element of a regulated price ceiling, there are much more effective ways to accomplish this goal in the financial and commodities markets, with the cooperation of the GCB to guarantee the credit-worthiness of the recipient(s) of such long-term price insurance.

The historical rationale behind the price ceiling structure is twofold: First, because the Bulgarian market is still largely dominated by state monopolies in refining (Neftechim) and distribution/marketing (Petrol), to ensure that these enterprises are not taking advantage of their monopolistic position, and instead delivering product under a reasonable cost structure, some objective standard of the market price and acceptable operating costs, including profit margins, must be formally established. Second, a number of factors could develop which could lead to gasoline run-outs, hoarding and the development of opportunistic black market sales of petroleum products at an extreme premium over costs, as occurred briefly in early 1991 in response to gasoline rationing then in effect. Hoarding and price-gouging activity remain quite possible owing largely to Bulgaria's relatively low fuel prices (particularly gasoline) in comparison to bordering countries. For example, the Yugoslavian market offers a large "war premium". Other incentives to hoard or "over-price" product are related to differing currency valuations (leva vs. hard currency), payment terms (prompt vs extended payment) and the special tax-exempt user categories still recognized by the government. As a result, supply to the traditional leva-based, and fully taxable market are moved into the

black market in response to such incentives as hard currency payment, tax exempt status or profitable export opportunities. This activity would tend to drive the price up, and siphon off available supply from the legitimate domestic market.

## 2. Structural Problems and Corrective Steps

In order to rationalize its pricing structure and improve the efficiency of its domestic petroleum market, Bulgaria needs to eliminate the major distortions in its petroleum price, tax and related regulatory structure. In the long-term these policies will discourage productive capital investment, infrastructure development, and ultimately result in higher prices to Bulgaria's oil consumers. The major distortions arise both from the price ceiling formula to the extent it places artificial constraints on the price formation process, but also from the uneven ability of the Bulgaria Government to enforce the critical tax collection, customs reporting and fuel quality inspection functions which would still exist independent of the formula. Suppliers abusing or otherwise avoiding any of these obligations, will be able to substantially undercut the explicit price ceiling established by the formula, at the expense of those suppliers (e.g., the state-owned Neftochim refinery and Petrol marketing company) that may be fully adhering to the various tax, duty, quality and related requirements of a fully compliant commercial transactions.

The previously mentioned tax exempt status of certain users is a core problem which should be eliminated. In addition, import fees, excise taxes and income tax obligations need to be identified and collected in a more thorough manner if they are to serve their broader revenue purpose without distorting internal pricing and competitive incentives. In short, both the formula and the potential for abusing the government-imposed revenue elements of the price formation process encourages the development of an uneven playing field or black market competition, rather than fully competitive commercial conditions and pricing signals of an efficient system. The basic pricing principal which should guide the GOB's policy reform in this area is the objective that price and taxation measures result in a net fiscal benefit to the economy. Thus, if current tax and duty structures are contributing to the deterioration of the legitimate domestic industry such that the domestic tax and revenue base are being eroded, the situation should be corrected.

Potential foreign investors in marketing and distribution want assurances that they will have reliable supply source at competitive prices. Similarly, potential investors in Bulgaria's two refineries (Burgas or the smaller Plama Plevan plant), need to control both feedstock selection and product distribution in order to assess their potential economics relative to imports. If importers are perceived to have a comparative advantage, or the desired control over feedstock and product output is threatened by inadequate supply or market access, unreasonable fees or other concerns (such as unequal tax application and enforcement), then investment will be discouraged and only come at a higher cost.

Although the Bulgarian market is open to imports, local distribution and marketing is monopolized by state-owned Petrol. Large end-users and enterprising middlemen are reportedly making inroads to this storage, transportation, distribution monopoly, and joint importing. Marketing and distribution ventures (with Petrol and other interests) have been proposed if not already consummated. Indeed, petroleum product imports are in fact increasing, largely because the Neftochim Burgas refinery has been forced by its poor comparative economics to virtually shut down as of mid-1992<sup>16</sup>, and previously had been operating at extremely low throughput rates, largely under processing agreements with western firms.

To some extent, the Burgas refinery's economic problems are related to its disadvantageous position vis-a-vis imports under Bulgaria's petroleum product tax and related enforcement standards. For example, the formula converts the dollar price to leva at official exchange rates, and does not account for the time allowed between crude purchase, product sale and ultimate payment by the end-user by adjusting for currency devaluation or interest costs in the price ceiling formula. In addition, domestically produced petroleum products are held to more stringent quality standards and enforcement oversight by Bulgaria's Committee for Standardization and Metallurgy. Manufactured domestic petroleum products are tested for 15 different quality standards, whereas imported products are held to just five quality standards (including appearance, density, color, octane and distillation point

<sup>16</sup> As of June 1992, the refinery had indeed been reported to be shut down due to inadequate capital to finance crude oil imports, and after previously operating largely under processing arrangements.

ranges). These, less stringent standards, give importers substantial lee-way in delivering sub-specification) product at a substantial potential cost savings relative to the domestic refineries meeting all 15 standards.

Finally, according to Neftochim Burgas officials, domestic output is thoroughly tracked and reported for product distribution and sales for tax/payment purposes, whereas much of the imported product is un-reported or may be routed through a tax-exempt customer, such as a trade union, school, hospital or other tax-exempt user in order to forego the excise tax, currently set at 35 percent for gasoline and 20 percent for diesel fuel, but as high as 50 percent and 35 percent, respectively, for gasoline and diesel fuel in 1991. In sum, the combination of interest and currency adjustment costs (domestic sales paid for in leva on extended payment terms), the uneven enforcement of product specifications and the lack of resources to enforce fuel quality, tax and customs violators places the domestic refiners at severe disadvantage to "creative" importers, particularly when the latter have the cooperation of major end-users to arrange for the further distribution of product.

Neftochim, like other corporations, is subject to a 52 percent tax on its profits. As a state corporation, however, Neftochim operates at a disadvantage relative to private importers because it must pay out half of its profit in the form of dividends, leaving just 24% for re-investment. Moreover, as a state corporation, Neftochim's financial operations, including tax reporting, are monitored more rigorously than private businesses with whom they must compete. The same lack of enforcement that plagues the customs and excise tax's effectiveness, also affects corporate profits taxes. As a state corporation, Neftochim is also limited in its access to foreign banking support and hard currency. Many importers function in hard currency under prompt payment terms and at extreme discounts to Neftochim's leva-denominated and often extended payment terms. This alone, gives importers and others capable of skirting the full enforcement of the law a substantial comparative cost advantage.

At this stage (late spring to early summer of 1992), because of its limited financial resources and negative operating margins, owing largely to import competition, the Neftochim Burgas refinery was virtually shut down, or operating at extremely low capacity

utilization rates. As a result, the Government of Bulgaria has temporarily lost an important source of industrial output, revenues and capital to the economy. This refinery is potentially Bulgaria's most valuable petroleum industry asset. In order to revive not only the economic viability of the Burgas refinery, but also the overall health of the petroleum transportation and distribution network throughout Bulgaria, large investments will be needed, including foreign capital and direct participation in equity or joint venture enterprises. Foreign participation in gasoline marketing has been discussed at some length between the GOB and several major international companies. Bulgaria's plans for limited privatization, however, have been stalled by uncertainties surrounding supply guarantees, the price of retail outlets, taxes and other investment deterrents. In order for Bulgaria to revive its domestic petroleum industry, specifically its refining-distribution-marketing infrastructure, the GOB must encourage foreign investment by establishing clear terms under which that investment will operate. Bulgaria's energy pricing and tax policy is directly linked to these broader development interests. In particular, the process of opening Bulgaria's petroleum product markets to foreign interests through privatization or joint venture activities must be coordinated with action on pricing, tax and customs policy, and their enforcement.

The concern of established interests, as represented by Neftochim (the state refining company), Petrol (marketing and distribution company) and their spokes-persons in the Ministry of Industry, is that foreign competition will erode their market share and effectively disenfranchise them. Prospective investors in downstream activities are concerned that without supply reliability and some stability in tax and customs levels, the risk of investment is too high to justify anything other than an arm's-length relationship selling products to private importers and state-controlled trading companies such as Neftoimpex and Chimimport.

Normally, supply reliability is provided by domestic refineries, under long-term agreements with marketing companies. However, in the case of Neftochim Burgas, Bulgaria's only large refinery<sup>17</sup>, its financial condition is such that it cannot enter long-term

<sup>17</sup>Neftochim Burgas' rated crude oil distillation capacity is 240 MB/D, but its actual operating levels are well below this figure due to financial and market demand restrictions, as well as relatively antiquated downstream process units.

supply commitments, and much of the product it does supply is re-purchased or received in-kind as payment from processing agreements with third party crude oil suppliers. These firms are typically western companies seeking to utilize Burgas' dormant capacity and favorable geographic location to convert crude oil to refined products at a relatively low cost. Increasingly, interest in processing arrangements has been expressed by both Neftochim's affiliated state-owned trading company, Neftoimpex, and its original organization, Chimimport, the state oil and petrochemical trading company, which still exclusively handles state-to-state transactions.

### 3. Efficiency Goals and Broader Policy Objectives in Petroleum Pricing

The GOB attempts to balance energy policy, fiscal and competitive objectives largely through the petroleum excise tax. Retail gasoline prices in Bulgaria remain below neighboring European levels primarily because the excise tax is relatively low in comparison to the total of excise, turnover, VAT and pump taxes imposed in various other European nations. Bulgaria's relatively low pump prices by international standards are not necessarily low using an internal comparative energy cost standard. As noted in Chapter 3, coal, district heat and electricity prices remain well below production cost estimates and/or comparative border price standards. A policy of gradualism in escalating petroleum product prices appears justifiable to the extent that gasoline and diesel fuel are viewed as largely essential consumption or intermediate goods, with relatively low price elasticity, and a relatively high share of personal income.

Because petroleum product prices are now largely linked to international price levels, the primary vehicle through which a gradual "equalization" policy for petroleum product prices might be implemented is the excise tax. This tax is already utilized to effect the cross-subsidization of diesel fuel prices relative to gasoline. The relatively low diesel fuel excise tax encourages commercial use relative to personal use of transportation fuels. However, to the extent that the allowable profit margin on diesel fuel (to the refiner or importer) is set by government fiat at a fixed percent mark-up, the desired response to this policy goal (i.e., encouraging diesel fuel supply and demand relative to gasoline) may not be forthcoming. Indeed, a situation whereby diesel supply decreases due to more favorable profit opportunities in the gasoline market is possible if the lower absolute price of diesel fuel

(resulting from its lower excise tax) is not balanced by supply inducements in the form of more attractive margins on production.

In the case of gasoil for heating, the GOB can induce greater or less use by adjusting the level of the multiple used to determine the maximum allowable gasoil price (between 1.59 and 1.8) over the high sulfur fuel oil price. Given the typical price of high sulfur fuel at around \$12/barrel, the multiple selected translates to a theoretical discretionary range in the assigned ceiling gasoil price as great as \$2.50/barrel. While representing a reasonable seasonal range, this range limits the GOB's ability to stimulate a substantial demand response without further tax incentives.

The relatively low excise tax structure presents an opportunity for the GOB to supplement the excise tax to fund environmental or infrastructure programs, such as pollution control (e.g., clean fuel) technology projects. For example, a de-sulfurization unit at the Burgas refinery might be subsidized via an increase in the excise tax, or perhaps through a targeted fee, as the Superfund fee is used in the United States. Similarly, capital for infrastructure improvements, or even to finance oil cargo acquisition, could be obtained through dedicated fees or an increase in excise tax revenues. As a political decision, any targeted fee or incremental tax would have to receive broad support. Therefore, the need for the funds would have to be justified in terms of national economic and industrial sector development policy objectives. External sources of loans and investment capital could provide a stimulus to the political process by identifying high priority investments, and assisting in defining and measuring the political argument (i.e., imposition of taxes, fees) in economic development and financial terms.

Currently, Bulgaria's pricing structure provides no explicit incentives for meeting environmental and necessary capital investment goals. Indeed, one fundamental problem of the tax code concerns the treatment of investment expenses. Currently, funds spent for investment are treated as coming from profit, not as a fixed cost against which tax liability can be reduced. Capital depreciation is recognized as a before-tax fixed expense. However, the procedure for valuing the capital base to be depreciated substantially understates the real value of the capital, both because the initial capital value is under-valued, and because

the leva-denominated value severely lags inflation rates, particularly over the past several years.

One strategy for the GOB to consider to stimulate environmental investments is to establish a special (western-styled) depreciation cost calculation methodology with respect to energy efficiency and environmental investments. Given the need for foreign capital, expertise and participation to meet environmental and general infrastructure goals, a supportive tax structure and related financial incentives will be needed to stimulate such investments.

## **B. Pricing and Policy Issues for Non-Petroleum Fuels**

### **1. Natural Gas**

Bulgaria has very limited domestic natural gas reserves and is almost entirely dependent on natural gas imports from Russia through a single pipeline that enters Bulgaria from Romania. This pipeline delivers Russian gas that Bulgaria buys under the Yamburg and Orenburg Agreements. The Yamburg arrangement allows for the receipt of natural gas against a Russian debt to Bulgaria for the latter's contribution to the construction of the Yamburg gas pipeline. The Orenburg agreement allows for the exchange of goods against gas receipts valued in leva at a deemed leva/dollar exchange rate under the bilateral clearing arrangement with the Russian Federation.

Russia bases its nominal gas export prices on the previous quarter's average of high and low sulfur fuel oil (1% and 3% sulfur) and gasoil prices. This typically produces a border price of around \$90-\$95/thousand cubic meters<sup>18</sup> (mc<sup>3</sup>) or about \$2.60/thousand cubic feet (mcf). However, the actual cost to Bulgargaz's customers also reflected the dollar/leva exchange rate used in the bilateral trading agreement with the Russian Federation. This rate fluctuated substantially in 1991, as did the quarterly average price of oil, leading to substantial variation in gas prices to Bulgarian consumers, as shown in Exhibit 5 (Chapter 3).

<sup>18</sup> World Bank, Bulgaria Energy Strategy Study, April 30, 1992, p. 44.

In October 1991 the sharp decline in natural gas prices reflected the change in the leva value of the clearing dollar. As a result of the developing surplus of Bulgaria's balance under the bilateral trade (barter) arrangement, the clearing leva/dollar rate was reduced in late 1991, reportedly to 12 leva/dollar, or almost half the market rate. This resulted in an effective decline in the price of Russian gas, valued in Bulgarian goods under the Orenburg Agreement.

Prior to January 1992, the price of gas to Bulgaria's largely industrial consumers reflected the costs of imported gas from Russia, resulting in a relatively volatile price path with direct implications for the economics of Bulgaria's industrial plants. In January 1992 retail prices of natural gas were formally tied to a 90 percent ratio of the price of high sulfur (3.5%) residual fuel oil (mazut). One purpose of setting the gas price at a discount to the mazut price is to inhibit oil consumption and to attempt to improve the price competitiveness of Bulgaria's industrial output in global markets. The Ministry of Finance's Commission on Pricing determines and publishes gas prices every two weeks, setting them at 90 percent of the wholesale mazut price (= 2100 leva per 10<sup>3</sup>m<sup>3</sup> in April 1992). The relatively low prices maintained for heavy fuel oil (mazut) provide a subsidy primarily directed at industry and the electric power sector. Mazut is consumed by these users for heat and power generation. Mazut price levels are also very important in Bulgaria because this is the single largest petroleum product consumed, accounting for over 80 MB/D in 1990, or roughly 40 percent of total petroleum product consumption.

The use of a controlled mazut price as a reference for delivered natural gas prices provides greater stability in the natural gas price to Bulgarian gas consumers (primarily industrial users), but at some cost in the form of reduced efficiency from distorted gas price and rate signals. Specifically, Bulgargaz may at times sell gas for less than it pays Russia, resulting in a government price subsidy to those industrial and commercial gas users served by Bulgargaz. Moreover, the delivered price of gas does not reflect unit or average costs of providing gas service to the various different customer classes, as reflected in U.S. and other western cost-of-service rate-making procedures. Finally, the direct link to fuel oil eliminates the price incentive for fuel switching, thereby removing the dynamics of inter-fuel competition. If energy prices were market driven, monthly consumption data would give

some indication of the extent to which dual-fuel capable industrial users switched between natural gas and mazut with retail price fluctuations. For instance, although the large state chemical company, Chimko, can burn mazut instead of gas in thermal applications (i.e., for boiler fuel), it has done so for only 3-to-4 days during the past three years, and then only on an emergency basis.

There is pressure within the Ministry of Finance to change the current method of setting the gas price by establishing one of two different pricing models, as follows:

- . Model 1: Set gas prices at 80 percent of the mazut price (= 1700 leva per 10<sup>3</sup>m<sup>3</sup> in April 1992) for general boiler fuel use, and 70 percent of the mazut price (= 1500 leva per 10<sup>3</sup>m<sup>3</sup> in April 1992) for industrial process gas use.
- . Model 2: Average the actual delivered cost of gas purchased under the Yamburg and Orenburg Agreements, including transportation costs through transit pipelines (= 1500 leva per 10<sup>3</sup>m<sup>3</sup> in April 1992).

The resultant lower gas prices would presumably stimulate industrial output and result in increased profits. However, in averaging the delivered cost of gas, it would be preferable to use the market leva/dollar exchange rate rather than the artificial clearing rate, which would raise the effective leva price.

There are no taxes applied directly to Bulgargaz's natural gas sales, although Bulgargaz pays a 40 percent tax on its profits. The size of this tax is determined annually by the Ministry of Finance, based on the financial results of all state-owned enterprises. Additionally, there are no direct incentives to burn gas as a cleaner fuel alternative other than the formula pricing discount to fuel oil prices. If fuel oil prices were completely decontrolled, a gas pricing policy could be developed which maintained environmental incentives to use gas (e.g., through fees, taxes incentives) while stimulating greater inter-fuel competition.

Ultimately, Bulgaria's natural gas use and pricing strategy will rely on supply diversification and the development of cost-based rate structures to price its combination of

gas supply and transportation services. Central to this process will be the creation of additional sources of gas supply in order to stimulate gas-to-gas competition and encourage the evolution of the gas pricing and delivery service in Bulgaria towards a system which is responsive to market conditions, recovers service costs and is conducive to a pricing regime which promotes government policy objectives, including environmental and tax policy. The ability to develop rates which recover costs of service is particularly important if Bulgaria seeks to expand natural gas usage (outside the industrial sector) through the construction of an additional distribution network to reach new customers.

Bulgaria has entered discussions to obtain natural gas from Iran, but this gas would (at least initially) have to be delivered via pipelines traversing the former Soviet republics. Eventual construction of a natural gas pipeline across Turkey will reduce Bulgaria's dependence on the former Soviet republics for both natural gas supplies and transportation. If built, this system will also allow Bulgaria to increase its role as a transporter of "transit" natural gas supplies from the Middle East to Western Europe. The current natural gas pipeline system in Bulgaria entering from Romania has a northern leg and a southern leg looping between Varna in the east and Sofia in the west. Several laterals deliver gas to customers located off of the main loop. There is one gas storage field located at the northwestern end of the loop at Chiren, relatively close to Sofia.

In 1989, Bulgaria had proven natural gas reserves of 5,000,000  $10^3\text{m}^3$  and produced 150,000  $10^3\text{m}^3$ , resulting in a reserves-to-production (P/P) ratio of 33 years (see Table 9 and Annex C). Bulgaria's domestic gas production satisfied less than 2.5 percent of its 6,208,000  $10^3\text{m}^3$  of domestic consumption in 1989. Gas consumption is predominantly industrial, resulting in a relatively high per capita consumption of 0.694  $10^3\text{m}^3$ .

Bulgargaz is the state-owned natural gas company and sole seller of natural gas in Bulgaria. Bulgargaz sells and delivers gas to more than 100 predominantly industrial customers. Although Bulgargaz has no local distribution facilities to serve individual residential customers, gas provides 90 percent of Sofia's heating requirements through

district heating. Residual fuel oil<sup>19</sup> (3.5 percent sulfur content) is the alternate fuel for natural gas in industrial applications.

Table 9

1989 Natural Gas Balance in Bulgaria  
(Thousands of Cubic Meters)

Proven Reserves	5,000,000
Production	150,000
R/P Ratio	33.300
Consumption	6,208,000
Imports	6,058,000
% Domestic Usage	2.42%
Consumption per Capita	0.694

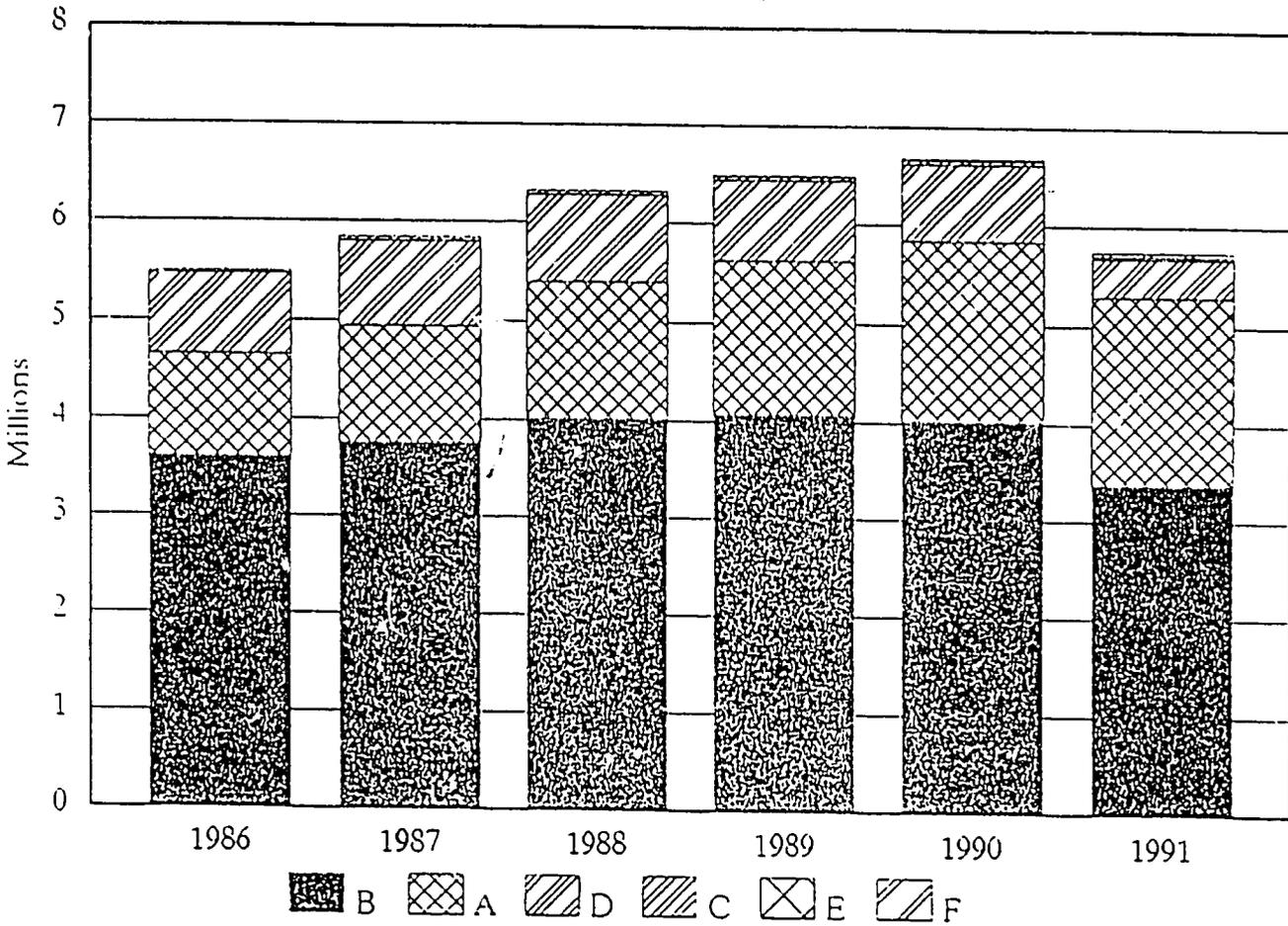
Data Source: 1991 PC Globe, Inc.

Bulgargaz's total annual natural gas deliveries fell from a peak of 6.692 billion cubic meters (bcm) in 1990 to 5.751 bcm in 1991, reflecting both a general economic decline and reduced industrial gas consumption in response to higher prices on imported Russian gas. Exhibit 7 graphs the recent six year trend in Bulgargaz deliveries among the major user categories, designated by the government organization controlling each activity. Retail deliveries of gas to Ministry of Industry and Trade facilities have consistently accounted for about 60 percent of Bulgargaz's total deliveries, since 1986. These facilities are predominantly power stations associated with specific industrial plants. Retail gas deliveries to facilities of the Committee on Energy (i.e., for general steam and electricity generation) have accounted for about one-third of Bulgargaz's total deliveries over the same time period. Combined, deliveries to the Ministry of Industry and Trade and the Committee on Energy facilities accounted for approximately 90 percent of Bulgargaz's total annual natural gas deliveries, since 1986. The remaining 10 percent was dominated by gas deliveries to

<sup>19</sup> Mazut

# BULGARGAZ NATURAL GAS DELIVERIES

1986-1991



A - COMMITTEE OF ENERGY

B - MINISTRY OF INDUSTRY AND TRADING

C MINISTRY OF AGRICULTURE & FOODSTUFF INDUSTRY

D MINISTRY OF ARCHITECTURE, HOUSING CONSTRUCTION & DEVELOPMENT

E SPECIAL ESTABLISHMENTS

F ASSOCIATIONS, ETC.

... 48

Ministry of Architecture facilities (e.g., for district heating and production of construction materials). Taking the analysis one step further, 26 customers (of the 106 customers initially identified to us) consistently accounted for over 90 percent of Bulgargaz's total annual deliveries during the years of 1986-1991.

## 2. Electricity and District Heat

The Committee on Energy (COE) effectively functions as the state power, heat and coal company. As all of these energy prices remain below costs, the COE is the primary recipient of direct government subsidies to cover fuel and related operating costs, including processing, transmission and distribution of fuel, heat and power. The level of this subsidy was estimated at 2.5 billion leva in 1991, and could range between 1.5 and 3.0 billion leva in 1992, depending on the degree of energy price increase passed through this year, the degree to which organizations in the energy sector engage in cross-subsidization (i.e., profits in one activity used to subsidize another activity).<sup>20</sup>

With respect to electric power, the COE's policy is to utilize pricing to limit consumption, particularly in peak hours because with the temporary shut-down of blocks one and two at the Kozloduy nuclear power facility, peaking power is severely limited. Although imported electric power has offset some of this loss (nuclear was providing 35% of Bulgaria's total electricity supply), most of the shortfall has been made up either by reduced demand from deteriorating economic conditions, particularly in the industrial sector, or scheduled power outages.

A second basic power principle pursued by the COE is that prices should recover the cost of production, at least in the industrial sector. According to the COE, this has been accomplished as of the first quarter of 1992, although it would appear that tariff rates are still not fully recovering depreciation costs and inflation's impact on power production costs. A third guiding principle being pursued is that of full cost pass-through adjustment, to all users. In pursuit of this objective, the COE expects that electricity rates will be raised to all

<sup>20</sup> World Bank, Bulgaria Energy Strategy Study, April 30, 1992, pp 19-20.

consumers in 1993, with the degree of the subsidy to residential and small commercial users gradually eliminated over time. The COE maintains a forecast and schedule of anticipated future tariff increases. The Council of Ministers has reportedly agreed in principle to the concept of full fuel cost adjustment pass-through, but has yet to confer the right of automatic cost pass-through on the COE. The central political debate is over how rapidly to pass through higher costs to the household sector.

As of the second quarter of 1992, the COE had submitted a formal methodology for determining allowable tariff rates for the Commission on Pricing's review, which in turn makes recommendations to the Council of Ministers. This methodology is based on rate structures which vary according to volume of energy consumed, the voltage rate utilized, time of day (peak, off-peak) and season. Once these procedures are accepted in practice, it was suggested that the likelihood of implementing automatic fuel adjustment cost pass-through would increase substantially.

As of the first quarter of 1992, electricity rates in Bulgaria were structured as shown in Table 10. Table 10's average rates are also adjusted for voltage rates, with lower voltage service paying more than the average, and higher voltage customers paying less than the average. Comparing these rates those shown in Table 7 (Chapter 2), household rates have not changed since June 1991, while average industrial rates have risen only modestly from 461 to 476 lev/000 KWh. Due to inflation alone, the costs of production were estimated to have risen some 6-to-7 percent over the past year by the COE. However, these higher costs were excluded from cost calculations at the request of the Ministry of Finance.

**Table 10**

**Electricity Rates In Bulgaria<sup>21</sup>:**  
(lev per 1000 KWh\*, effective 1st quarter 1992)

<u>User Class:</u>	<u>Period:</u>	<u>Night</u>	<u>Day</u>	<u>Peak</u>
1) Industrial**		204	476	952
2) Household		140	284	---

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\* Use 22 lev/\$ for conversion.  
\*\* Without metered measurements, tariff = 782 lev.

This inability to fully recover operating and particularly capital costs is a central problem in most ECE economies which do not have accounting practices which define or fully recognize the concept of depreciation and market valuation of equipment and related capital investments. As a result, depreciation costs are understated and returns on investment are often below a level needed to attract capital. In order to encourage new investments in power production or transmission facilities some change in these accounting laws and valuation procedures, including special exceptions for external capital, will be needed. In the interim, Bulgaria and other ECE nations may become more dependent on international donor sources to support emergency infrastructure investments.

In summary, a number of problems remain in the pricing of electricity and the system's responsiveness to future demand requirements. Foremost among these is the large subsidy to household consumers, which continues to increase as inflation and depreciation costs go unrecovered. Second, tariffs for industrial consumers, while more closely approximating production costs, continue to provide a cross-subsidy to residential users, in part because the latter are not subject to peak user rates. Recent efforts to adjust rates according to voltage service should be supplemented with other service cost and rate incentives for the household sector to conserve. The methodology proposed to calculate user class-specific cost-of-service should continue to be refined and should provide the

<sup>21</sup> Committee on Energy, Bulgaria.

basis for automatic cost pass-through, subject to the review of a third party export regulatory board. (Currently, such expertise lies with the COE, but it is not a dis-interested third party.) Finally, a firm schedule for raising domestic rates towards their full service costs should be established and adhered to in combination with efforts to increase energy use efficiency, including improved metering and conservation technology, and practiced through awareness campaigns and investments financed from energy savings.

As with electricity, the COE indicates that steam heat and hot water costs are now fully recovered by rates charged the industrial sector, but remain subsidized to the household and commercial/public building sectors. Effective May 1992, it was estimated that prices charged for steam heat and hot water were some 75 percent below costs for the household sector, and 50-to-75 percent below costs for the commercial/public sector. The average cost for producing steam heat across all customer classes was estimated at 300-325 lev/giga calorie (Gcal) in 1991<sup>22</sup> and more recently as high as 450 lev/Gcal<sup>23</sup>. Recently reported average rates by customer class are shown in Table 11, below.

Table 11

Recent Average District Heat Prices  
by Customer Class<sup>24</sup>  
(lev/gcal\*)

<u>Customer Class &amp; Use</u>	<u>Period:</u>	<u>1st Qt. 1992</u>	<u>May 1992</u>
Industrial... steam heat		343	463
Industrial... hot water		128	na
Public Buildings		na	173
Household... mostly hot water		85	115

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\* convert at 22 lev/dollar

<sup>22</sup> World Bank, Bulgaria Energy Strategy Study, April 30, 1992, p. 25.

<sup>23</sup> Committee on Energy, Bulgaria

<sup>24</sup> Source: Committee on Energy, Bulgaria

Thus, while steam and hot water heat prices have risen, particularly in the industrial sector, a substantial subsidy remains to be made up in the household, commercial and public sectors. A fundamental barrier to improving the ability of the COE to recover heat costs is the lack of metering equipment for the household and commercial customers. Approximately 80 percent of such customers are located in private buildings without metering equipment. These customers are typically billed according to cubic meters of space, at a rate which is well below average costs. As a result, these users have little incentive to conserve. In order to begin to rectify this situation it is necessary to both begin to meter usage, perhaps in groupings of buildings or "areas" to start, and then provide rate incentives for reduced heat usage, simultaneous with a program to raise rates towards their true service costs.

### 3. Coal

Coal prices remain highly subsidized in Bulgaria in part because coal is a major fuel source for electric power generation, and in part because production costs are relatively high due to the continued operation of relatively uneconomic mines. Coal consumption declined to 35.1 million tonnes (MT) in 1990, after peaking at 40.5 MT in 1987. Roughly 85 percent of Bulgaria's coal consumption is in the power and heat sector, formerly controlled by the COE, but reorganized under the control of the National Electric Company (NEC), three major district heating companies. Most of Bulgaria's coal output is relatively low (heating) value lignite and some sub-bituminous coal, ranging in heating value from 1,200 to 5,500 kilocalories per kilogram (kcal/kg). Prices are established in reference to a high quality coal (7,000 kcal/kilogram), with deductions made for heating value, sulfur, moisture and ash content. In addition, industrial and utility users are expected to pay transportation costs to their plants. The Commission on Prices reviews the pricing proposals and advises the Council of Ministers on final pricing policy.

The average price of coal for industrial and utility use remains at 485 lev/thousand kilograms. Average household prices are 375 lev/000 kg, which includes a transportation charge which averages 115 lev/000 kg. This compares to an average production cost

estimated at around 950 lev/000 kg.<sup>25</sup> The average price of imported coal (roughly 10% of total consumption) was reported<sup>26</sup> to be around 800 lev/000 kg. Coal production costs could be reduced substantially (e.g., by as much as 10 percent) through the shut-down or rationalization of select mines and mining operations, particularly the Maritza East mining complex which provides about 75 percent of Bulgaria's domestic output.

As a general strategy, Bulgaria should continue to rationalize its coal production operations, reducing costs and cutting uneconomic output, while relocating workers. Coal imports should be encouraged, and combined with the gradual decontrol of domestic prices. Household prices, in particular, should be raised, at least in line with increases in electricity and heat rates. Most importantly, the costs of coal production, and its price should begin to reflect its environmental costs, and incentives to entice clean coal technologies to Bulgaria, such as tax holidays and price supports, should be given priority.

<sup>25</sup> World Bank, Bulgaria Energy Strategy Study, April 1992.

<sup>26</sup> by officials with the Ministry of Finance

## CHAPTER 4

### PRICE ANALYSIS CAPABILITIES AND MODELING SERVICES DELIVERED

#### A. Energy Price Modeling Capabilities in Bulgaria

As a central command and materials-flow economy until 1991, Bulgaria has little historical experience in analyzing the volumetric or revenue implications of energy price changes on a national level. However, many energy professionals in Bulgaria appear to be quite adept at characterizing the materials balances in the energy system and process costs resulting from alternative assumptions about energy inputs, utilization rates and related demand or price assumptions. Prior to 1991 Bulgaria had largely been insulated from free market price levels. In addition, fuel use in Bulgaria has been segmented among captive fuel consuming groups, with little opportunity for inter-fuel substitution. Therefore, the potential benefit of a multi-fuel national energy modeling capability had not been evident. Most of the limited analysis which had been undertaken was at the plant or company level, with little evidence of an active central policy analysis effort among the Ministry of Industry, the Committee of Energy or the Commission on Prices.

In Bulgaria, the Ministry of Industry has the broadest responsibility for coordinating industrial and energy policy. However, the expertise to perform detailed economic analysis lies largely within the operating companies, along with some specialized expertise among Ministerial staff working in key (typically industrial) sectors. For example, industrial energy specialists appeared quite adept at estimating the output and revenue loss likely to be experienced among Bulgaria's major industrial gas users given a posited price increase and other macroeconomic variables affecting input costs and utilization rates for the productive enterprise. However, this level of detailed analysis is not necessarily present at the top levels of government, and much of the potential analytical input to pricing decisions is secondary to special political and economic interests by the time the Commission on Prices establishes its advisory position to the Council of Ministers. In short, the analysis that is regularly undertaken tends to occur at the plant or perhaps regional level, whether for oil, coal or natural gas. Moreover, the ability to develop national energy models and multi-fuels analysis is limited by data restrictions and the lack of a central analytical authority to support or

otherwise assume the role of the Commission on Pricing.

The Committee on Energy has responsibility for developing electric power and district heat rates, and is involved in coal pricing because of coal's major role in electric power generation. Bulgaria's coal production costs remain subsidized, in part because of coal's primary contribution to electric power production, and pricing decisions are made largely on a regional basis, now under a mechanistic formula for heat value and other quality adjustments. Coal prices and demand levels are not nearly as volatile as for oil, or even natural gas, which are subject to world market and currency fluctuations. Coal pricing efforts tend to focus more on cost estimation and inflation adjustments, so that the degree of price uncertainty is substantially lower than for oil and gas.

In electricity, the interest in price modeling and rate-making procedures is increasing, but the nation's limited base-load and peaking capacity (with two units of the Kozloduy nuclear plant closed down) limits the ability of the COE to actively pursue a multi-fuels pricing analysis. As a result, most of the analysis undertaken at the Committee on Energy focuses on identifying incremental service costs, in order to create a more rational and efficient rate structure. Once the Council of Ministers formally endorses the concept of automatic fuel cost pass-through, the dependence on government subsidies to offset higher costs will diminish and the analysis of relative fuel costs and appropriate rate structures, including recovery of necessary retrofit or new facility investments costs, will take higher priority.

## **B. The Petroleum Sector**

The emphasis on petroleum market analysis capability is particularly relevant in Bulgaria since petroleum is now both the primary source of energy input and final consumption. In addition, the petroleum market is the primary source of government revenues from the energy sector, primarily via the excise taxes levied on motor gasoline and diesel fuel. Moreover, Bulgaria is nearly 100 percent dependent on crude imports and increasingly dependent on petroleum product imports to meet domestic supply requirements. This degree of import dependency has led to considerable frustration in

managing domestic price and customs policies in the face of extremely volatile international prices in recent years. Finally, the need for concerted action in analyzing petroleum pricing, fiscal and financial relationships is underlined by the size and strategic value of Bulgaria's oil refining, distribution and marketing facilities and the associated large indigenous markets for petrochemical products.

The severity of the financial situation faced by Bulgaria today is evidenced by the fact that perhaps Bulgaria's single largest energy asset, the Neftochim Burgas refinery, has recently been shut down. The refinery has been unable to compete with imported products as demand has plunged and unit costs have increased substantially relative to international competition. The economic condition of Burgas has been created in part by government's own fiscal and regulatory policies, which place the refinery at a disadvantage to product importers. One aspect of the problem is the inconsistent enforcement and collection of tax and customs duties. In particular, Bulgaria's recognition of tax exempt status to a range of public service and related high priority users creates potential for abuse. In addition, less than uniform enforcement of fuel quality inspection and testing standards opens the system to potential product mis-certification. As a state-owned company subject to more diligent reporting requirements, Neftochim operates at a disadvantage in relation to importers dealing in hard currencies, prompt payment, limited accountability and lower price and cost structures. These conditions have worked severely against the Burgas refinery, to the point that it currently is running no term or direct purchases of spot oil, but instead must resort to processing third party oil under relatively low fee structures (i.e., not fully re-capturing even incremental operating costs) in order to keep the plant operating at some minimum level. The refinery's operating rates averaged less than 50 percent of through-put capacity over the first half of 1992. Most of this volume was under processing agreements, or funded from a special World Bank credit facility which ended in March 1992. As of June 1992, the Burgas refinery was at least temporarily shut down owing to a strike and inadequate funds to purchase crude oil.

The refinery continues to negotiate terms for third party processing arrangements, but these agreements typically provide a fee payment to the refinery which covers only a fraction of its true operating costs, and is inadequate to finance necessary capital

investments, or even to provide a cash flow through which direct crude oil cargo purchases could be financed. As a result, the refinery finds itself in a position of having to buy back its own processed product in order to meet domestic demands, or risk losing additional market share to importers.

In Bulgaria, oil pricing policy is set primarily by the Pricing Commission, with input from the Ministry of Industry and key producing and consuming groups. In the case of the petroleum sector, the key producing group is the state-owned Neftochim refining and petrochemical company, which controls the large Burgas refining company. Historically, the technical expertise to perform detailed petroleum market analysis, and the source of most data collected on the domestic oil economy has been Neftochim, and more precisely its computer and analytical support division called Neftosoft. Neftosoft provides a range of analytical support services to the refinery's management, including forecasting, accounting, refinery process unit simulation and other technical services. Neftochim, in turn, prepares analyses that are submitted to the various Ministries and directly to the Pricing Commission.

Although Bulgaria's Pricing Commission has reportedly increased its technical capabilities over the past year, it is not directly staffed or structured to engage in original data collection and analysis in the Petroleum sector, a role that Neftochim/Burgas has historically filled. Oil market data is collected by a number of sources within Bulgaria, such as customs, the tax collection activity of the Ministry of Finance, Petrol and large end-users, but the most consistent and historical data have been collected directly by the Neftochim Burgas refinery. The Government's Central Office of Statistics apparently obtains data from a variety of these sources, but performs no original collection or analysis functions. The most consistent records and highest level of analytical capability for oil product pricing analysis resides at Neftochim.

### **C. Delivery of Petroleum Product Pricing Model**

As a result of Neftochim's historical position in collecting and analyzing oil market data, its continued input to the Commission on Prices, and their well-equipped and staffed computer support services, IRG concluded that the most useful recipient of a technical modeling tool in the petroleum sector is the Neftochim Burgas refinery, and specifically its analytical support group, Neftosoft. Moreover, it is clear that Burgas is at the center of Bulgaria's policy turmoil regarding the appropriate role of government in regulating market prices through tax and duty policies. Indeed, Neftochim is not only an interested party, but the one with most at stake in properly characterizing the impact of government tax and trade policies on the domestic industry. Neftochim presents a potential conflict of interest in representing its side in any analytical interpretation of its own data. However, this bias may be more than offset by its access to actual sales records and transaction prices, as well as specific estimates of refinery production costs in meeting particular volume or fuel quality objectives.

The model delivered to Neftochim Burgas' Neftosoft Division is called the Burgas Refined Product Pricing Model (BREF). This model uses commercially available spreadsheet software tools to demonstrate and test the impact of different refined product pricing policies on product demand, tax receipts and refinery operations. The model accounts for currency value fluctuations and can be modified to reflect a range of refinery process investments and their associated costs, from simple "de-bottlenecking" to the addition of new process units. BREF can help to determine whether price levels are sufficient to recover capital costs, environmental and other cost factors. A full description of the model is included as Annex D to this report in the form of a User's Guide.

The BREF model has been delivered to Neftochim/Neftosoft, where it is anticipated that the forecasting and analysis section will be the primary operator. This group is anticipated to function in support of the newly created trading and supply activity. This group has received in-country training on the model's operation, and has been advised on the desired price, cost and related economic data which should be included in the choice of input parameters. The BREF model is intended to support mid-term planning activities in a 1-

to-5 year time frame. Longer-term planning and analysis studies are normally prepared for the Ministry of Industry and Trade or the Ministry of Finance. An example of the sort of policy analysis which the BREF model will support is the analysis of refinery "make vs. buy" economics under assumed tax, customs and operating levels. Such analysis would be useful in evaluating the impact of various price and tax policies on the competitiveness of the domestic refinery relative to imported product prices, hence the outlook for the Burgas refinery's utilization rates. This forecasting analysis system would complement the use of a detailed refinery optimization model, in that the latter would provide more detailed information on incremental operating costs and margins associated with processing various crude oils, while the BREF system would allow for numerous forecast scenarios to be tested, with volumetric and price outcomes fed back into the development of additional refinery optimization case studies.

#### **D. Modeling Capabilities in Other Fuels**

Aside from the petroleum sector, where the emerging expertise is based in the Burgas refinery's technical support group, Neftosoft, the degree of interest and ongoing activity in applying energy pricing models was limited. In the natural gas sector, the total reliance on imported Russian gas under relatively confusing price terms has limited the GOB's interest, through state-owned Bulgargaz, in pricing gas to reflect market conditions or policy objectives. However, the recent volatility of gas prices, whether linked to fuel oil or to changing ruble clearing values, has motivated a number of major industrial end-users to evaluate the price of gas as a function of their comparative cost structure.

This understanding of the microeconomic implications of gas price changes was not observed to be matched by similar interest at the macroeconomic level. There appears to be no demonstrated experience in the use of price modeling tools to evaluate the impact of alternative pricing and/or regulatory policies on either their own industries or, more broadly, the macro economy. In the Pricing Seminar the IRG team identified and detailed the three primary components of most energy price models: the supply component, the demand component and the pricing component. In Bulgaria, the supply component is fairly simple, and could be modeled through the specification of a single (Russian) gas supply curve at

the moment. The demand curve would consist of an amalgamation of Bulgaria's 10+ primary industrial users of gas, then further specified to reflect seasonal, peaking or other use characteristics. The pricing component would be established as the meeting of the supply and demand curves, coupled with any additional policy objectives sought in pricing gas. These might include some subsidy to encourage gas use, particularly among high priority industrial and utility plants, and to limit oil and coal consumption. A useful first step in delivering a modeling capability to Bulgargaz or the Ministry of Industry and Trade would be through the delivery of a multi-fuel model, such as the Total Energy Resource Model (TERA) of the American Gas Association, which would be modified to reflect Bulgaria's unique energy demand and supply alternatives. Such a tool would be a useful building block around which long-term multi-fuel investment decisions could be analyzed, and a central analytical tool for the proposed department of energy to utilize.

## CHAPTER 5

### SUMMARY AND RECOMMENDATIONS FOR FURTHER ANALYSIS

#### A. **Price and Policy Reforms Implemented to Date**

As a result of the transitional government in place for most of 1990 and 1991, significant energy price reforms were not implemented in Bulgaria until 1991. These changes were motivated by the necessity to pay world market, hard currency prices for imported oil and gas. Since the democratic government's November 1991 election, a number of price policy reforms have been implemented within the overall objective of removing subsidies, and adjusting prices to reflect free market levels where adequate competition either exists or can be generated. Bulgaria's overall energy pricing policy is one of maintaining price regulation in energy sector activities having the character of natural monopolies, and eventually moving towards full decontrol in oil and coal pricing, subject to structural re-organization within each of these sectors.

The maintenance of government controls in the gas, electricity and district heat sectors also reflects the political and economic reality of gradually phasing higher energy costs through the economy. As is the case throughout the ECE region, household incomes, business and government budgets have been severely strained by rising energy costs. Thus, the decision to phase out subsidies is necessitated for political and macroeconomic stability. On the other hand, raising energy prices serves as an impetus to encourage conservation and improve the economic payback from energy efficiency investments. Greatest immediate payback are in the industrial sector and also in thermal energy generation. Payback for conservation, particularly in the use of district heat, are also great in the household sector, but the lack of metering equipment limits the GOB's ability to raise prices. As a result of these conditions, the GOB has consciously allowed the subsidy to household consumers of heat, electricity and natural gas to remain subsidized relative to industrial consumers. The degree of the subsidy is estimated to range between 40 and 70 percent for household consumers, and perhaps half that amount for industrial users. Greater analysis needs to be

done on the true long-term marginal costs of costs of energy service to each customer class so that the GOB can adopt a rational strategy of phasing in price increases and reducing cross-consumer subsidies contained in natural gas, heat and electricity rates.

In the petroleum sector, price reform has taken the form of opening Bulgaria to imported petroleum products (eliminating the import monopoly of the state-owned companies), formally linking maximum allowable sales prices to a formula based on world market prices. Excise taxes and relatively modest import duties are added to the world price to achieve fiscal and conservation goals. The excise taxes remain relatively low by Western European standards, and should be gradually increased over time. In addition, the GOB should seek to rationalize its excise tax, import fee and Income tax policies in order to reduce the resulting price distortions and abuses in the system which currently plague the creation of a level competitive playing field among the domestic refiners and marketers and importers. In order to be effective, the current excise tax, exemption, import duty and income tax procedures would require a significant investment in scarce government resources to enforce. Aside from simply not reporting imports and transactions, a major loophole exists in the recognition of certain tax exempt consumer classes, initially intended to be related to a crucial public service or economic activity, but which reportedly extends to labor unions, schools and a number of other activities which potentially function as middlemen re-directing un-taxed and mis-certified product to non-exempt customers at a below-market price, accentuated by prompt payment terms often in hard currency, rather than leva. This exempt customer loophole should be ended and the tax structure, including its incidence and collection aspects, should be analyzed not only from the perspective of establishing the desired revenue and consumption incentive effects, but also from the point of simplifying the process to reduce incentives to cheat and limit the cost of effective enforcement. In short, continued price and tax reform in the petroleum sector needs to be combined with rational enforcement efforts and the reduction of opportunities for tax and customs abuse.

A balanced policy also needs to be established towards the Burgas refinery if major investments in the refinery's process units are to be justified on the basis of projected economic returns under the current tax and duty structure. Refinery officials have expressed the concern that they function at an extreme disadvantage to importers due to the refinery's

adherence, as a state-owned company, to excise tax, income tax and fuel quality requirements, and their primary payment in leva, often on a delayed basis, unlike many importers, who may function on the black market in hard currency. While a number of factors contribute to the domestic refiner's declining competitive position, steps clearly need to be taken to identify those disadvantages which can be corrected, and those abuses of the system which can be ended through both a change in the rules and a change in enforcement tactics.

If foreign investors are to be allowed to establish retail outlets and otherwise become involved in the downstream end of the industry, they will seek some guarantee of supply access and equal treatment under the tax and customs laws. The potential benefits of stricter tax and duty collection enforcement are substantial, particularly in light of Bulgaria's relatively low cost of fuel and location advantage at a crossroads of both overland and waterborne traffic. Foreign capital is desperately needed to finance the cost of upgrading the downstream petroleum infrastructure in Bulgaria. Efforts to encourage such investment will be aided by the adoption of reform steps which demonstrates the GOB's commitment to establishing a truly competitive market climate and the reduction of opportunities for system abuse. A major issue for potential investors in Bulgaria's downstream market is that of reliable and equitable access to supplies. Such guarantees can be made with greater confidence if both the refinery, bona fide importers and foreign investors (i.e., those with significant capital investments at stake) can operate on equal terms without concerns about counter-productive government exemptions, tax, duty and fuel quality regulations which encourage the continuation of an erosive black market.

## **B. Recommended Studies**

A number of potential studies would be supportive of Bulgaria's efforts to re-organize and rationalize its energy pricing policies. Government policy in the areas of tax, trade, tariff and related subsidy levels will have a significant impact on the attractiveness of the Bulgarian energy sector for not only foreign investor, but also for the internal allocation of capital. Abuses in the current system should be removed before they become long-term, endemic practices which become politically difficult to remove. A brief description of potentially fruitful

areas of further research follows.

1. Petroleum Sector

The GOB needs to re-establish its control over the domestic petroleum market by creating an investment environment which will attract foreign capital in the grossly neglected domestic infrastructure, from exploration and production to marketing. Several specific areas of investigation which warrant attention include:

- a. an analysis of alternative approaches to taxing petroleum product consumption, and the potential revenue gains to be made from alternative tax and enforcement strategies.

Among the approaches to consider are 1) the use of a uniform value added tax, (VAT), supplemented with specific fees at the end-use level, 2) removing the exemption status of certain users, and moving tax incidence further downstream (e.g., to the point of final consumption, to minimize abuse and maximize ease of collection).

- b. an analysis of the potential value and economics of the Burgas refinery under alternative process investments, cost reductions, market and operating assumptions, as a first step towards integrating tax and customs measures with a longer term plan to privatize the refinery.

Investments in Burgas (and the Pleven refinery) must be analyzed under various price, demand and tax scenarios. The GOB needs to fully understand, and attempt to quantify the linkage between its pricing and trade policy and the potential value of its refining sector.

- c. an analysis of the investment requirements needed to upgrade Bulgaria's pipeline, port, storage, rail and retail petroleum product distribution network, and financial approaches to funding this investment, including tax incentives and ownership on "discounted" terms, marketing licenses, targeted fees on product sales, etc.

Efficient operation and necessary capital requirements both argue for a policy of inducing foreign investment under terms which will improve Bulgaria's petroleum infrastructure, and solidify government control over the flow of revenues derived from

an expanded oil market. Bulgaria's infrastructure needs are numerous, and should be addressed with a well-planned regional approach to the introduction of foreign capital through privatization. Such action might initially take the form of joint venture activity among foreign companies and Petrol (the current state monopoly distribution and marketing company). In a transition phase the GOB might consider breaking Petrol down into regional units with the simultaneous objective of creating private (joint venture or partnership) affiliations with foreign companies. Such a structure should improve the reliability and cost of service, and ultimately encouraging competition among the various Petrol spin-off and private investor entities as they compete for greater territory and market share. Various approaches to valuing the marketing and distribution infrastructure and territorial assets of Petrol's existing operations and should be initiated along with the evaluation of a variety of third party funding and equity approaches to stimulating privatization and the rational re-structure of Petrol into smaller private units.

## 2. Commercial Price Hedging Strategies (Oil and Gas)

An additional subject of investigation which would appear to have merit in Bulgaria, owing to its nearly total dependency on crude oil and natural gas imports, and therefore severe micro and macro-economic exposure to rising oil prices, is the potential use of commercially available commodity price stabilization techniques in the form of a either long term swap or price cap linked to oil prices, or a series of shorter term hedges designed to guarantee price terms to end-users. These strategies could be evaluated as a means of stabilizing fuel costs in a commercial (not regulated) manner. From a purely competitive perspective, the incentive to fix or otherwise cap prices may also be attractive in terms of controlling production costs and improving the stability of energy resource costs in order to improve budgetary and resource planning in production costs and related margin controls.

Such activity, however, requires financing either in the form of up-front premium payments (for option-type insurance) or a margin account in the case of swaps or futures-styled hedges. Given the limited financial resources of indigenous Bulgarian companies and banks, any widespread efforts to pursue such hedge strategies would rely on external

funding from either commercial or international lending institutions. The incentive for such institutions to participate in such a strategy would have to be expressed in terms of the major benefits to Bulgaria's indigenous industry and in to the overall economy; specifically in reducing exposure to further price inflation during the transition to a decontrolled price environment and reduced reliance on government subsidies. The basic concept would be to establish a long-term fixed or capped price for crude oil, as the raw material cost base for petroleum products and natural gas (recall that Bulgargaz purchases gas from Russia under price terms tied to the price of residual fuel oil). This price insurance, coordinated through a financing intermediary and the recipient oil or gas-consuming (Bulgarian) company(ies), would temporarily insulate these enterprises, and well as their customers, from the deleterious effects of rising energy prices in the form of higher production costs and related inflationary pressures. Bulgargaz might attempt to recover the costs of financing such a hedge through the imposition of fees on participating gas customers. Because such hedging activity would presumably be limited in its forward duration by financial constraints, incentives to conserve energy and invest in related efficiency technology would not be blunted. Indeed, such a strategy is viewed as a transition price risk management approach which should preclude the need for government regulatory action to achieve the described macro and micro-economic benefits.

In the case of petroleum, the price stability which Neftochim could offer on its product sales, backed by a hedged price of crude oil, would provide it with a unique advantage in both retaining and expanding its customer base. This stability feature would be particularly beneficial in a rising price environment because competitive supplies would be priced in reference to rising market prices. In periods of declining prices price stabilization would confer little apparent advantage, except that in the case of a cap price arrangement, the price charged by Neftochim could freely decline with the market price, but would continue to offer upside protection. Moreover, the downward price movement could be matched by the hedging company (e.g., Neftochim) if the upside price hedge against crude oil prices were coupled with a downside (short sell) hedge on refined product prices. This would in effect lock in a gross refiner's margin or "crack spread" in the parlance of the trade. This strategy alone is often considered when undertaking investments in refinery process additions or improvements in order to insure the differential or gross spread between crude oil costs and

refined product sales prices.

In the case of natural gas, price insurance linked to crude oil would serve as a hedge against Russian gas imports linked directly to the price of fuel oil (mazut). This would stabilize a large component of Bulgargaz's imported fuel costs, and enable major gas users to plan their operations without having to be concerned about gas price volatility, particularly to the up side. To the extent that the crude oil price hedge limits domestic fuel oil price increases, the price of gas would be restrained. Again, incentives to conserve and invest in more fuel efficient technologies should not be reduced in the course of undertaking this strategy, as efficiency and price protection are ultimately aimed at the longer-term goal of minimizing energy costs relative to energy value.

The benefits of natural gas price hedging to Bulgargaz and its customers would depend on the degree to which stable gas prices would encourage demand, and allow gas projects (and general use) to be expanded due to the removal, or at least reduction, of a substantial component of price risk. This benefit was discussed in some detail by representatives of major industrial consumers and the Ministry of Industry in both Component 4's technical assistance on gas pricing and the oil procurement seminars of Component 3 of the Energy Emergency Program. Like the oil price cap, the insurance premium or margin costs of a program targeted to natural gas consumers would have to be funded from external sources, at least in the near term.

Another major benefit of a price hedging programs, which is particularly pertinent to the petroleum sector, relates to credit terms and the difficulty of Neftochim Burgas to obtain financing for a crude oil cargo. Under a capped price arrangement the refinery's expected gross margin between crude oil acquisition price and refined product sales price becomes far more predictable, and should improve the cash flow and financial capability of Neftochim to re-establish control of crude acquisition and product market sales. Furthermore, a price hedging program could formally be linked to oil cargo finance through the participation of a foreign bank or other investor in the operation of the Burgas (and possibly even) refinery(ies).

Importantly, such programs should not be viewed as restrictive of competition, as any private importer would be free to engage in the same price hedging activity on its own account. The intention would simply be to provide the Bulgarian companies a funding vehicle through which economic benefits to consumers in the form of stable prices, and reduced energy price inflation would be transferred. At the same time, the price fixation elements and finance elements of the program would provide the state oil and gas companies, and their customers, with an improved capability to plan production decisions and reduce the costs of raw fuel price risk on their operations. On a commercial basis, this is an important potential option to consider in a country attempting to re-establish some control over markets for its indigenous suppliers while remaining particularly vulnerable on a macro-economic and industry-specific level to further increases in oil and gas prices.

### 3. Other Fuels

Fuels pricing studies which fit Bulgaria's overall energy sector development and institutional strategy, and which relate to one another via the link of generating appropriate signals for finance, should focus on:

- 1) rate design in the electric, gas and heat utility areas, and
- 2) approaches to financing desperately needed infrastructure rehabilitation and expansion projects in all fuel production, transportation and distribution facilities, including privatization strategies.

Several revenue-based or equity incentive approaches were suggested under the petroleum sector discussion, including the need to induce external investment by developing an operable framework for privatization, starting in the downstream marketing and distribution phase of the petroleum market. Equally urgent attention needs to be given to the "regulated" fuel sectors. In the electric utility sector, the need to develop additional peak power generation, reduce peak demand through demand side management measures, and to improve the internal transportation and distribution system, in order to move electricity more effectively to meet peak demand should take priority. As noted, the Committee on Energy specifically indicated their interest in learning more about rate-making procedures, including

the use of western models, modified to their situation (including accounting law, political technical constraints). Capital to fund investments in the electric power transmission and generation infrastructure should be pursued and analyzed, including a variety of equity, privatization or supplemental fee approaches.

In order to make a rational rate-making policies, the COF also recognized their need to better understand the use of financial models to evaluate such issues as the rates of return needed to induce new investment and how to structure rates to include an adequate return on investment. Such financial models are based on accounting practices, with particular attention given to measuring allowable depreciation costs. The broader objective of such an analysis might be to recommend appropriate adjustments to Bulgaria's accounting laws in order to establish western principles which recognize the need to fully recover depreciation expenses and achieve a rate of return which will generate the desperately needed capital investment in system upgrades and new plant.

In the district heat sector, investments in fuel use measurement and efficiency instruments could conceivably be evaluated under a program of "efficiency payments", whereby the resulting energy use reductions are credited to a customer's account on a declining scale (much like depreciation), simultaneous with an increasing tariff "ramp" to encourage efficiency. Alternatively, providers of efficiency and metering equipment could be paid in heat for some percentage of their savings, with the payment terms guaranteed to improve over time under an increasing rate schedule for heat.

Other programs in natural gas which might be pursued include the analysis of the most economic approach to expanding Bulgaria's access to international gas supplies outside of their current restrictive access to Russian supplies. In addition to the prospect of having access to "exchange gas" from Iran under the proposed regional (Turkey) gas pipeline project, alternative options including LNG and a tie into transmission systems running through Yugoslavia and Austria should be considered. On the rate-making side, Bulgaria should take steps to develop a transportation and distribution tariff which reflects the marginal service costs by customer class and region. This will tend to encourage gas use where it is most economic and result in a more efficient set of price signals to

encourage an increase in demand and via which system expansion could be financed and utilization rates improved. In short, the gas industry needs to be evaluated to determine how inter-fuel and inter-regional pricing can better reflect marginal costs, and gas resource investment signals can be improved.

**ANNEX A**

**SUMMARY OF TECHNICAL ASSISTANCE RENDERED**

## ANNEX A

### SUMMARY OF TECHNICAL ASSISTANCE RENDERED

#### A. Overview

Assisting the transition to market economies is one of the principal areas of emphasis in the U.S. strategy to aid the new democracies in Eastern and Central Europe<sup>1</sup> (ECE). At an early stage in the process of transition to democracy and a free market economy, the U.S. Agency for International Development (USAID) recognized that instituting rational pricing and taxation systems is of critical importance in energy and other economic sectors. Under the former centrally-planned economic system in the ECE region, energy prices were heavily subsidized and did not reflect world price levels or the economic costs of production. This resulted in widespread distortions in energy resource allocation, consumption and energy inefficiency. In addition, with the declines in Soviet oil deliveries, higher international oil prices, and the switch to hard currency payments for Soviet oil and gas in January 1991, the ECE countries are faced with difficult decisions on the nature and rate of price reform.

In order to support the ECE countries in their efforts to rationalize and reform their energy price systems, USAID developed technical assistance for *Energy Price Reform Program* (Component 4) under the USAID-funded Emergency Energy Project in Eastern and Central Europe. The objectives were to assess the current pricing regime, to identify critical issues confronting the governments of ECE nations, to evaluate the analytical resources available to the Government of Bulgaria to assess the impact of energy pricing reforms, and to provide training to improve the Government's analytical capabilities on pricing issues.

#### 1. Contractor Team

International Resources Group, Ltd. (IRG) was selected in February 1991 as USAID's prime contractor to carry out this technical assistance in Bulgaria. Working with IRG in Bulgaria were its subcontractor Energy Security Analysis, Inc. (ESAI) and Benjamin Schlesinger & Associates. The principal personnel conducting the technical assistance tasks under this contract, along with their primary responsibilities, are listed in the following table:

<sup>1</sup> Refers to Bulgaria, Czechoslovakia, Hungary, Poland, and Romania. However, this report covers only Bulgaria.

**Participants in Component 4: Energy Pricing Reform  
Bulgaria**

<u>Participant</u>	<u>Function</u>
Dr. Charles Ebinger	Project Director
Mr. John Banks	Project Coordinator
Mr. Rutherford Poats	Energy Economics
Dr. Donald Hertzmark	Electricity Price Modeling
Dr. Edward Krapels	Petroleum Pricing
Dr. Benjamin Schlesinger	Gas Pricing & Rate-making
Dr. Lori Smith Schell	Gas Pricing & Rate-making

**2. Technical Assistance**

The IRG Team performed the following energy pricing technical assistance in Bulgaria:

- monitored existing price levels and changes for each fuel (petroleum products, gas, and electricity) over the life of the contract;
- evaluated the pricing policy decision-making process (and responsibilities/functions of various government ministries/agencies);
- analyzed the reforms already undertaken by the Government by the commencement of the project, as well as those implemented since February 1991 and policies/reforms under consideration;
- assessed the modeling and other analytical capabilities of those institutions involved in the energy pricing research/analysis and policy process, and;
- examined the critical issues confronting the Government as the reform process

evolved, particularly the social and political impact of changing (increasing) price levels.

Based on this ongoing assessment and feedback process, IRG identified the key pricing issues and fuel sectors that were of greatest interest to the host-country institutions. IRG then designed in-country training programs to address these issues, which included hands-on or "how to" discussions of pricing in the petroleum products, electricity and natural gas sectors. These training seminars included discussions on theoretical regulated and free market pricing concepts used in the West, comparative views of pricing systems around the world, and the applicability of different systems and concepts to the energy economy in Bulgaria. The participants attending the Seminar and Workshop represented a wide spectrum of individuals involved in the energy pricing system, including government agencies, suppliers, and end-users. Participants typically were from: the Ministries of Industry and Finance; key energy producers such as oil, gas and coal production companies, refineries, or power generators; transportation and distribution entities such as natural gas distribution companies, and large industrial consumers such as chemical plants.

Finally, IRG has conducted technical assistance incorporating the design and delivery of a petroleum pricing model to Neftochim, the state-owned oil refining and petrochemical company which functions both as the primary source of domestic petroleum product supply, and the primary data collection and reporting resource for the Bulgarian government. This task is geared to providing Bulgaria with an analytical tool (computer-generated program or spreadsheet) to support quantitative evaluations of proposed price, demand, and economic impact scenarios.

## **B. Summary of Technical Assistance Conducted in Bulgaria**

### **1. Assessment Mission**

During the week of June 24, 1991 Dr. Krapels of ESAI visited Bulgaria to commence project activities. The purpose of the visit was to meet with appropriate entities and assess the current status of energy price reform in the country, including an evaluation of the impact of any reforms already undertaken as well as the outlook for future policy decisions and

directions. In addition, Dr. Krapels examined the decision-making process, including the responsibilities and analytical capabilities of various institutions, and received feedback from the Bulgarian counterparts on the critical energy pricing reform issues confronting the country. IRG identified technical assistance needs and training seminar content designed to aid the government in its efforts to implement a economically rational and politically feasible system of price reforms.

Dr. Krapels met with the Committee on Energy, the Ministry of Industry and Trade, the Pricing Commission, and the Council of Ministers as well as U.S. Embassy staff. See Annex C for a list of individuals contacted during the trip.

## 2. Energy Pricing Seminar

IRG conducted an *Energy Pricing Seminar* in Sofia December 3-5. Approximately 35 individuals from the following Bulgarian organizations attended: Chimimport; Neftoimpex; Burgas Refinery; National Commission on Prices; Petrol; Bulgargaz; Ministry of Industry, Trade and Services; Ministry of Construction, Architecture, and Public Works; the Bulgarian Engineers Union; Thermoconsult; Intertrade; Energoproject, and; the Technical University (see Annex D for a complete list of attendees).

Dr. Krapels discussed oil and petroleum products pricing with a focus on: the likely impact on economic activity and energy consumption of potential petroleum product pricing policies in Bulgaria; a description of alternative pricing models, i.e., the French, Japanese, and free market systems; a discussion of the main objectives of petroleum pricing policies and the principal elements of petroleum pricing programs, and; the effects of product price decontrol programs.

Dr. Hertzmark provided an overview of the principles of efficient energy pricing and commonly-used approaches (for example by the World Bank) for developing, analyzing, and implementing appropriate energy pricing regimes. In addition, he discussed electricity pricing issues such as the objectives attainable through proper electricity pricing, marginal cost-based prices, pricing of generation, long-term vs. short-term prices, pricing of transmission, and distribution marginal costs.

**Dr. Schlesinger** examined natural gas pricing issues including: the structure of the natural gas relationship between USSR and Europe, including Eastern and Central Europe; supplies available to Bulgaria – methods and strategies to take advantage of lower cost local energy vs. distant suppliers; how rate-making works and how tariffs are designed to accommodate different end-users, and; how conservation and environmental legislation affects natural gas use.

### 3. Key Natural Gas Pricing Issues: Management Training and Strategy Workshop

During the period April 28-29, 1992, IRG conducted this Workshop in Sofia. Our purpose was to develop for the natural gas industry in Bulgaria, and related key people, an understanding of the important analytic tools and strategic imperatives related to the changing natural gas economic and pricing situation. Given the rapidly changing energy and economic situation in Bulgaria, IRG was seeking to ensure that the key natural gas policy people in Bulgaria are aware of the major issues and concepts as the situation unfolds. The Workshop was structured to incorporate a working group of individuals from across the gas industry (producers, government agencies, and end-users). See Annex D for a list of Attendees. The IRG Team comprised Mr. Banks, seminar coordinator and manager, and Dr. Schlesinger and Ms. Schell. Discussion topics included:

- an examination of gas pricing models used in the U.S. and their relevance to Bulgaria's gas pricing situation;
- natural gas supply issues, such as factors affecting future gas requirements in Bulgaria's domestic markets (economic growth, industrial development, and prospective domestic gas markets);
- factors affecting future gas supplies (delivered retail prices and reliability under existing gas purchase contracts, anticipated future prices of alternative gas supply sources such as various Russian fields, Iran, Western Europe and Central Asia;
- pricing implications for each supply source of field depletion rates, well strengths, gas quality and processing costs, and pipeline degradation;
- future capital requirements for field extensions, well work-overs, gas processing upgrades, and pipeline repairs, extensions, and expansions as well as implications for wellhead pricing;
- natural gas supply contract analysis;

- natural gas transportation issues such as Bulgaria's gas distribution and transportation infrastructure, and its capability to service current and future gas requirements;
- expansions and extensions required in Bulgaria's gas pipeline storage and delivery systems to service both domestic market growth and pipeline transit markets;
- the role of Bulgaria in a Pan-European gas network;
- natural gas transportation contract analysis; and
- implications for retail pricing of an open access gas transportation system.

#### 4. Neftochim Burgas Model Development

During the month of June 1992 IRG provided technical assistance to the Neftochim Burgas Refinery in the form of developing a supply/demand and pricing spreadsheet model. Developed by Dr. Hertzmark, the proposed model is an expandable spreadsheet-based system which provides a structure for examining the potential impact of alternative oil price, tax and regulatory policies on consumer demand, production vs. import economics and government revenues. The system will account for the role of currency and payment terms in determining the netback economics on petroleum product sales, and whether prices are sufficient to cover capital re-investment needs, environmental and related social policy objectives. The model will be developed initially for use by the forecasting and analysis section of Neftochim/Neftosoft, in support of Neftochim's marketing activities. On-site training in the use and applications of the model has been provided, and a user's manual will be delivered prior to contract termination.

## **ANNEX B**

### **KEY DOCUMENTS AND REPORTS PREPARED**

## ANNEX B

### KEY REPORTS AND DOCUMENTS PREPARED UNDER THE CONTRACT

<u>Document</u>	<u>Date</u>
● "Definitional Mission on Energy Pricing in Bulgaria"	August 1991
● "Bulgaria Energy Pricing Seminar", Trip Report	Dec. 1991
● Seminar Proceedings	Dec. 1991
- International Oil Price Formation and Information	
- Short and Medium Term Oil Price Analysis & Forecasting	
- International Oil Market Structure & Competitiveness	
- Trends in the Structure of the International Oil industry	
- Other Country Experiences in Regulating Oil Markets	
- Regulating Natural Gas Prices	
- Regulating Electricity Prices	
- Macroeconomic Issues in Energy Pricing	
- Energy Pricing Analysis: Methods and Models	
- Reforming Energy Prices: A Brief Guide	
● "Key Natural Gas Pricing Issues for Bulgaria", Trip Report	April 1992
● Seminar Proceedings	April 1992
- Analysis of the Bulgarian Natural Gas Market	
- Examination of Gas Pricing Models Used in the U.S.	
- Natural Gas Supply Contract Analysis	
- Natural Gas Transportation Contract Analysis	
● "Energy Price Reform In Bulgaria", Final Report	August 1992
● Monthly Status Reports	June 1991 - August 1992

**ANNEX C**  
**BULGARIA ENERGY PRICING SEMINAR**  
**List of Attendees**

## BULGARIA ENERGY PRICING SEMINAR

### List of Attendees

	NAME	ORGANIZATION
1.	O. Dimitrov	Chimimport
2.	Nikolai Nedelchev	Neftoimpex
3.	Maria Stojanova	
4.	St. Pinev	Neftochim - Burgas
5.	V. Georgieva	
6.	D. Velev	
7.	Dimitar Grivekov	National Commission on Prices
8.	Hristo Markof	
9.	Ivan Ivanof	
10.	V. Dardanova	
11.	Stanislav Tachev	Petrol
12.	Kaloyana Rassolkova	
13.	Irina Pavlova	
14.	Georgi Ronkor	
15.	Roumeu Venkov	
16.	Georgi Georgiev	
17.	Nikola Shamatanov	BulgarGas
18.	Milka Georgieva	
19.	Velin Lukanov	
20.	Dobrin Orechkov	Ministry of Industry, Trade and Services
21.	Petar Kamburov	Thermoconsult
22.	Hristo Hristov	Energo-Eco-Economy
23.	Gzozolan Gzozev	Intertrade
24.	Stefan Kantshovski	Energoproject
25.	Rossitsa Katschamakova	
26.	Ivan Sotizov	
27.	Margarita Atanasova	Technical University
28.	Simeon Batov	

- |     |                   |  |
|-----|-------------------|--|
| 29. | Basil Tzvetkov    | Bulgarian Engineers Union                            |
| 30. | Mihail Stoyanov   | Min. of Construction, Architecture, and Public Works |
| 31. | Zdravko Guentchev | " -  |
| 32. | Christian Spassov | Ecotech Product                                      |
| 33. | Raina Zlatareva   |  |
| 34. | Ivan Nicolov      |  |
| 35. | Dimitar Tomov     |  |

**ANNEX D**  
**NATURAL GAS RATEMAKING SEMINAR**  
**List of Attendees**

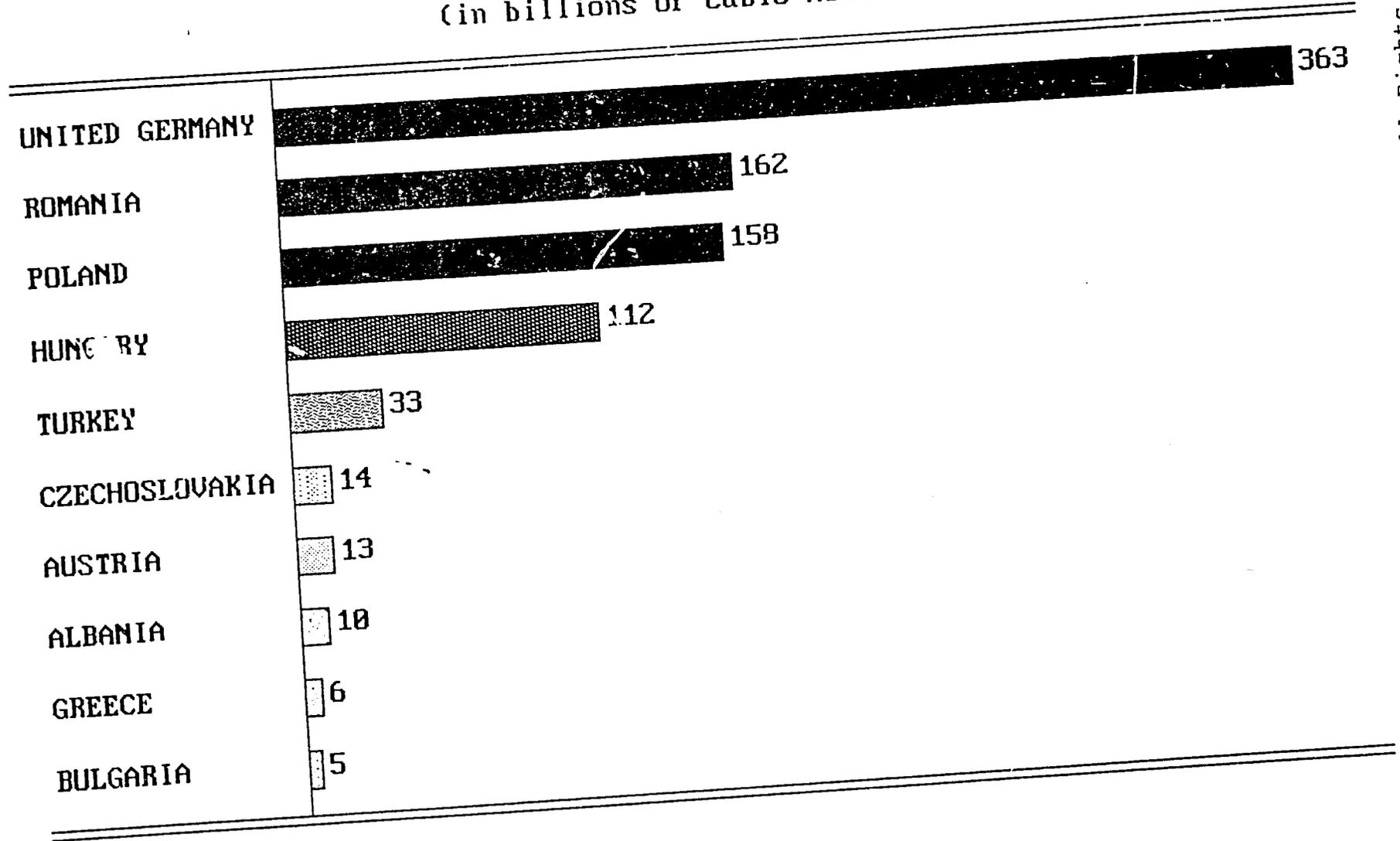
## Key Natural Gas Pricing Issues for Bulgaria: Management Training and Strategy Workshop

### List of Attendees

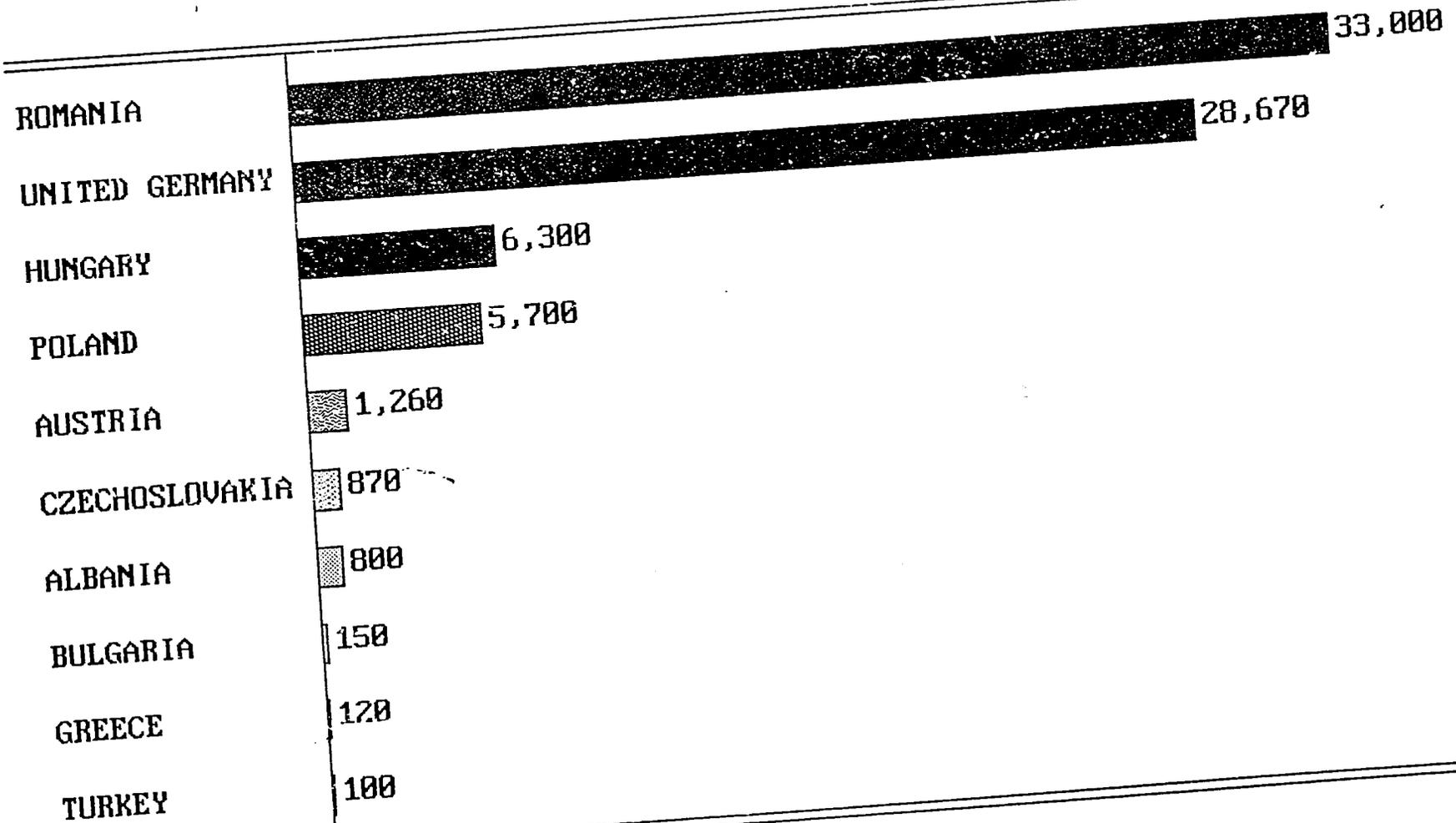
1. Stoil Simov Associate, Committee on Energy
2. Todor Ivanov Associate, Committee on Energy
3. Emilia Boeva Inspector, Committee on Energy
4. Nikolay Komarov Chief Expert, Ministry of Industry and Trade
5. Dobrin Oreshkov Ministry of Industry and Trade
6. Georgi Rogadiev Head of Dept., Power Production Co.
7. Slavei Spassov Chief of Energy Efficiency Dept. Anibiotic AD (Pharmaceutical Co.)
8. Ivan Grozev Deputy Manager, Neochim AD (Nitrogen/Fertilizer Co.)
9. Lubka Georgieva Energy Efficiency Dept., Ministry of Construction
10. Hristo Stoikov Ministry of Finance
11. Velin Lukanov Foreign Trade Dept., Bulgargaz
12. Milka Georgieva Head of Dept., Bulgargaz
13. Hristiva Stoyanova Head of Dept., Bulgargaz
14. Nikola Shamatanov Economic Manager, Bulgargaz
15. Nikolay Nikolov Head of Section, Chimko
16. Kichka Yankova Head of Economic Dept., Chimko
17. Margarit Mazhdrakov Chief Technical Specialist, Chimko

**ANNEX E**  
**NATURAL GAS MARKET DATA**

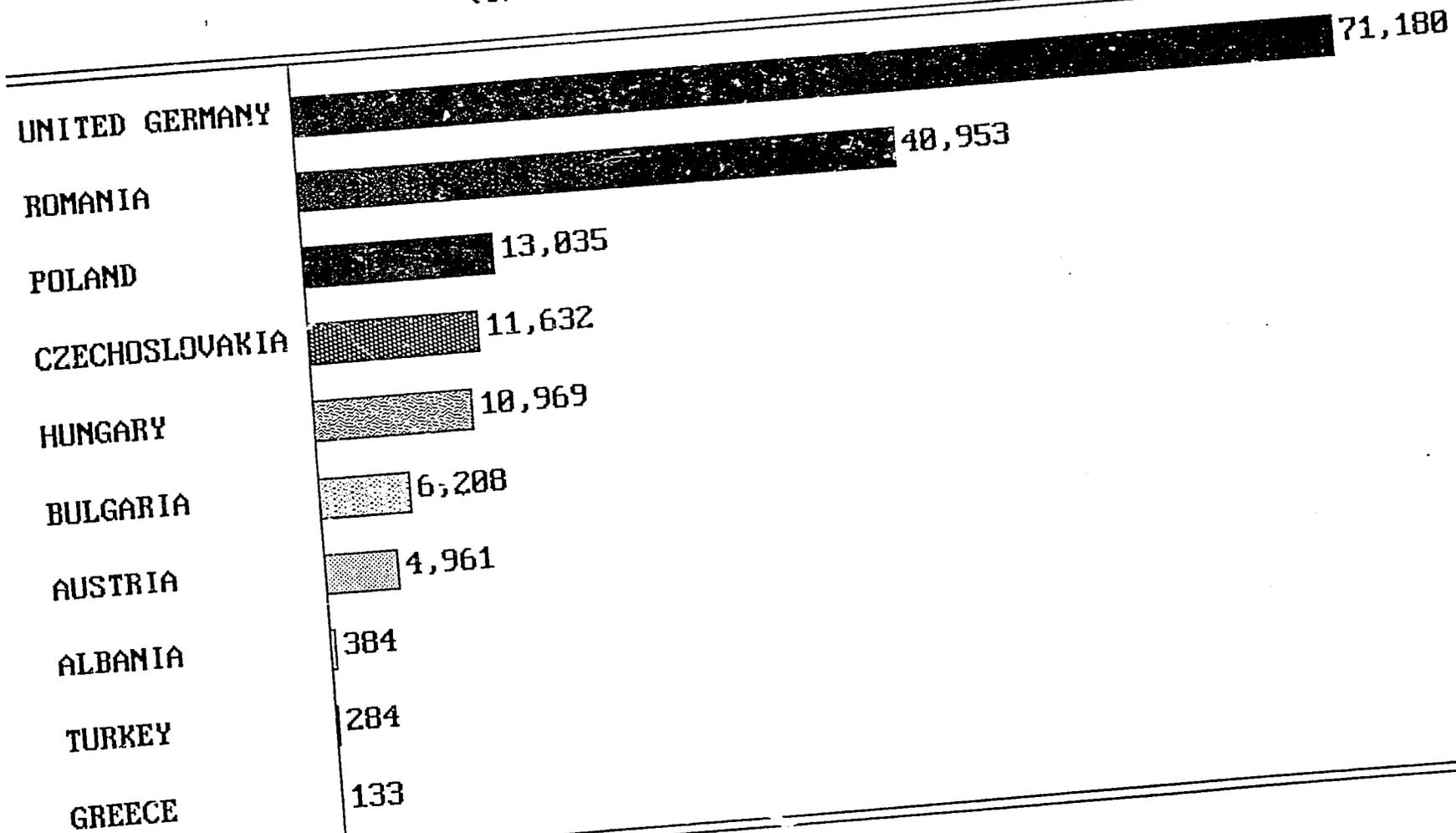
NATURAL GAS RESERVES (1989)  
(in billions of cubic meters)



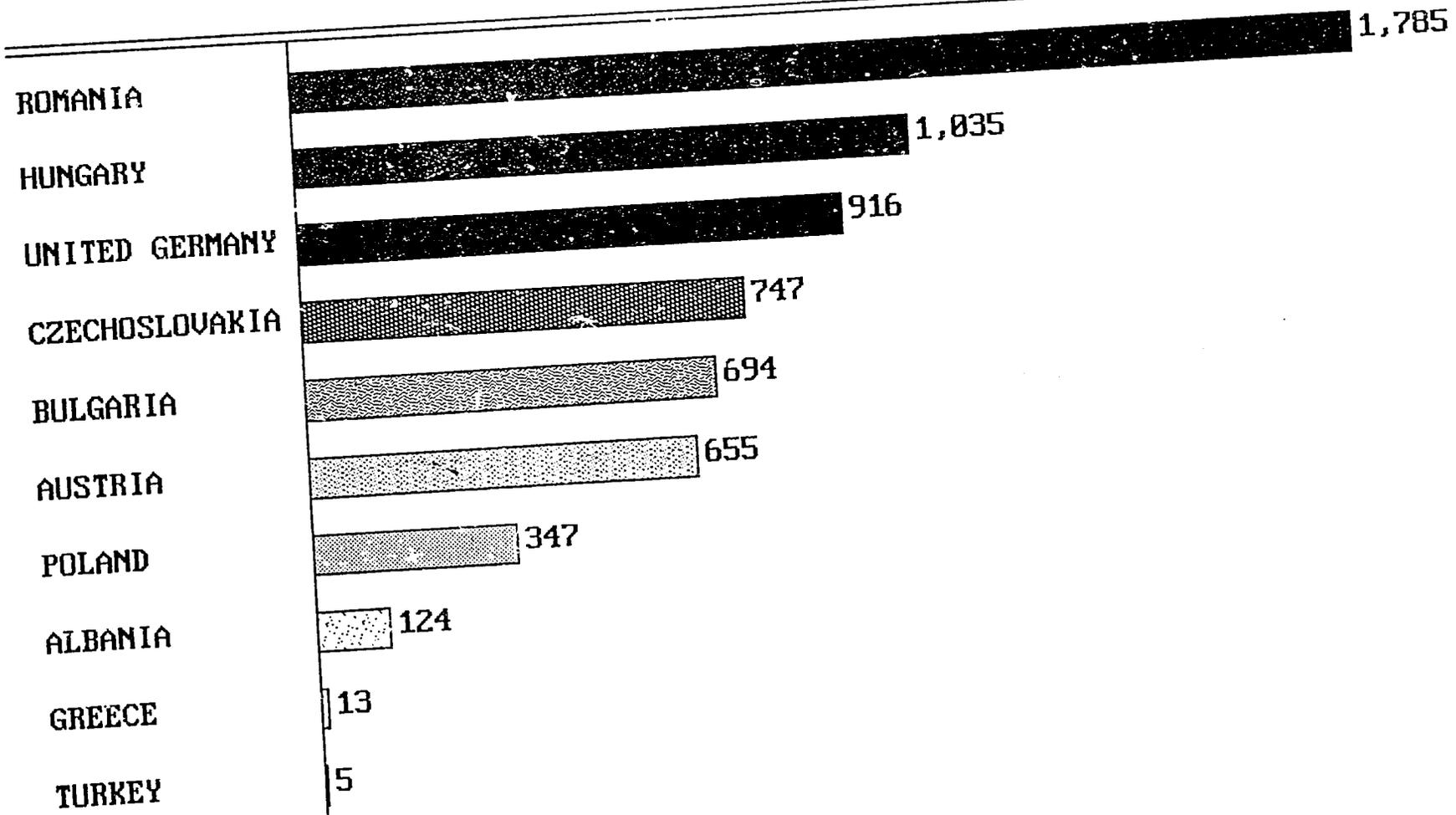
NATURAL GAS PRODUCTION (1988)  
(in millions of cubic meters)



NATURAL GAS CONSUMPTION (1987)  
(in millions of cubic meters)

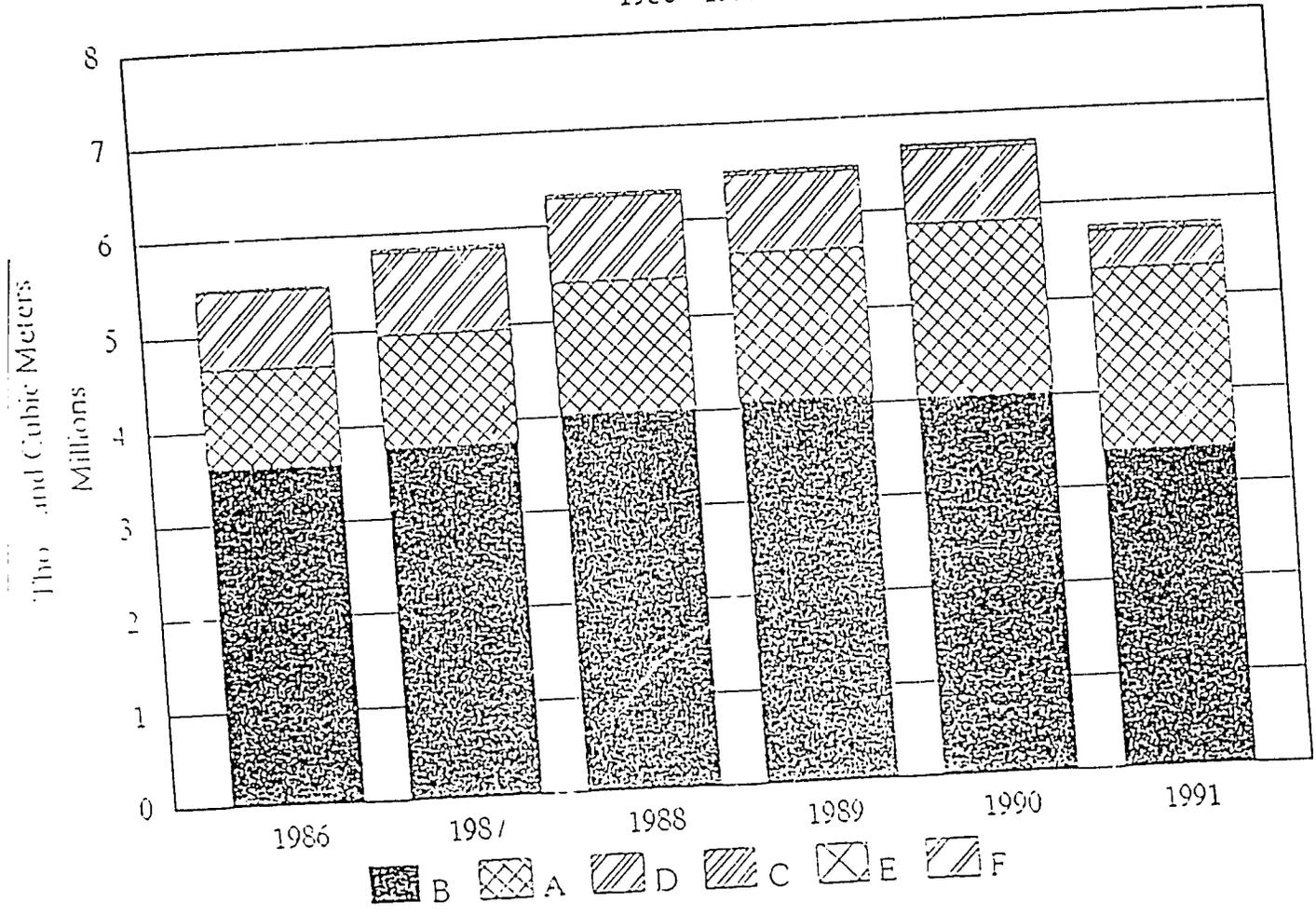


NATURAL GAS CONSUMPTION PER CAPITA (1987)  
(in cubic meters)



# BULGARGAZ NATURAL GAS DELIVERIES

1986-1991



A - COMMITTEE OF ENERGY

B - MINISTRY OF INDUSTRY AND TRADING

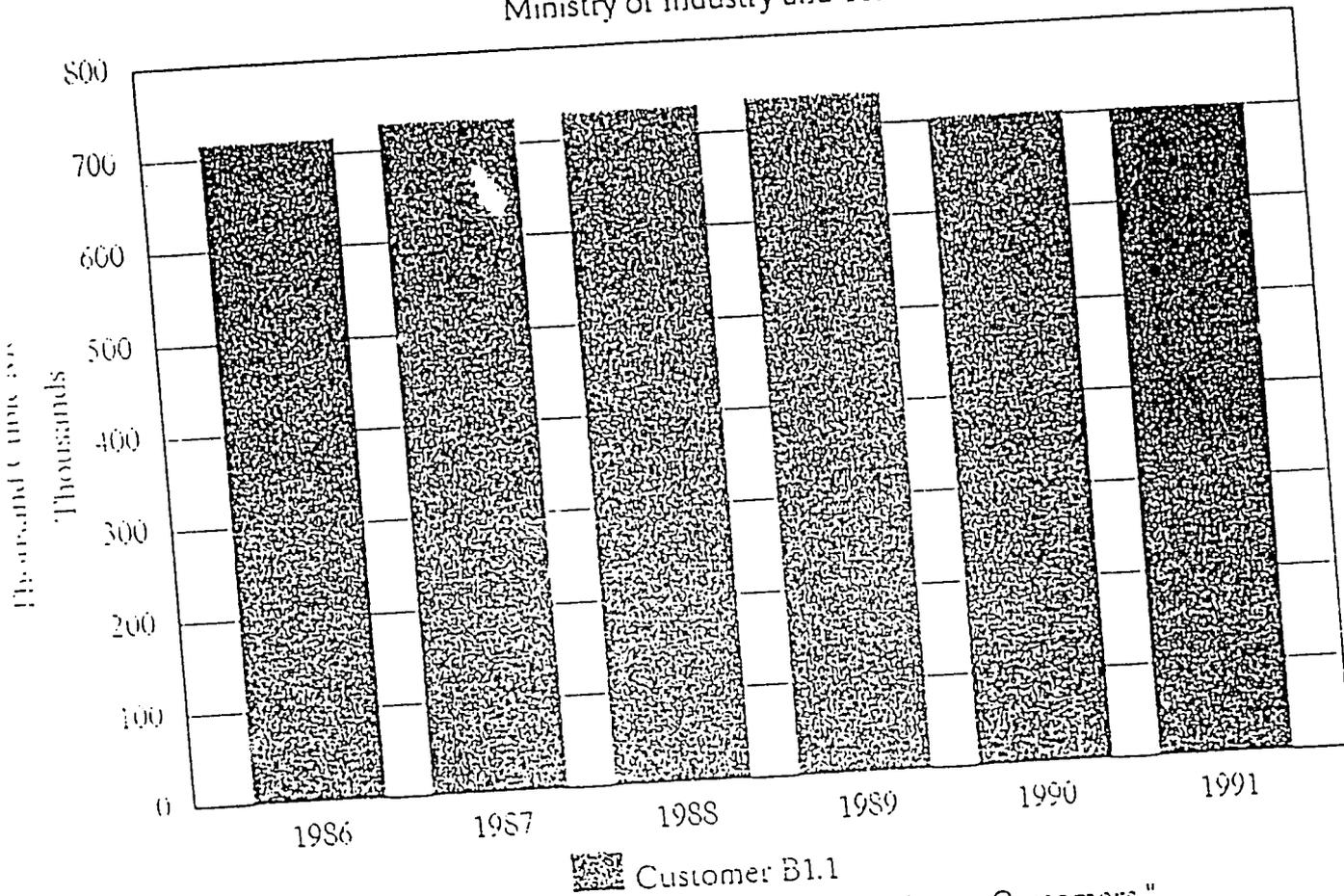
C - MINISTRY OF AGRICULTURE & FOODSTUFF INDUSTRY

D - MINISTRY OF ARCHITECTURE, HOUSING CONSTRUCTION & DEVELOPMENT

E - SPECIAL ESTABLISHMENTS

F - ASSOCIATIONS ETC.

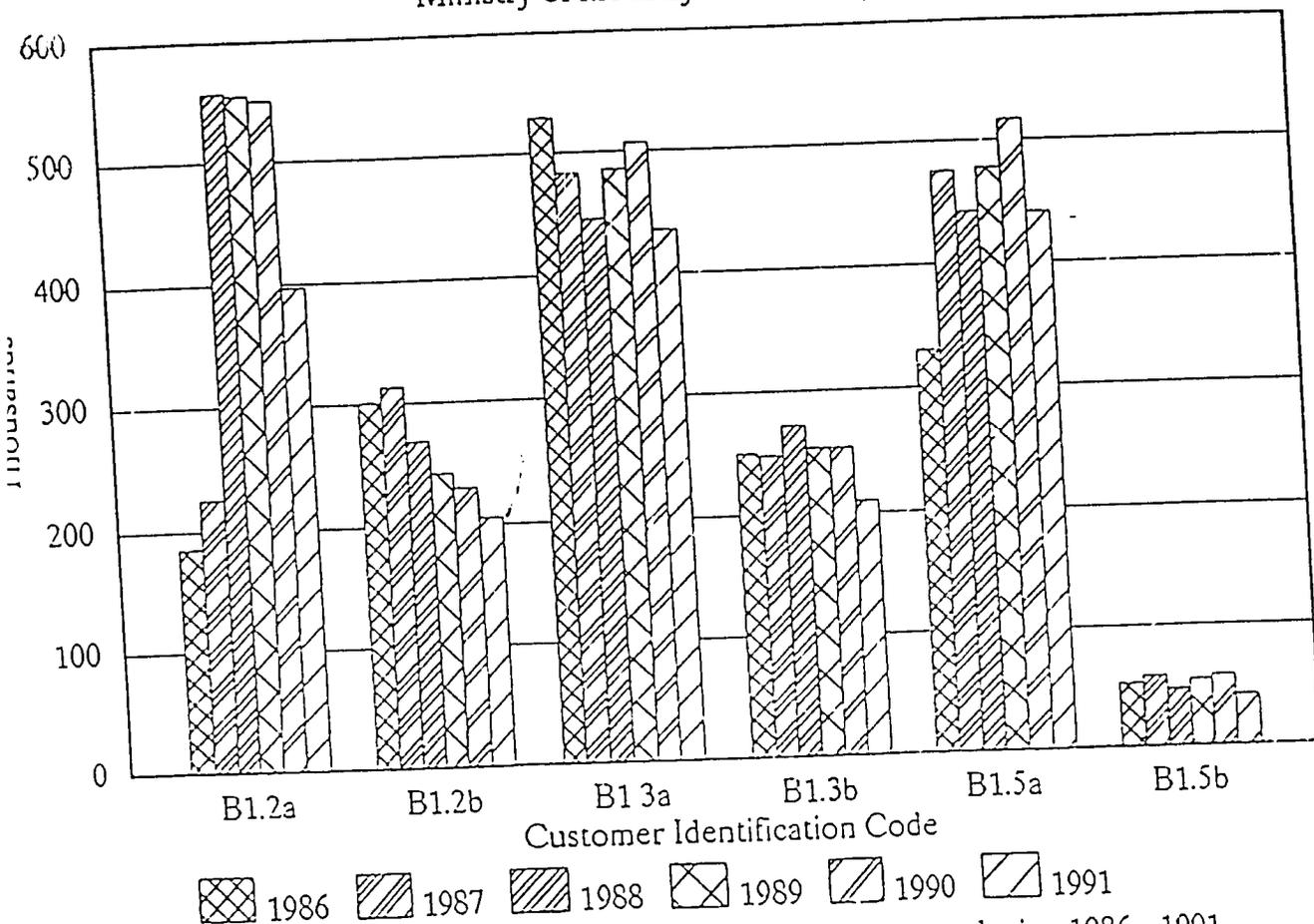
Gas Consumption By Largest Customer: 1986-91  
Ministry of Industry and Trade



"Largest Customer" is included in the group of Bulgargaz's 26 "Large Customers."  
The 26 "Large Customers" accounted for > 90 percent of total Bulgargaz deliveries each year.

B1.1 CHIMKO-STATE FIRM-VRATZA

Gas Consumption By Large Customers: 1986–1991  
 Ministry of Industry and Trade (1 of 2)



Large Customers" each consumed > 50,000 E3m3 in at least one year during 1986–1991.  
 The 26 "Large Customers" accounted for > 90 percent of total Bulgargaz deliveries each year.

B1.2a CHEMICAL TECHNOLOGICAL COMBINE WORKS - DIMITROVGRAD

B1.2b CHEMICAL TECHNOLOGICAL COMBINE WORKS - STARA ZAGORA

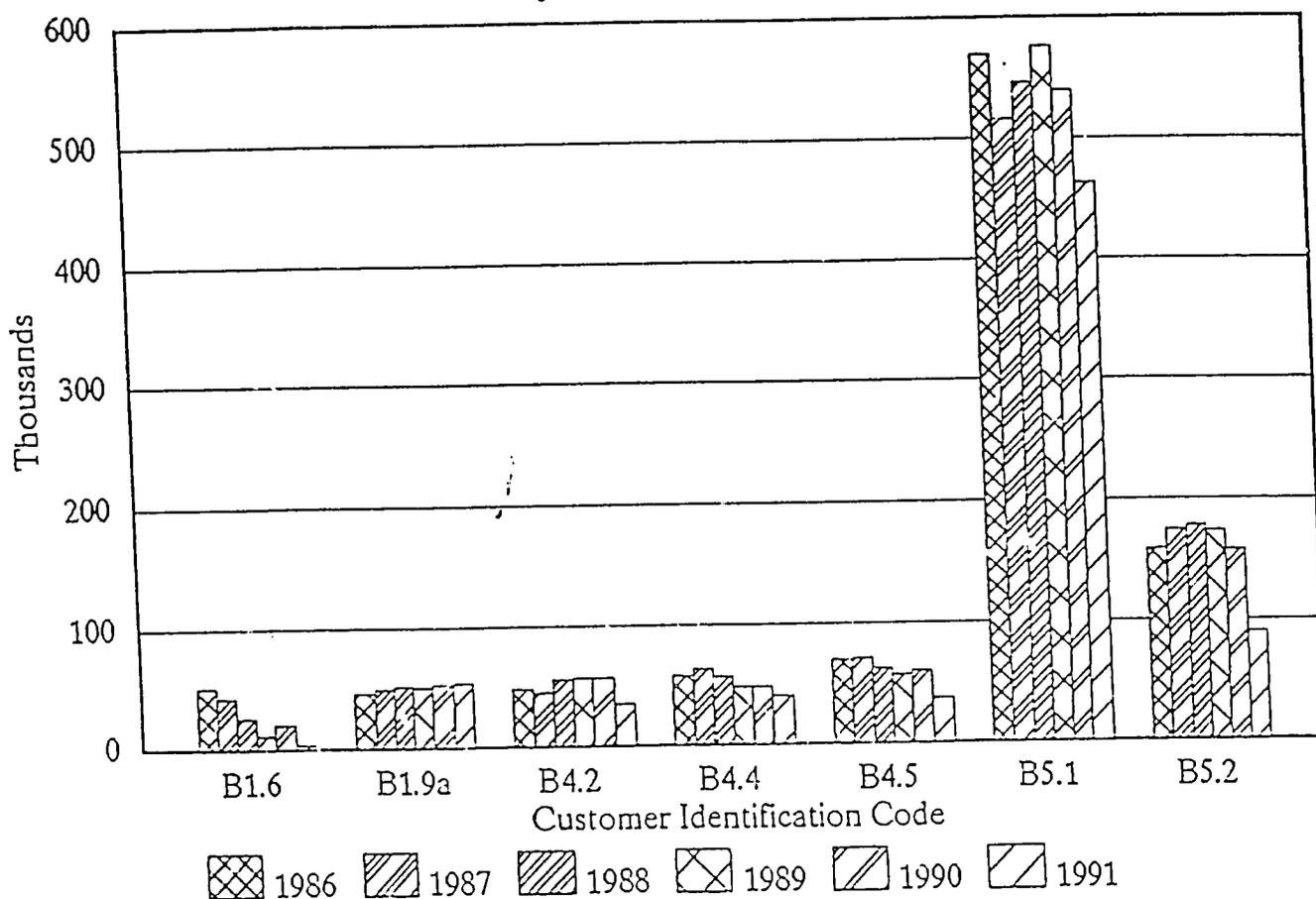
B1.3a THERMAL POWER STATION -DEVNIA

B1.3b FERTILIZERS TECHNOLOGICAL COMBINE WORKS - DEVNIA

B1.5a CHEMICAL TECHNOLOGICAL COMBINE WORKS - BURGAS

B1.5b CHEMICAL TECHNOLOGICAL COMBINE WORKS - PLEVEN

Gas Consumption By Large Customers: 1986–1991  
Ministry of Industry and Trade (2 of 2)



'Large Customers' each consumed > 50,000 E3m3 in at least one year during 1986–1991.  
The 26 "Large Customers" accounted for > 90 percent of total Bulgargaz deliveries each year.

B1.6 BULGARGAZ - STATE FIRM

B1.9 POLYMERS COMBINE WORKS - RAZGRAD

B4.2 "RUBIN" STATE FIRM - PLEVEN

B4.4 "KITKA" STATE FIRM - NOVI PAZAR

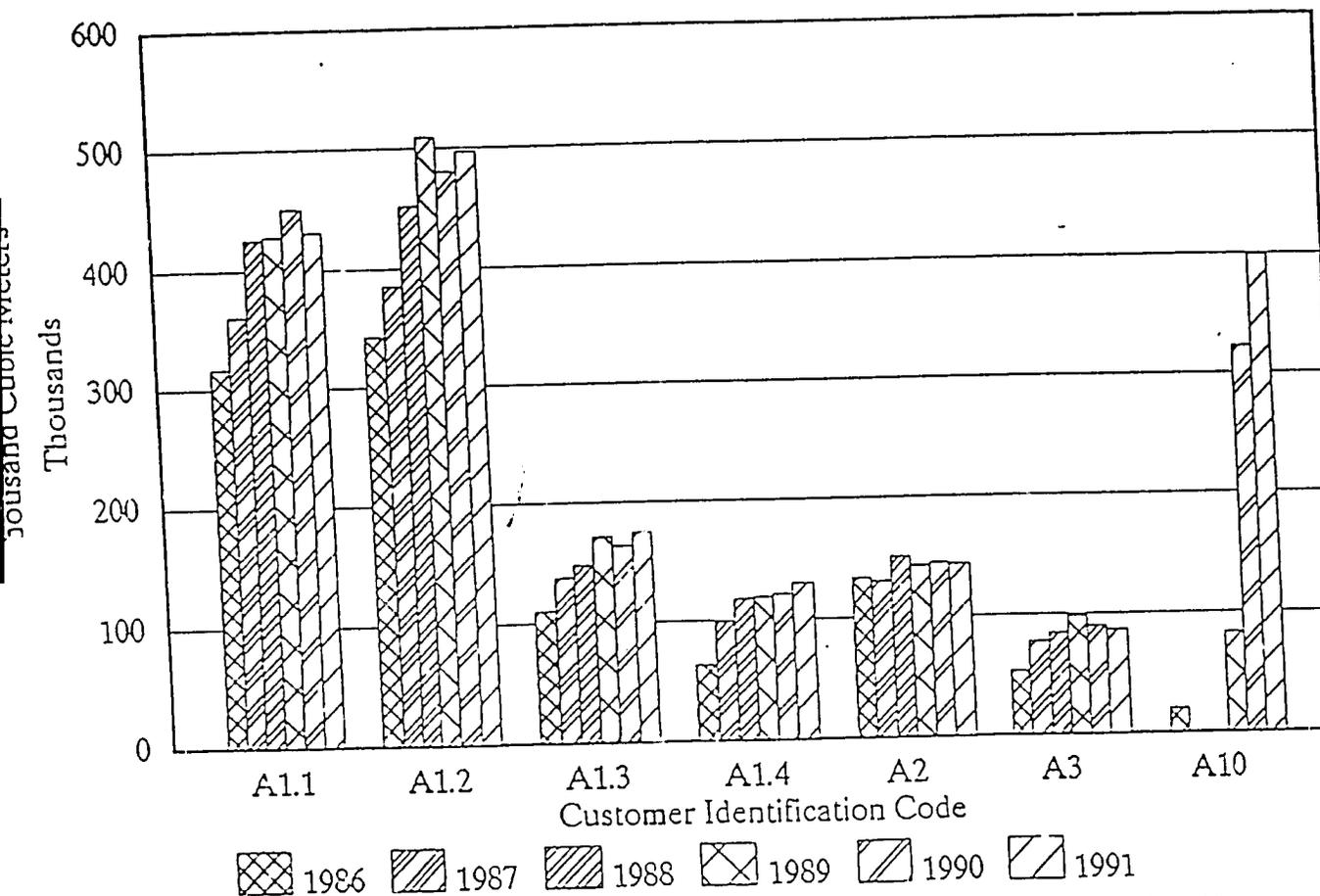
B4.5 "BELOPAL" STATE FIRM - BELOSLAV

B5.1 "KREMIKOV TZI" STATE FIRM

B5.2 "STOMANA" STATE FIRM - PERNIK

004

Gas Consumption By Large Customers: 1986-91  
Committee on Energy



"Large Customers" each consumed > 50,000 E3m<sup>3</sup> in at least one year during 1986-1991.  
The 26 "Large Customers" accounted for > 90 percent of total Bulgargaz deliveries each year.

A1.1 THERMAL POWER STATION "SOFIA"

A1.2 THERMAL POWER STATION "TRAICHO KOSTOV"

A1.3 HEATING STATION "ZEMLIANE"

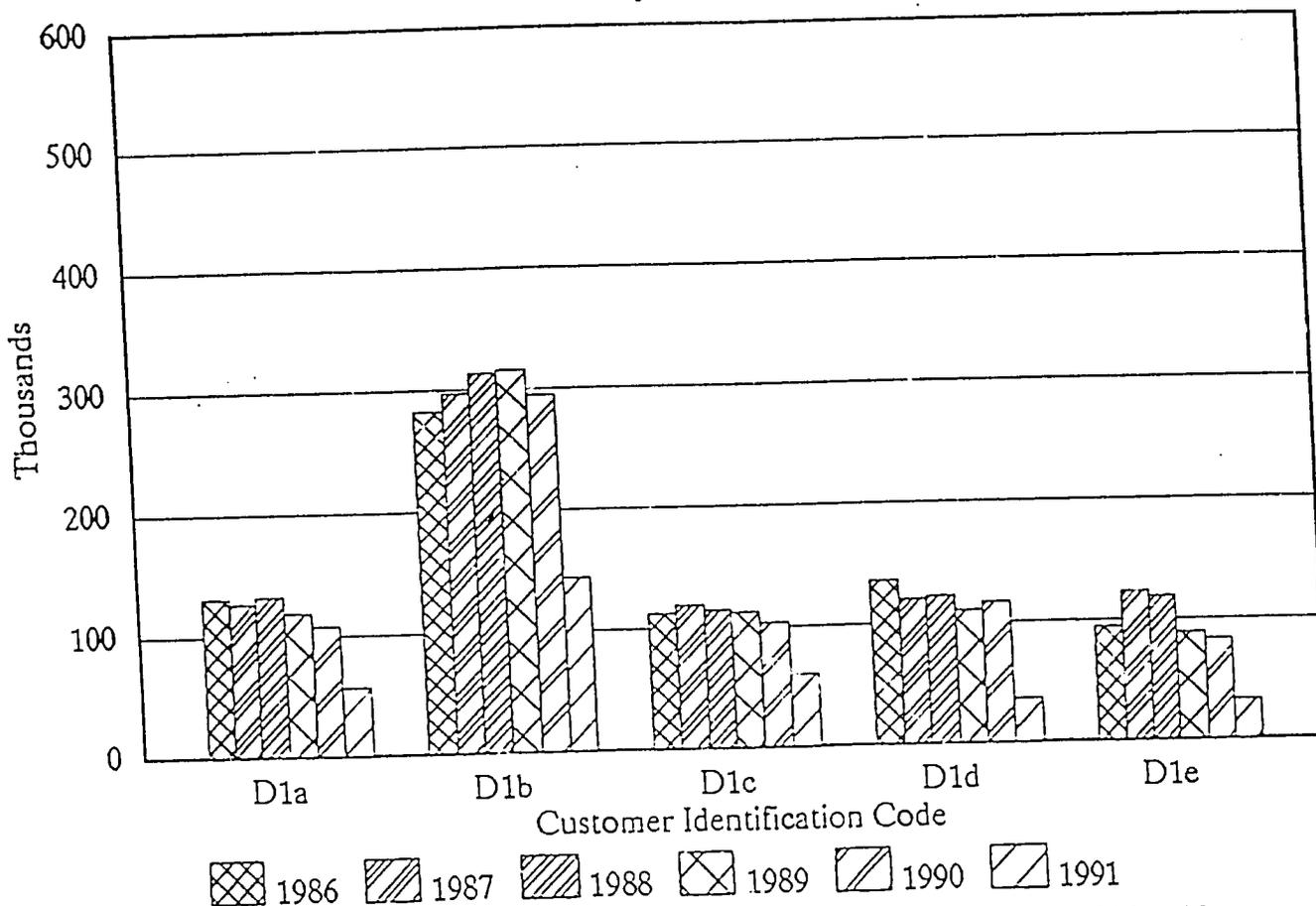
A1.4 HEATING STATION "LULIN"

A2. THERMAL POWER STATION "PLEVEN"

A3 THERMAL POWER STATION "SHUMEN"

A10 THERMAL POWER STATION "VARNA"

Gas Consumption By Large Customers: 1986–1991  
Ministry of Architecture



"Large Customers" each consumed > 50,000 E3m3 in at least one year during 1986–1991.  
The 26 "Large Customers" accounted for > 90 percent of total Bulgargaz deliveries each year.

D1a "BELOIZVORSKI CEMENT" - STATE FIRM

D1b "DEVNENSKI CEMENT" - STATE FIRM

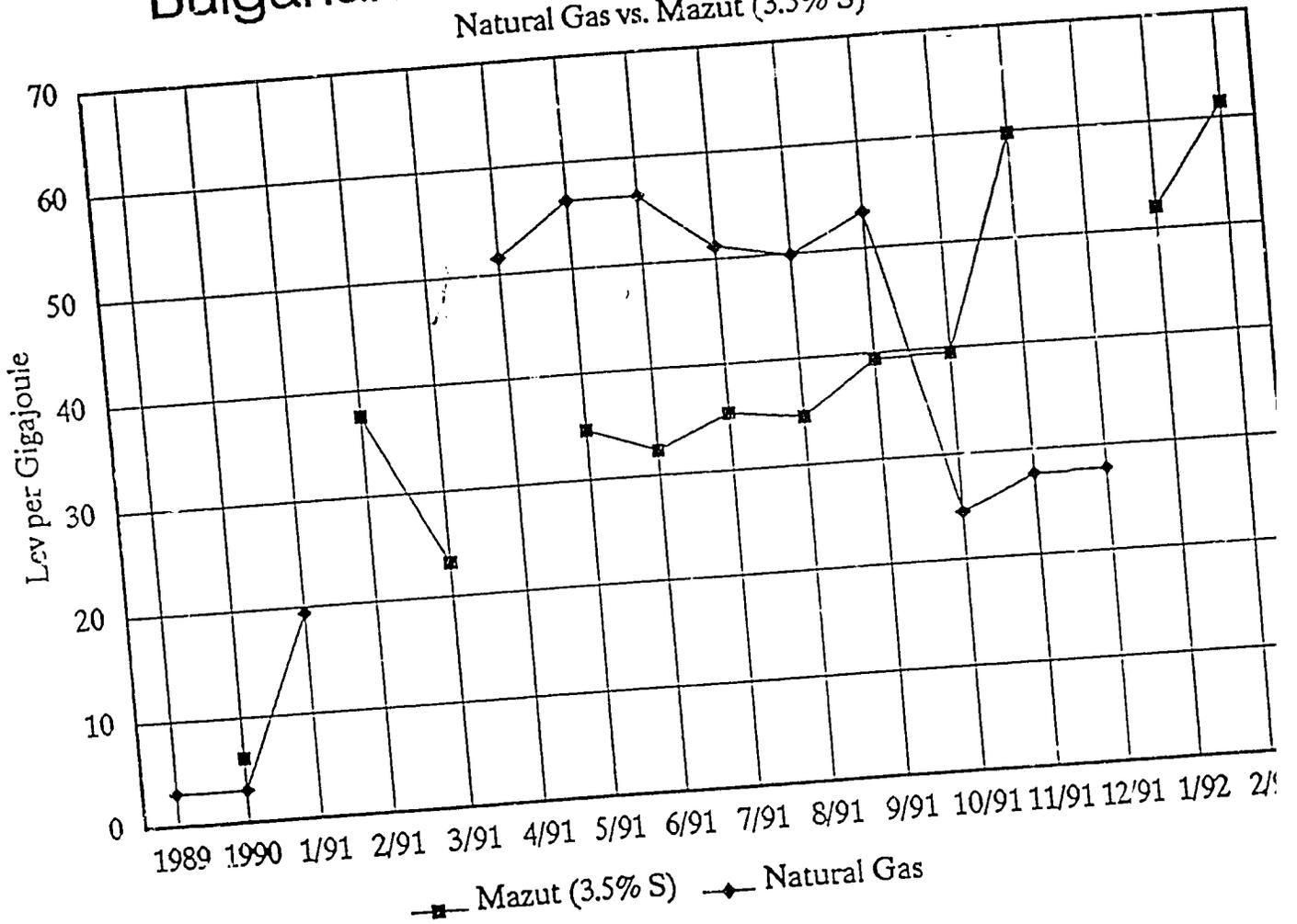
D1c CEMENT PLANT - ZLATNA PANEGA

D1d GRANITOID - TEMELKOVO

D1e "VULKAN" - DIMITROVGRAD

# Bulgarian Energy Prices: 1989-1992

Natural Gas vs. Mazut (3.5% S)



**ANNEX F**

**BURGAS REFINED PRODUCT PRICING MODEL:**

**User's Guide**

# The Burgas Refined Product Pricing Model: User Guide and Introduction

Donald I. Hertzmark, July, 1992

(Note: this work has been funded by USAID as a part of its Emergency Energy Program for Eastern Europe under a contract to the International Resources Group.)

The Burgas Refined Product Pricing Model (BREF), uses commercial software tools to show the impacts of different refined product pricing policies on product demand, tax receipts, and refinery operations. BREF is currently available on three different software platforms, Quattro Pro<sup>®</sup>/Lotus 123<sup>®</sup> (any version), and Microsoft Excel<sup>®</sup> 4.0.<sup>1</sup> This user guide will focus on the Excel implementation of the model.

The model starts with the year 1991, displayed from historical data. Data on Bulgaria's economy, national income, inflation, exchange rates, are used as the basis of the economic growth and inflation scenarios that determine future income levels and exchange rates.

Data on the first two quarters of 1992 are treated as given with regard to prices and demand for refined products. The simulation part of the model starts with the second quarter of 1992 and extends by quarter through the end of 1997. At the present time, the uncertain nature of macroeconomic data in the country makes econometric projections of more than 4-5 years unsupported in terms both of data and model structure. Once the Bulgarian economy settles down a bit, the BREF structure can be used to project over periods as long as 7-8 years.<sup>2</sup>

Another limitation of the model is its use of quarterly reporting. Given better data on seasonal patterns of oil product demand and GDP, it will be desirable to shorten the calculation interval to a monthly basis.<sup>3</sup> Other items in the model's data will require some significant additional efforts before the model is fully operational. These include:

- Econometric estimates of demand for both major and minor refined oil products;

<sup>1</sup> The Excel version of the model works exactly like the Lotus version but is more easily expanded and modified.

<sup>2</sup> It is suggested that any such expansion be undertaken on the Excel version of the model since the Lotus version may become intractable and unjustifiably slow to operate in Lotus with such a degree of expansion. In addition, it is far simpler to effect the requisite modification of the program in Excel than in Lotus.

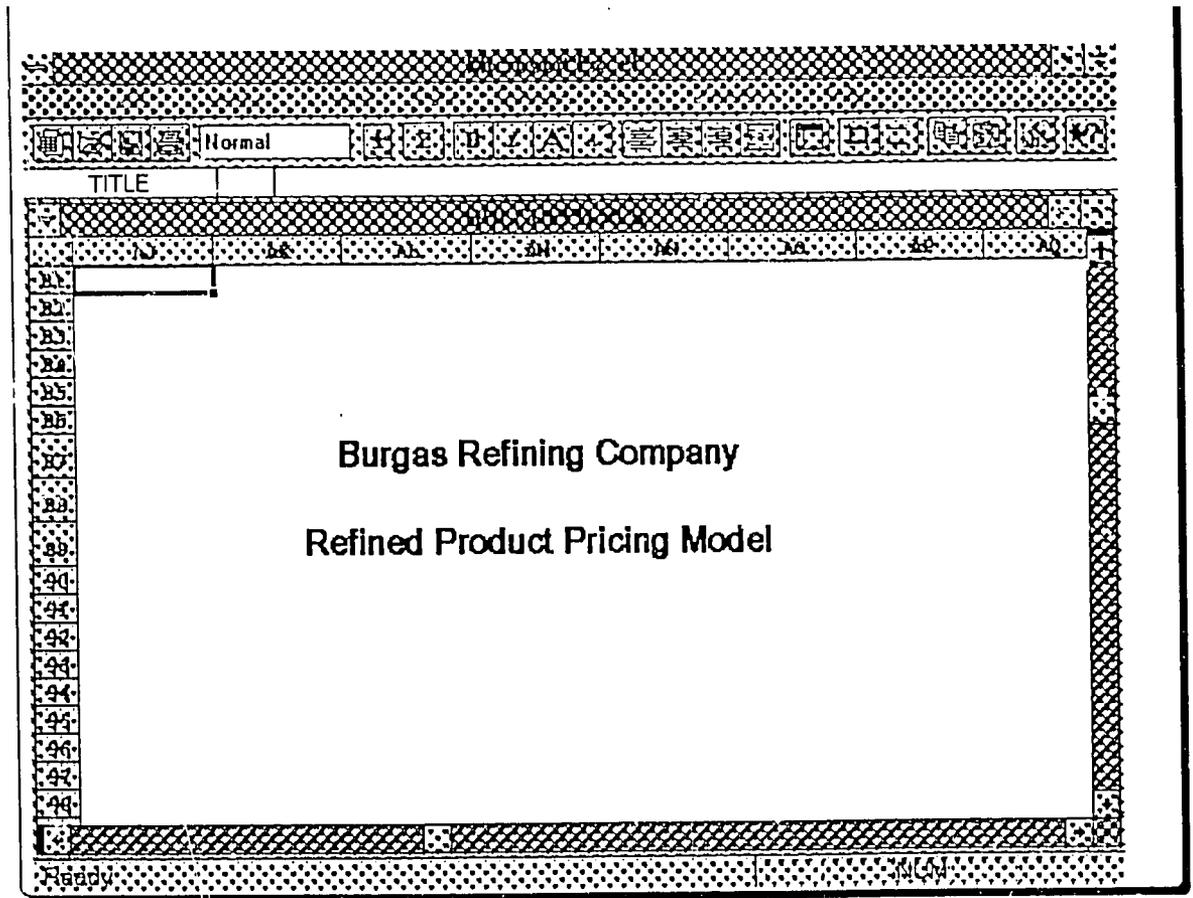
<sup>3</sup> Such a quadrupling of the number of entries would approximately double the amount of computer memory required to run BREF to over 600 kb.

- Econometric demand estimation of the substitution between fuel oil, natural gas, and coal;
- Demand curve estimates for minor products including LPG and petrochemical naphthas;
- Fuller characterization of the national refinery and refined product transport and distribution system;
- Fuller characterization of import and excise taxes on gasoline and other refined products.

At the present time the model uses data from the Burgas refinery staff on yields and costs, data from the World Bank on economic output and inflation, and elasticity data that were estimated for a middle income developing country for the demand equations.

## Operating the Model

The model opens with a title screen and then a main menu for the primary user-selected options. This menu and those that follow are shown on pages 5-11 as they appear on the computer screen in Microsoft Excel and are explained in the Table below.<sup>4</sup>



In both Quattro Pro and Excel, the menu choices will appear vertically in boxes. In Lotus, the menu choices will appear across the top of the screen.

The choices in the initial menu are:

<b>BREF: Initial Menu</b>		
<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>Parameters</i>	Goes to set of menus to modify model parameters or data inputs	Use this menu for most data entry
<i>Product Sales</i>	View net surplus or deficit on product sales account	Shows whether refined product sales are profitable for Neftochem
<i>Netback</i>	View crude oil netback value associated with chosen parameters	Gives a basic measure of price sufficiency and refinery/marketing operational efficiency
<i>Recalc</i>	Recalculates model with new parameters	Default setting is manual recalculation to speed up model use
<i>Move</i>	Exits from menu system	Useful for modifying user code or basic data
<i>Print</i>	Exits from menu system	Future versions of BREF will make use of this menu
<i>Save</i>	Saves a particular version of the model to disk	Menu prompts the user for a version name different from main model name
<i>Quit</i>	Exits model and Excel to Windows PM	

**Note.** Throughout the menuing system, the *Return* command will always put the user back to the main *Parameters* menu.

Once the user is familiar with navigating the initial menu, he or she can activate the next set of menus by pressing <Enter> when the highlight is on the *Parameters* key.<sup>5</sup> Choosing the *Parameters* menu item activates the parameter menus, the main menuing system of the model.<sup>6</sup> The parameter menu will also show the status of the key parameters of the model so that the user can decide which parameters, if any, require new input.

The key parameters of the model are:

- The price of crude oil and its evolution over the period of the simulation;

In Excel a menu item may be chosen by double-clicking or by highlighting and then pressing <Enter> or <accept>. In 123 or Quattro, items can be selected simply by pressing the first letter of that selection. In a number of menus, though, there is more than one choice that begins with the same letter so caution is advised.

From outside the menu system, this menu can be invoked at any time by pressing Ctrl-M.

- The pattern of refined oil product prices;
- The growth of the economy, and inflation, exchange rates and taxes on refined products;
- The pattern of output from the nation's refineries; and
- The level and structure of refined product taxation.

<b>BREF: Parameter Menu Choices</b>		
<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>Oil Prices</i>	User chooses oil price for start of simulation period in III91	User can choose from pre-set menu or can input any other figure (in \$/barrel)
<i>Oil Price Growth</i>	User chooses path of oil price evolution from menu	Choices include real growth, inflation adjustment and "shock" and subsequent decline scenario
<i>Economic Growth</i>	User sets growth rates for economy and sets tax parameters	Tax menu is distinct from economic growth parameters
<i>Dom Oil Price</i>	User sets refined product pricing rules	Allows the user to choose from a number of domestic product pricing options that range from a fully controlled price environment to one that depends entirely on market prices in the main refining centers of Europe
<i>Return</i>	Returns user to initial menu	

The first parameter menu allows the user to set the price of crude oil at the beginning of the simulation period. A number of fixed choices are given along with the option to pick some other value for the 1992 crude oil price. The second menu in this group allows the user to set the type and path of crude oil price growth over the period that the model simulates. A number of options are given, including adjustment for domestic inflation, adjustment for world inflation, real price growth, nominal price stability, and a price spike with a subsequent decline. The latter scenario is used largely to test the impacts of sudden crude price runups on the profitability of the refinery and on the change in net tax receipts from refined product sales.

The economic growth menu allows the user to pick the key economic growth rate and inflation parameter for the simulation period. Given the instability of the Bulgarian economy at present the user can enter inflation and economic growth information for two periods, 1992-1993 and 1994-1997. The tax menu is a submenu of the economic growth menu and allows the user to set key tax parameters on refined oil products.

The Domestic Pricing menu allows the user to specify the formula which is used to set domestic refined product prices. Using this menu, a user can specify the type of pricing system that the country uses for some or all of its

refined products. The choices include complete deregulation, full reregulation, partial deregulation, and partial deregulation with differential pricing among road fuels and industrial fuels. The choices that are made in this menu will affect the quantities of oil products that are demanded as well as the net-back values of the crude oil that is processed in the refinery. Charges in the specific markup formulæ can be accessed outside the menu system by going to the ranges named "trans\_diff," "customs," "incentive," and "discount," and then filling in the appropriate values.

<b>BREF: Economic Growth Menu</b>		
<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>1992-1993</i>	Pick real economic growth rate for 1992-1993	Model to quarterly growth rate and adjusts for inflation
<i>1994-1996</i>	Pick real economic growth rate for 1994-1996	
<i>Taxes</i>	Go to taxation menu	
<i>Inflation</i>	Go to inflation menu	
<i>Return</i>	Return to main menu	

Note that negative numbers can be used for real economic growth rates or for inflation rates. Enter economic growth rates in *annual 0.xxx* format.

The final important menuing system is the refinery menu which is accessed by pressing [Ctrl] R. The user is given the option to modify the refinery output characteristics through minimal or maximal debottlenecking or to leave the output patterns unchanged. In addition, the user can specify the types and volumes of crude oils that are to be used in the refinery along with their relative prices.

Once the user has attained a degree of familiarity with the model, choosing key parameters will become essentially automatic. The taxation menu allows the user to establish the basic tax rates for the key refined oil products. It is a relatively simple matter to add new tax rates in the future for such additional products as industrial and utility fuel oils.

105

## BREF: Tax Menu Choices

<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>VAT</i>	Currently Inactive in BREF	Can be used to specify Value Added Tax
<i>ROAD TAX - Mogas</i>	User sets road tax for gasoline in %	Assumes same level of road tax for all gasolines
<i>EXCISE - Mogas</i>	User sets excise tax levels for gasolines	
<i>ROAD TAX - Diesel</i>	User sets road tax for diesel in %	applies only to automotive diesel (ADO)
<i>EXCISE - Diesel</i>	User sets excise tax levels for diesel; fuels	
<i>Inflation</i>	User decides whether to adjust taxes for inflation	Adjusting taxes for inflation keeps real value of taxes constant. Otherwise, real value of tax receipts will fall leading to loss of revenues and falling real price of the refined product subject to such taxation.
<i>No Inflation</i>	Keeps taxes at constant nominal level	
<i>Return</i>	Returns user to initial menu	

Note that a marketing margin is also used in the model and can be adjusted by the user for all of the refined products.

The Tax menu can be expanded once there are additional categories of excise and other taxes. One type of tax to consider is one which fills the coffers of an oil price stabilization fund, a fund to buffer the wholesale market from price spikes in the very short term. Such a buffer fund tax would need to be variable and rules worked out concerning its deployment. However, the concept has been used in the past in a number of countries and can be made workable at a relatively low cost.

The next submenu in the economic growth menu concerns the rate of inflation in the economy as a whole. the user is permitted to choose inflation rates for two periods, 1991-1992, and 1993-1996. The demarcation between the periods is somewhat arbitrary but the purpose is to allow the user to distinguish between the near term when high inflation is expected to result from macroeconomic instability and the medium term when the stabilization of the inflation rate is expected to accompany and even to lead renewed economic growth.

### BREF: Inflation Menu Choices

<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>1992-1993</i>	Set annual inflation rate for period	
<i>1994-1997</i>	Set annual inflation rate for period	
<i>Return</i>	Returns user to initial menu	

Note that inflation rates should be entered on an *annual* basis in the 0.xxx format. The program converts these values to quarterly rates.

### BREF: Domestic Pricing Menu Choices

<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>Flexible</i>	Adjusts <b>current</b> system of domestic prices to changes in real price of world oil	Relies on previously existing set of prices for relative price structure
<i>Inflation Adjusted</i>	Adjusts <b>current</b> system of domestic prices for domestic inflation only	
<i>No Change</i>	No adjustments to current domestic system for either inflation or real oil price changes	Tests financial and product demand impacts of current pricing system
<i>Ex Rotterdam</i>	Bases domestic <i>ex refinery</i> prices on crude oil plus refining margins for each major product	Tests the impacts of fully decontrolled or formula set prices
<i>Part Decontrol</i>	Similar to <i>ex Rotterdam</i> scenario except one product can remain controlled	
<i>MoF</i>	User sets refined product prices according to whatever rules the user wants	Tests the impacts of creating another pricing regulation system relying on government decisions rather than market forces
<i>Return</i>	Returns user to initial menu	

The final menuing system that is used in the BREF model allows the user to modify the refinery output slate and to test the effects of improved yields of gasolines and middle distillates on fuel netbacks, net foreign trade in refined products and in tax receipts. This menu is invoked by pressing [Ctrl]-R.

105

## BREF: Refining Menu Choices

<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>Current</i>	Keeps refinery output at current levels	
<i>Low</i>	Choose small changes in patterns of product yields	Reflects minimal debottlenecking of refineries to increase light end output and reduce losses. No new process units.
<i>High</i>	Choose larger changes in patterns of refined product yields	Additions of new process units at refineries to increase conversion of HFO and HGO to gasolines and middle distillates. Implemented over one year period.
<i>Crude Oils</i>	User chooses types of crude oil to use in refinery	User goes to subroutine that allows choices among a light, medium, and heavy crude oil.
<i>Return</i>	Returns user to initial menu	

When the user chooses the crude oils menu, the following choices appear:

<b>BREF: Crude Oil Menu Choices</b>		
<u>Command</u>	<u>Action</u>	<u>Notes</u>
<i>Iran Heavy</i>	User chooses proportion of refinery input that is similar to Iranian Heavy crude	Change in crude oil chosen affects both prices paid for crude and product yields.
<i>Urals Blend</i>	User chooses proportion of refinery input that is similar to medium weight Urals Blend crude	
<i>Bonny Light</i>	User chooses proportion of refinery input that is similar to Bonny Light crude	
<i>Prices</i>	User chooses price differentials relative to Brent crude	
Input Volume, 1992-1993	User sets volume of crude oil to be processed annually in tonnes	Allows user to vary overall refinery utilization.
Input Volume, 1994-1997	User sets volume of crude oil to be processed annually in tonnes	
<i>Return</i>	Returns user to initial menu	

## Graphing Results

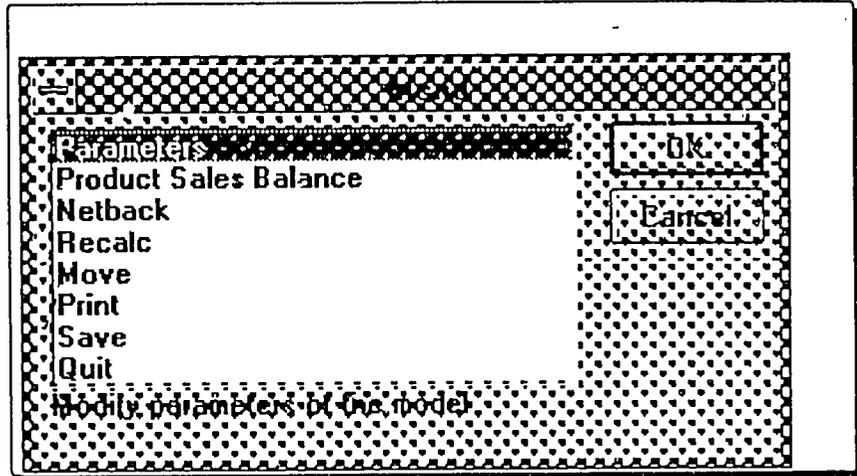
There are a number of possible graphical results that might be of interest to a user. At the present time only one graph is provided as a part of the BREF model. If the user opens the graphics file, a graph will appear that shows the annual sales receipts for the five major refined oil product. This file, known as "Fin-Bal.XLC," loads separately from the rest of the program.

Other results that might be useful to graph include product sales by quarter, crude netback values v. crude acquisition costs, and tax receipts from major oil product sales.

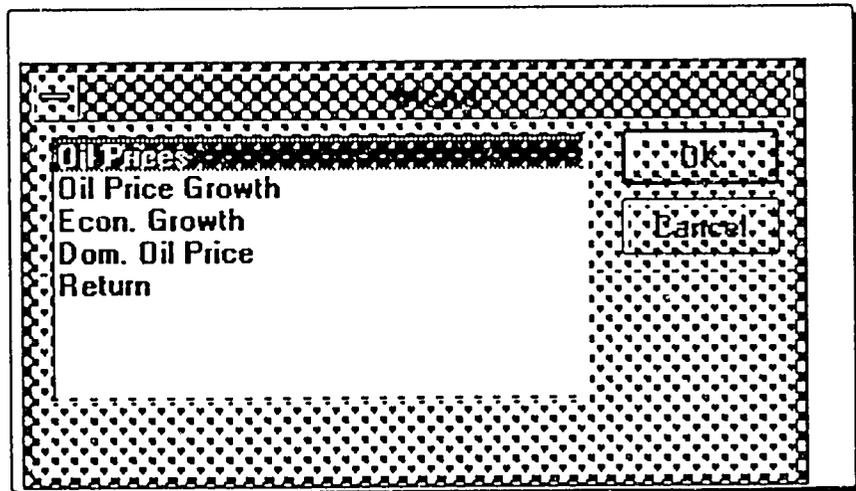
101

# Menu Screens for BREF Model

## Initial Menu (Main Menu)

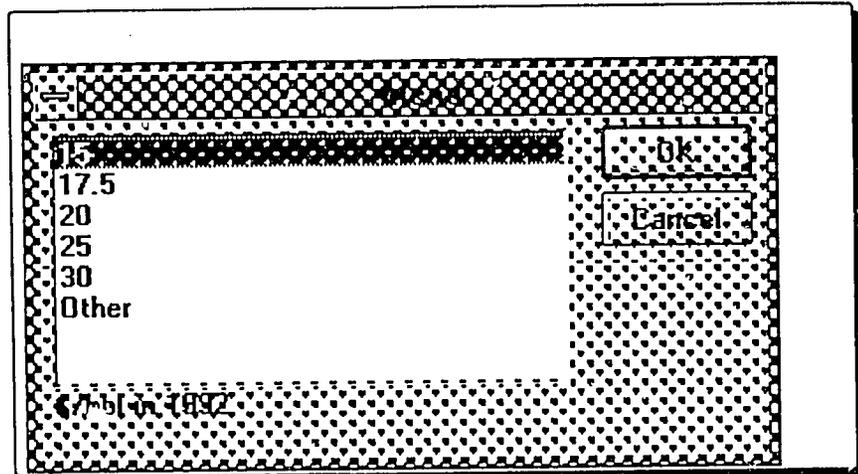


## Parameters Menu

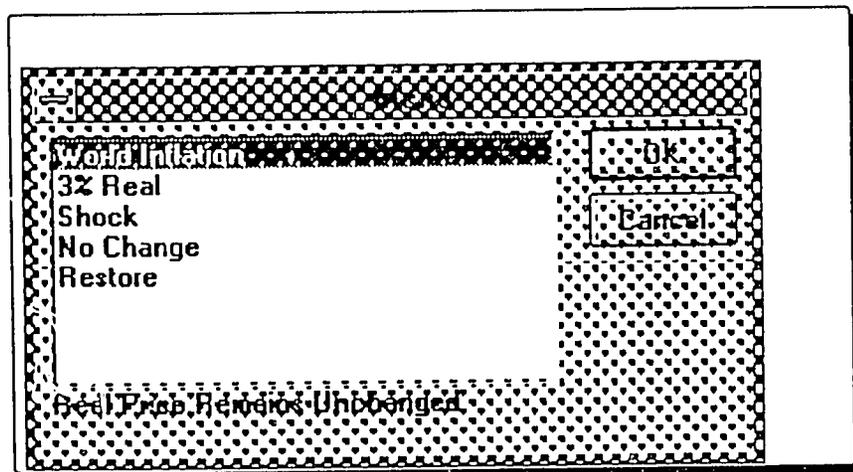


107

## Oil Prices Menu



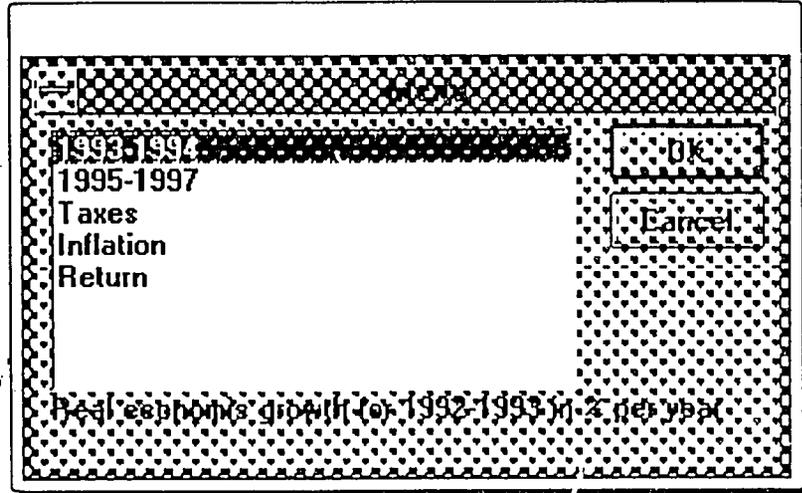
## Oil Price Growth



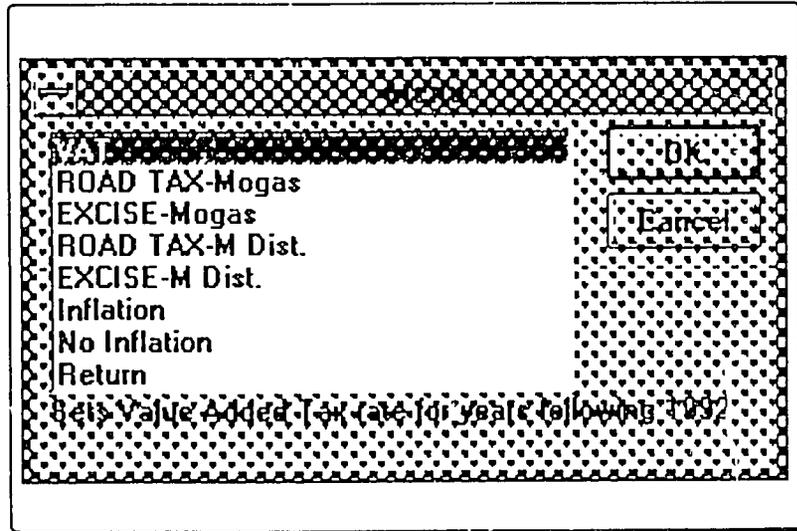
11/14

# Economic Growth Menus

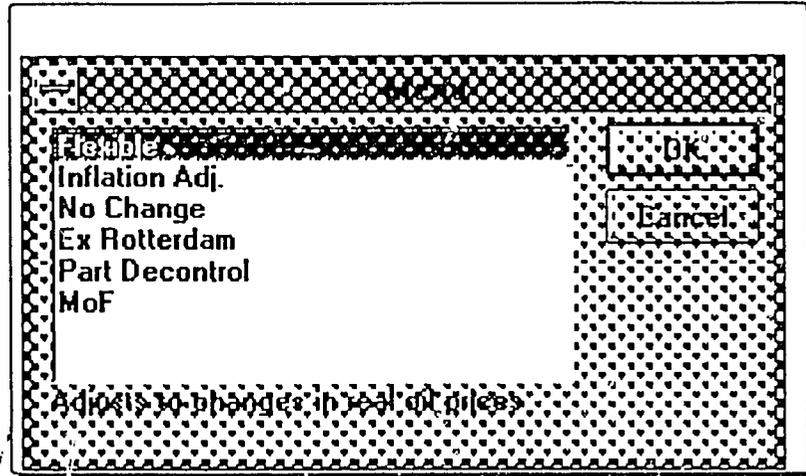
## Growth Rates



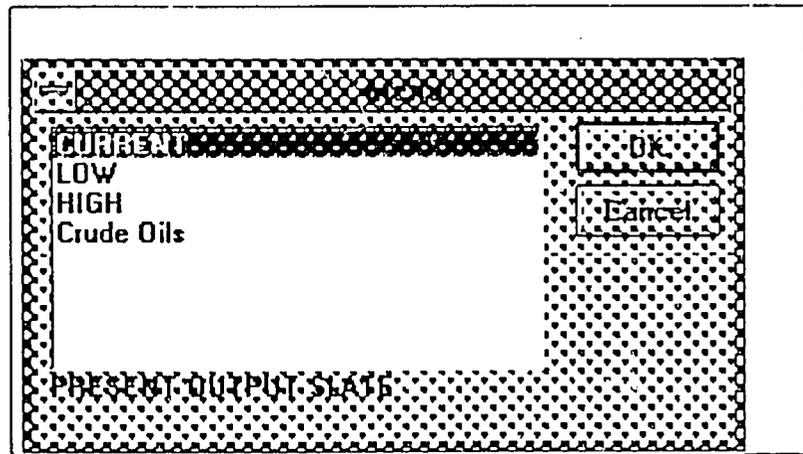
## Petroleum Product Taxes



## Domestic Oil Product Prices

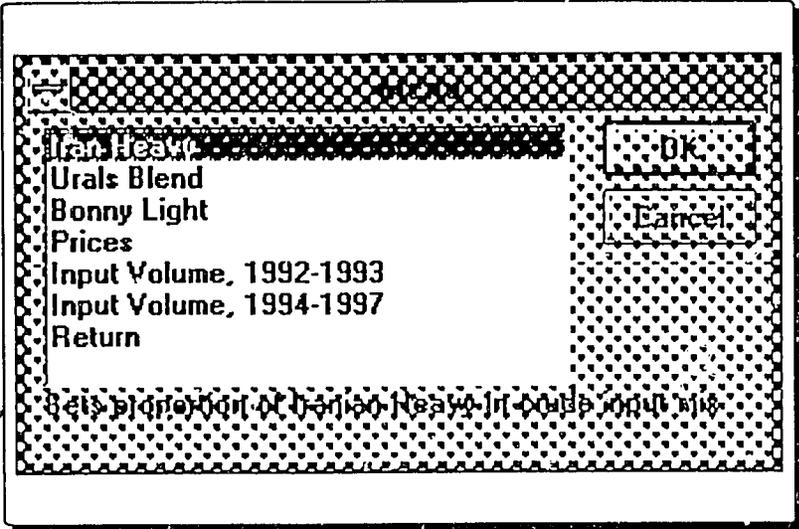


## Crude Oil Inputs and Refinery Outputs



10/1

Crude Oil for the Refinery



112