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ENERGY PRICE REFORM
POLAND

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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 were 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 Poland 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 Poland 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 Poland 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 (PGNIG) may seek to adapt as it develops commodity and rate-making policy.

In addition, IRG focussed its efforts on petroleum pricing policy through a series of interviews and proposals to government and commercial participants in the petroleum industry, including the Energy Department within the Ministry of Industry and Trade, the Ministry of Finance, Ciech Petrolimpex, the state petroleum trading company, CPN the state marketing and distribution company, and the refineries, affiliated with the Ciech industrial/petrochemical conglomerate. IRG's discussions with these parties focussed on Poland's need to develop the necessary analytical skills and tools needed to support price and trade policy reform in the petroleum sector. In particular, existing analysis and modeling capabilities were assessed, and recommendations were made for expanding or otherwise coordinating these efforts among the various government and industry participants in the policy-making process. The specific application of an integrated data collection and modeling capability for the petroleum sector would include such tasks as evaluating the impact of various, supply, demand and pricing scenarios on the consumer demand, or perhaps on refinery operations, system optimization and fiscal objectives. A basic central data and computer-supported analysis capability could be used to assess such fundamental policy questions as the impact of various excise tax, fee and domestic vs. international supply economics on the refinery economics, 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 with such a capability.

Historically, Poland had functioned under a system of subsidized and regulated prices, of both domestic and international supplies, which in turn subsidized its domestic and export industries. With the end of the Soviet-supported Comecon price subsidies and the onset of democratic reform by late 1989, Poland, like the rest of Eastern Europe, was faced with adjusting to major distortions in absolute and relative energy prices. In January 1990, prices for light petroleum products were doubled from levels which were initially higher than most ECE countries, but still remained well below equivalent western levels, while coal prices were increased by 5-to-7 times above extremely subsidized levels. Much of this increase was simply to keep pace with the hyper-inflation of 1989, which continued into 1990. Domestic coal (hard and brown/lignite) accounted for over 75 percent of Poland's primary energy supply in 1989. As a result, Poland was less vulnerable to immediate

deterioration in the terms of trade due to the "real" energy price spike of 1990. Nevertheless, there was substantial pressure for the domestic economy adjust domestic prices to more accurately reflect the costs of domestic production, including environmental costs and the costs of alternative energy sources. Unlike the rest of ECE, Poland's dependence on oil and gas imports was, and remains, relatively low. In 1990 oil and gas imports accounted for roughly 14 and 7 percent of final energy consumption, respectively, or virtually all of Poland's net 20 percent dependency on imported energy.

Foremost among Poland's broad energy policy goals was the objective of diversifying energy use away from subsidized and environmentally costly coal production. In the short term, diversification of imported oil and gas supplies was counted on to replace the least economic coal supplies, with improved efficiency, and more rational pricing policies also acting to reduce Poland's dependence on heavily subsidized coal. Effective early 1992 the formal subsidy to coal producers was eliminated. However, as a matter of domestic economic policy, coal prices have not been raised to the extent necessary to keep pace with inflation. As a result "real" (hard currency-denominated) coal prices remain some 50 percent below true production costs. In addition to continuing to raise price to keep pace with inflation, this gap can be reduced over time by continuing to rationalize coal production by shutting down or consolidating inefficient mining operations.

Because the electric power sector is the single largest coal consumer, much of the rationalization in coal pricing will come from the bargaining process between mines and the power grid, power generators and district heat plants. The terms established for determining transfer prices will in turn largely reflect the ability of the electric power and district heat sector to recoup their energy costs. In this regard, the Polish Power Grid (PPG) has made substantial progress in rationalizing its rate structures to reflect unit service costs by customer class. Sixty percent of Poland's 32,000 MW of electricity supply capacity is fired by hard coal, and another 30 percent by lignite coal. Moreover, the large majority of Poland's sizeable district heat system (25 percent of final consumption in 1989) is coal-fired. As district heat prices rise and metering becomes more widespread, efforts to control fuel and related production costs will intensify. Moreover, much of the aging capacity of both

cleaning processes, including sulfur and particulate removal. Thus, coal pricing will increasingly reflect environmental costs, and eventually gas-fired generation may emerge as a more significant competing source, as externalities and full life-cycle plant costs are accounted for.

Like coal and oil, natural gas prices have also experienced major upward revision, and more rational tariff structures are being developed by the state gas monopoly (PGNIG). In early 1990, nominal prices were increased by a factor of approximately five. Another doubling of gas prices occurred in July of 1990, and since then rates have been increased to household relative to industrial users, reflecting the higher unit service costs associated with residential customers. Quarterly adjustments are made (although commonly deferred due to political pressures) in an attempt to keep pace with inflation. Nevertheless, natural gas prices remain some 25 percent below most equivalent western levels, albeit well above the equivalent coal price. Another difficulty faced by PGNIG is in recouping the true imported commodity cost of gas based on complex pricing terms from Russia. These should be made more transparent, and passed on to all consumer classes.

Despite the political pressure for the GOP to limit and defer the increase in energy prices to the economy, and to retain central control over its strategic assets in the oil and gas sector, the GOP remains committed to a policy of eliminating most subsidies by 1995. For petroleum products this means allowing the market to set the price, with taxes and duties used to balance revenue and social objectives. Currently the GOP (through the Ministry of Finance with advice from the Ministry of Industry and Trade) sets maximum allowable gasoline and diesel prices on a quarterly basis, under a rigid price "build-up" process intended to roughly equalize the cost of domestic supplies with imported supplies. The Ministry of Finance has indicated that this relatively cumbersome and inefficient process is intended for replacement by a uniform value-added tax by late 1992, effectively removing the Ministry from the petroleum product price-setting process.

Meanwhile, stricter import quotas have been set to reduce the degree of black market activity which undercuts efforts to protect Poland's domestic industry. In the long run, such restrictions need to be complemented by some form of re-structuring of the domestic

industry in order to encourage the necessary investments and competition needed to keep domestic supply options competitive with imported economics. Various alternatives being considered include the creation of a single vertically integrated oil company along the lines of MOL in Hungary, to the regional division of the industry among the key refining and transportation centers, and allowing for some form of open access to pipelines and storage facilities. In either of these structures, the role for foreign investors or venture partners is perhaps the most important variable, as the Polish production, refining, transportation and distribution/marketing infrastructure is desperately in need of capital investment for rehabilitation and modernization. Part of this process will involve shutting down inefficient units, and perhaps providing tax incentives to encourage investment.

Over the next few years efforts to maintain energy price reform in Poland will have to address a number of difficult analytical and political/economic issues. In order to effectively address these issues, the policy-making process will need to be strengthened, coordinated and centralized, both from an organizational and analytical perspective. Specifically, the GOP needs to coalesce its data collection, analysis capabilities, and lines of authority in developing structural and tax policy decisions in the oil and gas sector. In the petroleum sector this means making definitive decisions about the desired structure, investment needs, tax and customs policies needed to effect its goals. Currently, the Ministries of Industry and Finance are not sufficiently staffed to address these issues, and the industry (i.e., largely the refiners, Ciech and CPN) appear to be uncertain about their future organization and "ground-rules" with regard to foreign partnerships or investments.

In the case of natural gas, similarly broad thinking about the domestic industry's organization, supply sources, investment needs and rate design needs to be undertaken at a high level, and without undue influence from the vested interests represented by the state monopoly. Re-organization of this monopoly, including the spin-off of production from the transportation and distribution function is one example of the sort of broad strategic evaluation which should be pursued. Regional planning also needs to be undertaken on such competitive issues as gas supply terms to distribution companies versus direct pipeline transportation to major end-users. As in the case of petroleum market and taxation and pricing analysis, Poland should adapt multi-fuels energy planning models to their national

and regional market in order to develop greater analytical insight from an economic efficiency standpoint, in order to shed light on what is now largely viewed as a political decision process.

In the electricity sector, the GOP appears to have achieved considerable success in administering the evolution to a rational rate structure, transfer pricing schemes and system improvements. These developments have been gained by drawing largely on the existing expertise at the Polish Power Grid (PPG), and through the select use of international assistance. Continued efforts need to be focussed on rate structure modifications, including the use of variable rates to encourage conservation, demand side management practices, and investment in metering and related efficiency equipment. In addition, analysis of tax incentives, specifically the treatment of depreciation, is needed in order to encourage investment in plant rehabilitation or related process expansions, if foreign capital is to be attracted. In the district heat sector, rate-based billing and efficiency investment incentives are needed to increase the use of metering and reduce usage in response to price.

CHAPTER 1

INTRODUCTION: ECONOMIC AND POLITICAL BACKGROUND

A. Changing Energy Price Relationship with the USSR

At the outset of this project, in February 1991, the ECE countries were in the midst of broad political and economic changes while managing the transition from centrally-planned to market-driven economies. The adjustment to market-based energy prices was then, and remains, a central component of the economic adjustment process for the ECE countries as they move towards a free market framework. The economies of the ECE region 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 to the ECE nations, they were caught with the conflicting objectives of simultaneously attempting to:

- maintain the competitiveness of their export sector,
- limit the inflationary impact of rising energy prices on their economies, specifically their indigenous purchasing power and growth rates,
- 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 to 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 quantify these), and
- reducing cross-fuel and direct labor or "income" subsidies built into current fuel or prices 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 energy 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 effectuation of this policy change became evident by early 1990, as political change and breakdown of the Soviet and Eastern European Communist Bloc gained momentum. Dire economic conditions within the USSR necessitated this change in policy, as declining crude oil production and inefficiency bred 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 the 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 coinciding with Iraq's invasion of Kuwait. World oil prices rose from less than \$20/barrel in July 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 pronouncement in January 1991. As a result, the starting point for evaluating recent energy price reform 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 internal energy policy issue, and as the primary external motivator to this 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 more broadly, energy was re-defined, the value structure underlying most barter arrangements similarly required restructuring. Oil, as the primary Soviet export commodity (followed closely by natural gas), 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 cross-sectoral use, ready 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. Oil prices impact the price of other fuels either directly through inter-fuel competition, or indirectly through the costs of economic activity in each sector (e.g., transportation, manufacturing, commercial and residential heating). Indeed, this leadership role of oil is evidenced by the ex-Soviet states through their 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. The loss of the energy price subsidies also eliminated much of their export price advantage relative to non-bloc nations. As a result, the ex-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 often opaque barter arrangements which specified the price of oil relative to a basket of finished goods or commodities (e.g., medicine, agricultural goods, machinery and equipment) which themselves were often valued well under equivalent western price levels.

The Bucharest Agreement established the principle of pricing Soviet crude oil on the basis of a moving five-year average of world oil prices, 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/\$, 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

Poland is characterized by an extremely high level of energy use per unit of gross domestic product: estimated at roughly double average western standards¹. This reflects Poland's sizeable industrial base, which in turn was developed largely from subsidized energy and other raw material costs under the CMEA system which encouraged the export of finished goods to the USSR. The industrial sector in Poland accounted for an estimated² 41 percent of total final energy consumption in 1989, compared to an average level of just 34 percent in OECD Europe.

Compared to other ECE countries, Poland's degree of energy import dependency is low. As shown in Table 1, in 1989 coal accounted for 90 percent of Poland's domestic primary energy production and nearly 80 percent of total primary consumption³. Oil and gas accounted for roughly 14 percent and 7 percent, respectively, of final fuel consumption, compared to typical levels of approximately 30 percent in other ECE nations. Overall, Poland is approximately 20 percent dependent on imports (largely petroleum and natural gas) for its total energy consumption. This compares to an overall import dependency of perhaps 30 percent on average for primary energy use (including electricity) throughout the ECE region. Poland's domestic production of oil provides less than 1 percent of its total crude oil supply.

As seen in Table 2, Poland experienced a decline in GDP of just 8.9 percent in 1990 and 8.0 percent in 1991, despite a 20 percent decline in industrial output in 1990 and 12 percent in 1991⁴. This reflects Poland's relatively expansive monetary and trade policy which

¹ International Energy Agency, Energy Policies: Poland, 1990 Survey, Paris 1991, page 11.

² IEA, Energy Policies: Poland, 1990 Survey.

³ International Energy Agency, Energy Policies: Poland, 1990 Survey, Paris 1991, p.9.

⁴ U.S. Department of Commerce, Fact Sheet: Poland.

stimulated consumption, trade and the service sector. Moreover, Poland's larger internal economy was less dependent on energy-intensive industrial exports as a percentage of gross domestic product. As a result, Poland was less vulnerable to a deterioration in energy-based terms of trade than some of the smaller, more import-dependent ECE countries. In most ECE countries, the balance of trade impact from the energy price escalation following 1989 was negative. In contrast, Poland experienced steady growth in exports; from \$9.8 billion in 1989 to \$11.9 billion in 1990 and \$14.4 billion in 1991,⁵ fueled by rising foreign debt and inflationary monetary policy.

Table 1

Poland's Summary Energy Supply Balance: 1989
(in million tons of oil equivalent)

<u>Fuel</u>	<u>Total Primary Energy Supply</u>	<u>Total Final Consumption</u>
Coal	93.2	29.8
Other Solid	1.6	0.9
Oil	17.4	11.5
Nat. Gas	9.5	5.9
Hydro	0.4	0.0
Electricity	0.1	9.1
<u>Heat</u>	<u>0.0</u>	<u>18.8</u>
Total	122.2	75.8*

* Difference accounted for by transformation and energy, district heat and combined heat and power production, use and loss, largely in coal.

Source: International Energy Agency, Energy Policies: Poland, 1990 Survey, OECD, Paris, 1991

⁵ U.S. Department of Commerce, Fact Sheet, Poland.

Table 2

Poland's Summary Macroeconomic Indicators

<u>Economy</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
GDP (1986 US \$ bn)	183.4	167.1	160.0
GDP Growth Rate (%)	-2.0	-8.9	-8.0
GDP Per Capita	4,791	4,400	4,000
Inflation Rate	900.0	249.0	70.0
Foreign Debt (US \$ bn)	40.0	43.2	41.3
Unemployment (%)	n/a	5	11.4
<u>Trade</u>			
Total Exports (US \$ bn)	9.8	11.9	14.3
Total Imports (US \$ bn)	8.3	8.9	9.8

Source: U.S. Department of Commerce, International Trade Administration, Fact Sheet, Poland.

Unlike other ECE nations, Poland pursued aggressive policies to promote trade, liberalize monetary policy, establish full currency "convertibility" (albeit at fixed official rates through 1st quarter 1990) and decrease reliance on subsidies in its internal energy and manufacturing sectors. Hard coal prices were increased by a factor of five-to-seven times immediately in January 1990. Heavy oil, natural gas and electricity prices were immediately raised by four-to-five times in January of 1990.⁶ Subsequent price increases were relatively small by comparison thereafter, and largely reflected an effort to adjust energy prices with overall inflation trends. In part as a result of Poland's liberal monetary and price "shock" therapy, reported inflation rates for Poland (albeit differing substantially depending on the source), reveal that a hyper-inflationary situation existed in 1989 and 1990. For example, the U.S. Department of Commerce reports inflation rates in Poland of 900 percent in 1989, 249 percent in 1990 and 70 percent in 1991.

Because of Poland's severe inflation, energy pricing policy in Poland is perhaps more formally linked to inflation and specifically the political debate over how long traditional subsidies to household users and certain producers/suppliers of energy should be maintained by resisting the "pass-through" of upward inflation-adjustments to energy prices.

⁶ International Energy Agency, Energy Policies, Poland: 1990 Survey, OECD, Paris 1991.

While the same debate occurs throughout the ECE region and the Newly Independent States (NIS) of the former USSR, the formalization of the link between inflation and energy pricing policy is perhaps most extreme in Poland. Specifically, Poland's price policy bodies, the Ministry of Finance and the Ministry of Industry and Trade, have made it a practice to review energy price increases based in the context of consumer price inflation. Price increases are typically made to keep pace with inflation; or, they may be delayed for several quarters, owing to political resistance to further inflationary pressure and impact on already strained real personal income levels. Because inflation has been particularly severe in Poland, energy pricing policy appears to be highly sensitive to making price adjustments in response to inflation levels, although strict indexation has not been adopted.

C. Political and Organizational Perspective

During periods of tumultuous political change, political factors exert an even greater influence on energy and economic policy development than in stable economies. Special sectoral interests, managerial capabilities, organizational structures, and "turf battles" always influence economic decisions and energy pricing policy. Political ideology and power balances provide the framework around which any evaluation and modification of energy or other government policy must be structured. The new leadership in Poland faced a number of practical economic and organizational hurdles in attempting to restructure its energy pricing system.

Poland's broad energy policy objectives include:⁷

- diversifying its energy balance to reduce reliance on subsidized and environmentally costly coal production,
- diversifying sources of oil and gas imports to replace coal, and
- improving energy efficiency and reducing pollution associated with energy production and use.

⁷ IEA, Energy Policies Poland, 1990 Survey, OECD, 1991, p. 19.

Specific steps which the Polish Government took in pursuit of this policy by mid-1991 included the removal of the state-owned trading company's (Ciech Petrolimpex) monopoly position on oil imports, various organizational changes, and price reform commitments, including⁸:

- a commitment to adjust coal prices to industrial consumers to OECD levels by end-1990;
- a commitment to adjust energy prices to households (except for district heat prices) up to 50 percent of industrial levels by the end of 1990, and 100 percent by the end of 1991;
- a commitment to liberalize coal prices progressively to reflect production costs and to remove export taxes to allow domestic prices to rise to world levels by end-1992;
- a commitment to raise industrial natural gas prices to West European levels by the end of 1992, to gradually end the gas tariff cross-subsidy from industrial to household consumers by raising household gas prices to industrial levels by the end of 1991, and to rationalize gas tariffs fully (i.e., have them reflect costs of service by customer class) by end-1995, and;
- a commitment to rationalize domestic oil pricing policy by converting to a uniform value-added tax, in place of the current convoluted turnover tax system, by end-1991.

Although most of these policies are being pursued, in many cases the target implementation date has been delayed owing to political pressures. These are largely related to the degree of energy price increases which can be absorbed by the economy. For the household sector rising energy prices threaten to reduce an already strained real disposable income base and consumers simply cannot afford additional price increases in essential expenditure items, such as home-heating. For the industrial and commercial sector, higher prices fuel inflationary pressures and raise production costs, resulting in a deteriorating comparative cost position, reduced output, layoffs and increased un-employment. Therefore, much of the delay in implementation is a matter of obtaining a political consensus as to what the economy can absorb, and which sectors (energy producing or consuming) should bear the brunt of another round of price increases. The policy to date appears to be one of

⁸ IEA, Energy Policies: Poland, 1991 Survey, OECD, 1991, p. 20.

attempting to keep energy price increases in line with general inflation levels, but deferring some increases (particularly to household consumers) for political reasons.

Poland's energy policy-making is concentrated in the Ministry of Industry and Trade, primarily in its Department of Energy (formerly the Department of Fuel and Energy Management) and the Ministry of Finance, which develops pricing policy and collects revenues for the state-owned enterprises. These enterprises are actually owned by the Treasury, but their functions are administered by the Ministry of Industry and Trade, including the key coal, oil, gas, and electric power production and transportation companies. The Hard Coal Agency, established in Katowice in September 1990, is under the authority of the Ministry of Industry and Trade, as is Ciech (the oil and petrochemical refining and trading company), CPN (the oil marketing company), PGNIG (the vertically integrated oil and gas production, transmission and distribution company), the Polish Power Grid (electricity transmission) and major energy production companies. Negotiations between producers and buyers of coal are overseen by the local Treasury Chambers which are part of the Ministry of Finance. In addition, labor unions have a major impact on price negotiations and policy at the local and national level.

Political support for, and the rate of, market reform were relatively progressive early in 1990, but the degree of adjustment required in energy pricing was more severe than anticipated owing to general inflation levels. The more inflationary monetary and financial policy in Poland helped widen the gap between real domestic and free-market energy prices. In pursuing their stated objectives of reducing the overall subsidy to industry and gradually adjusting household prices to reflect actual costs of service, the Government of Poland (GOP) has been hampered by high rates of inflation, which continued to cause the nominal Polish (zloty) price to lag behind western price equivalents measured in hard currency. In pursuing its stated energy pricing policies in the major bulk fuel markets, the GOP has attempted to keep pace with inflation via quarterly price adjustments. However, most energy price adjustments needed to keep pace with the approximate 50 percent annualized inflation rate since July of 1991 have been deferred, so that most bulk fuel (coal, gas and electricity) prices remain some 20-50 percent below western standards as of mid-1992.

Chapter 2

FUELS PRICING REFORM TO DATE

A. Political and Economic Setting

Prior to the political and economic changes in late 1989, virtually all fuels in the ECE region 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 terms 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 equivalent gas and coal prices) 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 a factor of two and perhaps as high as six times (i.e., priced at one half to one sixth) free 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 not been implemented owing to acute political and economic pressures. The degree of subsidization apparent at the outset of this project varied depending on a number of assumptions:

- 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 manufacturing including 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.

B. Petroleum Products

In Poland the increase in energy prices began earlier than in some ECE countries (i.e., early 1990), but the rate of increase was less pronounced, particularly when denominated in hard currency. However, this lower rate of escalation also reflects a higher initial base price for petroleum products. Recall that inflation was reported to average as high as 900 percent in 1989. Thus, the initial price movements were simply efforts to catch up with inflation rates. Subsequently, in late 1990 and early 1991, much of the petroleum product price increases were prompted by rising energy price levels, and specifically the imminent requirement to pay for Soviet energy supplies in hard currency. In this context, the price increases were necessary but restrained relative to inflation rates and the degree of subsidization remaining in energy prices.

The first major increase in petroleum product prices occurred in early 1990 (January 2), resulting in a near-doubling of nominal prices for the major light products, gasoline and diesel fuel. Table 3 reviews the major petroleum product price changes between January 1990 and March 1991. The percent increase in prices over this 14 month period is shown in the right-hand column. Notice that the most extreme increase was in premium gasoline, and that diesel fuel price increases were less than gasoline. This reflects the lower turnover tax to which diesel is subject, owing to its primary role in agriculture and other commercial and light industrial applications. By March of 1991 motor gasoline price levels reached a level of \$0.40/liter (at 9,500 zl/\$), or \$1.51/gallon for regular grade gasoline. This compares to a price of about \$1.15/gallon in Bulgaria during the same period (at 12 lv/\$).

Table 3
Petroleum Price Evolution in Poland: January 1990 - March 1991
(Zlotys per liter and U.S. \$/gal.)*

Effective:	Jan. 1 <u>1990</u>	Jan. 2 <u>1990</u>	Sep. 1 <u>1990</u>	Oct. 10 <u>1990</u>	Percent Change from 1/1/90 to:	
					Mar. 3 <u>1991</u>	Mar. 3, <u>1991</u>
Gasoline:						
Reg. E-86 (zl/lt)	1150	2300	3000	3500	3800	230
(\$/gal.)	0.46	0.92	1.20	1.39	1.51	228
Prem. E-94 (zl/lt)	1200	2400	3200	3700	3700	242
(\$/gal.)	0.48	0.96	1.27	1.47	1.47	206
Diesel Fuel:						
Summer Grade						
ONI Ls (zl/lt)	1000	1900	2200	2500	2800	180
(\$/gal.)	0.40	0.76	0.88	1.00	1.12	180
Winter Grade						
ONI Z-20(zl/lt)	1000	1900	2300	2500	2900	190
(\$/gal.)	0.40	0.76	0.92	1.00	1.16	190
ONI Z-35(zl/lt)	1050	2000	2500	2800	3100	195
(\$/gal.)	0.42	0.80	1.00	1.12	1.24	195

Source: International Energy Agency, Energy Policies: Poland, 1990 Survey, OECD, Paris 1991, p. 156.

* Utilizes the official fixed z!/\$ exchange rate of 9,500 in effect from January 1990 through Apr. 30, 1991.

Poland's gasoline prices were not comparatively low by this limited Eastern European standard, but they were low compared to Western European levels, and their rate of increase was clearly not as fast as seen in other countries. Since March 1991, the price of 94 octane gasoline (E-94) has increased from 3700 zl/liter to 4896 zl/liter six months later, and 5100 zl/liter in February 1992⁹. Using approximate z!/\$ exchange rates of 11,200 and 11,800 for September 1991 and February 1992, respectively, produces a retail price equivalent of

⁹ Ministry of Finance

\$1.57/gallon in September 1991, and \$1.64/gallon for February 1992. Therefore, in hard currency terms the rate of price escalation over the past year has decreased substantially now that petroleum prices reflect world market levels. The Ministry of Finance continues to modify the turnover tax levels and the level of allowable cost factors in establishing the maximum selling price, but the basic quarterly adjustment process does attempt to reflect external market price levels. A full discussion of the petroleum product price "build-up" process is provided in Chapter 3. A pictorial view of the trend in Poland's light petroleum product price movements is provided in Exhibit 1. Here, the increased level of taxation on gasoline relative to diesel prices is quite evident. Recently (June 1992), the turnover tax on gasoline averaged around 50 percent, compared to a level of 20-30 percent for diesel fuel¹⁰.

Together, gasoline and diesel fuels account for about 70 percent of Poland's petroleum product consumption, as shown below in Table 4. Poland is a net exporter of fuel oil, which is not taxed and indeed is priced to be competitive with coal as a start-up fuel for power generation and as an export good. In addition, Poland's refineries produce a significant quantity of petrochemical products, which are typically priced internally at a transfer price which allows a reasonable return to petrochemical plants. Lubricants and asphalt account for the balance of Poland's estimated 12.635 MT of annual oil consumption in 1990¹¹.

The primary revenue sources from petroleum product use to the Ministry of Finance are, therefore, the turnover taxes imposed on gasoline and diesel fuel. This tax level is set as a matter of policy by the Ministry of Finance, with advice from the Ministry of Industry and Trade regarding the appropriate levels at which to set turnover taxes, balancing consumer with producer interests, and attempting to roughly equalize domestic and imported price levels. Fuel oil is in surplus in Poland owing to the dominance of coal in the power and industrial sectors. In early 1990, fuel oil prices were increased by a factor of slightly more than four times, compared to 5-to-7 times for hard coal. Since then no formal increases in

¹⁰ Ministry of Finance.

¹¹ CPN, as reported in IEA, Energy Policies: Poland, 1989 Survey, OECD, Paris, 1991, p.155.

POLAND: RETAIL PETROLEUM PRODUCT PRICES

1990-1992: CPN

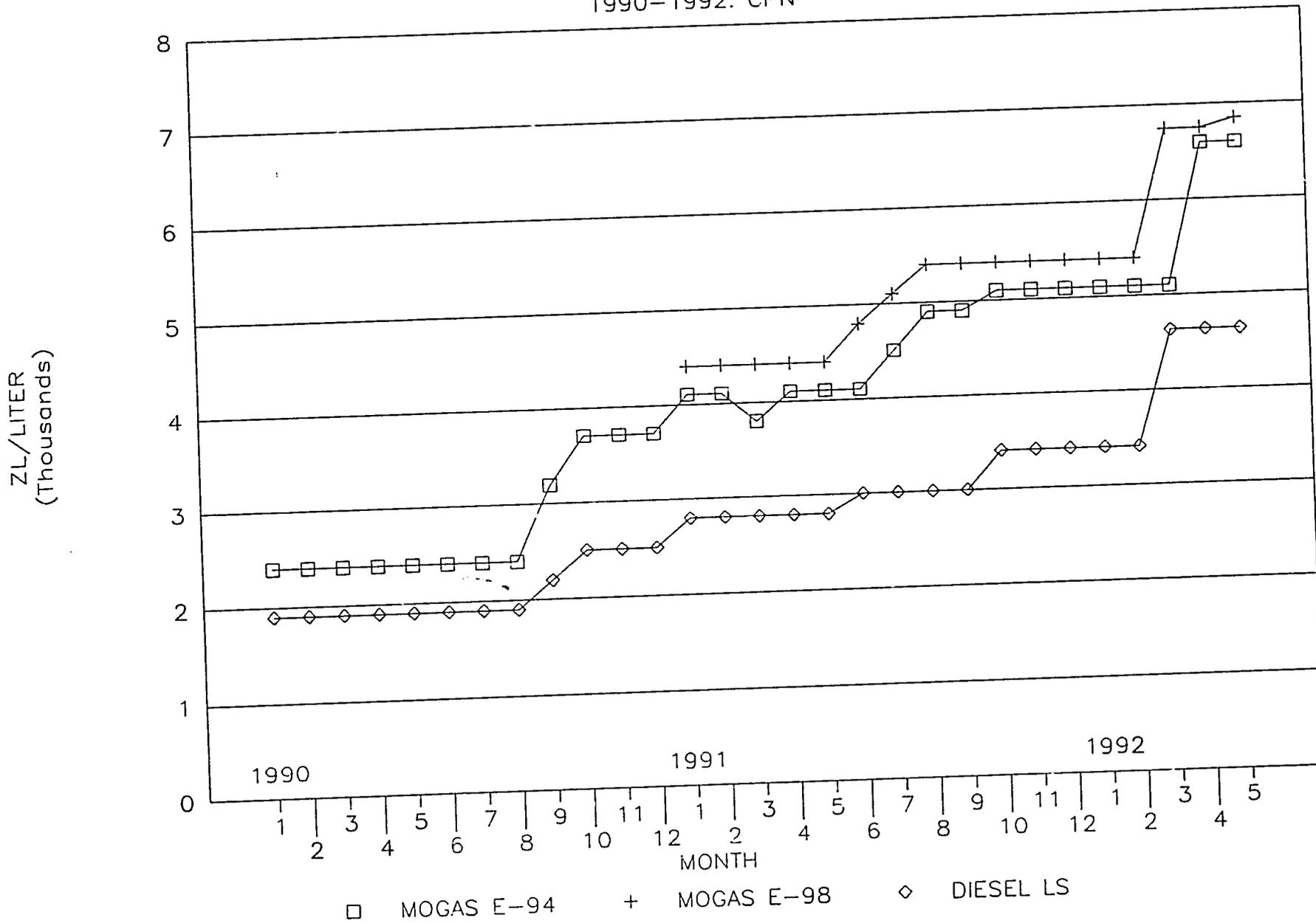


Table 4

Poland's Estimated Oil Product Supply in 1990
(MT)

Product:	<u>Refinery Output</u>	<u>Imports</u>	<u>Exports</u>	<u>Net Total Supply</u>	<u>Percent of Total</u>
Gasoline	2.100	1.350	-	3.450	27.3
Diesel	3.900	1.500	-	5.400	42.7
Fuel Oil	2.900	0.100	1.300	1.700	13.5
LPG	0.145	0.050	some	0.195	1.5
Lubricants	0.300	0.150	-	0.450	3.6
<u>Asphalt</u>	<u>0.500</u>	-	<u>negligible</u>	<u>0.500</u>	<u>4.0</u>
Totals	9.845	3.150	1.300	12.635	100.0

Source: CPN, as published in IEA, Energy Policies: Poland, 1989 Survey

fuel oil costs have occurred, allowing fuel oil prices to remain subsidized relative to the cost of foreign imports and light product prices.

In general, the GOP has been less responsive to the dynamics of the oil marketplace than other ECE countries. Prior to 1992, a consistent procedure had not been established for adjusting petroleum product price levels in response to market price movements and government revenue or other objectives (e.g., border price equalization, etc.). Subsidies were maintained for residual fuel oil in order to compete with coal, and substantial cross-subsidies were given to diesel prices, mainly owing to its primary use in agriculture. A formal procedure for routinely adjusting petroleum price levels to world market standards was not established until February 1992, and even then only for quarterly adjustments for gasoline and diesel fuel. The basic policy is to establish a roughly equivalent cost base for domestic refined product output and imported product prices, inclusive of turnover taxes, customs duties and other fees or "margins" allowed in developing a final price. As detailed in Chapter 3, this methodology is quite cumbersome and with only quarterly adjustments provides little responsiveness to market pressures. In particular, the fixed price and margin assumptions built into the process are quite artificial compared to the changing relationship between domestic and imported supply economics. This provides incentives for abuse and inefficiency in attempting to balance import competition with domestic output and related

costs. The announced plans for a uniform value added tax (VAT) on petroleum products by early 1993 will remove the Ministry of Finance from its regulatory function, and move a long way towards allowing Poland's petroleum product prices to respond efficiently to market forces.

C. Hard Coal and Lignite

Hard coal is Poland's primary indigenous energy resource, and its principal source of fuel. Poland was the world's sixth largest producer and exporter of hard coal in 1989, at 177.6 MT and 33 MT, respectively.¹² In early 1990 hard coal prices were raised by a factor of five to industry and seven to households, in an effort to begin to move coal prices towards production costs. A reported export sales price of \$70/ton¹³ was recorded in early 1990, implying a previous price level of just \$7-\$10/ton in 1989, at the official zl/\$ exchange rate of 9,500. However, average mine-mouth prices were substantially lower. For example, in June 1990, the average mine mouth price was reported to be 115,000 zl/ton,¹⁴ or roughly \$12/ton (see Exhibit 2). In July of 1990, end-use prices were raised again by roughly 30-50 percent¹⁵. By September of 1990 the hard coal price was reported to be decontrolled, subject to the negotiated outcome of transfer prices between the major mines and consumers, under the supervision and consent of the regional Chambers of the Treasury. These are part of the national Treasury, and function as local arbitrator for contracts in key industries. In fact, while prices are ostensibly decontrolled, the allowed rate of monthly escalation is usually limited to the general rate of inflation (i.e., no more than 5-10 percent per month, as seen in Exhibit 2). Therefore, effective January 1991 Poland's hard coal prices still need to increase by roughly 70 percent to approach equivalent western levels. In local currency terms an increase of roughly this degree occurred over the past year (from 218,000 zl/ton in Jan. 1991 to 361,000 zl/ton in Jan. 1992). However, in hard currency or inflation-

¹² IEA, Energy Policies: Poland, 1990 Survey, OECD, Paris, April 1991.

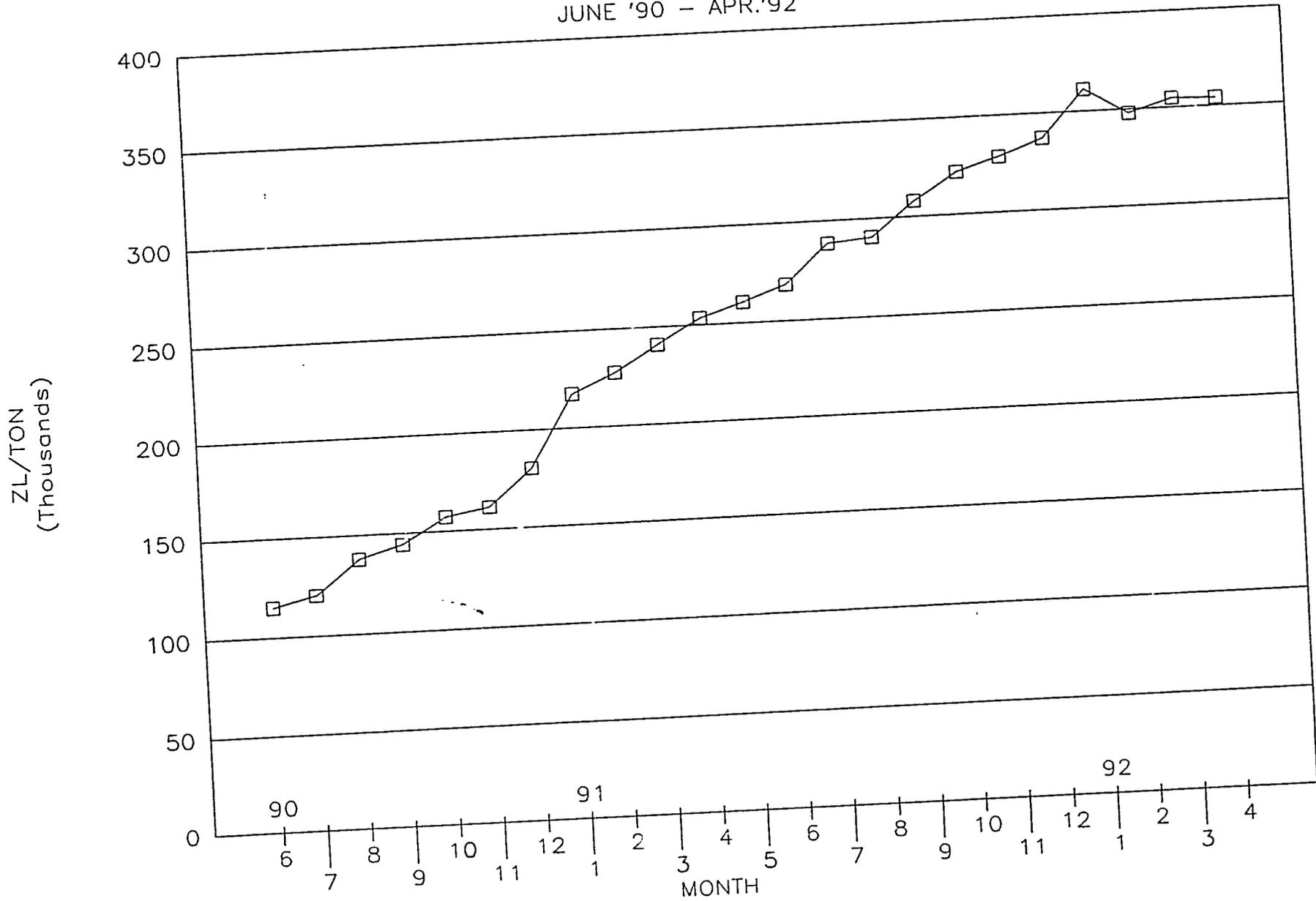
¹³ Based on an export price negotiated with the USSR, as reported by IEA, Energy Policies: Poland, 1989 Survey, OECD, Paris 1991, p.31.

¹⁴ Polish Hard Coal Agency

¹⁵ IEA, Energy Policies: Poland, 1990 Survey, OECD, Paris, April 1991.

POLAND HARD COAL PRICES:

JUNE '90 - APR.'92



adjusted terms, the hard coal price still lags western standards and "real" production costs by as much as 50 percent.

In 1990 coal prices were still subsidized, with the subsidy averaging \$6.70/ton. This represents a 47 percent reduction from 1989 subsidy levels. Further reductions in hard coal subsidies will require a sharp reduction in average production costs, including the shutdown of the higher cost mines. The Hard Coal Agency was set up in September 1990 largely to handle this task, in an environmentally and socially acceptable manner. Effective April 1992 price subsidies for coal producers have been eliminated, with the exception of a fund to cover mine liquidation expenses. The intent is to shut down mines with relatively high production costs as rising price levels both reduce demand and intensify the bargaining position of the buyers. Tougher negotiation terms are expected to put further pressure on producers to cut costs in order to remain competitive. Some mines have been shut down, although other incentives, such as relocation resources may be needed to accelerate this process. Despite this liberalization of coal prices at the mine mouth, hard coal's price increases have not been fully passed on to consumers. Only those increases effective through July 1991 have been reflected in consumer prices. Since July 1991, average mine mouth prices have risen from 288,000 zl/ton to over 350,000 zl/ton, or more than 20% in nominal terms.

The Finance Ministry determines how much of the increase in energy prices to pass on to final consumers. Recently, its policy has been to pass on an increase roughly equal to the consumer price inflation level. Thus, in 1991, an average increase of 56 percent, roughly the inflation rate, was allowed. In 1992, an inflation rate of 35 percent had been recorded through the first five months. Therefore, a similar level of energy price increases is anticipated. On average the price deliverable to households exceeds the industrial price by about 20 percent, or roughly the difference in transportation costs to these customer classes.¹⁶

Virtually all lignite production in Poland is consumed by the electric power sector.

¹⁶ Ministry of Finance

Production was roughly 40 percent the level of hard coal in January 1990 (71.6 MT in 1989). The initial escalation in lignite prices was less severe than for hard coal, rising 2.5 times, compared to hard coal's approximate 400% increase. In nominal terms, the price of hard coal to industrial users rose from around 23,000 zl/ton in late 1989 to 115,000 zl/ton in January 1990¹⁷, which translates to a lignite price estimated at 20,000 zl/ton in late 1989 to 50,000 zl/ton in early 1990. Thereafter, lignite prices have been allowed to evolve towards a freely negotiated price level in the same manner as hard coal. In reviewing appropriate price levels, consideration for btu content, ash and sulfur content, as well as other unit energy value and environmental aspects are now formalized in the pricing process. There are no turnover taxes or customs duties on hard coal, coke or lignite, but a small export duty is attached to hard coal to discourage its export into higher priced markets. In fact, Poland exports little coal because there are no significant port facilities to handle large (economically-sized) volumes.

D. Natural Gas

Prior to the 1990 price increase and collapse in demand, Poland consumed 12.7 billion cubic meters (bcm) of natural gas, and another 3.1 bcm of coke oven gas. Roughly 70 percent of this consumption is for industrial use, and 30 percent for household consumption. Indigenous production accounted for 35 percent of this demand, with the balance imported from the Soviet Union via two different pipelines: one through Belarus, and the other through Ukraine. Poland's natural gas price levels, at an average delivered price (for all customer classes) of 44.334 zl/cubic foot, or \$3.26/thousand cubic feet (mcf) at a recent exchange rate of 13,600 zl/\$, are still well under average Western European levels, which average around \$5.00/mcf, average delivered price to all customer classes. The price increase process remains under Government control, although general principles of achieving market price and replacement cost objectives now appear to be guiding the long-run pricing strategy. Price increases are made quarterly, under the review of the Ministry of Finance and with input from the Ministry of Industry and Trade, and the Polish Oil and Gas Company (Polskie Gornictwo i Gazownictwo, or PGNIG). The overall intent appears to be to

¹⁷ Hard Coal Agency of Poland

phase in market level prices over a period of several years, so that by the end of 1995 the Polish natural gas prices reflect western levels.

Tariff structures are being devised to more closely link the delivered price by customer class to the cost of service. Specifically, this means that the price to household users has been increased dramatically relative to the price for industrial users. This shift in policy took place in July 1990, although the household price did not surpass industrial levels until the first quarter of 1992. Effective March 1992, retail gas pricing was officially aimed at: 1) pricing gas at levels more accurately reflecting costs of service, and 2) providing gas users with more accurate signals regarding the market replacement cost of gas.

An estimated natural gas price path to household consumers is shown in Table 5. The first major increase in natural gas prices occurred in January 1990, when gas prices were increased by a factor of five from an estimated 23 zl/cu. meter in 1989 to 115 zl/cu. meter in January 1990. This reflects an equivalent starting point of \$0.34/mcf. In July 1990, natural gas prices were doubled to 227 zl/cu. meter, or roughly \$0.68/mcf at the then official exchange rate of 9,500 zl/U.S. dollar. Household gas prices were increased another 80 percent in January 1991. By then the Soviets were requiring payment for imported gas in hard currency, and traded under complex barter terms, with prices fixed around a ruble "transfer" price and the general level linked to world crude oil prices. On average this methodology yielded a price to Western European buyers of between \$2.50 and \$3.00/MMBtu (or \$15.50 to \$18.50/barrel), but this price is expected to rise to \$3.85/MMBtu-equivalent by the end of 1992. In June 1991 gas prices to household consumers increased to 1080 zl/cu. meter (\$2.78/Mcf), where they remained before being raised again in January 1992. The latest increases have moved household natural gas prices over \$4/MMBtu, which is still some 25 percent below average Western European standards, but above Poland's estimated imported cost level. Western European natural gas prices are tied to the price of home heating oil, which implies a recent gas price level of \$4.50 - \$5.00/MMBtu on straight wholesale basis, but as high as \$7-\$/MMBtu for household consumers, depending on the downstream delivery charges added to the direct commodity price of home heating oil.

Table 5

Estimated Average Natural Gas Price to Households in Poland:

January 1990 - May 1992

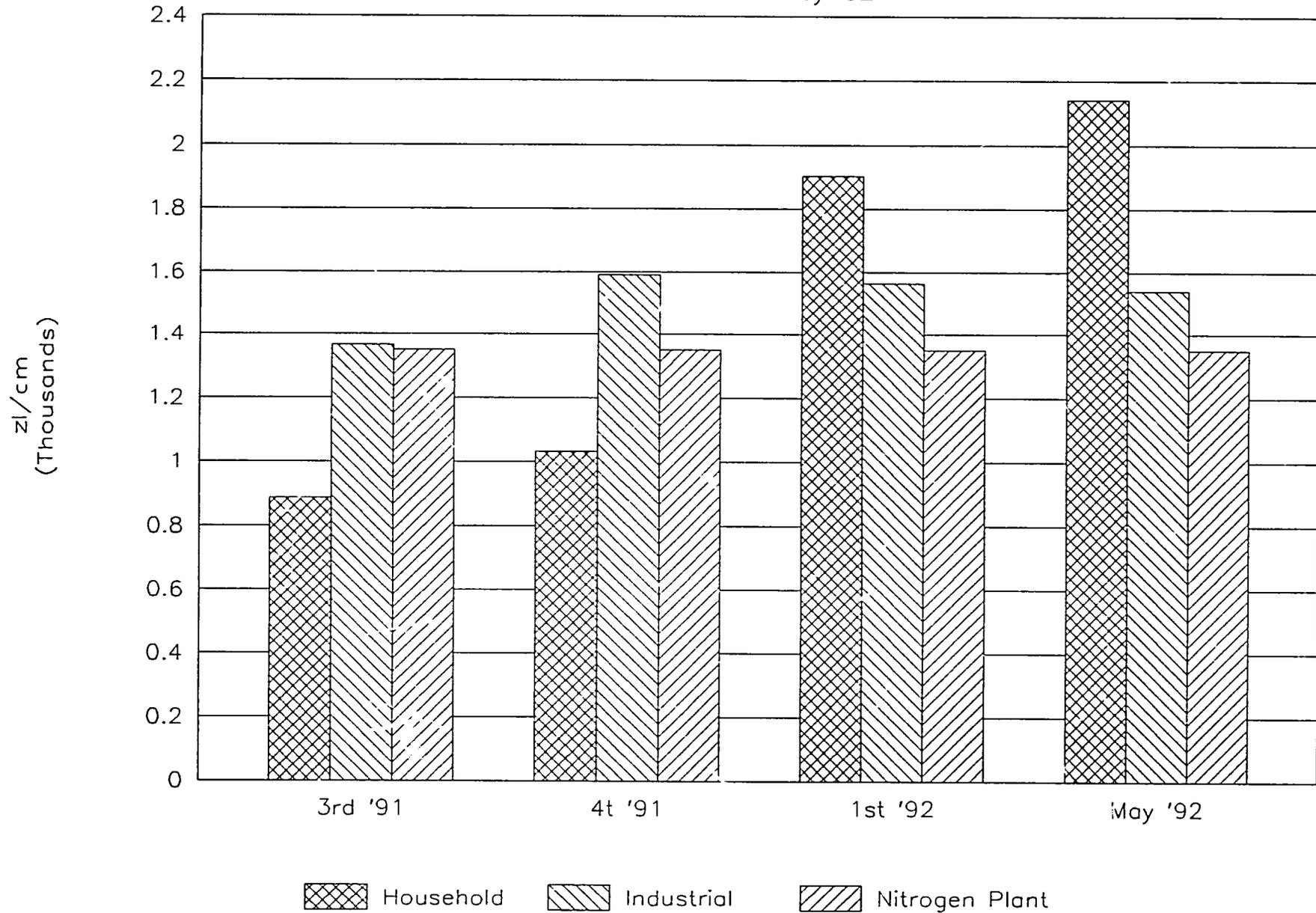
Eff. Date:	Jan. <u>1990</u>	July <u>1990</u>	Jan. <u>1991</u>	June <u>1991</u>	Jan. <u>1992</u>	May <u>1992</u>
Household Price:						
ZL/cu. meter	113	227	410	1080	1904	2140
\$/MMBtu... @ zl/\$	0.34	0.68	1.22	2.78	4.76	4.45
ex. rate of:	9500	9500	9500	11000	11300	13600

Source: Poland, Ministry of Finance

The degree of rationalization in gas rate structures is evident from the increase in household prices relative to industrial prices over the past two years. Household natural gas prices were subsidized by 50 percent relative to industrial users prior to January 1991, and as much as 40 percent as recently as the third quarter of 1991. Average household prices of natural gas are now 25 percent higher, on average, than prices to industrial users, excluding local distribution charges. This trend is shown in Exhibit 3, which plots the recent quarterly average gas prices by customer class. Note that the reported average price level increased by over 50 percent in the first quarter of 1992, with most of the increase in the residential sector. This increase, in turn, reflects a recent effort to rationalize the tariff structure for natural gas, which is now segmented by user type and class. For example, household consumers now pay a fixed 100 zl/cu. meter distribution charge. In addition, all retail customers now pay a fixed proportional use or "reservation" charge equal to some proportion of its average annual use, and, of course, the commodity charge. The relative increase in gas prices to the household sector corresponds to an increase in this sector's total share of natural gas consumption in Poland. Industrial consumption was reported to constitute 65 percent of total usage in 1989, slipping to 50 percent by 1991, owing to the overall impact of rising prices on domestic manufacturing demand. Meanwhile, household and commercial consumption levels have risen from approximately 35% in 1989 to 50 percent in 1991. Therefore, the higher rate structure for household user's provides an increasing revenue base for PGNIG in attempting to cover its relatively higher distribution

Natural Gas Prices in Poland

3rd Quarter '91 – May '92



service costs to the household and commercial consumer class.

Industrial users pay both a demand charge and a commodity charge for the gas taken. However, the degree of subsidization remains quite pronounced because PGNIG recovers little if any of the costs of service for industrial users, and perhaps less than half of its full service cost for residential and commercial customers. An example of the natural gas rate structure among residential and commercial (R/C) and various industrial customer classes is shown in Exhibit 4. These estimated rates were effective at the start of 1992 and, therefore, do not fully reflect the latest increases cited in Table 5, above. The average retail rate of \$3.86/Mcf compares to a small volume (SV) industrial customer rate of \$3.23/Mcf, and a large volume (LV) rate of \$2.79/Mcf equivalent in peak periods, dropping to \$1.86 in off-peak (summer) months. By contrast, the steady seasonal demand of the nitrogen fertilizer industry is priced at \$2.23/Mcf. Both of these major industrial categories appear to be priced at a level which does not cover the reported average border price of Russian gas, at \$2.50/MMBtu. In effect PGNIG appears to be subsidizing industrial customers prices, who in effect are paying a negative cost of service.

E. Electricity and District Heat

Electricity tariffs have also been increased substantially since 1990, particularly to household consumers, as shown in Table 6. After an initial quintupling of electricity prices to the household sector in January 1990, rates were increased another 120 percent in 1990. Nevertheless, electricity rates remained roughly 2.7 times (65 percent) below equivalent Western European levels for household consumers in early 1991, and roughly 60 percent below this standard for industrial users. This apparent degree of subsidization reflects the fact that nearly 95 percent of Poland's electricity is generated by solid fuels (rather than the higher priced liquid and gaseous fuels), including 60 percent from hard coal, and about 35 percent from lignite. Moreover, the tariff structure, including full recovery of transmission and distribution costs has not fully kept pace with service costs, most notably depreciation.

NATURAL GAS PRICES TO FINAL CONSUMERS

POLAND, 3RD '91 - 2ND '92: ZL/CU.M

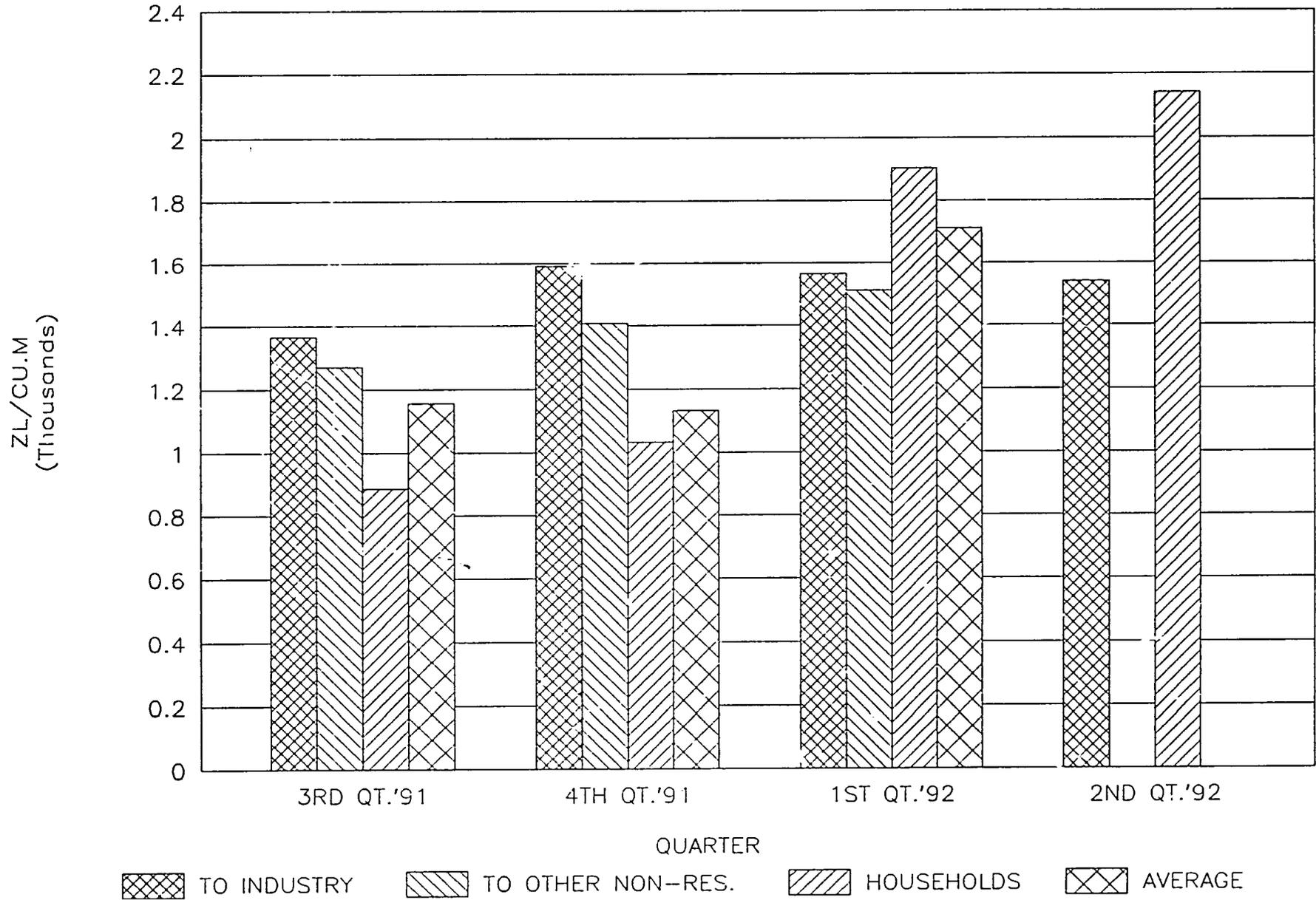


Table 6**Estimated Average Electricity Rates to Household Customers in Poland****(zł/KWh and ¢/KWh)**

Effective Date:						
Month	Dec.	Jan.	July	Jan.	June	Jan.
Year:	<u>1989</u>	<u>1990</u>	<u>1990</u>	<u>1991</u>	<u>1991</u>	<u>1992</u>
Household Price:						
in zł/KWh	22	105	192	230	475	537
in ¢/KWh	0.23	1.15	2.20	2.42	4.32	4.75
@ zł/\$ ex. rate...	9500	9500	9500	9500	11000	11300

Source: Poland, Ministry of Finance.

Since early 1991, electricity rates to household consumers have been increased roughly two and one half times, from 230 zł/KWh in January 1991 to 537 zł/KWh in January 1992 (holding through April 1992). Over this period, the official Polish bank exchange rate increased from 9,500 zł/\$ to 11,300 zł/\$. Although roughly 50 percent of this increase reflects currency devaluation and inflation, the rate structure to household consumers is now much closer to Western standards. The recent 537 zł/KWh rate translates to over 4.75¢/KWh at the reported average January 1992 exchange rate, and just 3.95¢/KWh at a more recent (May 1992) exchange rate of 13,600 zł/\$. This figure is at least 33 percent below western standards.

As in the case of natural gas, the Polish Government, led by the Ministry of Finance in cooperation with the Polish Electric Power Grid, is taking progressive steps to rationalize its electricity rate structures. The basic guiding principle is for rates to reflect the unit cost of service to different classes of customers. For example, residential rates now vary depending on the voltage network (high vs. low) and demand levels. Low voltage system, low-use customers pay the highest unit rate, while high voltage, high volume customers pay the lowest unit rates. In addition, the rate structure distinguishes by time of service (peak, off-peak). A summary breakout of customer tariff classes has the following structure:

Industrial Users: (large vs. small, high vs. low voltage)

- a. peak
- b. off-peak
- c. energy rates (day, night and peak)

Residential and Commercial Users: (large vs. small, low vs. high voltage)

- a. peak
- b. off-peak
- c. bulk tariff

In addition, effective July 1992, a new tariff rate based on the maximum electric service capacity, together with the amount of electricity actually taken, is scheduled to go into effect. Electric power rate adjustments are approved quarterly (by the Ministry of Finance), and now reflect the energy transaction costs (largely coal) between producers and the Polish Power Grid, as administered by the Ministry of Industry.

The procedures for establishing and negotiating transfer prices between power producers and the PPG are now fully documented in a new (Feb. 1992 release) publication entitled "Rules of Settlement Between Generators and Grid Company Distributors." The framework for these producer-Grid contracts is re-established annually, and based on individual plant cost analysis (there is no power pooling among plants). Seven different generic power production plants groupings have been developed for purposes of designing energy rate charges. The groups are differentiated based on region, fuel type and other co variables, such as size. For example, Group A consists of large system power plants and hydro pumping stations (there are 17). Group B consists of independent (non Grid-linked) plants capable of steam-driven starts. Group C includes nine combined heat and power cogeneration plants greater than 100 MW in capacity. Power rates are standardized to a common calorific value, sulfur and ash content, so that environmental costs are internalized under the transfer price "settlement" procedures. Transmission costs are also calculated individually, as these differ for each plant.

Of Poland's total capacity of 32,000 MW approximately 60 percent is fired by hard coal, and another 30 percent by lignite. Hydro capacity accounts for roughly 6 percent, of

which 1,300 MW is from pumped storage. This is the only true peaking capacity available to the system, as oil is too expensive to use for this purpose. Oil is used for start-up units only, and no natural gas is currently used for direct generation. Roughly 10 percent of Poland's power is not moved through the Power Grid's system; rather it is sold directly to one of the 33 different local distribution systems, typically by a cogeneration plant associated with an industrial facility.

District heating rates are also heavily subsidized, although efforts are underway to phase out subsidies over the next 1-to-2 years. The major deterrent to removing subsidies is the impact that a full rate for heating would have on the populace's disposable income. This is a formidable political/economic issue given that Poland is one of the most intense users of district heat in the world. An estimated 70 percent of large buildings in urban areas are heated with district heat, and 50 percent with hot water. The Ministry of Finance sets prices, with subsidies administered through the local townships and municipalities. These local entities will eventually take over the administration of district heat once prices are allowed to approach cost levels. This will require an increase of some 3-4 times for space heat and hot water heat, respectively.

As in Bulgaria, a major problem with imposing market-level rate structures is the lack of metering equipment which should encourage consumers to control their use of energy. The GOP has enacted regulations (effective Jan. 1, 1991) requiring all new buildings to contain metering equipment, and for old buildings undergoing modernization to install similar metering equipment. These efforts may also be extended to individual apartments.

Chapter 3

CRITICAL ISSUES IN ENERGY PRICE REFORM

A. Primary Developments to Date

The Government of Poland has taken major strides to adjust its energy price structure in order to reflect resource replacement costs more accurately and the desired consumer and producer response to price signals. Most of these efforts have been directed at the coal and electricity sectors to date, as these are the primary energy sources which drive Poland's economy. Oil accounts for only about 14 percent of Poland's energy requirements, a comparatively low level even for Eastern European countries. Similarly, natural gas pricing has been given less attention owing to its limited share of Poland's overall energy needs (about 7 percent in 1989) and because its real price terms have largely been concealed in barter arrangements.

Substantial progress still is required to open the pricing process to market forces, and eliminating the inefficient systems of state subsidies to certain guarded interests. The price rationalization process has been impeded primarily by political pressure to maintain control over fuels pricing in order to insure that energy costs do not add to overall inflation levels and economic hardship for Polish consumers and industry. In addition, the GOP's interest in maintaining central control over its strategic assets in oil production, processing, transportation, and marketing has limited the introduction of outside investment which would expedite the introduction of market pricing into most fuel sectors, particularly petroleum.

As discussed in Chapter 3, the nominal price of most fuels has been increased by at least a factor of five times their 1989 levels, and the GOP remains committed to a policy of eliminating most subsidies by 1995. In the case of petroleum products this means ultimately allowing the market to determine price levels, coupled with taxes to balance revenue and social objectives, including the desired signals regarding consumer demand, pricing externalities and stimulating needed investment. However, despite these goals, petroleum product price-setting procedure remain largely under government control, often utilizing antiquated systems, so that the overall process continues to be characterized by the trade-

off between market efficiency and the concern to maintain centralized or special interest control over fuels pricing and asset ownership.

Among the major accomplishments it should be noted that:

- **petroleum product prices** for transportation fuels are now market-responsive on a quarterly basis, and price levels are approaching Western standards exclusive of downstream taxes.
- **hard coal prices** have virtually been decontrolled, with the exception of the timing of the pass-through to the public owing to the primary interest in controlling inflation rates, and protecting Poland's export competitiveness.
- **natural gas tariff rates** have been restructured to account for the cost of service to household consumers, and as import opportunities are diversified and long-term barter arrangements closed, gas prices will more directly respond to market price developments. The commodity price of gas is expected to equal border levels by end-1995.
- **electricity costs and rate structures** have been modified to reflect more realistic costs of service, and the subsidy to household consumers has largely been eliminated. The Power Grid has taken steps to improve its metering and load management capabilities and will continue to develop cost-of-service based rate structures to limit the degree of cross-subsidization by user class, and among fuel supply sources. Finally, a formalized procedure for negotiating power production cost between the Grid and individual producers has been established, providing the groundwork for recognizing the principle of fuel-cost adjustment pass-through.

Despite these accomplishments, substantial progress needs to be made in opening up fuels pricing to outside competition, including new supply sources, and in reducing government involvement in the price-setting process. Since coal and electricity are at the heart of the Polish energy sector, actions taken to liberalize coal pricing must be taken in concert with commodity and service cost adjustments. In the case of natural gas, rate structures should be rationalized to at least cover the commodity and marginal service cost among consumer classes. With district heat, incentives to conserve and invest in simple metering and fuel efficiency technology must be combined with incremental rate increases.

Most of these developments appear to be moving according to schedule. The Power Grid and Hard Coal Agency have been the beneficiaries of substantial technical assistance in

devising fuels pricing and rate-making strategy. The greatest amount of confusion and need for analytic capability appears to lie in assessing the policy impacts of alternative petroleum product and natural gas pricing strategies. In the case of gas, prices and rate structures need to be introduced to allow the PGNIG to make an adequate rate of return, and stimulate additional investment in gas production, transmission, distribution and end-use technology. In the case of petroleum, the Polish market should be freed from inefficient price-setting techniques, and tax and customs regulations should be enforced. As the primary short-term alternative to coal, both gas and oil pricing should be given more attention in developing market analysis tools which can be relied upon for planning both price rationalization and industry restructuring to insure a competitive climate. To date, little attention has been given to developing these skills in any kind of integrative framework to support a multi-fuels government policy and planning capability.

B. Petroleum Product Price Reform

Despite increasing most nominal petroleum product prices by a factor of roughly five times, and moving to a system of market-responsive pricing, Poland still suffers from over-regulation of its petroleum market. The net result of this regulation is that price signals, while improving, remain somewhat inefficient, and limit the ability of Poland's domestic industry to compete against or attract investment from external interests. Moreover, the regulated price "build-up" system, which establishes maximum allowable price levels, is open to substantial abuse, not only from the participants not reporting accurate transaction volumes and prices, but also owing to the rigidities in the process compared to the dynamics of the marketplace.

As previously noted, pricing policy, macroeconomics and politics are inseparable in Poland. The primary vehicles through which petroleum pricing policy is implemented are the turnover tax, customs and related components of the maximum allowable price for petroleum products. This "build-up" procedure is created by the Ministry of Finance, with policy input from the Ministry of Industry and Trade's Energy Department, and technical input from the state-owned refining (e.g., Plock, Gdansk), importing (Ciech) and distribution/marketing (CPN) companies.

1. The Petroleum Price "Build-up" System and Tax Levels

Since February 1992 the Ministry of Finance has published a schedule which details how the maximum allowable selling prices for both domestically produced and imported petroleum products are determined. This schedule is known as Decision Nr PD 2/92. A full example of the price build-up process is provided in Exhibit 5. As seen in Exhibit 5, the spreadsheet is divided into two major sections: Rows 1-11 lay out the price build-up process for domestic product, while rows 12-17 show the steps for imported product. Each column refers to a specific regional variation and effective date, sub-divided into three product types: 98 octane gasoline (etylina), 94 octane and 1% sulfur diesel fuel. These are the three major transportation fuels, and the primary sources of tax revenue from petroleum products.

As shown in Exhibit 6, the combination of motor gasoline and diesel fuel accounts for roughly 70 percent of Poland's total petroleum product supply (roughly 9 MT out of a total of 12.5 MT consumed in 1990). The balance of refined petroleum product supplies are typically dedicated to end-uses, such as LPGs the petrochemical market, lubes and asphalt to industry and transportation, heavy fuel oil to industrial, electric power or shipping users. Pricing of these fuels is not subject to the formalized market-linked price build-up process detailed below, but remain subject to direct government control.

The price build-up shown in Exhibit 5 starts with an assumed cost of crude oil, shown on line #6 in USD/barrel and USD/ton. This is the assumed crude oil price to the domestic refiner based on recent price trends (i.e., the last quarter). This price is then converted to zl/kg in line #8, through the exchange rate shown in line #7. The importing firm's (Ciech's) margin is given on line #9, to produce a total crude oil cost to the refiner on line #10. Line #11 derives the estimated product-specific refinery revenue from production by subtracting the crude oil costs from the refinery sales price (line #5-line #10). Note that this per-unit amount differs between gasoline and diesel fuel, reflecting a desired product-specific production margin. The total refinery gate cost of production is shown on line #5 as the refinery price. This differs from the refinery sales price of line #3, which is derived from the retail price level (deemed in part by price policy, and in part from observing the comparable imported fuel cost). After excluding CPN's marketing margin (of 510 or 460 zl/kg) a transfer

Exhibit 5

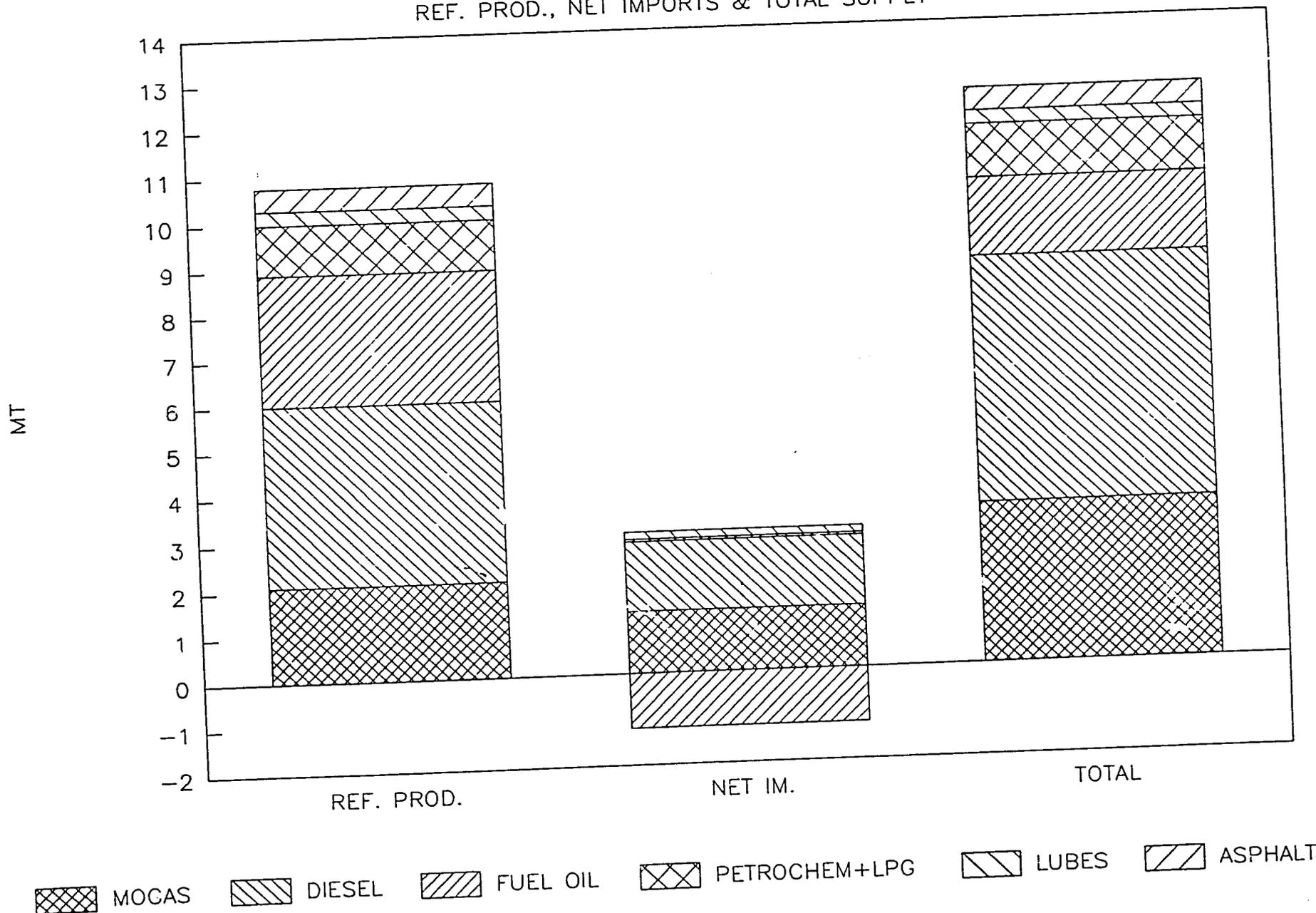
Poland's Petroleum Product Price Build-Up

24

			Present prices of fuels, crude oil price as of February 1992 US\$ exchange rate as of 2nd of March 1992			Suggested prices of fuels, variant I US\$ exchange rate as of 2nd of March 1992			Suggested prices of fuels, variant II US\$ exchange rate as of 2nd of March 1992		
			Type of fuel			Type of fuel			Type of fuel		
Item	Specification	Unit	Gasoline 98	Gasoline 94	Diesel fuel	Gasoline 98	Gasoline 94	Diesel fuel	Gasoline 98	Gasoline 94	Diesel fuel
1	2	3	4	5	6	7	8	9	10	11	12
1	Retail price	zł/litr	5.400	5.100	3.400	5.800	5.500	3.800	6.800	6.500	4.500
2	Margins of profit & CPN's commission	zł/kg	7.160	6.770	4.000	7.640	7.320	4.500	8.960	8.650	5.320
3	Refinery selling price (1-2)	zł/kg	510	510	460	560	560	510	560	560	510
4	Turnover tax - on item 3										
	- rate	%	-	53	20	-	49	18	-	57	32
	- amount	zł/kg	-	3.318	708	-	3.312	718	-	4.642	1.538
5	Factory price, at the refinery (3-4)	zł/kg	-	2.942	2.832	-	3.448	3.272	-	3.448	3.272
6	Purchasing price of crude oil										
	- barrel x 7.4 = ton	USD/bar	-	18	18	-	18	18	-	16	18
	- ton	USD/ton	-	133,2	133,2	-	133,2	133,2	-	133,2	133,2
7	US\$ exchange rate	zł/USD	11.400	11.400	11.400	13.554	13.554	13.554	13.554	13.554	13.554
8	Purchasing price of crude oil (6x7)	zł/kg	-	1.518	1.518	-	1.805	1.805	-	1.805	1.805
9	CIECH's margin of profit + 3.4%	zł/kg	-	52	52	-	61	61	-	61	61
10	Refinery purchase price (8+9)	zł/kg	-	1.570	1.570	-	1.866	1.866	-	1.866	1.866
11	Crude oil processing cost and refinery's profit (5-10)	zł/kg	-	1.372	1.262	-	1.582	1.406	-	1.582	1.406
12	World prices of fuels acc. to stock exchange values	USD/t	207	198	160	207	198	160	207	198	160
13	Customs	zł/kg	2.360	2.257	1.824	2.806	2.684	2.169	2.806	2.684	2.169
	- rate	%	15	15	35	15	15	35	15	15	35
	- amount	zł/kg	354	339	638	421	403	759	421	403	759
14	Tax base (12+13)	zł/kg	2.714	2.596	2.462	3.227	3.087	2.928	3.227	3.087	2.928
15	Turnover tax- on item 14										
	- rate	%	-	-	-	102	107	24	144	150	53
	- amount	zł/kg	3.300	3.300	3.162	6.527	6.387	3.628	7.867	7.272	4.468
16	Purchasing cost (12 + 13 + 15)	zł/kg	6.014	5.896	3.162	6.527	6.387	3.628	7.867	7.272	4.468
17	Difference (3-16) for research costs, unloading, financing and importer's profit	zł/kg	636	364	378	553	373	362	533	363	342
		USD/t	55,8	31,9	33,2	49,8	27,5	26,7	39,3	26,8	25,2

POLAND'S PETROLEUM SUPPLY PROFILE: 1990

REF. PROD., NET IMPORTS & TOTAL SUPPLY



or "refinery sales price" is derived in line #3. The turnover tax rate and amount, shown in line #4, is then applied to this transfer price. When subtracted from the refinery sales price shown in line #3, the refinery price (line #5) is derived. The turnover tax percent is based on the refinery sales price (line 3). For example, under the first 94 octane gasoline column, the tax rate of 53 percent is applied to the refinery sales price of 6,260 zl/kg, giving 3318 zl/kg in line #4.

A similar structure applies to diesel fuel (olej napedowy 1 LS), but the turnover tax rates are set appreciably lower for diesel fuel than for gasoline. Note, for example, that in the central district (Ceny paliw, including Warsaw) the turnover tax rate for diesel was 20 percent, compared to 53 percent for 94 octane gasoline. In region 1 (variant 1) the March diesel turnover tax was set at 18 percent, compared to 32 percent in district 2. In this manner the Ministries are able to adjust both inter-fuel and inter-regional price levels to attempt to achieve their policy objectives. In this case, however, the tax structure provides an inefficient cross-subsidy from gasoline to diesel fuel, since diesel's lower price encourages consumption, without generating an incentive for the refinery to increase production due to the fixed assessment of incremental per-unit refining costs assignable to the diesel output (line #10). The cross-regional subsidy is apparent from the different turnover tax rate applied to region 1 vs. region 2. Apparently region 1 is more reliant on diesel for agricultural production, thereby encouraging a lower tax rate.

Perhaps most importantly, the GOP's petroleum pricing policy reflects an effort to balance the price between imported and domestic petroleum products by attaching a combination of customs duties and turnover taxes to imports which approximately balance the delivered cost of imported products with the derived cost of domestic output. This process can be seen through a line-by-line description of the lower half of Exhibit 5 (lines 12-17). The price "build-up" process for imported fuels is as follows: First, in line #12, an estimate of the delivered cost of imported product based on the Northwest Europe spot price plus an estimate of shipping costs to the port of Gdansk is provided. This USD/ton figure is then converted to zl/kg. Second a customs duty and rate is applied to this estimated delivered (port-side) price, to produce a "taxable" base to which the approximate turnover tax (from the domestic price calculation..line # 4) is added. This turnover tax is

expressed as a percent rate of the taxable base, and as a zł/kg. amount. The total of the taxable base (lines 12 + 13) and the turnover tax is then compared to the domestic refinery sales price (on line #3, above) to derive a difference termed the "importer's profit," which is then converted back into USD/ton.

This derived importer's profit can then be used to evaluate both the desired customs duty to charge, and desired turnover tax levels. The objective is to create sufficient competition from imports to keep domestic price levels slightly below the "cost-based" derivation for domestic production, but not so low as to cause domestic refiners to lose market share and suffer forced reductions in capacity utilization rates, which will cause overall operating economies to deteriorate. The appropriate comparison to make for purposes of examining the apparent wholesale price or cost difference between domestic and imported product is line #17, which is simply the difference between the domestic and imported "wholesale" price, contained in lines #3 and #16, respectively. Thus, the GOP would appear to be encouraging import competition in the central region relative to regions 1 and 2, based on the higher apparent importer's profit shown for each of the products.

This system, while convenient for computational purposes in deriving desired turnover tax and customs duty levels, is far too rigid and insensitive to the dynamic economics of the marketplace to function effectively over time. Some of the unrealistic assumptions and procedures built into this system include the following:

- 1) The assumption of a fixed cost of crude oil based on the average of the last quarter ignores the dynamics of price movement in the international crude oil market, and presents a distorted picture of the real cost and competitive feedstock cost position of the domestic refinery relative to imported product. A sharp change in crude oil costs will cause the entire domestic pricing structure to misrepresent not only the economics of the domestic marketplace, but also the comparative economics of imported vs. domestic production. Given that this fixed crude oil cost (and other "adders") are set quarterly, it is highly likely that international crude oil and petroleum product prices will deviate significantly enough from this "deemed" cost to cause the Polish price

ceilings to be mis-representative of the marketplace. In the event of a sharp price increase, the Polish refiners will find their real crude costs substantially higher than shown, so that domestic production will have to be subsidized to stay within the allowed price level. In contrast, if international crude oil prices were to decline precipitously, the imported price of products would be substantially lower than indicated, and refiners would either have to lower their sales prices to compete, or lose market share to importers. In short, it is highly artificial to assume that crude oil and imported petroleum product prices will remain stable over an arbitrary three-month horizon.

- 2) The relation of the domestic refinery sales price to the imported crude oil cost is made at a fixed point in time and held for one quarter. In fact, the variation between refined product prices and the crude oil price can be as volatile, subject to seasonal and cyclical trends, as the absolute price level. Indeed, the economics of refining are largely dictated by this difference, known as the refiner's margin in the physical trade, or the refiner's "crack spread" in the paper oil trade. The latter term denotes the difference between the product price from a cat cracker's predominant output of gasoline and gasoil relative to the feedstock costs, which most closely reflect crude oil prices. In addition, the assumed fixed delivered cost of petroleum products makes no adjustment for the change in transportation rates which can occur over time, nor are any adjustments made for the different geographical origins and related costs associated with product imports. For example, a substantial quantity of imports may come overland from Germany, under a different cost structure than the Rotterdam spot price plus vessel delivery costs built into the delivered product price assumption (line 12 from Exhibit 5). The importer's incentive is to deliver product at a lower price than shown, for purposes of lowering its tax base and competing more effectively with the domestic price structure. To the extent that price levels generally rise, the product importer will be at a disadvantage because its real costs will rise relative to the domestic cost structure. This will shift more demand to domestic supplies, precisely at the time that the domestic price is squeezed against its allowable

ceiling. In contrast, declining prices work to the product importer's favor because it can lower its cost base, move product to relatively high-priced regions, and compete away incremental business as (lower) prices stimulate incremental demand.

3. The regional tax rate differences and assumed fixed marketing costs (CPN's take) create opportunities for importers to obtain market share, beyond their calculated profit incentive. In particular, importers have, no doubt, already become quite skillful at moving product into the region with the highest comparative cost structure, and then taking advantage of local haulers to move the product for final sale into higher taxed and cost areas. For example, diesel fuel brought into region 1 is subject to a lower turnover tax rate of 18%. This product might be subsequently moved to region 2 (albeit not reported) where it will sell at a comparative cost advantage to domestic product originally produced and sold into region 2.
4. The fixed, and relatively high, refinery income also creates an incentive for importers to increase their activity beyond the implicit profit margin shown on line #17. These margins alone are extremely high, averaging over 35,000 zl/kg or 10¢/gallon. The additional incentive coming from under-representing the landed cost (tax base), bringing in discounted below specified quality standards, or perhaps not reporting import volumes at all, is tremendous under such a system. As a result, the overall success of the system is only as good as its enforcement procedures.

In this regard, Poland has enacted annual quotas on gasoline and diesel imports effective January 1992. The annual quota for gasoline is 1.7 MT, and for diesel, 0.7 MT. The reason for this quota was stated to be the elimination of tax dodging, since unreported imports not only avoid the customs duties and turnover taxes directly, but also result in the displacement of domestic product which otherwise are subject to the turnover tax. The Ministry of Finance estimated that nearly six billion zlotys, or nearly one half million dollars in potential tax revenues was lost in the last two months of 1990 owing to tax dodging on

imports. The level of the problem regarding unreported imports is confirmed by both Ciech and CPN. Ciech is the old state importing monopoly which used to report all import and sales volume to the GOP. Now Ciech estimates that its figures do not capture anywhere from 15-20 percent of total consumption. The impact of rising imports on the Polish oil economy is pictured in Exhibits 7 and 8, which show that imports' share of overall new supply levels for gasoline and diesel fuel increased dramatically in 1990 as Ciech Petrolimpex's monopoly on imported product was ended. Gasoline imports now account for nearly 40 percent of Poland's total gasoline consumption, and slightly less than 30 percent of diesel fuel consumption. This trend continued into 1991, so that the 1.7 MT quota on gasoline imports is now very close to annual average import levels, while the diesel quota of 0.7 MT is well below recent import levels. The policy of discouraging imports of diesel fuel is also seen in the higher custom duty on diesel imports (35 percent vs. gasoline's 15 percent).

By contrast, fuel oil prices remain subsidized, while rising from 800,000 zl/MT in the third quarter 1991 to 1,000,000 zl/MT in the first quarter of 1992. This translates to a price of roughly \$11.50/barrel, or roughly 2\$-3\$/barrel below average Western European levels during this period. The trend in fuel oil exports is also shown in Exhibit 8. Thus, the overall effect of the price structure, turnover tax and custom duties is to encourage domestic production of diesel fuel and fuel oils, while discouraging gasoline production. This enables Polish refiners to maximize output of these relatively low cost products, but discourages investment in process upgrading to enhance gasoline production capacity. As seen in Exhibit 6, this is precisely the net effect of this policy, as Polish refineries show a relatively high yield of diesel fuel and fuel oil relative to gasoline.

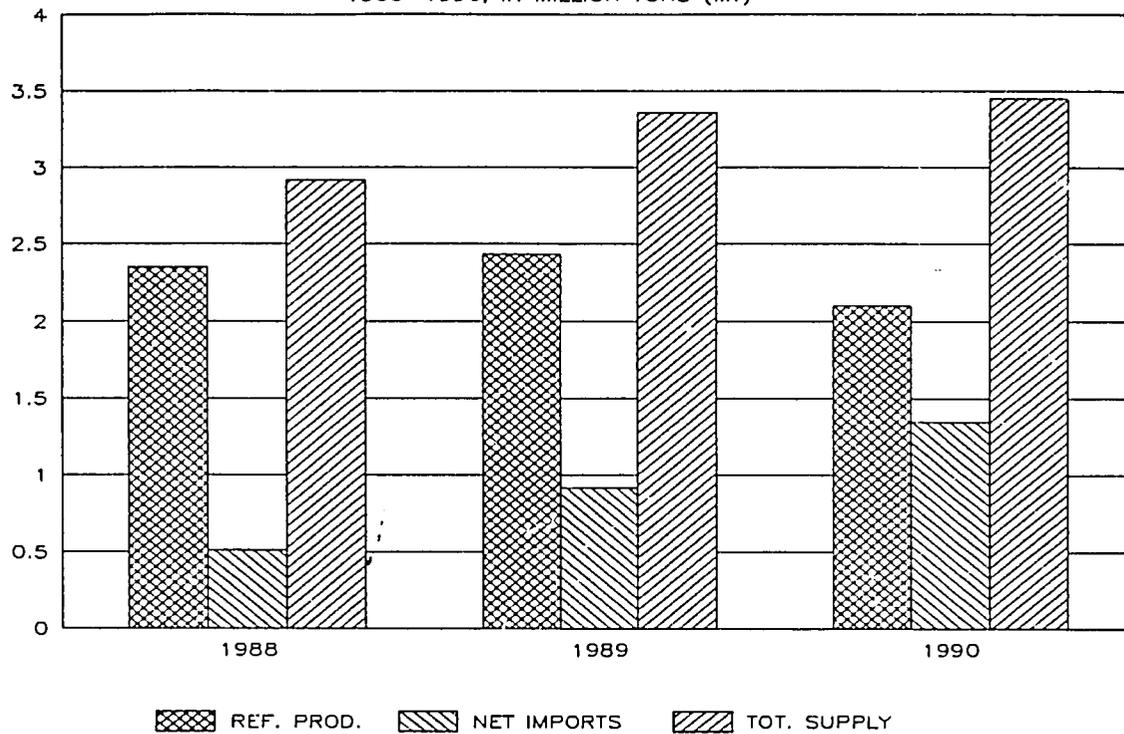
2. Proposed Improvements in Petroleum Pricing Policy

The Government of Poland is reported to be considering the replacement of the turnover tax system with a simple flat value added tax which will be set uniformly at around 20-22% for each transaction. The VAT will be uniformly applied to domestic production and imports. The tax can be supplemented with an excise tax on end-use consumption to bring domestic prices eventually up to Western European standards, or to modify end-use prices to selectively account for externalities or other desired pricing objectives or demand

Transportation Fuel Supply Trends

GASOLINE SUPPLY TRENDS IN POLAND

1988-1990, IN MILLION TONS (MT)



DIESEL FUEL SUPPLY TRENDS IN POLAND

1988-1990, IN MILLION TONS (MT)

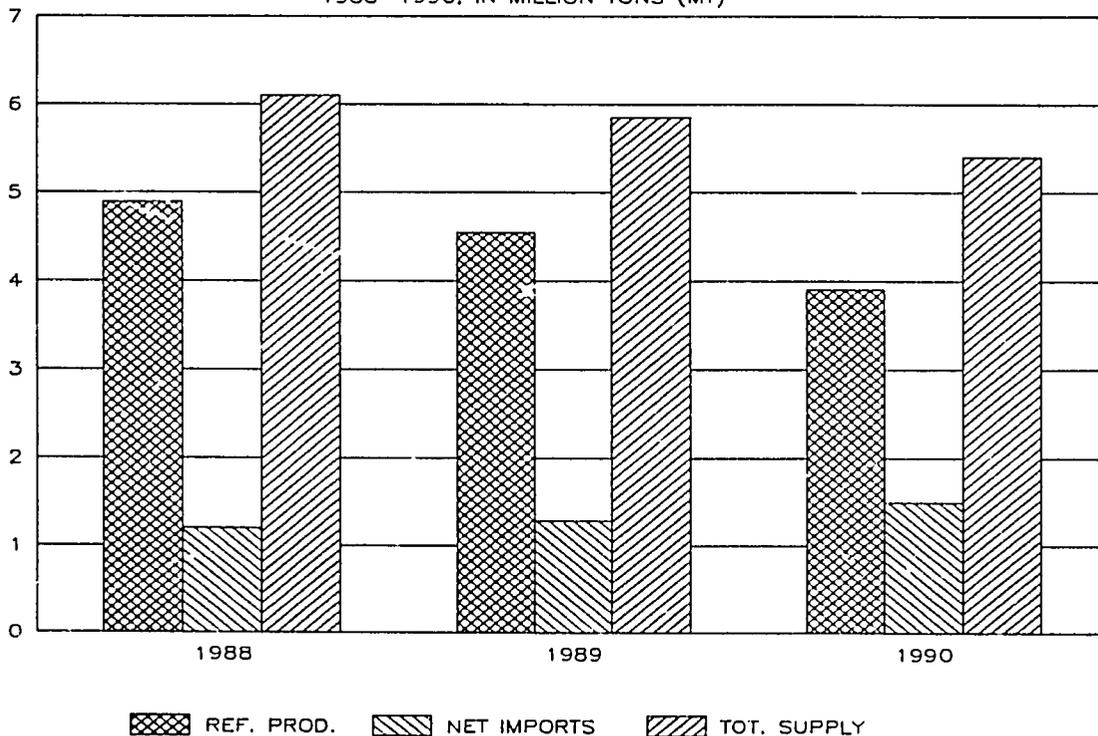
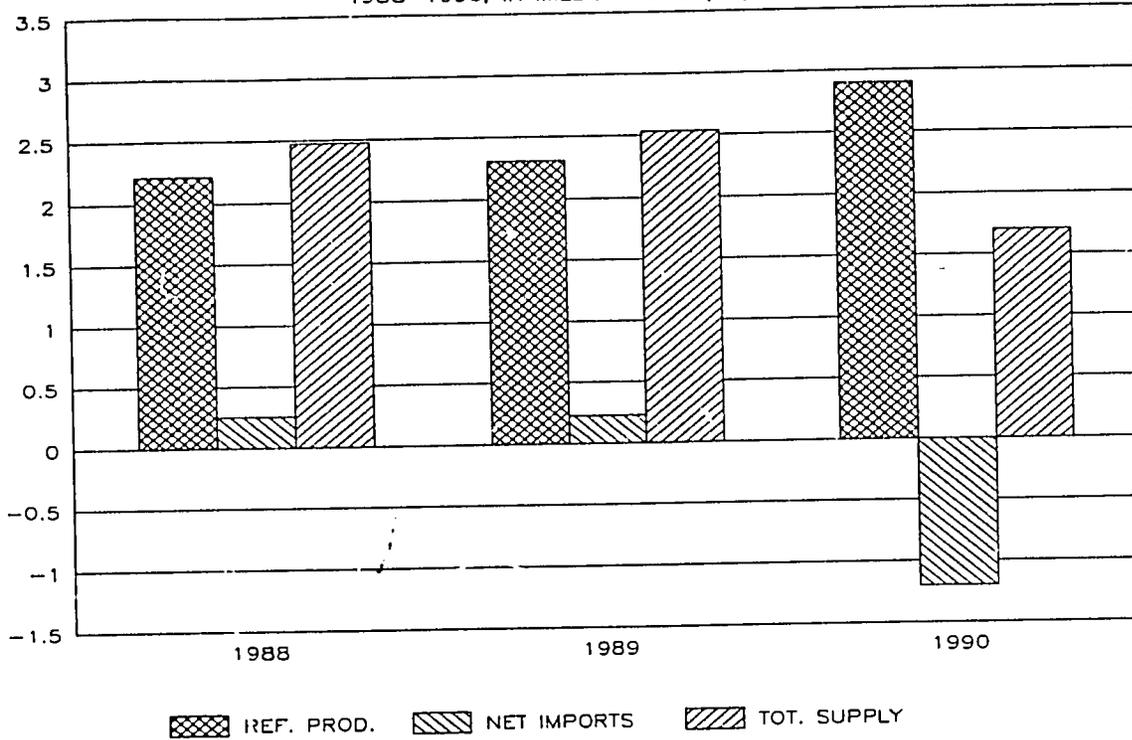
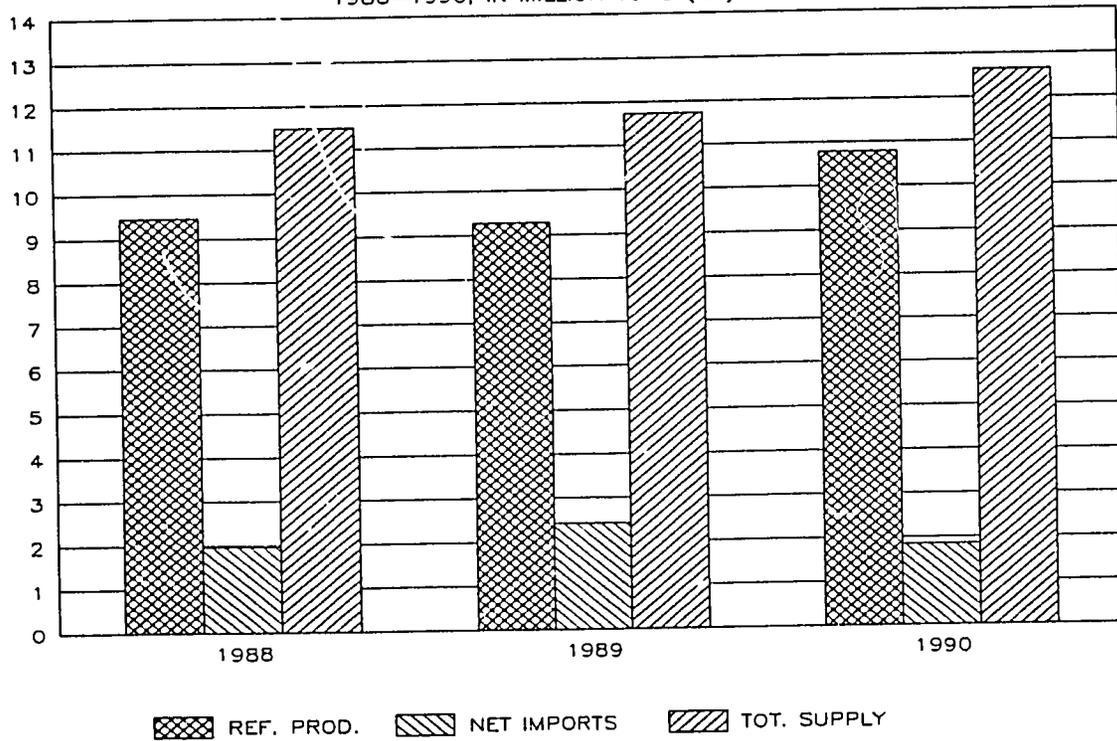


Exhibit 8
 Fuel Oil and Total Petroleum Supply

FUEL OIL SUPPLY TRENDS IN POLAND
 1988-1990, IN MILLION TONS (MT)



MOGAS, DIESEL & FUEL OIL SUPPLY TRENDS
 1988-1990, IN MILLION TONS (MT)



responses. A customs duty and quota (if necessary) can remain on imports. The key benefit of the VAT structure, besides mirroring tax procedures in most of the European Common Market is that petroleum prices could then be removed from the controls of the Finance Ministry's price build-up process, and be allowed to react to market pressures without great concern about the impact on the tax base. The use of a uniform VAT would reduce the incentive to mis-represent volumes or otherwise dodge taxes on imports because the full tax burden would be spread between the initial refinery gate or landed import price and further transactions downstream (e.g., from wholesale to retail). Most importantly, it will allow the market price to be determined in a more fluid manner, and create greater predictability in petroleum price levels, margins and supply planning. In short, the overall system will be rationalized, and many of the current tax and artificial price incentives for bringing in unreported product will be eliminated. Simultaneously, however, it will remain useful to intensify the tax collection and customs reporting activity to limit the potential for tax fraud or customs violations.

Simultaneous with an "open" market price structure, the GOP (primarily through the Ministry of Industry and Trade) should pursue efforts to restructure the domestic industry to clarify future procedures for access to or investment in downstream storage, transportation and distribution facilities. The organizational structure chosen could range from a central integrated national company, similar to MOL in Hungary, to a series of semi-integrated companies organized around natural regional refinery groups, supplemented by common access to transportation and storage facilities (currently controlled by CPN). An integrated national company might be organized around the existing Ciech Petrolimpex structure, particularly to the extent that a centralized refinery supply and distribution function could add value to the overall refining economics, utilization rates and margins. Indeed, a central problem faced by the refineries is their lack of control over feedstock selection and pricing, and lack of control over product sales, including access to storage and transportation facilities, and price terms for product sales. The combination of open market pricing and a clear organizational and legal structure from which both internal domestic and foreign investment strategies could be based would remove much of the uncertainty surrounding current price and profitability. The resulting investment should reduce the net cost of delivering product to Poland's consumers, by increasing the operating efficiency of each

unit. This, in turn, provides a better base from which taxes and various environmental fees could be added without creating undue inflationary pressure.

C. Policy Actions in Non-Petroleum Fuels

In addition to the changes made and contemplated in the petroleum sector, a variety of coordinated pricing and tariff rate adjustments are recommended in the non-petroleum fuels.

1. Natural Gas

Poland imported 7.9 million cubic meters (mcm) of natural gas, and consumed about 10.7 MCM in 1990. As with oil, Poland's per capita consumption of natural gas is low compared to other Eastern and Central European countries. Prior to 1990 all of Poland's natural gas imports came from Russia, via pipelines through Belarus and Ukraine. Currently, PGNIG is involved in negotiations over projects which could bring gas in from Germany, Norway and potentially Algeria via LNG delivered at Gdansk.

Prior to 1990, the average price charged to natural gas consumers (then largely industrial users) was not directly related to its import cost under various barter arrangements with Russia. As shown in Chapter 2, the residential and commercial price was even more steeply discounted than industrial prices at that time. The evolution of natural gas pricing since 1990 has been one of gradualism in pursuit of the principles of: 1) pricing gas to reflect its cost of service, and 2) pricing gas to reflect its economic replacement costs. Although the barter system with Russia is still in place, the value reference has now changed to U.S. dollars. Prices of natural gas to western buyers are typically set at the price of competing petroleum products, typically No. 2 fuel oil (gasoil), less negotiated delivery charges back to the pipeline transfer point. The degree of subsidy contained in PGNIG's prices to residential and commercial users has been reduced since late 1991, but the process of directly linking gas commodity costs to tariffs has yet to be formalized. Indeed, as noted in Chapter 2, the apparent transportation service charge is negative for certain industrial user classes based on an assumed border price of approximately \$2.50/MMBtu. As

with the rigid controlled petroleum product price controls (actually ceilings) the gas pricing structure is modified only quarterly, while real market price levels are more sensitive. As Poland diversifies its gas supply sources it will place a greater importance on timeliness in modifying its gas commodity rate structure to reflect market developments, both with respect to the price of competing fuels, but also to effect gas-to-gas competition.

Natural gas is a central component of Poland's strategy to reduce environmental pollution related to energy consumption, largely replacing coal with gas. Therefore, it is important that the rate structure for natural gas clearly compensate for the reduced pollution benefits of natural gas relative to coal, oil and other dirtier fuel alternatives. In order to assess the economic and social impacts of a fuel cross-subsidization scheme (e.g., paying a premium for coal which subsidizes a gas rate), gas prices and rates should be more transparent than they currently are. In pursuit of this goal, and the objective of increasing gas' share of Poland's total energy use, the following recommendations are made:

- PGNIG should enter market-based long-term gas procurement contracts with Gasprom (Russia), Ruhrgas (Germany) and Statoil (Norway), containing explicit pricing and currency conditions. A corresponding set of long-term gas transportation contracts should correspondingly be entered. In addition, PGNIG should simultaneously expand its gas receipt, storage and pipeline facilities on the German and Czech borders to allow for the receipt of significant German gas volumes.
- PGNIG should spin off its exploration, development and production activities to allow international firms to invest in these operations, exclusive of the coal gas producing properties due to the environmental liabilities contained in the latter.
- PGNIG should analyze its cost of service on a zone basis, breaking out individual functions, such as the transmission, storage and distribution and seasonal load considerations, in developing a more accurate cost-of-service rate structure.

2. Coal and Electricity

The Ministry of Finance should continue raising coal and electricity prices to reflect their costs of service. Incentives to close down high cost mines should be developed in tandem with other labor and capital relocation or investment projects. Cost calculations for both coal and electricity production should include a more accurate depreciation base and rate than currently allowed. This will not only cause prices to reflect true replacement costs more accurately, but will encourage foreign investment in plant refurbishment or replacement. Efforts to calculate service costs among industrial, residential and household users should continue to be fine-tuned so that the proper rate incentives will be encouraged to introduce investments in fuel efficiency. Finally, as Poland's power production capacity is re-furbished or replaced with new units, particularly with the anticipated development of gas-fired power, the Power Grid should consider pooling power for sale on a wholesale (wheeled) basis to individual distribution companies or directly to large end-users. In order to encourage power sector investments, the GOP should provide inducements, in the form of special tax and depreciation terms for new or re-habilitated plant, or special power sales terms to guarantee an adequate rate of return.

Chapter 4

Price Analysis Capabilities and Modeling Services Delivered

A. Situation in Poland

Authority for developing and implementing energy pricing policy in Poland lies primarily within the Ministry of Finance, with input from the Ministry of Industry and Trade, various national and regional regulatory bodies, fuel consuming and producing groups (e.g., the Hard Coal Agency, the Polish Power Grid, regional mining and power production interests, Chambers of the Treasury). The energy pricing system is highly regulated process, with the Ministries attempting to balance producer vs. consumer interests, industry, labor and broader macro-economic goals. As Poland moves away from its overwhelming reliance on coal, oil and natural gas will be increasingly important fuels. Historically, oil accounts for only about 15% of Poland's energy requirements, with the vast majority imported. Oil and gas consumption and imports are likely to increase as Poland develops alternatives to its inefficient reliance on subsidized brown coal.

The focus of the Pricing Component's Scope of Work is to support country efforts to rationalize their energy pricing systems, with priority given to petroleum price reform. This is a particularly appropriate focus in Poland given the degree to which the petroleum pricing policy in Poland has been regulated with limited regard to market forces and resulting direct costs to the domestic industry, and indirect cost imposed on the Polish economy. The ability of the Polish Government to assess the hidden costs of its regulated pricing structure for petroleum products is limited both by over-riding political considerations (i.e., the perception that the Government is maintaining relatively low and stable prices), and by the lack of clear policy and analysis responsibility assigned to a single Ministry or department.

In Poland, oil and gas pricing policy is developed between the Ministry of Industry and Trade and the Ministry of Finance, with input from major participants in each market, including the state-owned refining, trading and marketing companies. Ostensibly, the Ministry of Industry and Trade is responsible for the analysis of petroleum pricing policy, while the Ministry of Finance sets the quarterly adjustments in tax, price and cost variables

built into the allowable price for each controlled product. However, within the Ministry of Industry, the Department of Energy lacks sufficient staff to conduct analyses of a variety of fossil fuel pricing issues. Similarly, the Ministry of Finance is not staffed with experts in price modeling. As a result, there is little analysis of the fiscal impacts of alternative petroleum price scenarios and taxation structures. Coordination between the Ministries focuses more on the process of setting price, tax and duty levels, not on the analysis of their implications. In short, the capability to undertake model-based forecasting work to assess the impacts of policy changes is limited.

In contrast, rather sophisticated rate analysis and price vs. supply cost modeling systems have been developed for the coal, electric power generation and transmission activities. The petroleum sector has not enjoyed such analytical support, in part owing to its limited volumetric role and stable (Soviet-subsidized) price structure prior to 1989. Furthermore, the data needed to perform a consistent and thorough analysis of Poland's petroleum pricing policies is not centrally maintained or collected by a single Ministry. Rather, price and volumetric data have been collected historically by the state trading and marketing companies (i.e., Ciech Petrolimpex and CPN), supplemented by the efforts of government revenue collection bureaus (e.g., customs and tax), and reported to the Central Statistical Office. Under the closed system of subsidized Russian crude oil supplies and integrated control over downstream marketing this system worked well. However, with crude oil and product prices (ex tax) at world levels, the rise in imported product sales has made both sales volume and price data collection less thorough and less reliable over time. The lack of a centralized oil pricing analysis and data collection activity, coupled with staff limitations and other fuels responsibility, contributes to the vacuum in petroleum pricing analysis.

The changes undergone in Poland's petroleum market are illustrative of the data limitations and structural or institutional distortions which deter Polish officials from pursuing a modeling approach to policy analysis. With the break-up of Ciech Petrolimpex's monopoly on imports and the resulting surge in imported volumes, petroleum product supply and price data are now highly unreliable. According to Ciech Petrolimpex and CPN officials, as much as 20 percent of total sales volumes are not reported. Moreover, they expressed skepticism

over the usefulness of any analysis over the 1990-1992 period, given the overwhelming impact of the unique political and structural economic changes, which distorted market responses from their expected path in a more stable environment. In other words, the recent period provides a distorted laboratory environment from which to develop predictive quantitative relationships. For example, Ciech officials observe that when a price increase is put into effect or announced, the immediate impact on demand is positive, as expectations (related to inventory value and the future cost of product) outweigh the traditional negative price and income elasticity response.

The barriers to successfully developing a price modeling system appeared to be three-fold: 1) data are not available in sufficient detail, with limited historical consistency and reliability on which to develop reliable quantitative models; 2) political uncertainty and changing policy have caused organizational roles to be poorly defined, so that government officials lack consensus as to their (organization's) mandate and role in developing any sort of policy supportive analysis; and 3) manpower and technical expertise are either limited or not matched to the organizations that are in a position to influence policy by developing the appropriate analytical tools.

B. Modeling Capabilities in Other Fuel Sectors

1. Natural Gas

In the natural gas, coal and electricity sectors, the knowledge and use of modeling tools appears to be substantially more developed than in petroleum. From our work with PGNIG's planning staff it was clear that they had been exposed to gas supply-demand forecasting models and forecasting studies from a variety of western sources. Examples of such efforts, mostly related to the analysis of gas price controls, include the American Gas Association's Total Energy Resource Analysis (TERA) model, the U.S. Department of Energy/Energy Information Administration's variety of energy sector pricing models, and the Data Resources, Inc. (DRI) fuels forecasting models. However, despite this exposure, the PGNIG staff did not appear to be actively involved in any internal gas modeling activity.

Given their current gradual evolution away from "controlled" gas pricing to a structure

which reflects true commodity and delivery service costs, it was agreed that PGNIG could benefit from a greater understanding of both rate-making and price forecasting tools. A technical assistance session dedicated to gas rate-making and pricing was arranged for this reason. U.S. and Western European pricing and transmission rate structures were discussed, with emphasis on their emerging relevance as Poland diversifies gas supplies and moves towards a cost-of-service approach to pricing gas. The following specific recommendations are made as a result of this assistance and the emerging trends observed:

- 1) PGNIG should prepare an analysis of its system-wide, zone-based cost of service, separately identifying pipeline, storage, and distribution functions. Seasonal load factors should be developed and incorporated into the analysis. Cost of service and add-ons to average domestic and imported gas prices should be used as the basis for reformed gas rates at the wholesale or retail level.
- 2) PGNIG should undertake an analytic effort aimed at selecting and adapting one of the comprehensive energy models, with particular emphasis on the gas module for use in examining its natural gas pricing issues, including gas price vs. costs forecasting, various supply and demand forecast scenarios, and alternative strategies for achieving regional or consumer class cross-subsidies, as well as other strategic pricing objectives.

PGNIG's modeling efforts should also provide vital assistance in pursuing some of the gas supply diversification steps recommended in Chapter 3. Other major strategic activities also would benefit from a formal multi-fuel modeling capability. For example, the analysis of PGNIG's gas exploration, development and production assets, the evaluation of system expansions, such as the recommended investment in gas receipt, pipeline and storage facilities near the German and Czech borders in order to access the German pipeline system, would benefit from an application of the potential returns under alternative energy and macroeconomic assumptions. Finally, the ability to model inter-fuel price, supply and consumption responses in an integrated model is central to the development of an effective fuel substitution strategy, particularly if natural gas is to be promoted and priced as a competitor with coal and oil on the basis of environmental, fuel substitution or related energy resource development objectives.

2. Electricity

Over the past several years the Polish Power Grid (PPG) has made substantial strides in understanding its cost structure and accordingly adjusting tariffs to reflect these unit service costs. In cooperation with the Ministries of Finance (which approves tariff rates) and Industry and Trade (which approves power sales prices), the PPG has undertaken efforts to measure service costs and develop tariffs which reflect western standards of cost recovery and differentiation by use (including time of day, volume and allocated transmission costs). Western accounting, economic forecasting and forecasting utility consulting firms have assisted the PPG in this process. Models are used to calculate the costs of service, losses and appropriate rate adjustments, inclusive of power generation, transmission and distribution costs. Merit order optimal dispatching is used to optimize the matching of incremental demand with the most economic power source.

The procedures for pricing purchased power are now formalized in the "Rules of Settlement" between power generators and Grid company distributors. The Grid charges a transmission fee to the local distribution companies, of which there are 33 in Poland. Based on our discussions, the PPG appears well-equipped to engage in a variety of analytical exercises related to electricity transmission rate-making, analysis of potential returns on power plant and infrastructure investments.

CHAPTER 5

SUMMARY AND RECOMMENDATIONS FOR FURTHER STUDY

A. Pricing Adjustments and Reforms Implemented in Poland

In January 1990 Poland undertook its first major step in energy price "shock therapy" in an effort to move towards a modified market-based pricing structure. The broad objectives were to more accurately reflect production and resource replacement costs, encourage social and economic objectives of fuel efficiency, account for externalities and avoid excessive economic hardship to certain consumer and producer classes. The initial energy price increases from late 1989 levels were as little as 100 percent (in the case of light petroleum products), to as much as 600 percent in the case of highly subsidized hard coal to household consumers. Prices for lignite, natural gas, heavy fuel oil and electricity were raised by anywhere from 150 percent to 600 percent¹⁸ from their subsidized levels (see Table 7). After this initial shock the Government of Poland continued to increase energy prices through early 1991, with major increases occurring in July 1990 and January 1991. Concurrent with this major step in energy price reform, the macro economy was experiencing hyper-inflation of over 200 percent per annum. Gross domestic product was falling as was overall energy demand. Prices for most energy forms increased by another 50 to nearly 300 percent (depending on the fuel) over the period February 1990 through January 1991. By 1991, inflation levels slowed to between 50 and 60 percent.

Since early 1991, price increases have been reviewed quarterly, and have generally reacted to inflation and certain stated policy objectives or schedules, such as:

- raising industrial coal prices to Western European standards, and lifting household coal prices to half that standard,
- similarly, raising electricity and district heat prices to industrial users to reflect costs of service, and (with the exception of district heat) raising household prices to more closely reflect unit service costs,
- removing the subsidy in natural gas prices to household consumers, and to developing gas rate structures which more closely reflect service costs by

¹⁸ See IEA, Energy Policies, Poland: 1990 Survey, OECD, PARIS 1991, P. 13.

customer class, and

- linking domestic petroleum prices to international market price levels.

As a result, certain fuel prices have increased more rapidly than others, and now coal and light petroleum product prices are generally viewed as equivalent to world levels, although they remain regulated. The effort to reduce the cross-subsidy from industrial to household consumers is seen in the proportionately greater increase in household prices for hard coal, natural gas and electricity since early 1990. A synopsis of these price changes is provided in Table 7, below.

Table 7

Synopsis of Energy Price Increases in Poland: Jan. 1990 - Jan. 1991¹⁹
(factors)

<u>Period:</u>	<u>Jan. 1990</u>	<u>July 1990</u>	<u>Jan. 1991</u>	<u>Overall 1/90-1/91</u>	<u>Remaining to reach West</u>
<u>Fuel</u>					
Hard Coal:					
Industry	5x	1.3x	"free"	1.5x	1.7x
Household	7x	1.5x		1.5x	1.7x
Lignite	2.5x	-	"free"	1.5x	1.1x
Natural Gas:					
Industry	4.7x	-	1.6x	1.6x	1.2x
Household	5x	2x	1.8x	3.6x	5x
Diesel Fuel	1.9x	...several times...		2x	1.2x
Gasoline	2x	...several times...		1.7x	1.2x
Electricity:					
Industry	3.8x	-	-	1.15x	1.6x
Household	5x	1.8x	-	1.2x	2.7x

¹⁹ IEA, Energy Policies, Poland: 1990 Survey, OECD, Paris 1991, p.13.

The extreme right-hand column indicates the degree to which Poland's average energy prices remained below an estimated Western European equivalent effective January 1991. Note that this shortfall is not necessarily indicative of the remaining price escalation objective, or even an estimate of the prevailing "subsidy", owing to differences in production costs and other policy objectives. Nevertheless, the figure indicates the magnitude of the average price adjustments yet to be made by each major fuel group to the extent that the Western European example provides an appropriate standard.

Since early 1991 substantial progress has been made in closing the gap between domestic Polish energy prices vs. their targeted "efficient" levels, particularly with respect to the cross-subsidy to household consumers of natural gas and electricity. As seen in Exhibit 4 (Chapter 2), household prices of natural gas have nearly tripled since mid-1991, and now exceed average industrial prices by nearly 40 percent. Household electricity prices have increased by nearly 2.5 times since early 1991 (see Table 6), which has closed about half the "gap" identified in Table 7, after adjusting for inflation.

Where specific subsidies are not severe, the general political policy guiding energy price adjustments is to limit energy price increases to general inflation levels, and to continue working towards the full tariff or free market price principles noted above. However, even inflation adjustments are not automatic if political resistance develops to the economic burden placed on the populace or a particular sector of the economy. As a result, energy price increases which are approved in principle are often delayed in practice, creating a back-log of price adjustments to move through the economy once they are viewed as politically and economically palatable. For example, whereas the general principle of inflation adjustments to hard coal prices has been accepted, and hard coal prices were formally decontrolled effective April 1992, the actual pass-through of higher prices has been delayed since July 1991. Similarly, in the case of petroleum, market price levels can be cushioned somewhat by the turnover tax level imposed on light product consumption. Thus, if world prices rise, the turnover tax could be lowered.

Inflation, albeit slowing from the previous year's level of over 50 percent, continues to dictate at least a 35-40 percent adjustment simply to keep pace, assuming no significant

change in world price levels or internal cost structures. In fact, a major shortcoming of Poland's energy pricing procedures, as with most newly developing countries, is the understatement of depreciation costs, and the ongoing need to increase energy prices or rates sufficiently to entice investment capital and to internalize the environmental and related externality costs.

Despite this continued gap between efficient and current price levels, Poland has made substantial progress in certain areas of price reform over the past 1-to-2 years. Several of the major developments include:

- formalization of the link between light petroleum product (diesel and gasoline) prices and their import price equivalents in February 1992,
- intention to move to a VAT tax structure possibly by late 1992, removing much of the price intervention of the Ministry of the Finance, while more strictly enforcing petroleum product import restrictions and customs payments,
- decontrol of hard coal prices effective April 1992,
- adoption of formalized procedures for establishing and negotiating the transfer price of coal to major power producers, effective February 1992,
- acceptance of the principle of automatic fuel-cost pass-through in electricity rate determination, although no action has been taken to date on its implementation, and
- acceptance of the principle of cost-based rate-making in the electric and natural gas utility sectors, with period, area and voltage service distinctions among customer classes, and particular emphasis on adjusting household rates to reflect their unit service costs.

B. Organizational Issues and Capabilities

A number of important analytical issues must be addressed over the next several years which would benefit from a coordinated, centralized energy policy analysis group among the Ministry of Industry and Trade, the Ministry of Finance, the Ministry of Environment and various other national agencies (e.g., Hard Coal Agency, Polish Power Grid, PGNIG, Ciech) and regional groups (electricity, heat and coal producers, distribution

companies, unions, etc.) involved in energy pricing and policy development. A few examples are listed below:

- decontrol of petroleum prices and the movement to a uniform value added tax (VAT) structure,
- reorganization of the petroleum industry to encourage investment in and more economical use of (existing) refining, distribution and marketing infrastructure,
- diversification of gas supplies and evaluation of major investments in pipeline expansion and related gas receipt, transmission and distribution infrastructure,
- continued rationalization of gas and electric utility rate-making procedures,
- analysis of alternative approaches to planning and stimulating power plant investments, focusing on project design, fuels use, pricing and needed investment incentives (tax, depreciation treatment, power resale volume and rate guarantees, etc.) to entice both domestic and external sources of capital,
- analysis of methods to finance or otherwise charge for energy efficiency investments, including simple metering systems, among consumers of heat and power,
- analysis of alternative environmental fee structures, either targeted or built into transfer prices, in an effort to internalize pollution costs and to fund investment in clean fuels technology, related system conversions or simply clean-up efforts, and
- analysis of alternatives available in restructuring existing inefficient coal production, including shut down of mines, relocation of work force and full cost recovery in pricing coal.

In order to address such issues in a centralized, coordinated manner, the GOP needs to develop its analysis and data collection capabilities, particularly with respect to the petroleum marketplace, and multi-fuel modeling integrated with macroeconomic and specific industry indicators. Current efforts to model petroleum industry behavior are limited, although capability resides at the various academic institutions and to some extent within Ciech. With the recently announced (June 1992) increase in petroleum import duties and more restrictive import licensing procedures, the volume of un-reported imports may be reduced substantially, and an opportunity exists to re-establish some control over the reporting of petroleum volumes and price levels. This effort will require coordination among the licensed

suppliers, as well as the customs department and Finance Ministry's local tax enforcement authorities. Basic analysis, such as the expected impact of a particular price or tax change on the demand for petroleum products should be performed with the benefit of reliable monthly data and with the benefit of supportive modeling and coordinated analysis between the Department of Energy and the affected oil companies and major consumers (e.g., CPN, Ciech).

In developing a broader multi-fuels analysis capability, the Ministry of Industry would greatly benefit from the adaptation of a predictive multi-fuels modeling capability which would enable them to evaluate fuels pricing, rate and tax policy in a broader macro-economic and industry context. Many of the important energy resource investment and pricing decisions will revolve around the fuels choices and comparative cost analysis performed for different scenarios. For example, the choice of gas vs. coal in power generation will depend largely on their comparative costs, which in turn will relate to fuel price assumptions, alternative uses, development costs, tax and other macro-economic or industry-specific assumptions, which can only be addressed with a multi-fuels model.

The AID assistance program has been quite useful in pointing out both the availability and the potential application of such tools. The basic elements of rate-making and market analysis (whether for natural gas or petroleum) have been enhanced through this program. However, these basic resource and organizational limitations need to be overcome if the next phase of their productive application as input to policy decisions is to commence.

C. Recommended Studies in Support of Donor Assistance Efforts

A variety of USAID, World Bank, and EBRD-sponsored assistance and investment activities in Poland's energy sector are underway or in development. Energy pricing policy will have a significant impact on the potential economics and feasibility of most of these projects. Several major developments whose outcome will significantly influence Poland's energy sector developments, warranting further analysis, are summarized below by major fuels group.

1. Petroleum

The major long-term development in Poland's petroleum industry concerns the potential industry structure and the role allowed for foreign investment, particularly in the downstream. Meanwhile, the GOP has recently undertaken efforts to limit imports by raising the customs duty on imported light products (gasoline and diesel fuel) from 90 to 150 percent, and by establishing stricter qualification and review procedures to obtain licenses to import. These steps reflect a coordinated effort to re-establish control over import competition, particularly now that Poland's light petroleum price levels are roughly equivalent to international levels, and to re-enforce the market position of Poland's indigenous refining, distribution and marketing enterprises. In addition, the Ministry of Finance has indicated that a shift away from its current price "build-up" process, including variable turnover taxes, is being considered for replacement by a uniform VAT by late 1992. These developments suggest several possible studies for purposes of evaluating potential economic impacts and in order to relate possible organizational choices to the internal tax, import quota and pricing policies pursued in Poland.

- a) In cooperation with Poland's Ministry of Industry, Finance and affected state-operating companies (Ciech, CPN), an analysis of alternative organizational structures which may be under consideration for Poland's oil industry is recommended, with a focus on such organizational, ownership and financial issues as:
 - centralized vs. regional ownership and foreign participation at each stage,
 - access to pipeline and storage facilities and the role of CPN, specifically the potential cost of transportation/storage service under a common carriage treatment,
 - role of Ciech and access to petroleum imports, exports, and
 - priority investment requirements and financial incentives provided under alternative ownership structures.

- b) In cooperation with the Ministry of Industry and Trade and the Ministry of Finance, an analysis of Poland's changing petroleum product tax and customs duties and import quotas might be undertaken with an emphasis on the

following issues:

- the incremental economics (prices, costs and fiscal revenues) of meeting Poland's projected petroleum product demands under alternative price and macro-economic growth and demand assumptions, related to alternative price and volume controls implied by tax, duty and quota levels,
- the potential impact of the alternative proposed VAT levels on gasoline and diesel fuel prices, demand and government revenues,
- the impact of decontrolling fuel oil, jet fuel, LPG, petrochemical and other refined product prices under alternative phase-in schedules and cross-subsidy assumptions by user group, and
- the level of domestic prices and operating margins needed to encourage necessary infrastructure investments, upgrades (e.g., in refinery units, transportation, storage, marketing outlets), and the evaluation of approaches to funding such investments.

C) In cooperation with the Ministries of Finance, Environment, Industry and Trade, an analysis of the potential role (and level) of targeted environmental fees and tax incentives needed to promote environmental and fuel efficiency objectives in the petroleum industry, including such strategies as:

- the size and incidence of fees to clean up hazardous wastes, spills, water and land pollution to date, and to finance funds for future contingent needs,
- the appropriate level and incidence of taxes on diesel fuel and gasoline to fund the refinery investments in clean(er) fuel processing investments, the development of reformulated or otherwise desired blends of gasoline to meet emerging Western European quality standards (e.g., fuel oil and diesel de-sulfurization, gasoline lead and RVP reduction, etc.), and
- the use of targeted fees or tax incentives to encourage alternative uses to petroleum products and conservation efforts, such as fuel economy subsidies for auto manufacturers/importers, energy savings and conversion technology to industrial users, investment credits to processors and power producers/cogenerators for petroleum displacement.

2. Petroleum Market Modeling System

A functional data base and a statistical modeling structure of the Polish petroleum market is needed is needed to analyze the impact of Poland's petroleum market pricing and tax policy on such variables as: oil consumption, government revenues, the balance of domestic vs. imported supplies, environmental and other government policy objectives. The targeted data to be collected to perform this analysis, preferably in monthly units, would include:

- official "allowable" price levels for refinery gate and retail prices of the major light products, including two grades of motor gasoline and diesel fuel, as set quarterly by the Ministry of Finance;
- deemed import prices for each of these fuels, vs. the calculated free-market delivered shadow prices (developed by IRG);
- actual reported retail, wholesale or refinery gate prices relative to the official "allowable" reported by the Ministry of Finance;
- monthly petroleum product supply levels, including domestic refinery output and net imports for same products;
- monthly reported apparent consumption, sales or delivered supply levels for the same;
- macroeconomic data, including the rate of consumer wholesale price inflation, interest and z/\$ exchange rates, measures of GNP, personal income, industrial output and other sector-specific growth indicators which affect petroleum demand and real price levels; and
- measures of price expectations, such as announced price or tax changes, the gap between Polish and world (border-equivalent) price levels, and other structural adjustments which might affect consumer price expectations, and distort the price or income elasticity responses of demand.

The resulting statistical analysis would be structured in a time series format to address such key analytical relationships as:

- 1) the observed price and income elasticities of demand, based on nominal and real prices, and accounting for the distortions of price expectations measures or related "structural" changes (e.g., announced currency devaluation, tax

Increases, etc.),

- 2) the relationship between domestic vs. imported supply balances and the difference between domestic vs. imported price levels allowed under the Finance Ministry's price "build-up" structure, relative to "shadow" border prices for imported products, and actual sales prices reported,
- 3) the apparent responsiveness of supply from domestic vs. imported sources to price discrepancies introduced by government-set price and tax levels,
- 4) the government revenue response to such policies, based on demand impacts and sources of supply, estimated non-reported volumes.

The proposed analysis can be used by the Energy Department of the Ministry of Industry and Trade, in coordination with the Finance Ministry. The basic spreadsheet structure of the system would be supplemented by statistical analysis packages for more sophisticated linear regression and related time series analysis. These packages may stand alone or be built directly into the spreadsheet through one of the commercially available add-ins.

The objective is to pull together the relevant statistical data on which an analytical effort should be based and to develop some of the key analytical routines and software support which might benefit the Ministry of Industry as it addresses a series of critical petroleum pricing issues in the next year, including:

- the proposal to move to a uniform VAT structure by late 1992,
- the impact of various oil price and tax levels on petroleum demand, supply balances and government revenues,
- the impact of alternative import quota and customs levels on import competition and expected domestic output levels,
- the impact of raising Poland's retail gasoline prices towards EC standards, and implications for varying the composition and timing of that increase to include targeted environmental fees (for re-investment to refinery upgrades and cleaner fuels) vs. general VAT or turnover tax revenues, including such variables as tax incidence and collection procedures.

During the course of this contract the Ministry was not prepared to accept such assistance owing to the factors cited above, primarily the political uncertainty surrounding

the government's leadership. In addition, staff limitations, data availability, and the time required to collect a useful data base for analysis dissuaded the Ministry from accepting this proposal. Nevertheless, we believe that such an effort is warranted in the future as Polish officials readily express their need for consistent information and analytical tools needed to understand the oil market's behavior, particularly as industry restructuring and a change in the tax structure and price decontrol are considered in the near future.

Numerous other study topics present themselves which link environmental, efficiency, resource development, investment, organizational, price and fiscal objectives. The suggestions above result from observations made over the course of IRG's assistance in both the energy pricing and oil procurement components of the USAID program. While a great deal of analysis needs to be performed to establish a better economic and financial understanding of the trade-offs involved, IRG emphasizes that organizational, price, tax and related industry objectives are largely inter-related. Therefore, the analysis capability must be expanded beyond the current capabilities at the Ministerial level, and data collection and analysis must be improved in order to provide a reliable historical and projected basis for any analysis. Finally, in a broader context, we emphasize that petroleum constitutes approximately 14 percent of Poland's total primary energy consumption. Therefore, in a multi-fuels context, efforts to increase the efficiency of petroleum use and to internalize its environmental costs, may be secondary to efforts to diversify consumption away from coal.

3. Other Fuels

In the gas, electricity, coal and district heat sectors, a variety of potential studies present themselves, depending on the investment, fiscal or re-organization issues raised. In general, both Ministerial and operating company data on the internal markets for these fuels are more reliable, owing to the limited role of foreign trade and the traditions of uniform reporting procedures among major producers and distributors. However, most of these historical data emphasize physical flow, and provide less insight on the true cost structure of energy production, transmission and conversion. As previously noted, the Polish Power Grid, regional power distribution companies and coal producers have made significant strides over the past 2-to-3 years in identifying their commodity and service cost elements on a unit

service cost basis. This information has been quite helpful in rationalizing rates. The future challenge will be in identifying the capital investment and return on capital needed to rehabilitate power production, transmission, distribution and related infrastructure facilities needed to meet projected fuel demand needs, and to achieve broader national objectives of fuel diversification and reduced emissions. A sampling of the "investment-oriented" analyses which IRG recommends are provided below, by major fuel group.

a. Natural Gas:

- analyze alternative investment costs associated with expanding PGNIG's alternative long-term gas procurement and transportation service arrangements, focusing on required pipeline and storage facility expansions (e.g., along the Czech and German border), and the optimal combination of low cost gas, transportation and infrastructure investments needed to meet projected regional and sectoral growth in gas demand,
- analyze the potential value and appropriate organizational combinations of PGNIG's gas exploration, production and development assets in order to spin these off, towards the ultimate objective of encouraging foreign venture or equity involvement in the Poland's gas resource development, and
- continue to develop PGNIG's capabilities to analyze its costs of service on a zone, seasonal and related functional or contractual basis in order to develop a more representative rate structure by customer class and usage, to identify areas of inefficiency, and the potential role of specialized local distribution companies.

b. Coal:

- continue the process of evaluating methods to reduce average production costs and to consolidate operations and labor resources to close down uneconomic mines, and
- identify best projects for clean coal technology demonstration projects and alternative approaches for financing such investments via price or tax incentives,

c. Electric Power:

- evaluate future power needs (peaking and base-load), alternative plant

site, fuel supply and size and technology configuration alternatives on the basis of estimated costs and environmental objectives,

- identify alternative approaches to stimulating investment or otherwise financing power facility investments, including the role of the PPG in establishing proposal bid parameters, necessary contractual safeguards and incentives needed to induce power plant investments (e.g., alteration of accounting law to allow reasonable depreciation schedules, tax, return and other incentives), and
- scope the potential role of the PPG in establishing a wholesale market for electric power, wheeled among the distribution companies and producers.

d. District Heat:

- identify primary users by size priority and develop estimates of potential savings resulting from establishing metered rates under alternative price escalation and use efficiency objectives,
- evaluate the economics of district heat production and the savings achievable from more efficient steam production and consolidation of units as full cost pricing, metering are gradually implemented.

e. General:

- evaluate the structure and resources of Poland's various energy price policy organizations at the national (e.g., Ministerial and State-owned companies, such as PPG, Ciech, CPN, PGNIG, Hard Coal Agency) and regional levels, in order to centralize and coordinate energy pricing policy, and limit the political influence of local or industry interests.
- apply an appropriately modified multi-fuel energy forecasting model within a coordinated policy body in an effort to evaluate longer term energy resource investment planning activities which is responsive to alternative macro-economic assumptions and fiscal objectives, and
- develop a more thorough and consistent energy data collection activity either within the Department of Energy or by expanding and coordinating the roles of the Central Statistical Office and various state or regional organizations involved in the energy production, processing, transmission and consumption.

ANNEX A

SUMMARY OF TECHNICAL ASSISTANCE RENDERED

2. Technical Assistance

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

- monitored existing price levels and changes for each fuel (petroleum products, gas, coal, 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 contract, as well as those implemented since February 1991 and policies/reforms under consideration;
- examined the critical issues confronting the Government as the reform process evolved, particularly the social and political impact of changing (increasing) price levels, and;
- assessed the modeling and other analytical capabilities of those institutions involved in the research/analysis and policy process.

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 typically included hands-on or "how to" discussions of pricing in the petroleum products, electricity, natural gas and coal sectors. These training sessions 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 situation in Poland. The participants attending the seminars and workshops represented a wide spectrum of individuals involved in the energy pricing system, including government agencies, suppliers, and end-users. Participants typically were drawn 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

oil pipeline companies, natural gas distribution companies, and electricity transmission and distribution organizations, and; large industrial consumers such as chemical and steel plants.

From IRG's discussions during the Definitional Missions and observations made in the aftermath of the initial *Energy Pricing Seminars*, as well as from work conducted during the first year of the contract, it became clear that in Poland the natural gas industry is poised for considerable growth in the next decade. The need to diversify energy sources, develop cleaner fuels to limit adverse environmental impact, and to provide energy for continued economic growth and development has placed increasing importance on the role of natural gas. In order to assist Poland in negotiating for gas supplies effectively, determining the appropriate role for gas in its economy over the next 20 years, and to provide assistance in the implementation of appropriate gas pricing policies and reforms, IRG developed a *Natural Gas Rate-Making Seminar*.

Finally, IRG investigated the energy pricing modeling capabilities in Poland, focusing on petroleum supply, demand and price forecasting. IRG discovered that policy development, data collection and analysis functions were spread among several different entities, including the Ministry of Industry and Trade (encompassing the Department of Energy), the Ministry of Finance (tax and customs collection functions), the Central Statistical Office, Ciech (which owns the nation's refineries and the state trading company, Petrolimpex, and which formerly collected and reported data on petroleum prices, supply and sales volumes), CPN (the state distribution and marketing company), the Polish Power Grid, the Hard Coal Agency and numerous other entities. No single entity expressed the combination of pressing need, manpower and analytical resource availability, and policy influence to be take on external assistance in price modeling and policy analysis at the present. The uncertain political situation at the highest ministerial levels of government also made it quite difficult for managers at the Ministry of Industry and Trade or the Ministry of Finance to commit to any effort to develop or otherwise host the development of such capabilities.

IRG's objective was to provide an analytical tool to support quantitative evaluations of proposed price, demand, and economic impact scenarios. While the various Ministries (e.g.,

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Finance, Industry and Trade) and companies (e.g., Ciech and CPN) recognize the potential value of such a tool, none were prepared to undertake such an activity owing to a combination of current political uncertainty, inadequate data and lack of resources and staff capabilities to fully implement and sustain such an effort.

B. Summary of Technical Assistance Conducted in Poland

1. Assessment Mission

During the week of May 28, 1991, Mr. Bronek Dutkiewicz, Senior Consultant to IRG, visited Poland to meet with the counterpart representatives of the Polish Government and other organizations. The purpose of the visit was to assess the current status of energy price reform in the country and to examine the decision-making process, including the responsibilities and analytical capabilities of various institutions, as well as to receive feedback on the critical pricing reform issues confronting the country. IRG identified technical assistance needs and the contents of a training seminar designed to aid the government in its efforts to implement an economically rational and politically feasible system of price reforms. (The multi-fuel content of the training seminar conducted is detailed below.)

Mr. Dutkiewicz met with the Ministry of Industry, representatives of the oil, coal, gas, and the electricity sectors (the latter being the Polish Power Grid), as well as the USAID Mission in Warsaw. The discussions focussed on those issues which the host-country institutions wanted to include in the seminar, including electric utility and natural gas rate-making, petroleum product pricing in the free market, coal pricing, competitiveness and environmental considerations, and the economics of foreign trade. In addition, as called for in the project Scope of Work, the issue of assistance in pricing models was reviewed. However, computer models for energy sector simulation, planning, and forecasting were determined by the Government of Poland not to be a primary focus at that time, but potentially could be a topic for subsequent training programs.

2. Energy Pricing Seminar

The *Energy Pricing Seminar* consisted of three days of training sessions held during the period September 4-6, 1991. These were attended by approximately 55 people from Polish energy industries as well as government agencies and institutions. The participants represented the electric power, coal, oil, and natural gas sectors. (A list of seminar participants is provided in Annex A.) The Seminar had one principal purpose: to assist participants in developing a sound, consistent analytical basis for pricing all forms of fuels and energy in Poland. The IRG Team participating in this seminar were:

- Dr. Charles K. Ebinger, Team Leader, Introduction to Energy Pricing, Macroeconomic Implications for Poland;
- Mr. John P. Banks, Project Manager and Seminar Coordinator;
- Dr. Robert Borlick, Electricity Pricing;
- Dr. Donald Hertzmark, Principles of Energy Pricing, Electricity Pricing;
- Dr. Benjamin Schlesinger, Natural Gas Pricing and Tariff Policy;
- Mr. Broniek Dutkiewicz, Oil and Petroleum Products, and;
- Mr. Thaddeus Huetteman, Coal Production, Marketing and Pricing.

The seminar opened with a joint session of all the participants to discuss general energy pricing issues relevant to all the fuel sub-sectors. The issues discussed included an introduction to pricing principles, the policy implications of pricing strategies, and a brief examination of the experiences/lessons of several other countries. An overview presentation was made covering each of the major fuels and the primary pricing and economic aspects relevant to Poland. Specifically, there was an extensive discussion of electricity issues including a review of recent U.S. and UK experiences in their respective power industries which greatly interested the Polish participants. Of special interest was the discussion of the merits of opening the electricity grid to independent power producers and the benefits of ending state monopolistic control of the sector.

Beginning in the afternoon of the first day and continuing throughout the second day, the participants were divided into separate, fuel-specific sessions in electricity, coal, oil and natural gas. On the third day a joint meeting was reconvened during which each member of

the IRG Team summarized the highlights of the specialist sessions. The closing session also included an extensive Question and Answer period. The following is a brief summary of the topics discussed during the specialist sessions on the second day.

Dr. Schlesinger discussed natural gas rate-making, how tariffs are designed to accommodate different end-users, and various gas supply issues, including:

- U.S. gas supplies (and pipeline network) mostly domestic
- W. Europe supplies from external sources (principally Algeria, USSR, Norway, and the Netherlands).
- supplies available to Poland; methods and strategies to take advantage of lower cost local energy vs. distant suppliers

In addition, Dr. Schlesinger described natural gas market structures, ways the business is organized and how it differs in Europe and the United States, including the U.S. gas regulatory experience and the merits of common carriage and open access to relaying efficient pricing signals. Natural gas demand was also analyzed for its implications on rate-making mechanisms, firm (commitment of pipeline capacity) vs. interruptible service fee structures (excluding fixed charges), and various demand charges, including:

- fixed charges to rent capacity;
- charge for gas as it actually flows (based on operating & maintenance costs); and
- the price of the commodity itself.

Other gas-related discussion topics included how conservation affects gas sales and what factors drive the residential market, the potential use and pricing of natural gas in combined cycle units to provide peak capacity for electric power generation, the development of specialized gas markets in the U.S., including the air quality market where gas replaces coal under certain special circumstances to reduce toxic air emissions, improved efficiency applications, and natural gas vehicles (NGVs).

Dr. Schlesinger suggested that from a policy, strategic and financial standpoint it makes sense for Poland to develop and utilize domestic and nearby natural gas resources, as well as coal seam gas, before committing capital resources to major long-range, high-cost international pipeline and transportation projects. This view generated great interest among the participants.

In the coal sector Mr. Thaddeus Huetteman discussed the critical role of coal in the Polish economy, its opportunities and risks with regard to such issues as:

- the increasing competitiveness of Polish coal as the demand for and price of high-quality Polish coal (relative to West European coals) rise with increasing demand for cleaner burning, higher quality coal in Western Europe;
- Germany's plans to cut the utilization of lignite in the eastern part of that country by two-thirds, and the opportunity for delivery of Polish coal into this market;
- the impact of pricing decontrol on efforts undertaken to restructure the Polish coal industry, the will risks encountered in social disruption and shifts in employment.

Other discussion topics focused around the price competitiveness of Polish coal, coal quality issues, industry restructuring in Poland, and lessons from the U.S. experience in fuel switching driven by environmental regulations. Pricing discussions included:

- 1) an examination of the pricing of high quality, low-sulphur coal from Colombia and South Africa;
- 2) the price at which Polish coal would be competitive²; and
- 3) the direction of price for high quality coal in Western Europe in the near future.

Coal quality issues discussed included:

- 1) increasing environmental regulations in Western Europe;
- 2) higher heating values and the implications of burning different types of coal to produce electricity;

² The competitive price of Polish coal was \$44-\$45/metric ton at Baltic ports. Given a \$10/metric ton domestic transportation cost, the competitive price becomes \$30-\$35/metric tons at mine-mouth.

- 3) U.S. experience in burning higher quality coals to improve production costs of electricity at the boiler; and
- 4) the lag in world markets in valuing higher quality coals appropriately because many economic, financial and environmental aspects of coal utilization are not yet fully factored into cost and pricing calculations.

Polish coal industry restructuring topics included:

- 1) sizing criteria: limits on maximum and minimum size of new companies in order to prevent the emergence of monopolies or "weak sisters";
- 2) strategies to promote a balance of more or less profitable mines among companies; and
- 3) efforts to evaluate coal qualities in order to determine if investment in higher qualities is warranted, allowing a country (and the industry) that is capital constrained to concentrate on more profitable coals.

The discussion of lessons from the U.S. experience on fuel switching motivated by environmental regulations focused on:

- 1) the greater tolerance that coal-fired plants have for using different quality coals in the same plant;
- 2) the increasing importance of examining the economics of price differentials among various coal qualities;
- 3) the increase in burning non-traditional types of coal, such as metallurgical coals;
- 4) the U.S. Clean Air Act and environmental legislation and the costs of reducing pollution as an additional factor in coal pricing; and
- 5) consideration of SO₂ reduction costs when evaluating investments in coal quality in Poland.

In electricity Dr. Robert Borlick and Dr. Donald Hertzmark covered a variety of topics in the specialist session, including objectives attainable through proper electricity pricing, the proposed restructuring of the Polish power industry into three component businesses (generation, transmission, and distribution) and the marginal costs of each of the three businesses. Their presentation illustrated why prices charged by each business should be

set equal to its marginal costs, and described the processes of designing retail tariffs which recover all costs from the end-use customers while also providing the correct economic (price) "signals." Other discussion topics included:

- the role of prices paid to generating companies in determining how much new generating capacity gets built
- the need for imposing some form of price regulation on the transmission and distribution businesses to control the monopoly power that will necessarily exist in those businesses
- a comparison and contrast of the U.S. and U.K. approaches to regulating transmission and distribution prices.

In the oil sector Mr. Broniek Dutkiewicz' presentation consisted of a review of oil prices and factors influencing the international oil market in general, and specifically how decontrolling oil prices in the United States reduced energy demand. Topics addressed included the formation of crude oil and petroleum product prices, U.S. petroleum products prices and consumption levels by use sector, the breakdown of production costs between refinery operating costs and margins, relative product prices, product price scenarios, taxes pricing policy and the outlook for petroleum prices. Each area compared the U.S. with other international experiences and the subsequent lessons for Poland's petroleum industry.

A major topic of discussion centered on the pricing of intermediate petroleum products and the allocation of production costs to specific operations within the refinery/petrochemical complexes. The use of models, marginal cost allocation concepts, and the role of exogenous price factors were discussed in depth.

3. Natural Gas Rate-Making Seminar

During the period May 18-20, 1992, IRG conducted a *Natural Gas Rate-Making Seminar* in Jadwisin, Poland. The IRG Team comprised Mr. John P. Banks, Seminar Coordinator and Manager, and Dr. Benjamin Schlesinger and Mr. John Slocum. IRG's effort was aimed at assisting the Polish National Oil & Gas Company (PGNIG) and its major gas distribution functions to comprehend and evaluate better competitive energy markets. In particular, IRG sought to impart an understanding of relevant analytical tools and the rate-

making implications of the changing natural gas economic and pricing situation.

The Seminar sessions covered a wide array of gas industry topics (production, transportation, distribution), gas supply and demand analysis, pricing theory and models, industry strategy, rate setting, design and the regulatory oversight/approval process. The IRG Team walked participants through the regulated rate-making process in the U.S., using a recent proposed Tennessee Gas Pipeline expansion, and its associated analysis spreadsheet to illustrate typical financial structure, rate base, capital recovery, tax gross-up, test year, and fixed-variable rate design. Using a model gas transportation agreement distributed in advance, basic contract sanctity and guarantee concepts, maximum and nominated volume flow arrangements, penalties, binding terms, force majeure, and other key provisions of gas transportation agreements were reviewed.

Using a model gas purchase agreement, the IRG team presented major elements of a long-term gas sales contract, focusing on long-term pricing and warranty provisions, as well as spot-term purchases, gas reserve accounting and commitments, and major regulatory issues. Drawing on experiences related by the group, basic rate-making principles and applications at the distribution level to key customer classifications were presented: residential, commercial (small/large), industrial (boilers/feeds/stock/process uses), electricity generation and cogeneration, and others. IRG also presented and discussed U.S. examples of seasonal rates, distance and zones, firm and interruptible gas transportation and sales. The foregoing pieces were presented as a review of gas pricing models in current use, including structure, basic economics, and the energy price forecasting process. In addition, the objectives of regulated rate-making, focusing on the key tradeoff between equity and economic efficiency were examined.

The seminar was concluded with an illustration of natural gas market pricing, introducing seasonal gas prices, base point price referencing and its geographic configuration, and the key differences underlying gas industries in Europe (including Eastern Europe) and North America. Poland appears to be moving toward competitive market pricing mechanisms in natural gas, although PGNIG's transition is not as rapid as the rest of Polish industry. Generally in Europe, gas companies are state-run monopolies that buy gas in a

rather uncompetitive market, thus PGNIG's economic role under the old regime is not necessarily out of step with the rest of Europe today.

There was great interest and enthusiasm among the participants at the Seminar. Attendance was quite high (approximately 60 people), and PGNIG central planners and economists, as well as many individuals from PGNIG's dispersed regional distribution enterprises were present. A list of this seminar's participants is provided in Annex B.

ANNEX B

SUMMARY PROCEEDINGS OF SEMINARS (Key Lessons, Principles Communicated)

ANNEX B

SUMMARY PROCEEDINGS OF SEMINARS (Key Lessons, Principles Communicated)

I. Energy Pricing Seminar: Warsaw, Poland, Sep. 4-5, 1991

<u>Topic</u>	<u>Speaker</u>
1) Natural Gas Pricing	Dr. Benjamin Schlesinger
<ul style="list-style-type: none">● Rate-Making Principles...● Firm vs. Interruptible Tariffs, Demand Charges● Gas Supply Alternatives and Poland's Strategic Location, Indigenous Development Alternatives● Gas Market Structure & Commercial Practice● Gas Demand, Conservation● Role of Natural Gas in the Electric Power Market● Natural Gas as a Clean Fuel Boiler and Motor Fuel Alternative	
2) Coal Pricing & Markets	Mr. Thaddeus Huetteman
<ul style="list-style-type: none">● Role of Coal in Polish Economy● Comparative/Competitive Pricing Economics with Import Alternatives● Restructuring Criteria within Poland...Rationalization Among High and Low Cost Mines● Lessons from U.S. Fuel Switching Prompted by Environmental Regulations... U.S. Clean Air Act● Non-Traditional Coal Use● Coal Pricing and the Importance of Quality Differentials, Including SO₂ Reduction Costs	
3) Electricity Pricing	Mr. Robert Borlick and Dr. Donald Hertzmark
<ul style="list-style-type: none">● Objectives of Efficient Electricity Pricing Structures<ul style="list-style-type: none">- encourage efficient use- promote least-cost supply- guarantee adequacy of supply- provide sufficient revenues to make industry self-sufficient	

(i.e., fund new capacity requirements, system upgrades, maintenance)

- Proposed Functional Restructuring of Polish Electric Power Industry
 - competitive generating companies
 - regulated transmission and distribution companies
- Marginal Cost Pricing by Function
 - merit order dispatching
 - congestion charges
- Retail Tariff Design
- Pricing Power Generation to Include Capital/Capacity Investment Needs
- Price Regulation in the Transmission and Distribution Function
- Comparison/Contrast of U.S. vs. U.K. Regulatory Approaches

4) **Oil and Petroleum Product Pricing** **Mr. Bronek Dutkiewicz**

- Crude Oil and Petroleum Product Pricing in Open Markets
- Pricing and Consumption by Major Sector
- Production Costs from the Wellhead to the Refinery Gate
- Co-product and Relative Prices Among Petroleum Products
- Pricing Policy, Taxation & Tax Mechanisms
- Historical and Future U.S. Policy, Outlook

II. Natural Gas Ratemaking Seminar: Jadwisin, Poland, May 18.20, 1992

- | <u>Topic</u> | <u>Speaker</u> |
|--|---------------------------------|
| 1) Overview of the Natural Gas Industry and Key Aspects of S&D, Pricing and Rate Analysis | Dr. Benjamin Schlesinger |
| <ul style="list-style-type: none">● Gas Production, Transportation & Distribution● Gas Supply & Demand Analysis● Gas Pricing Theory and Use of Models● Rate Design and Regulatory Oversight | |
| 2) Natural Gas Ratemaking (TGP Example) | Dr. Benjamin Schlesinger |

- Financial Structure of Pipelines
 - Rate Base and Capital Recovery
 - Tax Adjustments
 - Fixed Variable Rate Structure
- 3) **Model Gas Transportation Agreement** **Dr. Benjamin Schlesinger**
- Basic Contract Terms & Guarantees
 - Maximum and Nominated Flows
 - Binding Terms and Penalties,
 - Force Majeure
- 4) **Long-Term Gas Sales Agreements** **Mr. John Slocum**
- Long-Term Pricing and Warranty Provisions
 - Spot Sales Arrangements
 - Gas Reserves Accounting and Commitments
 - Regulatory Interface
- 5) **Gas Distribution and Rate Structures by Customer Class** **Dr. Benjamin Schlesinger**
- Residential & Commercial Rate Principles
 - Industrial & Utility Rate Principles
 - Seasonal Rates
 - Distance & Zone Rates
 - Firm vs. Interruptible Rates
 - Demand Charges and Return on Capital
- 6) **Review of Gas Pricing Models** **Dr. Benjamin Schlesinger**
- Basic Economic Assumptions
 - Model Variables
 - Multi-Fuels Aspects
- 7) **Market Pricing of Natural Gas** **Mr. John Slocum**
- Seasonal Gas Prices
 - Base Reference Point Configuration
 - Pricing and Regulatory Differences
Between the North American and European
Markets
 - Application to PGNIG as a State Monopoly

11

ANNEX C

POLAND ENERGY PRICING SEMINAR

List of Attendees

POLAND ENERGY PRICING SEMINAR

List of Attendees

Name	Organization
------	--------------

Coal

- | | | |
|-----|---------------------|-------------------------------|
| 1. | Tadeusz Bartoszak | Brown Coal Board |
| 2. | Ewa Sledz | " " " |
| 3. | Tomasz Rybczynski | " " " |
| 4. | Teresa Kania | Polish Coal Agency |
| 5. | Jerzy Wrzesniewski | " " " |
| 6. | Antoni Madejski | " " " |
| 7. | Stanislaw Blaschke | Polish Academy of Sciences |
| 8. | Eugeniusz Mokrzycki | " " " " |
| 9. | Zbigniew Grudzinski | " " " " |
| 10. | Wieslaw Blaschke | " " " " |
| 11. | Jan Solinski | Energy Institute |
| 12. | Andrzej Brewczynski | Ministry of Industry & Trade |
| 13. | Jerzy Retke | " " " " |
| 14. | Janusz Stepniewski | " " " " |
| 15. | Danuta Zaborska | Center for Energy Information |

Oil & Petroleum Products

- | | | |
|----|-------------------|-------------------------------|
| 1. | Maria Kryzstofik | Petrochemia-Plock |
| 2. | Urszula Cholclo | Czechowice Refinery |
| 3. | Jozef Piekarz | Trezebinia Refinery |
| 4. | Stefan Olczyk | Ministry of Industry & Trade |
| 5. | Danuta Zaborska | Center for Energy Information |
| 6. | Darius Gwozdz | Ciech Petrolimpex |
| 7. | Gregor Kozakowski | |

List of Attendees (Cont.)

Name

Organization

Electricity

1.	Teresa Kierpiczow	Polish Power Grid
2.	Wladyslaw Zawalik	" " "
3.	Henryk Malysa	" " "
4.	Janusz Siemianowski	" " "
5.	Halina Gogo	" " "
6.	Elzbieta Ostaszewska	" " "
7.	Wanda Odowska	" " "
8.	Barbara Suwinska	" " "
9.	Ewa Dabrowska	" " "
10.	Mieczyslaw Chalupka	" " "
11.	Lujan Twardy	" " "
12.	Kujda Kazimierz	" " "
13.	Wlodzimierz Liszak	Center for Energy Informatior
14.	Stefan Skrzte	" " "
15.	Grazyna Bromszewski	" " "

Natural Gas

1.	Andrzej Brach	Polish Oil & Gas Company
2.	Magdalena Reszczyńska	" " " "
3.	Elzbieta Broczak	" " " "
4.	Alakesnader Magiera	" " " "
5.	Maria Kaczorowska	" " " "
6.	Piotr Lubienski	" " " "
7.	Bozena Klinger	" " " "
8.	Ewa Walczykowska	Energy Institute
9.	Katarzyna Micholczuk	" "
10.	Hanna Bartoszewicz	" "

List of Attendees (Cont.)

	Name	Organization
General Sessions		
1.	Stefan Lober	Ministry of Finance
2.	Teresa Kubacka	" " "
3.	Przemyslaw Zawadzki	Ministry of Industry & Trade
4.	Lidia Nagrodkiewicz	" " "
5.	Tadeusz Capala	" " "
6.	Mariola Linkiewicz	" " "
7.	Antoni Wolkowski	" " "

The general sessions also were attended by the majority of the participants listed above in the specialist sessions.

ANNEX D

NATURAL GAS RATEMAKING SEMINAR

List of Attendees

9/21

Natural Gas Ratemaking Seminar

List of Attendees

- | | | |
|-----|---------------------|---|
| 1. | Lidia Nagrodkiewick | Ministry of Industry and Trade |
| 2. | Tadeusz Capala | Ministry of Industry and Trade |
| 3. | Stefan Lober | Ministry of Finance |
| 4. | Teresa Kubacka | Ministry of Finance |
| 5. | Barbara Szewczyk | Polish Oil and Gas Company (PGNIG) |
| 6. | Marta Kinderer | PGNIG |
| 7. | Elizbieta Broczewik | PGNIG |
| 8. | Aleksander Magiera | PGNIG |
| 9. | Zbigniew Rozanski | PGNIG |
| 10. | Zofia Modrowska | Wielkopolska Regional Gas Utility |
| 11. | Roman Colka | Wielkopolska Regional Gas Utility |
| 12. | Marian Klos | Wielkopolska Regional Gas Utility |
| 13. | Jan Popena | Upper Silesia Regional Gas Utility (Zabrze) |
| 14. | Jerzy Wilski | Upper Silesia Regional Gas Utility (Zabrze) |
| 15. | Marian Szafarski | Upper Silesia Regional Gas Utility (Zabrze) |
| 16. | Henryka Sobon | Upper Silesia Regional Gas Utility (Zabrze) |
| 17. | Andrzej Pilaszek | Warsaw Regional Gas Utility |
| 18. | Teresa Lobjadowska | Warsaw Regional Gas Utility |
| 19. | Reresa Adamczyk | Karpaty Regional Gas Utility (Tarnow) |
| 20. | Janusz Nowicki | Karpaty Regional Gas Utility (Tarnow) |
| 21. | Jan Liszka | Karpaty Regional Gas Utility (Tarnow) |
| 22. | Wieslaw Chzoszcz | Karpaty Regional Gas Utility (Tarnow) |
| 23. | Zofia Orłowska | Karpaty Regional Gas Utility (Tarnow) |
| 24. | Andrzej Zgedb | Karpaty Regional Gas Utility (Tarnow) |
| 25. | Kazimierz Makowicz | Pomorski Regional Gas Utility (Gdansk) |
| 26. | Alicja Grzegorozyk | Warsaw Regional Gas Utility |

The following individuals are from Local Gas Utilities in these cities:

- | | | |
|-----|---------------------|-----------|
| 27. | Danuta Kowolewska | Koszalin |
| 28. | Ryszard Zarna | Koszalin |
| 29. | Andrzej Wrobel | Tarnow |
| 30. | Waldemar Potrowski | Pulawy |
| 31. | Maria Trefon | Opole |
| 22. | Anna Biernacka | Opole |
| 23. | Marian Szkolut | Lublin |
| 34. | Jerzy Piotrowin | Lublin |
| 35. | Janina Zawada | Bialystok |
| 36. | Teresa Ludankiewicz | Bydgoszcz |
| 37. | Irena Kowolczyk | Bydgoszcz |
| 38. | Joanna Kmiecik | Gdansk |

List of Attendees

39.	Teresa Jaworska	Lodz
40.	Irena Brozynska	Lodz
41.	Walentyna Zastarna	Szczecin
42.	Julian Wiater	Rzeszow
43.	Aleksander Chwodrzba	Krakow
44.	Lenon Lianski	Warsaw
45.	Miroslaw Calach	Warsaw
46.	Antoni Tecza	Walbrzych
47.	Anna Saricka	Sandomierz
48.	Janina Mialkowska	Kielce
49.	Maria Klepuszerska	Slupsk
50.	Kazimierz Lagocka	Jaroslaw
51.	Ursula Jawanska	Elblag
52.	Cecylia Wasowcz	Olszyn
53.	Krystyna Ruswel	Rzeszow
54.	Krystyna Sarna	Krakow
55.	Janusz malinski	Zgierz
56.	Ryszard Walysiak	Kalisz
57.	Teresa Dylus	Steel Plant "Batory" (Tarnow)
58.	Danuta Dzierzbicka	Chemical Industry Association
59.	Roman Nasternak	Siarkopol (sulfur producer)
60.	Zbigniew Brozonowis	Azoty Chorzow (chemical plant)

ANNEX E
NATURAL GAS MARKET DATA

POLAND

Energy

Electricity

Capacity (1988)	30,922 1000s kilowatts
Production (1988)	144,372 million kilowatt-hours
Consumption (1988)	148,848 million kilowatt-hours
Consumption per Capita	4,002 kilowatt-hours

Coal

Reserves (1988)	40,400 million metric tons
Production (1988)	266,504 1000s metric tons
Consumption (1988)	232,853 1000s metric tons
Consumption per Capita	6.3 metric tons

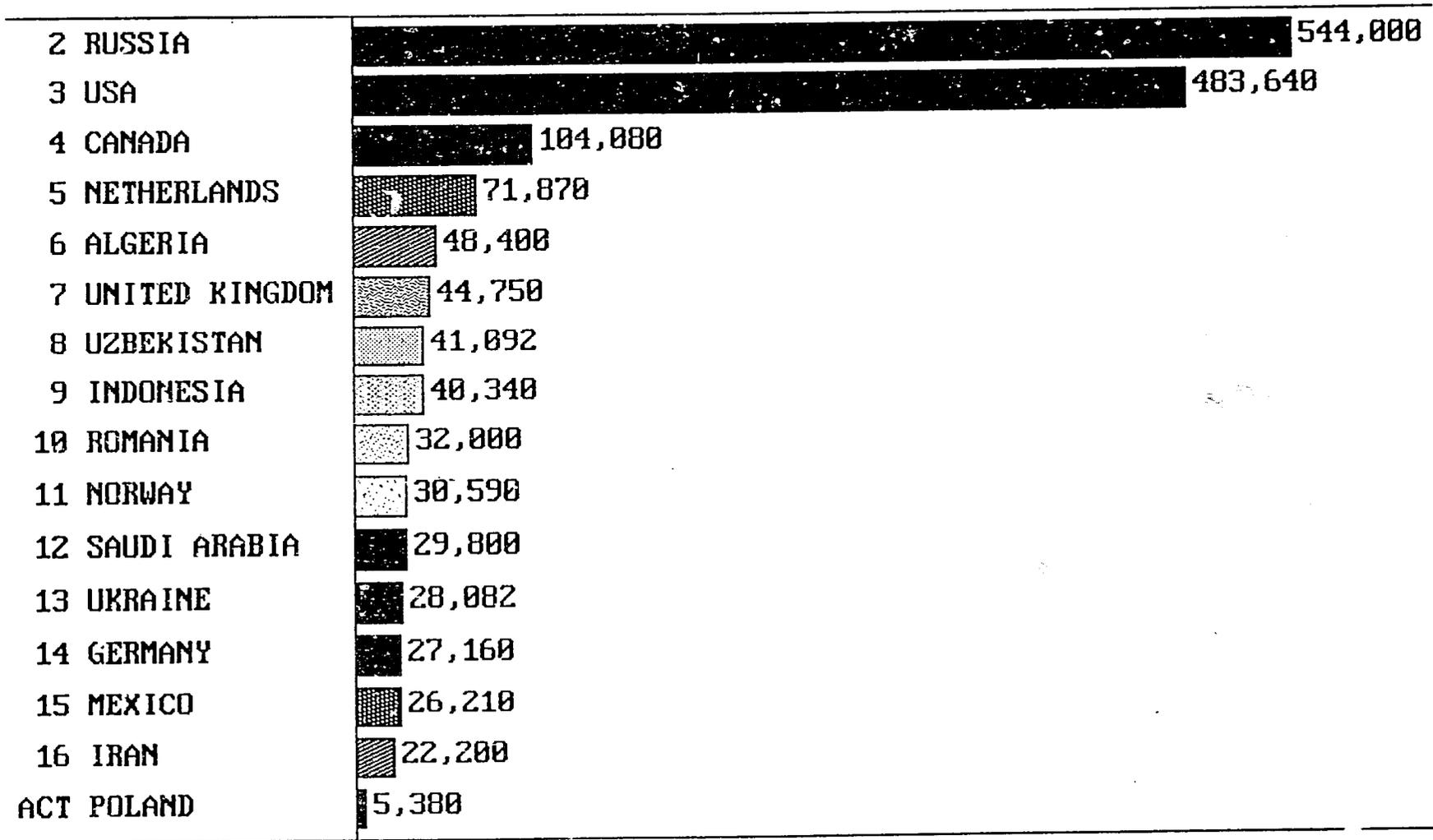
Natural Gas

Reserves (1990)	175 billion cubic meters
Production (1989)	5,380 million cubic meters
Consumption (1988)	12,883 million cubic meters
Consumption per Capita	346 cubic meters

Crude Petroleum

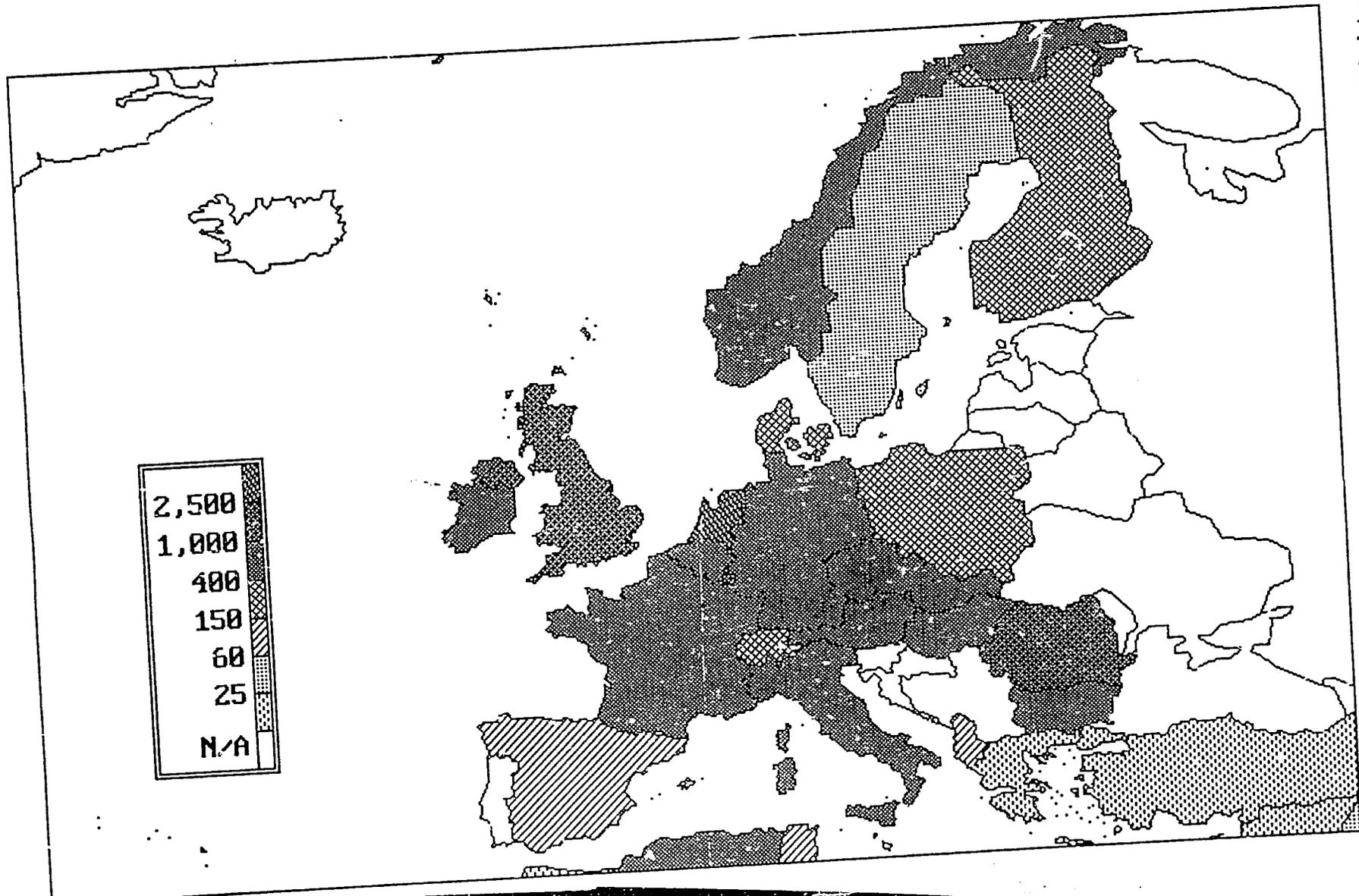
Reserves (1990)	11 million barrels
Production (1989)	1 million barrels
Consumption (1988)	111 million barrels
Consumption per Capita	3.0 barrels

NATURAL GAS PRODUCTION 1989
 (in millions of cubic meters)



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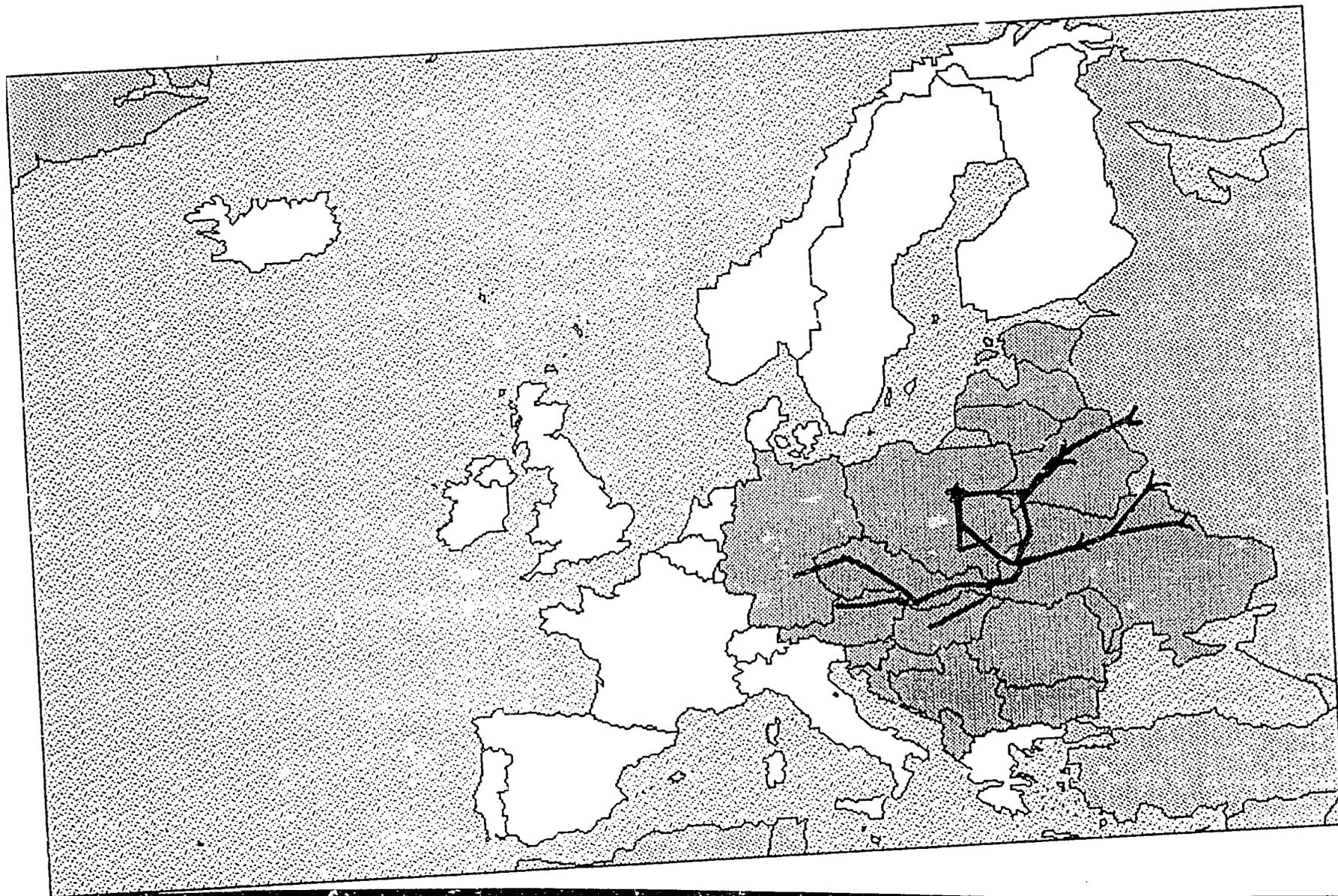
NATURAL GAS CONSUMPTION PER CAPITA 1988 (in cubic meters)



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European Gas Pipeline Network



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Poland and Gas Producing Region

