

PN-ABL-632  
12477978

**EMERGENCY ENERGY PROGRAM ASSISTANCE IN  
ENERGY PRICE REFORM IN HUNGARY**

Emergency Energy Program  
for Eastern and Central Europe

*Prepared for:*

Bureau for Europe  
**U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT**  
Washington, D.C. 20523

HBI Reference No. 92-4055-003

*Prepared by:*

**RCG/HAGLER, BAILLY, INC.**  
1530 Wilson Boulevard, Suite 900  
Arlington, VA 22209-2406  
(703) 351-0300

April 1992

## **TABLE OF CONTENTS**

### **Emergency Energy Assistance Program Energy Price Reform in Hungary**

#### **Chapter 1: Introduction**

- 1.1 Objectives of the Energy Price Reform Component
- 1.2 Organization of This Report

#### **Chapter 2. Energy Price Reform in Hungary, January 1990 - March 1992**

- 1.1 Energy Price Levels in the Late 1980s
- 1.2 Price Control and Decontrol
- 1.3 Recent Trends in Energy Prices
- 1.4 Increases in Household Energy Prices
- 1.5 Institutional Basis for Price Regulation

#### **Chapter 3. Activities of the Energy Price Reform Component of the Emergency Energy Program**

- 1.1 Meetings with Host Country Officials
- 1.2 Identification of Issues
- 1.3 Conference on Energy Pricing
- 1.4 Refined Product Pricing Model
- 1.5 Workshop on Energy Modeling
- 1.6 Transfer of Publications on Energy Pricing
- 1.7 Assessment of the Usefulness of Activities Conducted

#### **Chapter 4. Recommended Program of Studies Related to Price Reform**

- 1.1 Energy Pricing Policy Objectives of the Government of Hungary
- 1.2 Recommendations of the IEA Team
- 1.3 Recommended Program of Studies

#### **Appendix A. Energy Prices in Hungary**

## **CHAPTER 1: INTRODUCTION**

---

In December 1990 the U.S. Agency for International Development organized an Emergency Energy Program to assist the countries of eastern Europe in improving the energy efficiency of their industrial plants and refineries, in rationalizing and reforming their energy price systems, and in improving their oil purchasing techniques. Assistance programs for Poland, Czechoslovakia, Hungary, Romania, Bulgaria, and Yugoslavia were established. In July 1991 assistance to Yugoslavia was suspended, but in the fall of 1991 the Emergency Energy Program was extended to Albania, Estonia, Latvia, and Lithuania. Administrative responsibility for the program is located in AID's Bureau for Europe, Office of Development Resources, Energy & Infrastructure Division.

This report describes the Energy Price Reform component of the Emergency Energy Program in Hungary. Activities under this component were conducted by RCG/Hagler, Bailly, Inc., a management and technical consulting firm, under a contract with AID. This report is supplemented by four other pieces of documentation:

- a report entitled Identification of Issues in Energy Price Reform in Hungary which was written in July 1991
- proceedings of a "Conference on Energy Pricing in Hungary" that was held in Budapest on May 20-24, 1991
- documentation for the Hungary Refined Product Pricing Model, which was transferred to MOL Ltd in final form in October 1991
- documentation for a workshop on energy modeling which was held in Budapest on June 24-28, 1991.

### **Objectives of the Energy Price Reform Component**

The purpose of the Energy Price Reform component in the Eastern European democracies is to support country efforts to rationalize and reform their energy price systems, with particular focus on petroleum prices. By helping these countries rationalize and reform their energy price systems the United States can help them make a transition from centrally planned economies to market economies. The transition to market economies is one of the principal areas of emphasis in the U.S. strategy to assist these democracies. Developing competitive markets, removing trade barriers, and instituting rational pricing and taxation systems is of critical importance in the energy sector and in other sectors.

These objectives were established at the end of 1990, following the oil price spike associated with the loss of Iraqi and Kuwaiti oil supplies, and following the Soviet Union's announcement that eastern European countries would have to pay for Soviet oil and gas supplies with hard currency, beginning January 1, 1991. At this time it was clear that Soviet oil production was declining and therefore Soviet oil exports were expected to decline. In this context the Energy Price Reform component was given a particular focus on petroleum prices.

Since the start of 1991 the process of energy price reform in Hungary has involved several related developments:

- restructuring of energy supply industries, with a view toward the creation of competitive domestic markets
- opening of domestic energy supply markets to foreign firms, to promote competition (e.g., in gasoline marketing)
- deregulation of energy prices, in markets that have become sufficiently competitive to justify the removal of price controls
- implementation of energy price increases necessary to eliminate subsidies, maintain the financial viability of energy supply firms, and cover increases in the cost of imported supplies
- analysis of tariffs for electricity, natural gas, and district heat, with a view toward improving the linkage between tariffs and costs.

All of these activities may be considered efforts to rationalize and reform Hungary's energy price system.

Because the Energy Price Reform component is part of an assistance program, the objective is to provide information, analytical techniques, and ideas to support the efforts of Hungarians to reform their energy prices. The focus is on helping Hungarian organizations meet their own energy pricing objectives, consistent with a transition to a market economy.

To provide a focus on petroleum prices the project team in Hungary transferred a refined product pricing model to MOL Ltd, the state-owned oil company, and conducted a computer modeling workshop at MOL to show how energy pricing considerations can be introduced into refinery optimization models and other planning models. The team also worked with different ministries, banking institutions, and energy companies on issues involving the prices of coal, electricity and natural gas.

### Organization of This Report

The activities conducted under the Energy Price Reform component in Hungary represent a contribution to a process of price reform that was well under way when the project team conducted its first mission and was sustained after the team completed in-country work and transferred the refined product model. To place the project team's activities in context it is necessary to view the longer-term trends in energy prices. Therefore, in Chapter 2 we describe the development of Hungary's energy price reform program over the period from January 1990 to March 1992. The chapter begins with a discussion of energy price levels in the late 1980s, which were much higher in the industrial sector than in the household sector. The phases of price decontrol since 1990 are described, and trends in prices of each energy type are presented. The need to develop regulatory institutions for electricity and natural gas pricing is also discussed.

In Chapter 3 we describe the activities of the project team in Hungary under this component. These activities consisted of participation in meetings with host country officials, identification of issues, organization of a conference on energy pricing, transfer of a refined product pricing model, organization of a workshop on energy modeling, and transfer of publications and data on energy pricing. We offer our assessment of the impact of these activities on policies and analytical techniques used in Hungary.

In the scope of work defined by AID, RCG/Hagler, Bailly was asked to recommend a program of short and long-term studies related to price reform as input to national policy discussions and World Bank energy sector investment planning. In Chapter 4 we review national policy and World Bank activities and then present recommendations for a program of studies. The recommended program contains four elements:

- support for the development of regulatory institutions to oversee the natural gas industry and the electric power industry
- assessment of policy options for diversifying sources of imported oil, natural gas, electricity, and coal
- tariff studies for major district heating systems
- assessment of policy options for supporting private power development.

## **CHAPTER 2: ENERGY PRICE REFORM IN HUNGARY, JANUARY 1990 - MARCH 1992**

---

The technical assistance provided to Hungary under the energy price reform component of the Emergency Energy Program for Eastern and Central Europe was focused in the March 1991 through June 1991 time frame, when the in-country missions were conducted. Because energy price reform was well under way before March 1991 and is still in progress, the contribution of AID technical assistance to the process of price reform is best viewed in the context of events over at least a two-year period. In this chapter we review the course of energy price reform in Hungary since January 1, 1990. The discussion in this chapter is supported by the data presented in Appendix A. On the basis of information we have received from the Ministry of Industry and Energy, MOL Ltd (the oil and gas company), Mininvest (the entity managing the utilization of coal mining property), and MVMT (the electric company), we present a review of price changes over the period from January 1, 1990 to March 1, 1992.

### **Energy Price Levels in the Late 1980s**

Although Hungary imported oil, natural gas, and electricity from the Soviet Union in the late 1980s, Hungary has not had to experience the kind of energy price shock currently facing Russia and the other former Soviet republics. One reason for the less severe degree of energy price inflation in Hungary, relative to the former Soviet republics, is that the Forint has declined against the dollar very gradually since 1980, while the ruble fell sharply in 1989-1990. In Hungary the exchange rate fell from 32.2 Forint per dollar in 1980 to 62.5 in 1989, and 77.8 in January 1992.<sup>1</sup> For Hungarian industrial enterprises the Forint is practically a convertible currency. The strength of the Forint stands in contrast to the ruble, which has fallen dramatically.

When Forint-denominated prices are expressed in U.S. dollars on the basis of market exchange rates, Hungary's industrial energy prices of the late 1980s tend to be comparable to or higher than prices prevailing in the United States and in some cases comparable to prices in Germany and Austria (see Exhibit A.1). By 1989 Hungarian industrial consumers were already paying prices for light fuel oil and natural gas that were comparable to prices prevailing in Germany and Austria.

---

<sup>1</sup> International Monetary Fund, International Financial Statistics, 1991 Yearbook and March 1992 volume.

---

In 1989 the average price of gasoline (expressed in U.S. dollars) was 57 percent higher in Hungary than in the United States, although the average price of automotive diesel fuel was 17 percent lower. For industry the price of light fuel oil was 29 percent higher than in the United States while heavy fuel oil was 8 percent lower; electricity was 4 percent higher and gas was 34 percent higher. On the basis of heat content, the price of steam coal for industry in 1989 was 82 percent higher in Hungary (see Exhibit A.1). By western European standards, of course, many U.S. energy prices are low and are not an indication of the prices needed to achieve western European levels of energy efficiency.

In the household sector, Hungary's energy prices in the late 1980s were below U.S. (and western European) prices. In 1989 the price of light fuel oil was 59 percent of the U.S. level while electricity was 33 percent of the U.S. level and natural gas was 32 percent (see Exhibit A.1). Thus one of the obvious requirements of energy price reform, at the start of 1990, was to raise prices in the household sector. The other major objective of energy price reform was to facilitate a transition to a market economy. This objective has been partially achieved by gradually replacing a system of government price controls with market-determined prices.<sup>2</sup>

### **Price Control and Decontrol**

The phrase "price decontrol" must be defined carefully in the context of a formerly socialist country, because the government may continue to exercise control through its ownership of the assets of energy companies, or through its ability to control energy companies' access to materials and supplies. Government officials may make informal requests to energy companies, asking for lower prices or price stability, even when there is no formal institution of price control. For the purposes of the discussion below, "decontrol" is the passage of a law removing the authority of government ministries to set energy prices directly.

Most of Hungary's energy sector is still under government ownership. To the extent that markets for energy commodities become competitive, the government may retain ownership control without controlling energy prices. In the October 1991 reorganization of the national oil company, the government assumed the role of stockholder; the owner of the company is the State Property Agency, which is entitled to receive a dividend. Ideally, competitive pricing would be promoted through privatization and the entry of foreign firms into the marketplace. Hungarians recognize that a market with many privately-owned firms is more

---

<sup>2</sup> For a discussion of the objectives of energy price reform in Hungary, see RCG/Hagler, Bailly, Inc., Identification of Issues in Energy Price Reform in Hungary, pp. 3-10.

competitive than a market in which the state has a monopolistic share of ownership, but price decontrol is allowed to proceed under conditions of state ownership.

In any country, governments have the ability to alter energy prices by altering excise taxes. In the case of motor gasoline in Hungary, the government arguably has more "control" over the pump price than the oil companies, because the sum of road tax and excise duty (e.g., 43.5 Forint per liter for 86 octane gasoline at January 6, 1992) is larger than the refining and marketing cost (13.5 Forint per liter, at the same date). This situation is common in western European countries and occurs under price "decontrol."

Since January 1990 the government of Hungary has made a great deal of progress toward energy price decontrol. The first step was a decision in 1990 to decontrol petroleum product prices effective January 1, 1991 and allow foreign companies to compete with MOL, the state-owned oil company, for the sale of petroleum products to end users. In 1990 the parliament passed a law decontrolling petroleum product prices (and crude oil prices) and establishing procedures and guidelines under which the prices of other energy commodities would be set by the Ministry of Industry and Trade in conjunction with the Ministry of Finance.

The second phase of decontrol went into effect on March 1, 1992. In this phase, prices of coal sold to industry and households (but not power plants) were decontrolled, along with LPG and firewood prices. The concept of decontrolling prices of coal sold to industry and households had been debated in the spring of 1991 as an alternative to a price control system that lacked an objective basis for calculating prices, lacked a sound basis in cost accounting, and was applied to potentially competitive markets. The second phase of decontrol may be perceived, therefore, as a reflection of dissatisfaction with the existing price control system. The second phase is also related to energy sector restructuring. The decontrol of LPG prices was accomplished in connection with a program to create competitive markets through privatization and restructuring of the LPG industry.

There remains a possibility of another phase of price decontrol based upon the restructuring of the electric utility industry. If electric generating stations could participate in a competitive market by offering competitive bids for bulk power sales to distribution companies and/or large industrial companies, it should be possible to at least partially decontrol prices for electric generation. This concept was discussed by MVMT officials in 1991 in the context of plans for a major reorganization of MVMT, but such a reorganization not been implemented.

Another form of decontrol that has been debated but not put into effect is the decontrol of prices of natural gas transported under an "open access" program. In theory it should be possible for companies other than MOL affiliates to purchase gas at the border and pay for transmission of the gas to a distribution company or large industrial customer. The

purchaser of this gas would be able to pay a price lower than MOL's price, or sign a long-term contract with prices that differ from MOL's prices (and are either higher or lower in a given year). Because the concept of open access is being promoted by the Commission of the European Communities, and by certain European industries that seek an opportunity to pay lower prices for gas, Hungarians are considering the introduction of some form of open access system in the gas transmission grid. However, such a system may be delayed by the absence of a regulatory institution to oversee the gas transmission company's activities and protect the rights of third-party transporters of gas.

From the standpoint of price control, energy commodities in Hungary may be placed into four groups (as of March 1992):

- 1) Petroleum products. These commodities were the first to be subject to price decontrol, on the basis of the theory that the development of competitive markets would be accelerated by the entry of foreign oil companies. The limitations of competition are illustrated by gasoline price variations through February 1992. While gasoline retailing is indeed competitive and foreign oil firms have opened many gas stations in Hungary, MOL continues to set gasoline prices which are used not only by MOL but by its competitors. Foreign companies tend to compete with MOL on the basis of quality of service rather than price. MOL does not need to make frequent price adjustments and may not change gasoline prices for up to six months. Moreover, MOL faces little or no competition from imported products. Petroleum products are typically purchased by foreign firms from refineries owned by MOL, or processed at MOL's refinery at Szazhalombatta, rather than imported.

The retention of import duties may be regarded as an indirect form of price control because it discourages price competition based on product imports. The IEA recommended that the government of Hungary consider a policy of promoting product imports, and thereby promoting competition in product markets, by eliminating import duties on refined petroleum products.<sup>3</sup>

- 2) LPG, firewood, and coal sold to users other than electric generating stations. These commodities have been decontrolled without reliance on foreign firms to introduce competition in retail distribution. For example, prices of LPG were decontrolled (under a law passed on February 14, 1992) on the basis of a plan to form two competing companies in the business of distributing propane and butane. One of the competitors, Prímagáz Rt, was formed through the privatization of the propane-butane operations of three of Hungary's gas distribution companies (Tigáz, Dégáz, and Ddgáz) and the other competitor is to be formed through the privatization of the

---

<sup>3</sup> IEA, Energy Policies: Hungary, 1991 Survey (Paris, 1992), p. 117.

propane-butane operations of the other two gas distribution companies (Kögáz and Égáz).

- 3) Commodities sold to end users under conditions of natural monopoly: electricity, natural gas, and district heat. Although the electric generation industry might become competitive in the future, and natural gas could be sold under an open access program in the future, the electric and gas industries in March 1992 were still characterized by monopoly pricing. Prices were still controlled by the Ministry of Industry and Trade in conjunction with the Ministry of Finance.
- 4) Coal and lignite used in electric generation. Because these coals are of low quality and it is not economic to transport them over long distances, these coals are sold under conditions of monopsony and/or monopoly rather than in potentially competitive markets. In the future it is possible that each mine-mouth power plant will be owned by an entity which owns the associated coal or lignite mine(s) and therefore the "market" for these coals will disappear. Prices of coal used in electric generation are still controlled by the Ministry of Industry and Trade in conjunction with the Ministry of Finance.

The present system of control and decontrol is summarized in Exhibit 2.1.

### Recent Trends in Energy Prices

Because there is no central and comprehensive source of published information on energy prices in Hungary, recent trends in energy prices must be analyzed using different data sources for different fuels. The data supporting the discussion below are presented in Exhibits A.2 through A.9 of Appendix A. These exhibits show both international comparisons based on prices in U.S. dollars, and percentage changes in nominal prices expressed in Forint. For international comparisons we use first quarter 1991 numbers because we rely on published IEA data.

Motor gasoline. When gasoline prices are expressed in dollars per liter, it is clear that consumers pay far more in Hungary than in the United States. The price of 95 octane gasoline effective January 17, 1991 was 81.5 cents per liter while the first quarter 1991 price in the United States was 34.9 cents per liter (see Exhibit A.2). On the other hand, gasoline prices in Hungary were lower than in Austria (in the first quarter of 1991).

Gasoline prices expressed in dollars per liter were lower at January 6, 1992 than on November 30, 1990. The difference is especially clear when ex-refinery prices are compared; for 86 octane gasoline the nominal January 6, 1992 price is 34 percent below the

## Exhibit 2.1

### Decontrol of Energy Prices in Hungary

Type of Energy	Customer Groups	Status of Price Control*
<b>Petroleum products</b>		
Motor gasoline	All	Decontrolled on 1 Jan 91**
Automotive diesel	All	"
Light fuel oil	All	"
Household heating oil	Households	"
Heavy fuel oil	All	"
Natural Gas	All	Controlled by Ministries
Electricity	All	Controlled by Ministries
<b>Coal</b>		
Black coal	Electric generation	Controlled by Ministries
	All others	Decontrolled on 1 Mar 92
Brown coal	Electric generation	Controlled by Ministries
	All others	Decontrolled on 1 Mar 92
Lignite	Electric generation	Controlled by Ministries
	All others	Decontrolled on 1 Mar 92
Briquettes	All	"
LPG	All	"
Firewood	All	"
District Heat	All	Controlled by Ministries

\* Changes in the prices of these energy commodities must be approved by the Ministry of Industry and Energy and the Ministry of Finance. Producing organizations submit their requests for price changes to the Ministry of Industry.

\*\* Through February 1992, foreign companies have been charging prices that are identical to, or very close to, prices set by MOL Ltd. In this respect the process of price decontrol has not been completed because a state-owned company is still setting prices.

Source: RCG/Hagler, Bailly, Inc.

November 30, 1990 price. This price decline is associated with a decline in crude oil prices following the Gulf war and is perfectly consistent with a transition to a market economy.

Light fuel oil for industry. Industrial customers pay higher prices for light fuel oil in Hungary than in Austria and Germany (see Exhibit A.2). The tax component of 21.6 Forint per liter for 20/40 gasoil (a light, sulfur free heating oil) is 54 percent of the price effective January 6, 1992. When these industrial prices are compared with household heating oil prices in Hungary, it can be argued that the industrial prices are too high and are carrying too much of a tax burden. Light fuel oil currently carries the same tax per liter as automotive diesel, while household heating oil carries no tax at all.

Household heating oil. From January 1, 1990 to January 6, 1992 the price of household heating oil more than doubled, from 9.2 Forint per liter to 21 Forint per liter (see Exhibit A.2). It carries no road tax and no excise duty, and is roughly half the price of light fuel oil for industry. It is much cheaper in Hungary than in Austria or Germany, where the tax component is a significant portion of the price. Arguably what is needed is a review of tax policy, given the fact that household heating oil is chemically very similar to light fuel oil.

Heavy fuel oil. In the fourth quarter of 1990, heavy fuel oil prices (in Forint per metric ton) were raised 90 percent for industry and for electric generation customers. Following price decontrol (effective January 1, 1991), heavy fuel oil prices in Hungary declined in the second quarter of 1991 (see Exhibit A.3). This decline is consistent with world market conditions because it occurred at a time when Rotterdam spot prices of heavy fuel oil declined.

Industrial users pay high prices for heavy fuel oil in Hungary. From the fourth quarter of 1990 through the second quarter of 1991, the price expressed in dollars was higher in Hungary than in Germany (see Exhibit A.10). In the first quarter of 1991, the price of heavy fuel oil to industrial users (expressed in dollars) was 68 percent higher in Hungary than in the United States while the price for electric generation was 20 percent higher. Moreover, the industrial user in Hungary is paying a premium relative to MVMT. This is the opposite of the situation in Germany and the United States, where the average price of heavy fuel oil used in industry is lower than the price for electric generation (see Exhibit A.10). The heavy fuel oil price differential in Hungary is not explained by excise taxes, because neither industrial customers nor electric utilities pay an excise tax (see Exhibit A.4).

Natural gas. In the natural gas industry in Hungary there are five customer classes:<sup>4</sup>

- 1) Households pay a very low price (230 Ft/GJ) which is only 15 percent above the cost of gas purchased from the producer (199.5 Ft/GJ). The margin of 30.5 Ft/GJ is equivalent to 42 cents per million Btu, which is so far below western European norms that it cannot be enough to cover the marginal cost of transmission and distribution. In Hungary, households pay a lower price for gas than commercial customers. Household prices in Hungary are half the U.S. level and far below the Austrian level (see Exhibit A.6).
- 2) Commercial customers pay 310 Ft/GJ, which is roughly comparable to the average price paid by industrial customers in Austria (see Exhibit A.6).<sup>5</sup> Between July 1, 1991 and February 1992 the commercial price fell from 350 Ft/GJ to 310 Ft/GJ.
- 3) Interruptible industrial customers pay 310 Ft/GJ, the same price as commercial customers. This does not appear reasonable, given the interruptible nature of the service. Interruptible customers are called "buffer" customers. Between July 1, 1991 and February 28, 1992 the interruptible industrial price increased from 250 Ft/GJ to 310 Ft/GJ. In this time frame, therefore, the price differential between commercial and interruptible service fell from 100 Ft/GJ to zero. MVMT is among the interruptible customers.
- 4) Two large chemical companies buy gas directly from the producer and pay 7220 Ft per thousand cubic meters, which is roughly the same as the price paid to the producer by distribution companies. Between July 1, 1991 and February 1992 this price did not change.<sup>6</sup>
- 5) All other industrial companies pay a commodity charge of 207 Ft/GJ in the summer and 212 Ft/GJ in the winter, plus a demand charge of 250 Ft/MJ/h. The demand charge is called a basic fee. The commodity charge is little more than the producer price of 199.5 Ft/GJ. Between July 1, 1991 and February 1992 the summer

---

<sup>4</sup> The natural gas price information discussed here was obtained from MOL Ltd in February 1992.

<sup>5</sup> 1990-1991 data for Germany are not available in IEA Energy Prices and Taxes: First Quarter 1991. 1989 data show similar gas prices (in US dollars per ton oil equivalent) in Germany and Austria.

<sup>6</sup> IEA Energy Prices and Taxes shows a heat content of 8500 kcal/cubic meter for Hungarian gas. This yields a price of 203 Ft/GJ, although 212 Ft/GJ is shown in IEA, Energy Policies: Hungary, 1991 Survey (Paris, 1992), p. 52.

commodity charge declined from 247 Ft/GJ to 207 Ft/GJ, the winter commodity charge declined from 252 Ft/GJ to 212 Ft/GJ, and the demand charge declined from 280 Ft/MJ/h to 250 Ft/MJ/h.

According to the IEA, the average price of natural gas to industry declined from 359 Ft/GJ in November 1990 to 281 Ft/GJ in November 1991.<sup>7</sup> Although the terms of Hungary's gas contract with the Soviet Union in 1990-1991 are confidential, it is reasonable to suspect that the border price was tied to prices of gasoil and/or heavy fuel oil because this type of escalation clause is common in European natural gas contracts. With the decline in oil prices between November 1990 and November 1991, the border price probably fell sharply and the savings were probably passed on to industrial customers.

The wellhead market for gas in Hungary is not competitive. All gas production is controlled by Lowlands Hydrocarbon Production Company (NKFV), a subsidiary of MOL Ltd. The price is regulated by the Ministry of Industry and Trade in conjunction with the Ministry of Finance, and the same price is applied to all gas fields and delivery points. Between July 1, 1991 and February 1992 the producer price fell from 222 Ft/GJ to 199.5 Ft/GJ.

Gas prices to households were raised 25 percent on August 1, 1990 and again raised 53.3 percent on June 1, 1991. Although these increases are not adequate to bring household gas prices up to the level of commercial prices, they at least compensate for overall inflation in the economy. When the February 1992 gas price to households is adjusted for inflation, it is only 5 to 10 percent above the January 1990 gas price.<sup>8</sup>

Electricity. The structure of industrial electric rates is complex; it includes demand charges (or "power rates," in Ft/kW/year) for peak and off-peak periods, and energy charges (in Ft/kWh) for peak periods, daytime off-peak periods, and nighttime off-peak periods. Demand charges vary from 720 Ft/kW/year for general tariff demands larger than 5 kVA to 14,400 Ft/kW/year for intensive lights under the public lighting tariff.<sup>9</sup> The trend in

---

<sup>7</sup> IEA, Energy Policies: Hungary, 1991 Survey (Paris, 1992), p. 91.

<sup>8</sup> According to IMF data the consumer price index rose 28 percent from 1989 to 1990. At this writing the IMF has not yet published the CPI for 1991 in International Financial Statistics. At the beginning of 1991 the government set a target inflation rate of 35 percent for the year, but actual experience is probably 40 percent or slightly higher. If the CPI rose 40 percent in 1991, the two-year increase in consumer prices was 79 percent.

<sup>9</sup> MVMT's February 1991 description of the electric rate structure is reproduced in RCG/Hagler, Bailly, Inc, Identification of Issues in Energy Price Reform in Hungary, Appendix B. See also the description of MVMT tariffs in IEA, Energy Policies: Hungary.

industrial electric rates for "large consumers" is indicated by a simple data series in Ft/kWh which we received in February 1992 from the Ministry of Industry and Trade (see Exhibit A.7). This series indicates a cumulative increase of 75 percent in rates charged to large consumers, between January 1, 1990 and November 1, 1990, but no subsequent increases.

Household electric rates include a daytime rate of 3.7 Ft/kWh and a nighttime rate of 1.9 Ft/kWh. At February 1991 exchange rates these were equivalent to 5.2 cents/kWh and 2.7 cents/kWh, respectively. Between January 1, 1990 and February 1, 1991 the daytime rates was increased by 83 percent and the nighttime rate was increased by 111 percent. The nighttime rate is available only to customers who consume a significant amount of electricity at night.<sup>10</sup>

Household electric rates in Hungary are lower than the U.S. average, which is substantially below the averages for Austria and Germany (see Exhibit A.7). In the first quarter of 1991 the average household rate in Germany was equivalent to 17.8 cents/kWh, or 3.4 times the daytime rate in Hungary.

In February 1991 MVMT published a tariff study containing a detailed analysis of long-run marginal cost by customer class. In February 1992 MVMT was planning to complete a new tariff study in April.

Coal. Coal consumers in Hungary may be classified very broadly as households, industry, and electric generating stations. For households and industry, coal prices were decontrolled on March 1, 1992 but coal used in electric generation is still subject to price control.

The continued regulation of power station coal is sensible because of the structure of the coal industry and the absence of long-term contracts to supply the generating stations. In May 1991 Hungary had only one company mining black coal and one company mining lignite, and of course one electric company (MVMT), leaving no room for competitive pricing of black coal and lignite used in power stations. Because the lignite mines are located near the power plants that consume lignite, a competitive lignite market could not be created through coal industry restructuring. Because the black coal fields at Mecsek are largely depleted it is also improbable that a competitive group of domestic black coal producers could be formed. Although there are six companies mining brown coal, its quality is so low that it is not

1991 Survey (Paris, 1992), Table 33, p. 77.

<sup>10</sup> "Whenever the consumer has a significant night consumption (generally, it is heat generation) then this energy can be separately measured and it can be accounted with a more favourable tariff." MVMT, UNDP-IBRD Project on Energy Planning: Tariff Study, Technical Report (Budapest, February 1991), p. 34.

economic to transport brown coal over distances large enough to enable power stations to solicit competitive bids for coal supply.

To make international comparisons it is better to measure coal prices on the basis of heat content (Forint per Gigajoule) than weight (Forint per ton), although ideally sulfur, ash and moisture content would also be taken into consideration. On the basis of heat content the prices of coal for electric generation in Hungary are substantially higher than in the United States, although lower than in Germany (see Exhibit A.8).

Prior to decontrol in March 1992, price ceilings on coal sold to households were raised substantially on June 1, 1991. The price ceiling for household coal briquettes was tripled, for example (see Exhibit A.8). The June 1991 price increases were a first step toward decontrol and were regarded by the Ministry of Industry and Energy as a step toward decontrol. The June 1991 price increases pushed Hungarian coal prices well above the U.S. price level (on the basis of heat content) and roughly to the level of industrial coal prices in Austria. Comparisons with the United States are imprecise, of course, because household coal consumption is far higher in Hungary.

LPG. Prices of LPG were decontrolled on March 1, 1992 in connection with the restructuring of the LPG industry to provide competition between two companies. Between January 1990 and February 1, 1991, LPG prices were increased substantially. On March 16, 1992 LPG prices were increased 16 percent. Because the IEA does not publish data on LPG prices to end users it is difficult to compare Hungary's prices with those in western Europe. After February 1991, Hungarian LPG prices were generally lower than U.S. prices for propane, but not substantially lower. After February 1991, Hungarian LPG prices were far more stable than U.S. propane prices. In a normal competitive market LPG prices are very sensitive to weather conditions and prices fluctuate from week to week. This pattern of price fluctuation has not developed in Hungary.

An interesting aspect of LPG prices in Hungary is that they have been higher for households than for industry (i.e., "large customers"), since January 1990 (see Exhibit A.9). It is reasonable to assume that the cost per kilogram of distributing LPG is lower for large customers than for households, and therefore it is not surprising that prices to large customers are lower. For natural gas and electricity, however, large customers in Hungary have been charged higher prices. LPG provides an exception to the prevailing pattern of household-industry price differentials.

The restructuring of the LPG industry shows the willingness of the Hungarian government to create competitive markets where possible. In the United States, LPG distribution is deregulated and most of the companies in the business are not even affiliated with natural gas distribution companies. In the past LPG distribution in Hungary was part of the operations of natural gas distribution companies, which are natural monopolies. The government of

Hungary separated the potentially competitive industry (LPG distribution) from the monopolistic industry (gas distribution).

Firewood. Prices of firewood were controlled by the government until March 1, 1992. The price ceilings for firewood were increased about 30 percent on August 16, 1990 and 25 percent on July 1, 1991 (see Exhibit A.9). These increases are approximately at the level needed to allow firewood prices to rise with inflation. The decontrol of firewood prices may be considered an expression of confidence in the potential for competitive markets to develop. In countries where wooded lands are in private ownership it is natural for firewood to be sold competitively.

District heat. Because the distribution of district heat is a natural monopoly, it is not surprising to find that prices of district heat are subject to government price control. The trend in district heat prices since January 1990 is shown in a price series provided by the Ministry of Industry and Trade (see Exhibit A.9). Between January 1, 1990 and October 1, 1991 the price of district heat rose from about \$2.88 per million Btu to \$6.70 per million Btu; prices in Forint per Gigajoule rose 182 percent. This increase substantially exceeds overall inflation and represents an important component of price reform in the energy sector.

For household customers, district heat is not metered and the charges for heat are therefore based upon the volume of space being heated. In July 1991 residential consumers paid 104 Forint per cubic meter per year.<sup>11</sup> When the customer's bill is not related to actual energy use the incentive for energy conservation is lost. A price reform program to address this issue cannot be implemented, however, without the installation of valves to let the customer control energy use and meters to measure actual energy use.

In its policy recommendations the International Energy Agency expressed concern about the structure of district heating tariffs:

The tariff structure for district heating should be modified and prices related to actual energy consumption - energy consumption and capacity charges should replace flat charges. Cost based prices are also urgently needed to improve the financial situation of district heating companies.<sup>12</sup>

The price increases shown in Exhibit A.9 should not be interpreted as an indication that price reform is no longer needed.

---

<sup>11</sup> IEA, Energy Policies: Hungary, 1991 Survey, p. 91.

<sup>12</sup> International Energy Agency, Energy Policies: Hungary, 1991 Survey (Paris: OECD, 1992), p. 101.

### **Increases in Household Energy Prices**

One of the obvious requirements of energy price reform, at the start of 1990, was to raise prices in the household sector. The other major objective of energy price reform was to facilitate a transition to a market economy and market-determined prices. Because household energy prices had been suppressed by a system of government price controls, it was inevitable that a transition to market-determined prices would lead to substantial price changes in the household sector. One consequence of the old system of price control was that the industrial sector subsidized energy prices in the household sector.

In the household sector there are still price controls on electricity, natural gas, and district heat, but all other forms of energy have been decontrolled (see Exhibit 2.2). If we examine change in price ceilings, the largest cumulative increase occurred for coal briquettes - a 249 percent increase between January and June 1991. Most other energy forms show price increases above the level needed to match overall inflation in the Hungarian economy. Firewood prices approximately kept pace with inflation, until decontrol, and gasoline price increases between November 1990 and January 1992 were actually below the rate of inflation. Gasoline prices are the same for industry and households, and in 1990 gasoline prices to consumers were already at the level of prices in Austria and Germany.

### **Institutional Basis for Price Regulation**

Further progress in price reform in electricity and natural gas will be closely related to the development of regulatory institutions. If the structure of tariffs is to be based upon costs, it will be helpful (if not essential) to assign oversight responsibility to independent regulatory agencies that can make objective decisions about costs and cost allocation.

In June 1991 the Ministry of Industry and Trade prepared a document entitled Hungarian Energy Policy which was submitted to Parliament. In this document the need for regulatory institutions was clearly identified:

There are areas in the energy sector where market conditions can only be effective to a limited extent. They are the so-called "natural monopolies," the utilities which supply non-storable energies. These companies (which at present are owned by the state) own the technical facilities required for energy supply and customers have no choice as there is no alternative supply. To prevent these monopolies from abuse, it is necessary that the activities of production and distribution companies should be open and controllable for the public and its representatives. Executive power is the competence of the Government and an institutional background must be established. It is also the Government's responsibility to ensure that the self-financing activity of companies with

**Exhibit 2.2**

**Percentage Increases in Household Energy Prices, January 1990–March 1992**

Energy Type	Date	Price decontrol	Price	Unit of Measure	Cumulative Increase
Electricity Daytime	1 Jan 90		2.02	Ft/kWh	
	1 Feb 91	No	3.70	Ft/kWh	83.2%
Nighttime	1 Jan 90		0.90	Ft/kWh	
	1 Feb 91	No	1.90	Ft/kWh	111.1%
Natural Gas	1 Jan 90		120	FT/GJ	
	28 Feb 92	No	230	FT/GJ	91.7%
District Heat	1 Jan 90		170.4	Ft/GJ	
	1 Oct 91	No	481.0	Ft/GJ	182.3%
Household Heating Oil	1 Jan 90		9.20	Ft/liter	
	6 Jan 92	Yes	21.00	Ft/liter	128.3%
Coal briquettes	1 Jan 91		86	FT/GJ	
	1 June 91		300	FT/GJ	248.8%
	1 Mar 92	Yes			
Propane– Butane (LPG) Summer	8 Jan 90		6.78	FT/kg	
	15 Feb 91		15.91	FT/kg	134.7%
	1 Mar 92	Yes			
Winter	8 Jan 90		9.22	FT/kg	
	15 Feb 91		21.48	FT/kg	133.0%
	1 Mar 92	Yes			
Firewood	1 Jan 90		1.69	FT/kg	
	1 July 91		2.74	FT/kg	62.1%
	1 Mar 92	Yes			
Motor gasoline 95 Octane, unleaded	30 Nov 90		49.00	Ft/liter	
	6 Jan 92	Yes	61.00	Ft/liter	24.5%
86 Octane, unleaded	30 Nov 90		44.00	Ft/liter	
	6 Jan 92	Yes	57.00	Ft/liter	29.5%

Source: RCG/Hagler, Bailly, Inc. See Exhibits A.2, A.6, A.7, A.8, A.9

17

natural monopolies serve national interests and not extra profit generation for the company. Supervisory and ownership interests are contradictory, therefore they must be separated at governmental level, as required by the interest of the nation.<sup>13</sup>

In its review of energy policy the International Energy Agency supported these recommendations and favored the creation of independent regulatory authorities:

The Hungarian Government should establish an independent natural gas regulatory agency to safeguard the public interest where competition does not exist. Monopolies such as natural gas distribution, pipelines and storage would be subject to the agency's jurisdiction. This agency should be an independent body responsible for administering regulations enacted by the Government but not subject to political interference from the Government.

... State ownership of the electricity supply industry, in whole or in part, should be separated from administrative control. An independent regulatory agency should be established to assess system costs and regulate consumer prices and tariff structures on economic principles.<sup>14</sup>

Although independent regulatory agencies are common in North America, Hungary has no recent experience with such agencies. The concepts of public utility regulation are unfamiliar to most government officials and to the public. Moreover, the legislation supporting the price control system administered by the Ministry of Industry and Trade and Ministry of Finance in 1991 was passed in late 1990 and was implemented at a time when staff cutbacks precluded the formation of a large regulatory staff within the Ministry of Industry and Trade.

Although price decontrol for petroleum products, LPG, and other energy commodities is a very important development in the transition to a market economy, it should be noted that from an administrative standpoint price decontrol is much easier to implement than the creation of independent regulatory agencies. The administratively simple (but politically difficult) task of decontrol is largely completed, but the creation of regulatory institutions has just begun. Moreover, a major restructuring of the electric power system is planned for 1992. In the electric power sector the government is planning to establish an internal pricing system under which distribution companies would pay for power received and generation companies would receive payments for power generated. The process of energy price reform

---

<sup>13</sup> Ministry of Industry and Trade, "Hungarian Energy Policy," cited in International Energy Agency, Energy Policies: Hungary, 1991 Survey (Paris: OECD, 1992), p. 129.

<sup>14</sup> IEA, Energy Policies: Hungary, 1991 Survey, p. 99.

in electricity and natural gas has therefore entered a phase in which the Hungarian government continues to face major challenges.

The institutional framework for setting prices of district heat is undergoing change as well. Through a commitment to the World Bank the government of Hungary agreed to transfer authority for setting district heating pricing to local governments in 1992 and eliminate all household energy subsidies (including district heat subsidies) from the state budget by mid-1992.<sup>15</sup> If district heating tariffs are to be restructured to eliminate subsidies, municipal governments will have to establish new procedures for setting tariffs.

---

<sup>15</sup> IEA, Energy Policies: Hungary -1991 Survey, pp. 17, 91.

## **CHAPTER 3: ACTIVITIES OF THE ENERGY PRICE REFORM COMPONENT OF THE EMERGENCY ENERGY PROGRAM**

---

In this chapter we describe the various activities conducted under the energy price reform component of the Emergency Energy Program in Hungary. At the end of the chapter we assess the usefulness of these activities. The purpose of this chapter is to describe the type of assistance provided and suggest criteria under which the effectiveness of this component can be assessed.

### **Meetings with AID and World Bank officials**

Members of the project team attended the kickoff meeting for the Emergency Energy Program, which was held at AID offices in Washington on March 1, 1991. Members of the project team also participated in a meeting at the World Bank on March 7, 1991 to discuss the status of price reform in Hungary and identify the areas in which technical assistance was already being provided by the World Bank. In the following months various meetings were held at AID to review the status of the project and provide direction. These meetings helped the project team to develop an understanding of AID and World Bank policies on energy pricing issues.

### **Meetings With Host Country Officials**

The project team met with key host country policy makers and experts concerned with market reforms and energy pricing policy.

The definitional mission for the energy price reform component was conducted in March 1991 by David Keith, Charles Zimmermann and Thomas S. Tuschak. David Keith was the first to arrive in-country, and he arranged the initial meeting at the Ministry of Industry and Trade to discuss pricing issues. Andras Morenth, head of the Department of Energy Cooperation within the Directorate-General for Energy Policy, played a key role in introducing the members of the project team to representatives of the principal organizations involved in energy pricing. Mr. Morenth participated in many of the meetings on the definitional mission as well as the May mission conducted by Dr. Zimmermann and Dr. Tuschak. During the March 13-21 period the project team held meetings with the following organizations:

Ministry of Industry and Trade

Ministry of Finance

Mining Property Utilization Agency Company Limited (Mininvest)

Hungarian Electricity Board (MVMT)

Hungarian Oil and Gas Trust (OKGT), the predecessor of MOL Ltd

National Bank of Hungary

Budapest Bank Ltd. (the principal source of loans to the energy sector)

Institute for Industrial Economics

The March 1991 meetings served several objectives. The project team collected information on energy price reform and the economic and political factors affecting energy prices. The team also discussed economic concepts with host country policy makers and experts and provided information on the structure of energy prices and factors affecting energy prices in market economies. These discussions helped the project team to identify issues in energy price reform in Hungary. The March 1991 meetings also were used to identify the host country counterparts for energy modeling activity under this component and develop plans for workshops related to modeling. One issue to be resolved was the degree of participation of OKGT, the Ministry of Industry and Trade, and the Ministry of Finance. Among these organizations OKGT was best prepared to act as the counterpart for modeling activity. Another issue discussed in March 1991 was the extent to which the modeling activity would focus on petroleum prices.

The second mission was conducted in May 1991 and included the conference on energy pricing. Several meetings were held to organize the conference on energy pricing, which was conducted in the week of May 20-24. In these meetings Dr. Zimmermann and Dr. Tuschak discussed with each conference speaker the issues to be presented during the conference. The organizations contacted in May were the same as those contacted in March. In addition, meetings were held at OKGT to discuss the refined product pricing model developed by Donald Hertzmark and identify the individuals who would work most closely with Dr. Hertzmark.

Also in May 1991, Donald Hertzmark held meetings with representatives of OKGT and the Ministry of Finance to discuss plans for adapting the refined product pricing model to Hungary's situation. In these meetings Dr. Hertzmark discussed many of the economic concepts reflected in the model, such as netback pricing and demand elasticities. In a follow-up mission in June 1991 Dr. Hertzmark conducted a training workshop at OKGT to transfer the model.

In May 1991 Alexander Meeraus held meetings with representatives of OKGT, the Ministry of Finance, Mininvest, and MVMT to organize a workshop on energy modeling with GAMS software. In a follow-up mission in June 1991 the energy modeling workshop was conducted.

### **Identification of Issues**

The project team prepared a report entitled Identification of Issues in Energy Price Reform in Hungary. An initial draft was submitted to AID in April 1991 for review and comment and a revised draft was submitted in July 1991. This report summarizes the findings of the definitional mission, incorporates information and ideas obtained from the conference on energy pricing, and contains appendices with energy price data and energy production and consumption data from various sources. The report lists policy objectives that may be raised in the context of energy price reform and describes the extent to which the government of Hungary has linked these objectives with energy price reform. This discussion covers the use of pricing policy to incorporate environmental impacts in energy prices, and the use of prices as a mechanism for achieving broader societal goals. The report discusses past trends in energy production, consumption, and prices, and describes the legislative and institutional framework of price setting, the need for regulatory institutions and improved accounting procedures, and the current state of energy sector financing in Hungary. Issues in energy price reform in the oil and gas sector, coal sector, and electric power sector are reviewed.

The refined product pricing model was transferred to OKGT to help the Hungarians address key issues in petroleum price reform and identify criteria for product pricing in a market economy. The model uses an econometric approach to estimating the demand for refined oil products. A key issue discussed in the training sessions on this model was the impact of price changes on petroleum product use, and consideration was given to impacts on efficiency of consumer use. Projections of the impact of large quarterly fluctuations in world prices on retail prices in Hungary, and projections of the impact on consumer demand, can be developed using the model. The model can be used to project the impact of oil sector pricing systems and price trends on several variables:

demand for refined products

costs of crude oil inputs, and netback values of crudes

net tax revenues from oil product sales

effectiveness of various oil pricing and taxation schemes for demand stabilization or stimulation

refining costs

- demand for crude oil imports
- demand for refined product imports
- availability of refined products for export.

Among the oil pricing schemes that can be analyzed is an "Ex Rotterdam" option that bases domestic refinery prices on crude oil prices plus refining margins for each major product. This option represents reliance on the market for price setting, with a limited government role.

### **Conference on Energy Pricing**

To provide training on energy and petroleum pricing for key economic and energy officials, the project team conducted three activities: a conference on energy pricing, a training workshop on the refined product pricing model, and a workshop on energy modeling with GAMS software. The conference provided a forum in which pricing concepts could be presented to senior officials in the government, the energy sector companies, and banking institutions. The presentations by Charles Zimmermann, Thomas Tuschak, and Donald H. Mark provided a form of training on energy pricing. (The proceedings of the conference are bound separately from this report.) The two workshops provided more technical training for managers and planners in the oil sector and the coal mining sector.

The conference on energy pricing was held in Budapest on May 20-24, 1991. The objectives of the conference were:

1. To discuss the issues related to the transition to a market economy in the context of the energy sector, with a focus on energy pricing issues.
2. To provide a forum in which the subsectors of the energy supply industry could be brought together to facilitate a full discussion of the issues affecting interrelationships among these sectors.

Key issues in energy price reform were identified and addressed by all of the speakers participating in the conference. All of the organizations contacted during the definitional mission were represented at the conference. Papers presented at the conference by the project team were subsequently translated into Hungarian.

### **Refined Product Pricing Model**

During the course of activity under the energy price reform component the national oil and gas trust (OKGT) was replaced by a state-owned oil company, MOL Ltd. To provide MOL Ltd with an analytical tool for understanding the relationships among petroleum prices, customer demand for refined products, and refinery operations, the project team transferred a refined product pricing model to MOL. The model can be used to project the impact of oil sector pricing systems and price trends on several variables, as discussed above. The model allows consideration of the impact of different petroleum product prices and structure (including ex-refinery prices) on foreign exchange, end-use consumption, revenue, petroleum imports, and refinery outputs. (Documentation for the model has been bound separately from this report.)

Once the usefulness of the model had been discussed with oil company staff and the likely users of the model had been identified, the task of adapting the model to Hungary's needs and transferring it to MOL was conducted by Donald Hertzmark. The users of the model are senior MOL staff involved in the management of refining operations, corporate planning, and economic analysis. Utilizing the model, Dr. Hertzmark worked with counterparts at MOL to analyze different scenarios (e.g., different oil pricing systems available among the menu choices) and explain how the model could be used as a strategic planning tool.

### **Workshop on Energy Modeling**

To provide analytic support for the development of energy pricing policies consistent with a transition to a market economy, the project team arranged and conducted a workshop on energy modeling with the General Algebraic Modeling System (GAMS), an optimization tool that has dramatically reduced the time and cost of large-scale mathematical programming. The main objectives of the workshop were:

1. To introduce the GAMS modeling language to energy sector organizations and offer an introductory course in energy-related optimization models.
2. To review modeling techniques and formulate details relevant to modeling the energy sector in a market environment.
3. To present prototype subsector models and demonstrate how to modify, link, and integrate such models.

The one-week workshop was held in Budapest at the offices of OKGT on June 24-28, 1991 and was directed by Alexander Meeraus, president of GAMS Development Corporation and developer of the GAMS software. Workshop participants were from the petroleum sector, the coal sector, and the electric power sector. The workshop consisted of a mixture of

classroom lectures and hands-on experimentation on the computer. Prototype models were used to introduce modeling concepts and GAMS language features. Among the prototypes were models for single and multiple refinery scheduling, gasoline blending, coal production and distribution planning, power unit scheduling, power capacity expansion, and market simulation using partial equilibrium models. Workshop participants were also provided with a GAMS version of the refined product pricing model developed by Donald Hertzmark.

### Transfer of Publications on Energy Pricing

In Hungary one of the obstacles to the development of energy prices consistent with western accounting and international markets is the scarcity of information on market-based energy pricing. The project team discovered that in the Ministry of Industry and Trade, Ministry of Finance, and the offices of OKGT, MVMT, and Mininvest, there was a general shortage of publications on energy pricing and related topics such as the regulation of natural monopolies in the energy sector. Documents that were sold in OECD countries for hard currency were not readily available to our counterparts in Hungary. To support a program of training on energy pricing issues the project team distributed publications that could facilitate efficient energy pricing and a transition to a market economy. The topics covered by these publications fell in seven categories:

*Oil, gas, coal, electricity, and uranium markets.* The documents in this category describe energy prices and contracts in market economies. For example, a handbook on coal contract negotiation was loaned to Mininvest. This category included data on electricity price levels and the cost of fuels to electric utilities. Basic references such as the International Energy Agency's quarterly publication of Energy Prices and Taxes were provided.

*Utility regulation.* Electricity prices in Hungary were historically set by central planners under a system of socialist accounting that was not consistent with western accounting principles. In the process of price reform the electric power sector is attempting to establish electric rates on the basis of costs, and establish incentives to prevent costs from becoming excessive. Information on utility regulation is therefore of interest. This category included information on private power and deregulation of the generation sector.

*Antitrust regulation.* In a market economy, economic efficiency is achieved only if markets (other than natural monopolies) are competitive. This category included information on the way governments in the European Community and in the United States ensure that markets are competitive. This information was provided to the Ministry of Finance and the Ministry of Industry and Trade.

*International capital markets.* Energy prices should reflect the cost of capital, and the transition to a market economy will be facilitated by foreign capital investment in the economies of eastern and central Europe. Therefore information on international capital markets was of interest to the Ministry of Finance, Ministry of Industry and Trade, and OKGT.

*Fiscal policy.* In Hungary the Ministry of Finance and the National Bank are responsible for restraining the rate of inflation. Because energy price increases contribute to inflation, the government restrained increases in energy prices paid by domestic consumers. At the beginning of 1991 only petroleum product prices were decontrolled, although by March 1992 many categories of energy prices were decontrolled. The documents in this category provide information on projected inflation and trade in market economies and on the fiscal problems facing Hungary's trading partners in eastern and central Europe.

Many of these publications were on topics that were specifically requested by Hungarian participants in the meetings conducted on the definitional mission.

### Assessment of the Usefulness of Activities Conducted

The objective of the energy price reform component is to support country efforts to rationalize and reform their energy price systems, with a particular focus on petroleum prices. The component consists of training, transfer of analytical techniques, and discussion of issues with key policy makers and experts concerned with market reforms and energy pricing policy. All of these categories of activity were conducted by the project team in Hungary, and the organizations that participated in the program have proceeded with efforts to rationalize and reform Hungary's energy prices.

The technical assistance provided under this component contributed to the process of price reform but was not designed to influence Hungarian government policy to achieve a particular result. The process of making a transition to a market economy and removing government controls over energy prices began before the project team arrived in Hungary in March 1991 and continued after the final version of the refined product pricing model was delivered, in October 1991. We cannot identify a particular policy shift or price change that obviously would not have occurred in the absence of U.S. technical assistance under the energy price reform component.

It may be important to AID planning and budgeting to identify criteria under which the effectiveness of this component can be assessed, however. We suggest four criteria:

1. Were the activities under the energy price reform sufficiently important, from a Hungarian perspective, to merit high-level attention and a significant commitment of time?
2. Were the activities under this component focused on critical issues in which some action has been taken by the government?
3. Are the models and analytical techniques being used?
4. Did the training and transfer of information fill important gaps in the Hungarians' knowledge of energy pricing issues?

To the extent that each question can be answered in the affirmative, the program can be considered useful. The criterion suggested here is "usefulness," which cannot be measured in terms of energy savings or economic savings.

The principal activities conducted under this component - meetings with host country officials, the conference on energy pricing, the refined product pricing model, and the workshop on energy modeling - required a significant commitment of time, during a period when many of the participants were facing great demands on their time. High-level officials (at the Director General level) in the Ministry of Finance and the Ministry of Industry and Trade participated in the meetings and in the conference. These officials were responsible for the implementation of energy price controls and the development of energy policy. Senior officials at the National Bank of Hungary and the Budapest Bank also participated in meetings and in the conference. In the petroleum and electric power sectors the project team worked with the heads of economics departments, and their staff. In the coal sector the project team worked with the top officials of Mininvest, the organization playing a lead role in the development of plans to restructure the coal sector. To implement the refined product pricing model, OKGT staff had to collect the necessary data and develop a set of requests for model enhancement based on an understanding of the key issues associated with implementation of the model. To participate in the energy modeling seminar, individuals worked in all-day sessions for a full week. These considerations indicate that the activities under the energy price reform were sufficiently important, from a Hungarian perspective, to merit high-level attention and a significant commitment of time.

Several of the issues discussed in the meetings with policy makers and experts and in the conference were (and still are) critical issues facing the country. For example, the following topics were covered:

- the pros and cons of energy price control. At the conference on energy pricing, arguments for and against price control were presented and hotly debated. The principal outcome of this controversy has been the decontrol (effective March 1, 1992) of prices of LPG, firewood, and coal for public use, and the transfer of

control over district heat prices to municipal governments, without the support of state subsidies.

- the restructuring of the electric power sector. A proposal for restructuring was presented at the energy pricing conference. The project team provided MVMT and the Ministry of Industry and Trade with publications on competitive bidding for electric generation, and discussed these issues in meetings. Later in 1991 the government developed a restructuring plan that is scheduled to be implemented in 1992.
- the need to establish regulatory institutions to set electricity and natural gas prices. This need was recognized and strongly supported by the Ministry of Industry and Trade, and stated in the policy document submitted to Parliament in June 1991. From a Hungarian perspective an important principle is to separate ownership from ability to control prices.

In the first two examples, the government took actions that demonstrated a keen interest. In this respect the activities under this component were focused on critical issues in which some action has been taken by the government. In the third example - the need for regulatory institutions - implementation still lags a statement of policy intentions.

The refined product pricing model was transferred to counterparts who are now in key positions in strategic planning for MOL Ltd, the oil company. The model was modified to meet the oil company's needs in this area. Because the model can be used to analyze competitive strategies and MOL Ltd is a competitive firm, the data in the model are confidential, and it may not be possible for MOL to fully reveal the uses of the model. In the coal sector, a GAMS model was developed to manage coal transportation in Hungary (e.g. to minimize the delivered cost of coal). This model was used many times and the GAMS software was found to be very useful. A follow-up mission to assess the usefulness of these analytical tools has not been conducted, however.

Our assessment is that the training and transfer of information did fill important gaps in the Hungarians' knowledge of energy pricing issues.

- In May 1991, OKGT had no analytical techniques for assessing the response of customer demand to price increases. The concept of price elasticities of demand was unfamiliar. We provided training on this issue, in connection with the refined product pricing model.
- The transfer of publications on energy pricing helped to fill gaps in information. For example, the Ministry of Industry and Trade and MVMT were very interested in the concept of an independent regulatory agency but neither organization had basic reference books on the economics of regulation of electric and gas utilities, or

the regulation of natural monopolies. The economics department of OKGT was keenly interested in taxation of petroleum products in European countries but did not have a copy of the standard IEA reference, Energy Prices and Taxes.

- Because the Hungarian coal industry had no coal contracts or spot markets at the start of 1991, representatives of the coal industry were interested in factors affecting coal prices in market economies. Through meetings at Mininvest and through the energy pricing conference the project team provided information on factors affecting prices of different grades of coal.
- In general the Hungarians had little information on the experience of market economies with energy price control and decontrol programs. Through the conference on energy pricing the project team provided information on petroleum price control and decontrol in the United States, Canada, Indonesia, and Thailand.

Therefore, according to the "usefulness" criteria suggested above, it is clear that the activities under the energy price reform component were useful to our Hungarian counterparts. It is also clear that the Hungarian government has continued to support a process of price decontrol and removal of price subsidies. The energy price reform component supported Hungary's efforts to rationalize and reform its energy price system.

## **CHAPTER 4: RECOMMENDED PROGRAM OF STUDIES RELATED TO PRICE REFORM**

---

In this chapter we recommend a program of short and longer-term studies related to price reform as input to national policy discussions and World Bank energy sector investment planning. The chapter begins with a discussion of energy policy objectives of the government of Hungary and a review of the International Energy Agency's recommendations. At the end of the chapter we present recommendations for studies in four areas: support for the development of regulatory institutions, assessment of policy options for diversifying sources of imported energy, tariff studies for major district heating systems, and an assessment of policy options for supporting private power development.

### **Energy Pricing Policy Objectives of the Government of Hungary**

Through its actions over the past two years the government of Hungary has demonstrated an interest in supporting energy price reform.

- Prices of petroleum products, LPG, firewood, and coal other than power station coal have been decontrolled.
- Administrative control over district heat prices is being shifted from the central government to local governments.
- Central government subsidies for coal production and district heat are being eliminated.

In addition the energy sector is being restructured to promote competition and separate competitive markets from natural monopolies:

- Natural gas transmission and distribution has been separated from other oil and gas operations.
- The oil and gas trust has been replaced by a profit-oriented corporation with stock ownership.
- Foreign oil companies have been permitted to open gasoline stations in competition with the state-owned oil company.
- LPG operations have been separated from natural gas distribution, and two competing LPG firms are being created.

- Unprofitable coal mines are being liquidated.
- A major plan for restructuring the electric power sector has been introduced.

The primary objective of these reforms has been to facilitate a transition to a market economy. Despite the hardships created by energy price increases, the process of price reform is linked to the reduction of central government ownership and control of energy sector activity, and the reduction or elimination of funds available for energy subsidies. The political support for the development of a market economy is sufficiently strong to sustain the process of energy price reform.

It has been difficult, however, for the various organizations in the government of Hungary to reach consensus on energy policy, including energy pricing policy. The report on "Hungarian Energy Policy" submitted to Parliament in June 1991 by the Ministry of Industry and Trade received considerable criticism from Parliamentary committees, and a revised version of this report has yet to be completed.<sup>1</sup> The June 1991 document was not signed by the Ministry of Finance, although the Ministry of Finance shares authority over energy price controls with the Ministry of Industry and Trade. Different ministries have different energy policy objectives, and the ministries do not always share the policy objectives of the energy sector companies. A particularly difficult problem is the limited degree of competition in the energy sector, which makes price decontrol difficult to accept.

Three major pieces of legislation affecting the energy sector remain to be enacted: the Mining Act, which incorporates the law pertaining to ownership of oil and gas as well as coal, the Electric Power Act, and the Natural Gas Act. Although the Mining Act may be passed in 1992, it is unlikely that the Electric Power Act will be passed until the end of the year, and the Natural Gas Act will be debated after the Electric Power Act. Without these laws in place, energy pricing reforms will be delayed.

Our assessment is that the following reforms are still supported by the government, but not implemented:

- review of district heating tariffs with the objective of eliminating subsidies and making tariffs reflect fixed and variable costs more accurately
- restructuring of the electric sector, to promote competition in power generation
- creation of independent regulatory agencies to set electricity prices and natural gas prices

---

<sup>1</sup> This is a characterization of the situation at the end of April 1992.

- creation of a natural gas open access program to enable large industrial users to purchase natural gas at the border and pay a transmission tariff
- investment in pipelines and related facilities needed to diversify oil and natural gas imports and promote price competition among importers
- creation of competitive markets for wellhead production of oil and natural gas, through foreign investment.

Some sort of review of district heating tariffs is inevitable, given the government's decision to eliminate state subsidies for district heat and give local governments responsibility for setting district heating prices.

### **IEA Recommendations**

In its recent report on Hungary's energy policy the IEA made several recommendations regarding energy pricing:<sup>2</sup>

- 1) Elimination of import duties on refined petroleum products, to promote competition between domestic and imported supplies of petroleum products
- 2) Creation of independent regulatory authorities to establish tariffs for electricity and natural gas. In addition to supervising tariffs the natural gas agency would be responsible for:
  - supervising terms of gas supply and service levels for the various categories of natural gas consumers;
  - ensuring that government safety and environmental standards are met;
  - monitoring data on supply and demand and on prices in all segments of the industry.<sup>3</sup>
- 3) Redesign of natural gas tariffs, to eliminate cross-subsidization and ensure that tariffs accurately reflect the cost of service. Consideration should be given to:
  - differentials between summer and winter prices;

---

<sup>2</sup> See International Energy Agency, Energy Policies: Hungary, 1991 Survey, "Summary of Main Recommendations," pp. 93-101.

<sup>3</sup> International Energy Agency, Energy Policies: Hungary, 1991 Survey, p. 98.

- different prices for firm and interruptible supplies;
  - responsibility for connection costs and related payment policies;
  - actual distribution costs for the separate distribution companies.<sup>4</sup>
- 4) Redesign of electric tariffs, to eliminate cross-subsidization and develop generation tariffs in accordance with the new restructuring scheme
  - 5) Redesign of district heat tariffs, to eliminate subsidization and cross-subsidization, improve the financial situation of district heating companies, and ensure that tariffs accurately reflect the cost of service:

The tariff structure for district heating should be modified and prices related to actual consumption - energy consumption and capacity charges should replace flat charges.<sup>5</sup>

The IEA did not have a specific recommendation for restructuring the coal industry that serves the power generation market and therefore its recommendations on coal pricing are more general. The IEA stated that the Hungarian government should make a choice among three options regarding coal used in power generation:

- a) the mines can be made part of the electricity supply industry, in which case decisions about them are theoretically optimal but in practice made by an industry with a primary focus elsewhere;
- b) the purchasing monopoly can be managed by price and quantity agreements; or
- c) control of coal fired power stations can be transferred to the regional coal mining companies so that competition can be exercised in the supply of electricity to the high voltage grid.<sup>6</sup>

Only the second option involves coal pricing in transactions between separate companies. The IEA generally favored the use of long-term contracts to stabilize the level of coal production at individual mines, but did not make recommendations regarding the type of pricing clause to be used in long-term coal contracts in Hungary.

---

<sup>4</sup> International Energy Agency, Energy Policies: Hungary, 1991 Survey, p. 97.

<sup>5</sup> International Energy Agency, Energy Policies: Hungary 1991 Survey, p. 101.

<sup>6</sup> International Energy Agency, Energy Policies: Hungary, 1991 Survey, p. 98.

---

**Recommended Program of Studies**

The final task given to the contractor under the energy price reform component is to recommend a program of short and longer-term studies related to price reform. Our selection of a program of studies was guided by several criteria:

- priority given by the government of Hungary to the issues addressed in the proposed studies
- extent to which the proposed studies provide assistance in areas that are not already covered by programs of the World Bank, the European Bank for Reconstruction and Development, and other multilateral institutions active in Hungary
- ability of the proposed studies to complement and build upon work already conducted under the Emergency Energy Program in Hungary
- support for World Bank energy sector investment planning, and compatibility between the proposed studies and energy price reform recommendations reflected in World Bank lending programs
- extent to which the proposed studies support restructuring programs that can create business opportunities for U.S. firms and U.S. investors
- extent to which the proposed studies focus on regulatory developments in which the United States has more experience than most European countries.

On the basis of these criteria we suggest that AID consider four topics:

1. Support for the development of regulatory institutions.

In Hungary in 1991 the electric power system was owned by a trust, MVMT, which in turn was "owned" by the Ministry of Industry and Trade. At the same time the legislation establishing price controls gave authority to the Ministry of Industry and Trade to set prices, in conjunction with the Ministry of Finance. Thus regulatory authority was given to the owner of the enterprise being regulated, and that owner was a government ministry subject to political influence (like any other government ministry). From a Hungarian perspective this system of price regulation creates a conflict of interest and introduces an undue amount of political influence in matters that require technical understanding. This viewpoint was reflected in the June 1991 policy statement prepared by the Ministry of Industry and Trade:

Supervisory and ownership interests are contradictory, therefore they must be separated at governmental level, as required by the interest of the nation.<sup>7</sup>

The IEA fully supported the Ministry's recommendation:

Where government retains an administrative role, as in the regulation of prices where the operation of the market is limited (for example in the transmission and distribution of gas, electricity and district heating), ownership and regulation should be kept separate and above all transparent. Independent regulatory authorities that can implement government legislation free from direct political control may in many cases be the most effective solution.<sup>8</sup>

To some degree the Hungarian government has separated ownership and regulation by restructuring energy sector enterprises as "joint stock companies" in which all of the stock is owned by the state. Even when the State Property Agency is the stockholder, however, the current regulatory authorities (the Ministry of Industry and Energy and the Ministry of Finance) may continue to hold a supervisory role. The possibility of private ownership is advanced by the creation of the stock ownership arrangement, but the government has been careful not to pursue a privatization program that could create the appearance of a giveaway of state assets. Thus state ownership tends to be maintained and tends to blur the distinction between owner and regulatory authority.

In the United States the concept of regulation of electric and gas utilities and other natural monopolies is well-established because private ownership of these enterprises is widespread. Although U.S. regulatory institutions are based upon private rather than public ownership, the complete separation between ownership and regulatory authority makes the U.S. experience particularly valuable to the Hungarians. The German natural gas industry, the British electric power industry, the British natural gas grid, the Canadian natural gas grid, and the Belgian electric power industry provide other examples of private ownership of natural monopolies.

We propose that AID conduct meetings with Hungarian government officials to assess the strength of the government's commitment to the formation of independent regulatory authorities. If the commitment is strong and a counterpart organization can be identified as the recipient of technical assistance, AID could develop a program to train Hungarians in the legal and economic aspects of regulation. A

---

<sup>7</sup> Ministry of Industry and Trade, "Hungarian Energy Policy," cited in International Energy Agency, Energy Policies: Hungary, 1991 Survey (Paris: OECD, 1992), p. 129.

<sup>8</sup> IEA, Energy Policies: Hungary, 1991 Survey, p. 93.

portion of the funds devoted to this program could be used to enable Hungarians to travel to countries with privately-owned electric companies and/or gas distribution companies to see how regulatory authorities operate. Two types of assistance programs can be envisioned:

- a) A program to support the policy and legislative process of creating regulatory institutions. In the initial phase of this program the project team could provide suggestions and recommendations regarding the Electric Power Act and the Natural Gas Act being drafted and submitted to Parliament. This type of assistance would encompass politically sensitive issues.
- b) A program to provide technical assistance to a regulatory authority after the Hungarian government has passed the necessary enabling legislation and provided funding and staff for the authority.

Although AID may not be prepared to offer the first type of program, it should be possible to offer the second type of program.

2. Assessment of policy options for diversifying sources of imported energy.

Because Hungary's energy infrastructure was designed to rely on the Soviet Union for imported energy, the infrastructure now creates dependence on Russia, the Ukraine, and other countries that were formerly part of the Soviet Union. Crude oil, natural gas, nuclear fuel, and electric power are all imported via the Ukraine. Because oil and gas pipeline connections and electric transmission connections require significant capital investment, and because the planning considerations involve a region much larger than Hungary, it is unlikely that significant progress will be made by Hungary acting alone. Rather, major modifications to the oil, gas, and electric grid in eastern Europe will involve a complex set of international agreements involving multilateral lending agencies and several countries (possibly including non-European suppliers of crude oil and natural gas).

From the perspective of a multilateral bank evaluating a capital investment program that would create a major modification to the oil, gas, or electric grid, it is reasonable to focus on long-term planning issues and conduct extensive studies before issuing loans or recommending that construction begin. The multilateral banks have an obligation to focus on the long term. For Hungary and other formerly socialist countries, however, it is necessary to develop strategies for the short term. Short-term strategies could be much less capital-intensive than long-term strategies, and could involve private sector capital rather than public sector capital.

We propose that AID fund an assistance program to help Hungary develop short-term strategies to reduce dependence on former Soviet republics and diversify

sources of imports. Particular emphasis should be placed on the opportunities for private-sector capital to provide critically needed improvements in oil transmission, oil storage, natural gas transmission, and natural gas storage. The product of this assistance program would be a report or a series of reports presenting the government of Hungary with specific suggestions for dealing with the problem of import dependence. The focus of the work would be short-term strategic planning consistent with the policy objectives established by the Hungarian government.

The United States is in a favorable position to support this type of strategic planning, in two respects. First, the United States is not a European country or an oil exporter and therefore can be more impartial than western European countries that might be directly affected by changes in the oil pipeline grid, gas grid or electric power grid. Secondly, many of the private companies that could be involved in private-sector investment in oil and gas transmission and storage projects have offices, if not headquarters, in the United States. The United States is a world leader in providing capital and technical expertise for oil and gas transmission and storage projects.

3. Tariff studies for major district heating systems.

Hungary is now facing a very difficult transition in the management of district heating tariffs. The central government is eliminating subsidies and transferring authority to the local and municipal governments. It is still unclear how district heating tariffs will be structured, and it is unclear how the local authorities will obtain capital for investing in the types of valves and meters necessary to control and measure the flow of district heat to individual customers. The reform of district heating tariffs will require physical modifications to district heating systems.

We propose that AID fund a program to provide a combination of engineering assistance, economic assistance, and equipment to the district heating networks of one or more Hungarian cities. The objective of this assistance would be to enable customers to control the amount of heat they receive and to enable the district heating authority to bill each customer for the amount of heat delivered, according to a tariff structure that accurately reflects the cost of providing heat. For the pricing component of this assistance, different pricing principles could be considered. The economic analysis would examine the question whether to have demand charges as well as energy charges, and the question whether rates should reflect long-run marginal cost. For each city the product of the economic analysis would be a tariff study, including a set of recommended tariffs. Given the limits of AID funding, the scope of the project may be limited only to Budapest.

#### 4. Assessment of policy options for supporting private power development.

At present the government of Hungary is developing plans for restructuring the electric power sector. According to one proposal, the generating companies will sell power to a central "Concern" and will be allowed to retain profits and depreciation. Another option would be to allow generating companies to sell power directly to distribution companies and large industrial users.<sup>9</sup> Until the Parliament passes a new Electric Power Act it is impossible to be sure how the ownership structure of the electric sector will be established. It is reasonable to suppose, however, that opportunities for private-sector investment in cogeneration and small power production will be created. There is a possibility that opportunities for private ownership of independent power plants (IPPs) will also be created.

Because AID is already funding a study of the restructuring of the electric power sector in Poland, it would be reasonable to consider funding a similar study in Hungary. Because the Hungarians have already done a considerable amount of work on this subject, it is important that AID-funded projects be consistent with Hungarian government policy and avoid duplication of earlier studies. A possible focus of AID assistance would be the development of the "rules of the game" under which cogeneration, small power production, and independent power production could develop. It is virtually certain that these rules will develop in a two-step process, as in most countries: new legislation will define a set of general guidelines and criteria for determining electric rates paid to generators, and a regulatory authority will define more specific guidelines and make decisions about specific rates paid to generators. AID assistance could be focused either on both phases or on the second phase alone.

The issue of cogeneration, small power production, and IPP development may represent a "gap" in the current analysis and debate over the restructuring of the power sector. When the concept of privatization is discussed, there is a tendency for employees of existing state-owned enterprises to seek privatization of their own employers rather than new, competing enterprises. Moreover, the existing coal-fired power plants are the focus of considerable debate over the competitiveness of Hungarian coal with heavy fuel oil or imported coal, the problem of unemployment among coal miners, and the cost of shutting down unprofitable coal mines. The

---

<sup>9</sup> The concept of the "Concern" is described in the IEA report, but there is a possibility that Parliament will select a different ownership structure. See International Energy Agency, Energy Policies: Hungary, 1991 Survey, p. 99. The concept of direct sale by generating companies was presented by MVMT's Director of Economics at the Conference on Energy Pricing that was held in Budapest on May 20-24, 1991 and organized under the energy price reform component.

existing nuclear plant is also the focus of a nuclear safety debate. It is possible, therefore, that the debate over the restructuring of the electric sector will be focused on existing power stations and that only a modest amount of attention will be given to cogeneration and small power development. AID could do a preliminary assessment to determine whether this situation exists, and whether it could be remedied by the type of project described above.

The first three proposed studies involve topics that are of immediate interest to the government of Hungary. The assessment of options for supporting private power development is related to the restructuring of the electric power sector, which is currently a high priority for the government. Thus any one of these programs could be initiated in the near future if approval were given to set aside funding. In all cases, the effectiveness of the assistance would probably be reduced rather than enhanced by a one-year delay in the start date for the proposed study.

## **Appendix A**

### **Energy Prices in Hungary**

# Exhibit A.1

## An International Comparison of Energy Prices in U.S. Dollars, 1978–1990

Energy category	Country	1978	1980	1982	1984	1986	1988	1989	1990
<i>U.S. dollars per thousand liters</i>									
Light fuel oil for households	Austria			381.00	339.90	342.17	320.10	304.23	425.81
	Germany	153.00	339.95	323.78	267.56	197.31	182.40	231.94	296.94
	U.S.	132.32	261.98	317.67	289.76	217.97	223.36	245.68	282.40
	Hungary			94.78	97.14	132.79	156.80	145.84	173.91
<i>U.S. dollars per kWh</i>									
Electricity for households	Austria	0.080	0.101	0.096	0.085	0.117	0.145	0.135	
	Germany	0.085	0.100	0.092	0.083	0.114	0.149	0.143	0.162
	U.S.	0.043	0.054	0.069	0.075	0.074	0.075	0.076	0.079
	Hungary			0.027	0.021	0.026	0.029	0.025	0.039
<i>U.S. dollars per 10 million kcal (Gross Calorific Value)</i>									
Natural gas for households	Austria		402.09	423.45	383.36	472.50	367.99	331.52	391.13
	Germany	248.53	334.97	355.30	300.76	373.93	317.85	311.71	
	U.S.	98.63	141.78	199.19	235.79	224.61	210.74	216.91	233.77
	Hungary			68.22	56.08	73.51	78.29	69.89	99.29
<i>U.S. dollars per liter</i>									
Gasoline	Austria	0.482	0.670	0.662	0.570	0.624	0.725	0.729	0.904
	Germany	0.461	0.640	0.573	0.492	0.496	0.581	0.656	0.791
	U.S.	0.177	0.329	0.342	0.320	0.245	0.250	0.270	0.307
	Hungary			0.431	0.416	0.436	0.456	0.423	0.790
<i>U.S. dollars per liter</i>									
Automotive diesel oil	Austria	0.389	0.612	0.517	0.435	0.479	0.537	0.502	0.632
	Germany	0.391	0.553	0.477	0.402	0.400	0.439	0.441	0.540
	U.S.	0.143	0.270	0.305	0.319	0.248	0.256	0.266	0.310
	Hungary			0.233	0.194	0.203	0.243	0.220	0.474
<i>U.S. dollars per thousand liters</i>									
Light fuel oil for industry	Austria	149.82	276.26	298.87	251.99	274.19	210.71	195.37	
	Germany	135.99	300.81	286.56	234.71	173.08	160.00	203.45	260.48
	U.S.	100.15	212.73	252.07	227.49	139.73	141.79	171.18	205.53
	Hungary			230.98	191.98	201.23	244.48	221.62	462.94
<i>U.S. dollars per thousand liters</i>									
Heavy fuel oil for industry	Austria	102.33	179.72	196.77	178.61	160.12	115.88	97.60	
	Germany	103.67	186.21	189.16	191.42	108.65	103.98	122.61	142.79
	U.S.	75.35	143.30	167.41	180.57	86.86	82.20	95.01	109.33
	Hungary			164.26	138.84	126.33	102.35	87.36	200.31
<i>U.S. dollars per thousand liters</i>									
Heavy fuel oil for electric generation	Austria	94.84	164.61	175.44	150.67	176.95	132.80		
	Germany	103.78	197.25	190.95	192.26	103.21	99.77	127.32	145.79
	U.S.	88.65	178.01	201.58	200.75	100.16	100.87	119.37	143.38
	Hungary			140.76	119.48	106.32	84.90	72.46	147.19

40

Exhibit A.1, continued

An International Comparison of Energy Prices in U.S. Dollars, 1978–1990

Energy category	Country	1978	1980	1982	1984	1986	1988	1989	1990
<i>U.S. dollars per kWh</i>									
Electricity for industry	Austria	0.040	0.051	0.047	0.040	0.054	0.066	0.056	
	Germany	0.047	0.057	0.052	0.047	0.066	0.084	0.080	0.089
	U.S.	0.028	0.037	0.049	0.050	0.049	0.046	0.047	0.047
	Hungary					0.049	0.056	0.049	0.074
<i>U.S. dollars per 10 million kcal (Gross Calorific Value)</i>									
Natural gas for industry	Austria	107.36	172.95	226.79	183.86	201.11	166.61	142.25	
	Germany	107.02	156.75	206.74	180.41	196.84	141.16	143.94	
	U.S.	65.50	98.63	149.10	162.59	124.44	114.04	112.50	111.44
	Hungary			234.77	185.53	195.69	176.05	150.27	240.31
<i>U.S. dollars per 10 million kcal (Gross Calorific Value)</i>									
Natural gas for electric generation	Austria	95.46	211.82	211.49	186.81	121.61	141.33		
	Germany	78.03	126.54	158.19	145.99	162.33	125.00	128.67	
	U.S.	56.43	87.26	133.97	142.18	93.02	89.89	93.64	95.60
	Hungary			97.08	80.47	91.99	92.08	78.89	173.43
<i>U.S. dollars per tonne oil equivalent</i>									
Steam coal for industry	Austria	133.2	176.9	144.1	96.9	129.8	107.1	98.6	
	Germany	136.6	166.6	154.5	140.1	183.8	233.2	221.8	256.9
	U.S.	53.3	61.5	71.8	68.7	62.7	58.5	57.8	58.8
	Hungary			83.9	79.0	99.9	108.3	105.2	
<i>U.S. dollars per tonne oil equivalent</i>									
Steam coal for electric generation	Austria	245.5	250.8	125.9	99.7	135.4	114.1		
	Germany	131.1	156.0	150.1	127.3	165.2	194.3	188.7	220.9
	U.S.	47.0	57.1	69.3	69.7	66.1	60.8	59.8	60.4
	Hungary			55.7	52.6	66.9	76.6	74.7	
<i>Exchange rates: local currency per U.S. dollar</i>									
	Austria	14.53	12.94	17.06	20.01	15.27	12.34	13.23	11.39
	Germany	2.01	1.82	2.43	2.85	2.17	1.76	1.88	1.62
	Hungary			36.63	48.04	45.83	50.41	59.07	63.25

Source: International Energy Agency, "Energy Prices and Taxes: First Quarter 1991," pp. 281–293, 335–341.

**Exhibit A.2**
**Prices of Motor Gasoline, Light Fuel Oil and Household Heating Oil**

Country	Petroleum product	Pricing basis	Date	Forint per liter	Percent change in price	US\$ per liter	Schillings per liter	DM per liter	Forint per US\$
<b><u>Motor gasoline</u></b>									
Austria	Premium, unleaded	Retail	Q1 1991			0.875	9.1		
Germany	Premium, unleaded	Retail	Q1 1991			0.787		1.165	
U.S.	Premium, unleaded	Retail	Q1 1991			0.349			
Hungary	95 Octane, unleaded	Retail	30 Nov 90	49.00		0.808			60.619
			17 Jan 91	57.00	16.3%	0.815			69.926
			1 June 91	57.00	0.0%	0.734			77.623
			1 July 91	53.00	-7.0%	0.695			76.292
	86 Octane, leaded	Retail	6 Jan. 92	51.00	15.1%	0.784			77.790
			30 Nov 90	44.00		0.726			
			17 Jan 91	53.00	20.5%	0.758			
			1 June 91	53.00	0.0%	0.683			
	95 Octane, unleaded	Ex-refinery	1 July 91	49.00	-7.5%	0.642			
			6 Jan. 92	57.00	16.3%	0.733			
			30 Nov 90	19.50		0.322			
			17 Jan 91	19.50	0.0%	0.279			
	86 Octane, leaded	Ex-refinery	1 June 91	15.17	-22.2%	0.195			
			1 July 91	17.17	13.2%	0.225			
6 Jan. 92			18.58	8.2%	0.239				
30 Nov 90			12.02		0.198				
			17 Jan 91	12.02	0.0%	0.172			
			1 June 91	8.15	-32.2%	0.105			
			1 July 91	10.15	24.5%	0.133			
			6 Jan. 92	10.11	-0.4%	0.130			

AP.

**Exhibit A.2, continued**  
**Prices of Motor Gasoline, Light Fuel Oil and Household Heating Oil**

Country	Petroleum product	Pricing basis	Date	Forint per liter	Percent change in price	US\$ per liter	Schillings per liter	DM per liter	Forint per US\$			
<b><u>Light Fuel Oil</u></b>												
Austria	Industrial LFO	Retail	Q4 1990			0.352	3.6718					
Germany	Industrial LFO	Retail	Q1 1991			0.384		0.5685				
U.S.	Industrial LFO	Retail	Q1 1991			0.212						
Hungary	Gasoil, 20/40	Retail	30 Nov 90	30.00		0.495						
			17 Jan 91	31.00	3.3%	0.443						
			1 June 91	31.00	0.0%	0.399						
			1 July 91	31.00	0.0%	0.406						
			6 Jan. 92	40.00	29.0%	0.514						
			Ex-refinery	30 Nov 90	12.89		0.213					
			17 Jan 91	12.89	0.0%	0.184						
			1 June 91	12.70	-1.5%	0.164						
			1 July 91	12.70	0.0%	0.166						
			6 Jan. 92	15.80	24.4%	0.203						
			<b><u>Household Heating Oil</u></b>									
			Austria	Household LFO	Retail	Q1 1991			0.490	5.1		
			Germany	Household LFO	Retail	Q1 1991			0.438		0.6481	
U.S.	Household LFO	Retail	Q1 1991			0.309						
Hungary	Household H. Oil	Retail	1 Jan 90	9.20		0.147			62.481			
			30 Nov 90	11.00	19.6%	0.181						
			17 Jan 91	14.00	27.3%	0.200						
			1 June 91	17.00	21.4%	0.219						
			1 July 91	17.00	0.0%	0.223						
			6 Jan. 92	21.00	23.5%	0.270						
			Ex-refinery	30 Nov 90	8.17		0.135					
			17 Jan 91	10.47	28.2%	0.150						
			1 June 91	12.59	20.2%	0.162						
			1 July 91	12.70	0.9%	0.166						
6 Jan. 92	15.80	24.4%	0.203									

69

**Exhibit A.2, continued**  
**Prices of Motor Gasoline, Light Fuel Oil and Household Heating Oil**

**Note:**

Since January 1, 1991 these prices have been decontrolled, i.e., established by MOL Ltd for sales by MOL Ltd and not set by the Ministry of Industry and Trade. Foreign companies operating in Hungary have matched the prices set by MOL Ltd.

**Sources:**

Prices in Austria, Germany, and the U.S. are from IEA, "Energy Prices and Taxes: First Quarter 1991." Prices in Hungary are from MOL Ltd, February 1992. Exchange rates for Schillings and DM are from IEA, "Energy Prices and Taxes." Exchange rates for the Forint are from IMF, "International Financial Statistics."

hp.

**Exhibit A.3**  
**Prices of Heavy Fuel Oil**

Country	Customer Group	Pricing basis	Date	Forint per mt	Percent change in price	US\$ per toe	Schillings per toe	DM per toe	Forint per US\$
Austria	Industry	Retail	Q4 1990			144.444	1508		
Germany	Industry	Retail	Q1 1991			170.676		252.6	
U.S.	Industry	Retail	Q1 1991			105.890			
Hungary	Industry	Retail	Q1 1990	6670		107.385			65.382
			Q2 1990	6670	0.0%	108.576			64.665
			Q3 1990	6670	0.0%	112.723			62.286
			Q4 1990	12670	90.0%	217.039			61.449
			Q1 1991	12670	0.0%	177.425			75.169
			Q2 1991	10250	-19.1%	138.998			77.623
Austria	Electric Generation	Delivered	1988			138.331	1707		
Germany	Electric Generation	Delivered	Q1 1991			184.257		272.7	
U.S.	Electric Generation	Delivered	Q1 1991			111.870			
Hungary	Electric Generation	Delivered	Q1 1990	5120		82.431			
			Q2 1990	5120	0.0%	83.345			
			Q3 1990	5120	0.0%	86.528			
			Q4 1990	9730	90.0%	166.677			
			Q1 1991	9620	-1.1%	134.714			
			Q2 1991	8380	-12.9%	113.640			

**Assumptions:**

Heat content of heavy fuel oil for industry = 9500 kcal/kg = 0.95 toe/mt  
Heat content of heavy fuel oil for electric generation = 9700 kcal/kg = 0.97 toe/mt  
1 toe = 10000000 kcal

**Sources:**

Prices in Austria, Germany, and the U.S. are from IEA, "Energy Prices and Taxes: First Quarter 1991." Prices in Hungary are from MOL Ltd, February 1992.  
Exchange rates for Schillings and DM are from IEA, "Energy Prices and Taxes."  
Exchange rates for the Forint are from IMF, "International Financial Statistics."  
Heat content of heavy fuel oil is from IEA, "Energy Prices and Taxes."

**Exhibit A.4**  
**Petroleum Product Prices (Including Taxes) in Hungarian Forints**

Year or Quarter	Data Source	Automotive Fuels					
		Leaded Premium		Unleaded Premium		Autom. Diesel	
		Price Including Tax, ft/l	Tax, ft/l	Price Including Tax, ft/l	Tax, ft/l	Price Including Tax, ft/l	Tax, ft/l
1989	IEA	25.00	18.39	NA	NA	13.00	5.95
1990	IEA	50.00	25.90	NA	NA	30.00	5.46
Q1 90	MOL	31.00	20.10	31.00	18.92	17.00	8.06
Q2 90	MOL	31.00	20.10	31.00	18.92	17.00	8.06
Q3 90	MOL	37.50	24.40	37.00	22.88	22.00	12.63
Q4 90	MOL	50.00	29.26	49.00	27.30	30.00	15.46
Q1 91	MOL	56.00	37.60	54.00	34.40	37.00	16.60
Q2 91	MOL	59.00	47.60	57.00	39.40	33.00	16.60
Q3 91							
Q4 91							
Jan 92	MOL	63.00	43.50	61.00	38.80	NA	NA
Q2 91	IEA	57.00	38.40	NA	NA	34.00	16.60

Sources: IEA, Energy Prices and Taxes: Second Quarter 1991, p. 316.

MOL: Information received from MOL by fax dated January 30, 1992.

The January 1992 prices are the new price levels effective January 6, 1992.

sp.

**Exhibit A.4 (continued)**  
**Petroleum Product Prices (Including Taxes) in Hungarian Forints**

Year or Quarter	Light Fuel Oil				Heavy Fuel Oil			
	Industry		Households		Industry		Electric Generation	
	Price Including Tax, ft/l	Tax, ft/l	Price Including Tax, ft/l	Tax, ft/l	Price Including Tax, ft/mt	Tax, ft/mt	Price Including Tax, ft/mt	Tax, ft/mt
1989	13.090	6.010	8.614	0.704	5160	0	4280	0
1990	29.282	15.462	11.000	0.000	12670	0	9310	0
Q1 90	17.000	8.060	9.200	0.000	6670	0	5120	0
Q2 90	17.000	8.060	9.200	0.000	6670	0	5120	0
Q3 90	22.000	12.630	11.000	0.000	6670	0	5120	0
Q4 90	30.000	15.460	11.000	0.000	12670	0	9730	0
Q1 91	37.000	16.600	17.000	0.000	12670	0	9620	0
Q2 91	33.000	16.600	17.000	0.000	10250	0	8380	0
Q3 91								
Q4 91								
Jan 92	40.000	19.400	21.000	0.000	NA	NA	NA	NA
Q2 91	34.000	16.600	20.000	0.000	7610	0	6730	0

27

**Exhibit A.5**  
**Petroleum Product Prices (Including Taxes) in US Dollars**

Year or Quarter	Data ft/\$	Automotive Fuels					
		Leaded Premium		Unleaded Premium		Autom. Diesel	
		Price Including Tax, \$/l	Tax, \$/l	Price Including Tax, \$/l	Tax, \$/l	Price Including Tax, \$/l	Tax, \$/l
1989	62.543	0.400	0.294	NA	NA	0.208	0.095
1990	61.449	0.814	0.421	NA	NA	0.488	0.089
Q1 90	65.382	0.474	0.307	0.474	0.289	0.260	0.123
Q2 90	64.665	0.479	0.311	0.479	0.293	0.263	0.125
Q3 90	62.286	0.602	0.392	0.594	0.367	0.353	0.203
Q4 90	61.449	0.814	0.476	0.797	0.444	0.488	0.252
Q1 91	75.169	0.745	0.500	0.718	0.458	0.492	0.221
Q2 91	77.623	0.760	0.613	0.734	0.508	0.425	0.214
Q3 91	75.107						
Q4 91	75.620						
Jan 92	77.790	0.810	0.559	0.784	0.499	NA	NA
Q2 91	77.623	0.734	0.495	NA	NA	0.438	0.214

Source: Annual and quarterly exchange rates are from IMF International Financial Statistics.  
 See Exhibit 1 for sources of energy price data in Hungarian forints.

52

**Exhibit A.5 (continued)**  
**Petroleum Product Prices (Including Taxes) in US Dollars**

Year or Quarter	Light Fuel Oil				Heavy Fuel Oil			
	Industry		Households		Industry		Electric Generation	
	Price Including Tax, \$/l	Tax, \$/l	Price Including Tax, \$/l	Tax, \$/l	Price Including Tax, \$/mt	Tax, \$/mt	Price Including Tax, \$/mt	Tax, \$/mt
1989	0.209	0.096	0.138	0.011	82.50	0.00	68.43	0.00
1990	0.477	0.252	0.179	0.000	206.19	0.00	151.51	0.00
Q1 90	0.260	0.123	0.141	0.000	102.02	0.00	78.31	0.00
Q2 90	0.263	0.125	0.142	0.000	103.15	0.00	79.18	0.00
Q3 90	0.353	0.203	0.177	0.000	107.09	0.00	82.20	0.00
Q4 90	0.488	0.252	0.179	0.000	206.19	0.00	158.34	0.00
Q1 91	0.492	0.221	0.226	0.000	168.55	0.00	127.98	0.00
Q2 91	0.425	0.214	0.219	0.000	132.05	0.00	107.96	0.00
Q3 91								
Q4 91								
Jan 92	0.514	0.249	0.270	0.000	NA	NA	NA	NA
Q2 91	0.438	0.214	0.258	0.000	98.04	0.00	86.70	0.00

169

**Exhibit A.6  
Prices of Natural Gas**

Country	Customer Group	Pricing basis	Date	Forint per GJ	Percent change in price	US\$ per MMBtu	US\$ per toe	Schillings per toe	Forint per US\$
<b><u>Industry</u></b>									
Austria	Industrial customers	Retail	Q4 1990			564		1891	
U.S.	Industrial customers	Retail	Q1 1991			3.269	129.71		
Hungary	Commercial customers	Retail	1 July 91	350		4.840			76.292
			28 Feb 92	310	-11.4%	4.258			76.820
	Chemical industry	Retail	1 July 91	202.88		2.806			
			28 Feb 92	202.88	0.0%	2.786			
<b><u>Households</u></b>									
Austria	Household customers	Retail	Q1 1991			12.363		5102	
U.S.	Household customers	Retail	Q4 1990			6.545	259.74		
Hungary	Household customers	Retail	1 Jan 90	120.00		2.026			62.481
			1 Aug 90	150.00	25.0%	2.543			62.223
			1 June 91	230.00	53.3%	3.126			77.623
			28 Feb 92	230.00	0.0%	3.159			76.820

**Assumptions:**

Heat content of gas in Hungary =

	8500 kcal/cubic meter
1 Btu =	0.252 kcal
1 toe =	10000000 kcal
1 MMBtu =	0.0252 toe
1 kcal =	4.1868 kilojoules
1 GJ =	0.9478011 MMBtu
1 GJ =	28.099517 cubic meters

**Sources:**

Prices in Austria, Germany, and the U.S. are from IEA, "Energy Prices and Taxes: First Quarter 1991." Household prices in Hungary are from Ministry of Industry and Trade, February 1992; other prices in Hungary are from MOL Ltd, February 1992. Exchange rates for Schillings and DM are from IEA, "Energy Prices and Taxes." Exchange rates for the Forint are from IMF, "International Financial Statistics." Heat content of gas (Gross Calorific Value) is from IEA, "Energy Prices and Taxes."

50

**Exhibit A.7**  
**Prices of Electricity**

Country	Customer Group	Pricing basis	Date	Forint per kWh	Percent change in price	US\$ per kWh	Schillings per kWh	DM per kWh	Forint per US\$
Austria	Industrial	Retail	Q4 1990			0.0761	0.7943		
Germany	Industrial	Retail	Q1 1991			0.0986		0.146	
U.S.	Industrial	Retail	Q4 1990			0.0465			
Hungary	Large consumers	Retail	1 Jan 90	2.72		0.0435			62.481
			8 Jan 90	3.28	20.6%	0.0525			62.481
			1 Aug 90	3.39	3.4%	0.0545			62.223
			1 Nov 90	4.75	40.1%	0.0784			60.619
Austria	Households	Retail	1989			0.1345	1.78		
Germany	Households	Retail	Q1 1991			0.1780		0.2634	
U.S.	Households	Retail	Q1 1991			0.0759			
Hungary	Households (daytime)	Retail	1 Jan 90	2.02		0.0323			62.481
			1 Aug 90	2.45	21.3%	0.0394			62.223
			1 Feb 91	3.70	51.0%	0.0523			70.728
	Households (night)	Retail	1 Jan 90	0.90		0.0144			
			1 Aug 90	1.30	44.4%	0.0209			
			1 Feb 91	1.90	46.2%	0.0269			

**Sources:**

Prices in Austria, Germany, and the U.S. are from IEA, "Energy Prices and Taxes: First Quarter 1991." Prices in Hungary are from Ministry of Industry and Trade, February 1992. Exchange rates for Schillings and DM are from IEA, "Energy Prices and Taxes." Exchange rates for the Forint are from IMF, "International Financial Statistics."

51

**Exhibit A.8  
Prices of Coal**

Country	Customer Group	Type of coal	Date	Forint per GJ	Percent change in price	US\$ per MMBtu	US\$ per toe	Schillings per toe	DM per toe	
Austria	Industry	Steam coal	Q4 1990			3.18		1316		
Germany	Industry	Steam coal	Q1 1991			7.09			416.2	
U.S.	Industry	Steam coal	Q4 1990			1.51	60.02			
Hungary	Public use	Black coal	1 Jan 91	135		2.04				
			9 Feb 91	135	0.0%	2.01				
			1 June 91	220	63.0%	2.99				
			1 Mar 92	decontrol						
			Brown coal	1 Jan 91	79		1.19			
				9 Feb 91	79	0.0%	1.18			
				1 June 91	210	165.8%	2.85			
				1 Mar 92	decontrol					
			Lignite	1 Jan 91	42		0.63			
				9 Feb 91	42	0.0%	0.63			
				1 June 91	176	319.0%	2.39			
				1 Mar 92	decontrol					
			Industry	Briquettes	1 Jan 91	225		3.39		
					9 Feb 91	290	28.9%	4.33		
					1 June 91	290	0.0%	3.94		
					1 Mar 92	decontrol				
			Public use	Briquettes	1 Jan 91	86		1.30		
9 Feb 91	100	16.3%			1.49					
1 June 91	300	200.0%			4.08					
1 Mar 92	decontrol									

5

**Exhibit A.8, continued**  
**Prices of Coal**

Country	Customer Group	Type of coal	Date	Forint per GJ	Percent change in price	US\$ per MMBtu	US\$ per toe	Schillings per toe	DM per toe
Austria	Electric generation	Steam coal	1988			2.88		1408	
Germany	Electric generation	Steam coal	Q4 1990			6.04			357.4
U.S.	Electric generation	Steam coal	Q1 1991			1.52	60.46		
Hungary	Electric generation	Black coal	1 Jan 91	181		2.73			
			9 Feb 91	181	0.0%	2.70			
			1 June 91	182	0.6%	2.47			
			1 Mar 92	257	41.2%	3.53			
		Brown coal	1 Jan 91	196		2.96			
			9 Feb 91	198	1.0%	2.95			
			1 June 91	198	0.0%	2.69			
			1 Mar 92	218	10.1%	2.99			
		Lignite	1 Jan 91	168		2.53			
			9 Feb 91	168	0.0%	2.51			
			1 June 91	168	0.0%	2.28			
			1 Mar 92	188	11.9%	2.58			

**Assumptions:**

1 MMBtu = 0.0252 toe  
 1 GJ = 0.9478011 MMBtu

**Sources:**

Coal prices in Austria, Germany, and the U.S. are from IEA, "Energy Prices and Taxes: First Quarter 1991." Coal prices in Hungary are from Mininvest Rt., March 1992. Exchange rates for Schillings and DM are from IEA, "Energy Prices and Taxes." Exchange rates for the Forint are from IMF, "International Financial Statistics."

(6)

**Exhibit A.9**  
**Prices of LPG, Firewood, and District Heat**

Country	Energy Type	Customer Group	Date	Forint per kg	Forint per GJ	Percent change in price	US\$ per MMBtu	Forint per US\$	US cents per gallon
U.S.	Propane	End users	1990				8.16		74.5
			Jan 1990				9.94		90.8
			May 1990				6.00		54.8
			Nov 1991				8.08		73.8
Hungary	Propane-Butane (LPG)	Large customers, summer	1 Jan 90	5.89			1.97	62.481	
			1 Aug 90	7.91	34.3%	2.65	62.223		
			1 Feb 91	14.20	79.5%	4.19	70.728		
			1 Jan 92	15.90	12.0%	4.27	77.790		
			1 Mar 92	decontrol			76.820		
			1 Jan 90	8.11		2.71			
			1 Aug 90	10.71	32.1%	3.59			
			1 Feb 91	19.20	79.3%	5.67			
		Large customers, winter	1 Jan 92	21.50	12.0%	5.77			
			1 Mar 92	decontrol					
			8 Jan 90	6.78		2.27			
			1 Aug 90	8.78	29.5%	2.95			
			1 Feb 91	15.91	81.2%	4.70			
			1 Mar 92	decontrol					
			8 Jan 90	9.22		3.08			
			1 Aug 90	12.00	30.2%	4.03			
Households, summer	1 Feb 91	21.48	79.0%	6.34					
	1 Mar 92	decontrol							
	8 Jan 90	9.22		3.08					
	1 Aug 90	12.00	30.2%	4.03					
Households, winter	1 Feb 91	21.48	79.0%	6.34					
	1 Mar 92	decontrol							
	8 Jan 90	9.22		3.08					
	1 Aug 90	12.00	30.2%	4.03					
Hungary	Firewood	Households	1 Jan 90	1.69					
			16 Aug 90	2.19	29.6%				
			1 July 91	2.74	25.1%				
			1 Mar 92	decontrol					
Hungary	District Heat		1 Jan 90		170.4		2.88	62.481	
			27 July 90		242.0	42.0%	4.03	63.343	
			1 June 91		411.0	69.8%	5.59	77.623	
			1 Oct 91		481.0	17.0%	6.70	75.766	

154

**Exhibit A.9, continued**  
**Prices of LPG, Firewood, and District Heat**

**Assumptions:**

	1 GJ =	0.9478011 MMBtu
1 metric ton of LPG =		11.6 barrels
1 barrel of LPG (60% butane, 40% propane) =		4.130 MMBtu
1 barrel of butane =		4.326 MMBtu
1 barrel of propane =		3.836 MMBtu

**Sources:**

U.S. propane prices are from U.S. Department of Energy, "Monthly Energy Review: February 1992," DOE/EIA-0035(92/02), p. 111. Hungarian prices of LPG, firewood, and district heat are from the Ministry of Industry and Trade, February 1992. Exchange rates are from IMF, "International Financial Statistics," various months. Conversion factors are from U.S. Department of Energy, "International Energy Annual 1989," p. 149, and "Monthly Energy Review: February 1992," p. 138.



**Exhibit A.10****Prices of Heavy Fuel to Industry and to Electric Utilities, in US\$/toe**

Calendar Quarter	Germany			United States			Hungary		
	Price to Industry	Price to Utilities	Industry Premium	Price to Industry	Price to Utilities	Industry Premium	Price to Industry	Price to Utilities	Industry Premium
Q1 1990	138.05	142.72	-4.67	106.18	148.82	-42.64	107.39	82.43	24.95
Q2 1990	120.84	120.66	0.18	89.62	100.37	-10.75	108.58	83.35	25.23
Q3 1990	155.58	157.69	-2.12	112.74	131.51	-18.77	112.72	86.53	26.19
Q4 1990	178.79	184.77	-5.97	153.84	181.41	-27.57	217.04	166.68	50.36
Q1 1991	170.68	184.26	-13.58	105.89	111.87	-5.98	177.43	134.71	42.71
Q2 1991	128.72	NA	NA	NA	NA	NA	139.00	113.64	25.36

**Sources:**

Prices in Germany and the U.S. are from IEA, "Energy Prices and Taxes: First Quarter 1991." Prices in Hungary are from Exhibit A.3.

Prices in Germany are converted from DM to US\$ on the basis of exchange rates in "Energy Prices and Taxes."