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KAZAKHSTAN ENERGY PRICING AND TAXATION STUDY

PETROLEUM, GAS AND COAL PRICING AND TAXATION

International Resources Group, Ltd.
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for USAID

FINAL REPORT

For General Distribution

Owing to the proprietary character of certain information provided to the project team, the following Appendix tables have been omitted from this general distribution report:

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Table 7

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ACRONYMS AND ABBREVIATIONS

A.I.D.	U.S. Agency for International Development
bcm	billion cubic meters
COM	Council of Ministers, Government of Kazakhstan
EEC	European Economic Community
FSU	former Soviet Union
GOK	Government of Kazakhstan
GNP	Gross National Product
Kcal	Kilocalorie
KNP	Kazakhnefteproduct
LDC	lesser developed country
mcf	thousand cubic feet
mcm	thousand cubic meters
MIS	management information systems
MMR	million rubles
MMt	million metric tons
NIS	Newly Independent States
OECD	Organization for Economic Cooperation and Development
O&M	operation and maintenance
R	rubles; unit of currency in the NIS Republics - as of May 1993, 820 R=US$1.
VAT	value-added taxes

EXECUTIVE SUMMARY

Kazakhstan's energy sector has vast resources with sufficient export potential to lead its transition from a centrally planned economy to an export-based free market economy, in continued cooperation with the integrated trade structure of the former Soviet Union (FSU) republics. The economic transition will be largely dependent on Kazakhstan's success in securing improved access to trade, pricing and investment opportunities offered by external markets, and continued amicable trade relations with Russia and other FSU republics. Kazakhstan's success in capturing and re-investing the resulting economic rent as export volumes and values rise will largely determine the success of economic reform. As a result, effective tax policy, collection and foreign investment will be needed to meet both energy sector development goals and broader macro-economic objectives. The Government of Kazakhstan has placed high priority on energy pricing and taxation reform, as evidenced by a variety of steps taken in 1992.

In early 1992, energy prices were extremely low by free market standards, but in reasonable balance with Russian and other republics' price levels. Crude oil prices were, for example, set at 350 rubles(R)/ton, less than $0.50/barrel based on the existing R/$ exchange rate. The gross margin allowed refiners was, similarly, set at extremely low levels (about 275 R/ton for 76 octane gasoline and less for diesel fuel) and fixed at the same level for all three Kazakhstan refineries. In the case of natural gas, ex-tax wellhead prices reportedly ranged from 65-150 R/mcm, or about 2-4¢/mcf equivalent, while steam and coking coal were priced at an average level of about 13 to 31 R/ton, respectively. In general, domestic energy prices were less than three percent of most free world standards for the major fuels, and as little as one percent in some instances.

Since January 1992, Kazakhstan, largely in tandem with Russian domestic pricing policy, has made significant strides in re-structuring energy price levels and simultaneously enacting and revising a number of fiscal measures focussing on energy enterprises. Following initial price increases during the first six months of 1992, significant price increases occurred in September and throughout the fall, as energy pricing and taxation policy began to evolve more rapidly in the fourth quarter. At year's end, the official wellhead price of crude oil (ex tax and investment fund contributions) were 8,400 R/ton and gross refining margins for low octane gasoline were allowed to rise to approximately 10,000 - 12,000 R/ton, relative to an exchange rate which had risen from around 150 R/$ early in 1992 to 500 R/$ by late in the year.

Domestic wellhead prices for natural gas had reached 2,000 R/ton by end-1992. Prices had risen to approximately 10-to-20 percent of free market standards, based on a purchasing power exchange rate. Also during this period, inter-republic trade with Russia was formally de-centralized, meaning that producing associations, refiners and end-users were allowed to negotiate directly with their Kazakh counterparts, albeit under the coordination or assistance of the respective State Economic Committees and Foreign Relations Office of each republic. Certain principles of trade were maintained, such as the loose adherence to Russia's domestic prices as the standard for inter-republic trade, and the recognition of mutual agreement on rail and other tariff structures.

In early 1993, energy price and fiscal reform in Kazakhstan continued to evolve at a rapid rate. The January 28, 1993 Cabinet of Ministers Decree on Energy Prices continued the policies

established in the October 30, 1992 decree, and maintained momentum in adjusting energy prices and tariffs upward. The recent decree also formalized sectoral subsidy policy through the establishment of a Price Regulation Fund, targeted to the household and community (public use) sectors. Regulated fuel prices were raised by anywhere from 20 percent to 500 percent from late 1992 levels, and formal maximum allowable "coefficients" of price escalation were established. In addition, an Intergovernmental Agreement on Trade and Economic Cooperation between Kazakhstan and Russia was signed in January 1993, helping to solidify the pricing terms and procedures under which commodity trade would proceed for key petroleum, agricultural and mineral resources.

In the petroleum sector, Kazakhstan's effective development of its sizeable reserves will rest largely on its ability to meet potential production and export revenue targets via the development of major fields and the completion of pipeline systems to carry oil and condensate production to free markets. Additionally, Kazakhstan's success in obtaining higher prices for its exportable surplus will be significantly controlled by the rate at which Russia and other Republics increase domestic and inter-republic trade prices towards free market levels. The estimated netback price Kazakhstan potentially receives from sales to the free market via the Russian pipeline system and from the Black Sea port of Novorrosiysk is estimated at around $114/ton before taxes, after deductions for transportation costs and a quality discount. This is equivalent to 28,610 R/ton using a purchasing power parity exchange rate of 250 R/$, compared to a December 1992 controlled domestic price of 8,400 R/ton. Such a theoretical price, however, is likely only achievable for a relatively small portion of total exports due to Russian pipeline space restrictions and potentially other hidden fees.

In contrast, the price received in direct trade with Russia is limited by the domestic price of Russian crude oil, adjusted for quality and location differentials, as the Kazakh crude is higher in sulfur content, metals and wax than the Russian common stream from Siberia or the Urals area. In December of 1992, Russian crude oil export prices to Kazakh refineries were averaging nearly 13,000 R/ton, compared to the fixed domestic price of 8,400 R/ton. This difference exceeds a reasonable quality and location differential. The concept of an acceptable price "band" around which Kazakhstan's crude oil prices can be negotiated will likely set the standard for future inter-Republic trade. However, it is important that this band not become distorted beyond some reasonable quality and location differential. Indeed, this price "parity" principle was formally recognized in the January 1993 Intergovernmental Trade Agreement, which nominally adjusted both Russian and Kazakh inter-Republic crude prices up to 18,000 R/ton, but left open the possibility of negotiating differentials from these nominal levels based on differing quality characteristics. An indication of the potential difference between Russian and Kazakh crude grades is given by the domestic Kazakh price, which was increased to just 15,000 R/ton in January 1993, nearly 17 percent below the nominal Russian import price, but an improvement over the nominal price "spread" effective in late 1992.

As Russian domestic crude and export prices increase, Kazakhstan will need to increase its domestic wellhead price and/or increase taxes on crude oil sales to limit profits accruing to producers. In the case of foreign producers, royalty payments and other elements of negotiated or "model" concession agreements might be substituted for tax rate increases. Currently, the tax structure on crude production consists of a land rental tax, a value added tax of 20 percent, a gross profits tax of 25 percent and a supplemental surplus profits tax which may be applied to profit beyond the taxed 25 percent. In January 1993, the Government eliminated the hard currency tax of 40 percent, and is now considering alternatives, including export taxes and

customs fees. The land rental tax was established in October 1992, coincident to the increase in domestic crude prices to 8,400 R/ton. However, it is not designed to frequently adjust to the difference between achievable export prices and the cost of crude production inclusive of taxes. A fixed or sliding scale export tax applied to the difference between domestic and international prices is recommended for domestic (Kazakh) producers until the gap between domestic and international prices is closed.

The anticipated rate of increase or "ramp" of Russian crude prices to world levels slowed slightly following the national assembly meetings of early December 1992, but with the adjustments of January 1993 a target of reaching free market price levels by mid-1995 may still be achievable, particularly if one uses a purchasing power parity exchange rate assumption, rather than the still spiraling nominal ruble-dollar exchange rate. From Kazakhstan's perspective, the rate of price increase should be dictated both by immediate Russian domestic pricing policy and the anticipated completion of the Caspian crude oil export pipeline. A reasonable price "ramp" for crude oil may best be conceived as a steady progression to free market levels by mid-1995. Assuming a steady market exchange rate of 600 R/$, and flat nominal international crude oil prices, the domestic crude price should approximate the following path: end - 1992 = 8,400 R/ton; mid - 1993 = 28,000 R/ton; mid - 1994 = 50,000 R/ton; and mid - 1995 = 72,000 R/ton. Under this representative price ramp, the importance of effective tax structures, including collection capabilities and reasonably accurate ongoing determination of production costs, must be in place to achieve desired investment targets, collect and recycle petroleum tax revenues and to avoid system abuse and major distortions. In addition, the Government of Kazakhstan (GOK) must address the payment arrears problem which developed in 1992, and threatens to undermine the basic financial structure on which energy investments and services are based. Use of emergency funds, creation of liquidity through special energy finance banks and other approaches may be needed to enable enterprises and individuals to make timely payments and maintain the liquidity of the overall energy system.

The proposed rapid and substantial price and cost changes in the energy sector necessitate establishing timely, consistent and reliable systems for accurately measuring and monitoring costs of production, prices, apparent margins over costs and taxes. Effective price and taxation policy will depend on timely and reasonable interpretation of cost and related operational data, including the costs of capital investment, as traditionally captured in plant or capital depreciation rates, asset replacement and upgrade costs. As both domestic costs rise and an increasing portion of investment capital is obtained from free world sources at free market prices, the need to accurately account and build in these cost components will also rise proportionately.

In the petroleum products arena, Kazakhstan suffers from a current excess of nominal crude oil distillation capacity, but from a shortage of upgrading capacity needed to meet its basic transportation fuel needs. The three Kazakh refineries differ markedly in their age and upgrading capacity. As a result, refined product yields and incremental production costs should vary substantially under more liberalized "cost plus" pricing rules allowed under the October 1992 and January 1993 GOK energy pricing decrees. Early indications of refining margins derived since October 1992, suggest that significant variation in product prices and, hence, incremental production costs, may be justifiable based on varying intra-barrel economics among the three disparate refineries. Previously, refined product prices were set at fixed levels across products and regions.

Under an increasingly de-regulated price and volume environment, future investments in refinery capacity should be subjected to careful analysis of potential returns on investment, based on market demand, comparative imported product economics and costs. In general, selective investments in downstream process units to displace Russian imports (e.g., of high octane gasoline) would appear to be justified on a cost-effective basis, assuming future price and demand levels are sufficient to recoup the investment cost. Early estimates indicate an overall decline in 1992 petroleum product demand ranging from 12 to 16 percent. A critical level of domestic demand is needed to justify many planned or currently stalled upgrades in refining. Further downstream in product supply and distribution, the Kazakh system remains largely under the exclusive control of the state enterprise Kazakhnefteproduct (KNP). However, effective January 1993 the formal "state order" system (administered by the State Economic Committee and executed by KNP) has been replaced by a system of annual contracts, or nominations to which KNP must guarantee supply. The monopolistic role of KNP must be re-examined and greater direct contracting responsibility from the refineries or independent marketers should be considered, just as access to foreign trade in petroleum products has been expanded in 1992 via select licensing.

Perhaps the greatest need in the downstream is to upgrade the transportation and distribution system through more complete recoupment of the full cost of transporting fuel to end-users. Currently, rail accounts for the majority of long-haul petroleum product movements. Full costing would provide better short-term regional price and longer term investment signals, specifically in the petroleum products markets where, several regional pipeline projects are under consideration. As with refinery gate prices, the October 1992 and January 1993 energy pricing decrees enable KNP to price products on the basis of differentiated regional delivery costs. However, the cost accounting and capital recovery rules need to be liberalized to allow for upgrades to transportation and distribution system costs where justified by market conditions. Progress in rationalizing regional petroleum product prices, however, is likely to be slowed by the mandated need to cooperate with Russia on rail tariff adjustments, and the continued subsidization of end-user prices to critical consumers, particularly the agricultural sector. The October and January decrees establish both of these policies as necessary means to the smooth transition of trade relations and to cushion the deleterious macro and sector -specific impacts of rapidly rising fuel prices. In addition, the establishment of a Price Regulation Fund formalizes the role of Kazakhnefteproduct functioning as a collector of household and community subsidy funds by recycling its relatively high margins on gasoline sales back to these users . Subsidies are also funded directly from petroleum VAT, land rental and profit tax revenues. Other targeted taxes, such as a road fund or excise tax, should also be considered as funding sources for dedicated system upgrades as prices rise toward Western-equivalent levels.

In the natural gas sector a dual set of guidelines needs to be pursued. Prices of exportable gas should eventually rise to international equivalent price levels. Domestic sales within the transmission and distribution grid system should be progressively priced in accordance with rational cost-of-service parameters, including inter-regional and inter-fuel standards to encourage efficient use. Currently, the gas pricing structure is rigid both with respect to domestic and international pricing. Inter-republic pricing is determined largely by the price that Russia is willing to pay for un-processed Kazakh gas, while import prices are set substantially by the price Russia is willing to pay for gas from Turkmenistan and Uzbekistan. Kazakhstan's gas pricing will remain constrained until it has access to international markets directly or via exchange arrangements and, secondarily, until it has made sufficient investment in gas processing to

command a more favorable negotiating position. To achieve this end, extensive efforts to document and include the cost of processing plants, pipeline and storage projects into domestic and inter-republic gas commodity and transport rates.

Internally, prices at the wellhead and to the distribution network are determined by these import price equivalents and, until recently, a fixed mark-up of 700 R/ton was applied to cover the cost of distribution to the final consumer. Although the October 1992 and January 1993 decrees allow for some differentiation of transport costs, substantially more variation in distribution charges is needed to reflect the true cost of gas service among customers and locales. As with petroleum and coal, the full cost of transportation and delivery services needs to be accounted for. To initiate this process, basic information on gas consumption patterns, hauling distances and unit costs must be developed along the lines of a basic rate-making or cost-based tariff study. Gas pricing efforts should be based on differentiating service costs based on transmission and distribution cost allocation principles. Simultaneously, efforts should focus on fully accounting for the cost of gas field development, inclusive of field separation and processing costs.

Recognizing the longer lead times likely needed to both develop and market Kazakhstan's vast gas reserves, the lower current ratio of netback to domestic prices for natural gas as compared to oil and the need to encourage domestic consumption in place of oil and coal, the recommended price "ramp" for domestic natural gas is somewhat less pronounced in the early years compared to oil, but accelerates after 1994 as exportable capacity and infrastructure projects, including transmission and processing, come to fruition. The resulting concave price ramp of the domestic wellhead price should approximate the following path under these assumptions, and again assuming a future fixed R/$ exchange rate of 600 and a level nominal international price and transmission tariff for natural gas: end - 1992 = 3,000 R/mcm; mid - 1993 = 6,000 R/mcm; mid - 1994 = 10,000 R/mcm; mid - 1995 = 17,500 R/mcm; and mid - 1996 = 25,000 R/mcm.

The coal sector, unlike oil and gas, is in a retrenchment mode, owing to reduced demand from the primary export markets, Russia's power and industrial sectors. Domestically, coal demand is stagnant due to rising tariffs in the power and heat sector and falling industrial demand. Coal prices were theoretically decontrolled in 1992, and have increased on the order of 20 times for Ekibastus steam coal and about 10 times for coking coal from Karaganda during 1992. Despite price decontrol, coal prices declined in 1992 when expressed as a ratio to crude oil, and remained well below international netback levels. In early 1993, coal prices have in fact increased more rapidly (by 400 percent on average), substantially more than other fossil fuel prices. Coal pricing, however, remains constrained by limited access to Russia's rail system and Russian domestic prices for coal and electric power. In Kazakhstan, tariff policies for electricity and heat largely determine negotiated price levels. Coal cost subsidies to the power and heat sector remain widespread and extensive (upwards of 50 percent of cost), although there appears to be substantial differences with regard to their regional and sectoral distribution.

Coal's current substantial energy role, however, need not be conceded without significant steps being taken to improve the economics of coal production and to price the coal in a manner which fully recovers mining and transportation costs. As with petroleum rail and natural gas pipeline transport rates, the average transport rates for coal appear to average about one tenth of western long-haul standards. A complete evaluation of the rail cost rates should be initiated immediately. Moreover, mining costs should be identified on a mine-specific basis, with less

efficient ones closed down in favor of new development prospects. Tariffs should be set to recover upgrade investments, such as ash removal at the Ekibastus deposit, where the potential value of these investments in the export and domestic markets is fully documented on a life cycle cost basis. As with oil and natural gas, functional cost accounting systems must be in place to document the economics of these operations, and the potential financial return on upgrade investments. Absolute coal prices are likely to rise less rapidly towards an international netback equivalent due to several factors, including the likely slow rate of tariff increases to the power and heat sector, coal's long haul and rising rail rates to export market outlets in Russia and outside of the NIS Republics, and the relatively low cost of production of coal compared to oil and gas.

A theme for all of Kazakhstan's primary fuels is the need to develop more consistent cost, price, volumetric, and related operating data reporting systems so that the evolving structure of each fuels market and transportation network can be monitored and evaluated in a timely and reliable manner. Basic classification schemes, such as associated gas vs. condensates and basic refined products, should be clearly defined and standardized. Ongoing access to market developments through proper data reporting and management information systems would establish the quantitative building blocks around which better pricing, rate-making, revenue forecasting and taxation decisions can be based. Training in Western accounting and rate-making procedures, computer applications and reporting or survey techniques would be very beneficial in establishing this informational framework. Tariff studies, cost accounting and financial analysis will all be improved with the establishment of such reporting rigor. Imposition of any tax regime will also require effective verification of volumes, costs and price levels if tax policy and rates are to be enforced. Finally, a major fundamental need exists for measurement equipment to more accurately account for fuel consumption vs. processing or transportation system loss or theft.

Kazakhstan's tax structure for fuels at each stage must remain responsive to price and cost developments, as it has in 1992. The land rental tax, surplus profits tax, removal of hard currency and lowering of VAT levels are a few of the steps taken in 1992 to fine-tune the tax code to create a convergence of resource development and fiscal objectives. As revenues from exploration and development concessions become an increasingly large share of the tax base, it is crucial that the Government maintain a degree of flexibility in establishing exploration and development tax and incentive structures, including variable royalty structures, bonus payments and other performance-based terms. The petroleum legislation should be written broadly enough to allow tax, revenue and cost-sharing schemes to adjust to market conditions, in order to balance investor and host risk and reward exposures. Legitimate capital and operating expenses should be fully recoverable over time. As prices rise towards international levels, increased reliance on export taxes on domestic producers is suggested as a temporary bridge until full international price equilibrium is reached. In addition, the use of excise taxes or special fees should be considered for targeted investments, such as refinery upgrades or transportation projects.

A petroleum advisor should be retained to assist the Government of Kazakhstan in evaluating proposed contract terms for upstream E&P concessions and establishing a consensus view of the likely revenue flow from oil and gas production. In analyzing contract options, the advisor would utilize a model to evaluate the direct and indirect implication of alternative options under various market price, volume, tax and cost scenarios. In developing revenue projections from oil and gas production, the advisor would work closely with the Ministries of Energy and Fuel

Resources, Finance and the operating entities comprising Kazakhstanmunaygas and Kazakhgas. A basic model for this activity has been suggested, but substantial detail on individual tax and concession structures would have to be built into each of the oil and gas components. The application of a simple revenue projection model would assist various entities within the government and industry in arriving at a realistic set of assumptions and cases on which future tax and concession policy could be based.

I. INTRODUCTION

A. Context and Scope of Work

The Kazakhstan Energy Pricing and Taxation Study was sponsored by the U.S. Agency for International Development's (A.I.D.) Office of Energy Infrastructure for the Newly Independent States, in cooperation with the World Bank's Office of Infrastructure, Energy and Environment Operations for Europe and Central Asia.* This assessment is part of the broader energy sector technical assistance to Kazakhstan offered by both A.I.D. and the World Bank. The work supplements the World Bank's country energy sector review activities and A.I.D.'s energy efficiency and policy analysis activities also executed under contract with International Resources Group.

A.I.D. and the World Bank are providing technical assistance in a number of sectors to the Government of Kazakhstan to assist in its program of rapid economic reform. The energy sector is one of the most important in the Republic of Kazakhstan as Kazakhstan possesses substantial energy resources. Energy pricing and taxation reform are crucial in Kazakhstan's program of economic reform. The Government of Kazakhstan places a high priority on energy pricing and taxation reform and on liberalization of markets. Price reform involves letting prices rise to economic, world levels. Market liberalization includes institutional reforms that abolish the central decision-making by the government and allows decision-making by a large number of enterprises and consumers.

Increased energy prices will provide incentives for more efficient use of energy, greater self-financing of investments, and eventually an increase in exports. Also, the energy sector will be a significant source of revenue for the national budget. There are significant macro-economic constraints to the speed at which prices should be permitted to rise to world levels. The Government of Kazakhstan has assigned a high priority to designing a tax regime for the oil and gas sector which provides appropriate incentives for foreign investors while, at the same time, protects national interests.

A.I.D. has supported this study of energy pricing and taxation in Kazakhstan. The responsibilities of the prime contractor, International Resources Group, in executing this study included the following tasks:

- To review existing petroleum (crude oil and petroleum products), natural gas, and coal pricing and taxation;
- To work with the appropriate ministries and institutions to formulate guidelines for the pricing and taxation of petroleum, gas, and coal;
- To identify key weaknesses in the tax regime being established for oil and gas, and to develop a framework for estimating potential tax revenues from the production of oil and gas.

* This report may not be published or quoted as representing views of USAID or the World Bank, nor do USAID or World Bank accept responsibility for its accuracy or completeness.

B. Organization of the Report

This study reviews recent price and tax developments, stresses key guidelines and principles of fuel pricing in Kazakhstan, suggests key issues to be considered in Kazakhstan's petroleum legislation being proposed currently, and makes recommendations for pricing and taxation of the primary fuels. **Section 2** provides an extensive review of the primary fuel price and taxation developments in 1992 as well as presenting inter-fuel and international price comparisons. **Section 3** discusses key principles of fuel pricing, focussing on cost recovery and commodity price relationships (including border price equivalents, location and quality and inter-fuel differences), and proposes a price "ramp" or schedule for moving domestic Kazakh prices to world-equivalent levels. **Section 4** emphasizes various issues to be considered in developing an appropriate fiscal regime in Kazakhstan, especially as it applies to attracting foreign investors into the oil and gas sector. **Section 5** presents recommendations for various strategies of price reform in the primary fuels.

Perhaps the key distinguishing characteristic of this undertaking was the extensive effort and priority given to establishing a functional data base of detailed fuel price, volume, production and transportation cost data. A substantial body of original and supplementary fuel price, cost and volumetric data was collected in the performance of this work, much of which provides a framework for continued tracking and updating of energy price, cost and tax developments in Kazakhstan and neighboring republics.

In addition to the tables presented in the body of the report, **Appendices 1 through 4** contain approximately 60 detailed back-up tables, the majority of which are original forms prepared by the study team and completed by the highly responsive Kazakh enterprises and their participants in this effort. **Appendix 5** contains pictorial aids used to explain the data collection effort. **Appendix 6** contains the basic spreadsheet structure developed for making revenue projections of oil and gas production and sales. The need to develop consistency and structure in data reporting is especially great in an economy undergoing rapid transformation, both organizationally and systemically. Previously, centralized reporting responsibility primarily focussed on relatively stable volume flows, rather than on price, cost and "margin" variables. The latter have become quite dynamic in the process of the radical transition towards a market-responsive system.

C. Key Findings and Recommendations

The transition period to free market price levels is likely to extend at least through the period 1993-1995 for petroleum, slightly longer for natural gas, and possibly through the entire decade for key "grid" system energy forms, including electricity, coal for heat and power and gas for domestic distribution and use. The key factors affecting the speed of this transition for the primary projected export "growth" fuels (crude oil and natural gas) will be the completion of export pipeline projects and the rate of energy price and market reform pursued by Russia, as Kazakhstan will remain highly dependent on Russia for continued high levels of inter-republic trade with and for access to world markets. The structure of taxes on the primary fuels will continue to evolve rapidly as prices, foreign investment and export opportunities increase. Kazakhstan has shown effective adaptability to the changing price and cost conditions of 1992, and will need to remain responsive to market price, cost and resulting optimal tax structures and incentives in 1993 and beyond. Timely and reliable information, as well as effective enforcement

and revenue analysis capabilities will be needed to develop an effective fiscal regime for the oil and gas sectors. Accurate cost measurement and more complete allowance for capital investment costs will be needed to encourage rational rate structures for the transport of energy, and investments in desperately needed transportation and quality enhancement "processing" upgrades for oil, gas and coal.

Specific observations and recommendations which should guide the Government of Kazakhstan (GOK) in the transition period include the following:

- Energy and broader interdependence with Russia and other Central Asian republics should be recognized and cooperative trade policies should be coordinated among these partners.

- Subject to the constraints of international market access, GOK should increase energy prices as soon as possible to reflect at least the incremental cost of supply, and as soon as technically possible, the long-run marginal cost of supply, inclusive of capital investment costs. The latter may take more time to measure, and vary substantially depending on the technology employed. Prices of crude oil, refined products and coal should be decontrolled subject to the natural limits imposed by the Russian market. Tax structures should be in place to capture any surplus profit over the full cost of the energy supply, including a fair return on investment.

- Oil prices should lead the movement to free market levels, as significant oil export capacity is most likely to be realized first.

- Gas prices should be loosely tied to oil, but with some time lag in the "ramp" to free market levels. In addition, the captive grid character of domestic gas pricing should be recognized in appropriate cost of service rate calculations performed to efficiently price gas among consumers in the domestic market. Natural gas prices should be set to reflect the full production and opportunity cost of supply, including investment costs for gas processing, regional and delivery service costs among final consumers.

- Refined product prices should be allowed to vary in response to intra-barrel production economics and market demand, subject to some reasonable mark-up over crude oil costs, and refiners should be given greater direct control over downstream marketing and distribution.

- Coal prices should be set to recoup the cost of justifiable upgrade investments, and price subsidies for inefficient mines should be ceased. Rail tariffs should be rationalized in concert with Russian rail tariffs, and prices to the electric power and heat grids increased over time.

- The Government of Kazakhstan should undertake a variety of training courses and initiate formal energy data reporting and MIS procedures intended to improve reliability and to assist the tax collection and prospective revenue evaluation process.

II. Current Status: Recent Price and Taxation Developments Among the Primary Fuels

Kazakhstan's experience with radical energy pricing and taxation reform has recently passed its one year anniversary. Previously, Kazakhstan's energy price and supply management was coordinated with or managed directly from Moscow, in the context of the FSU's highly centralized inter-republic planning system. Since early 1992, the pace of energy pricing and taxation reform has escalated rapidly, partly due to developments in Russia and Kazakhstan's other NIS neighbors, but also as a result of initiatives from Alma-Ata. Initial increases in primary fuels prices were made in the spring of 1992. Since then, the pace of energy price and taxation reform has accelerated, particularly in the petroleum sector. Notably, the Council of Minister's October 1992 energy price and utilization "decree" set the framework for a variety of price reform measures in the energy sector, particularly with regard to oil and gas pricing.

In 1991, petroleum (oil and products) accounted for approximately 30 percent of Kazakhstan's primary energy production, and 25 percent of final consumption.[1] This compares to primary production and consumption shares of 74 and 59 percent for coal, 7 and 17 percent, respectively, for natural gas. (See ESR, Table 1.1.) Although the petroleum sector ranked behind coal in its contribution to both domestic production and consumption in 1991, prior to price reform, petroleum nearly equaled coal in gross export volumes and revenues. The projected output growth and export earnings for petroleum as prices approach world market levels will cause petroleum exports to soon exceed both the level and value of coal, possibly quadrupling to more than $3 billion over the next five years[2]. By contrast, Kazakhstan's coal production and exports are projected to remain flat or decline slightly, while oil and condensate production is projected to double by the year 2000[3] (see **Appendix 2**, Table 2). Similarly, Kazakhstan's domestic gas production is projected to more than triple by 2000[4] (**Appendix 2**, Table 10), shifting the nation from a net importer to a sizeable potential gas exporter. These trends emphasize the critical role of petroleum and natural gas pricing, taxation and resource investment decisions in leading Kazakhstan's trade and economic development strategy. Nevertheless, coal will remain an important contributor to the power and heat sectors, and will play a crucial role in the country's transition to an energy-based export economy, as its effective development reduces indigenous needs for imported natural gas, petroleum products and electricity.

A. Petroleum Sector: Crude Oil and Condensates

Kazakhstan's effective development of its petroleum sector will rest largely on its ability to meet potential production and export revenue targets via the development of major oil fields in partnership with foreign companies, both with respect to field development and pipeline systems

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[1] Kazakhstan Energy Sector Review, World Bank, Dec. 15, 1992 (hereinafter referred to as the ESR).

[2] According to preliminary estimates from the World Bank's ESR.

[3] According to Ministry of Energy and Fuel Resources Projections

[4] According to projections by the Ministry of Energy and Fuel Resources.

needed to expand the capacity to reach export markets. This means establishing both fair and flexible terms for negotiating production agreements, and effective international cooperation in negotiating the financial and operating terms of pipeline projects. Taxation and pricing terms must be set in a manner to capture excessive economic rent without discouraging investment, and with sufficient enforceability to insure that revenue objectives are indeed being met. As with any economy undergoing tumultuous reform, the accurate measurement of costs, prices and apparent margins is critical to the establishment of effective price and taxation policy.

In the petroleum products sector, Kazakhstan needs to develop domestic price and taxation policies which will encourage the selective investment in capital and infrastructure needed to improve the quality of refined products and efficiency of their transportation and distribution. The "downstream" investment strategy should be targeted to improving Kazakhstan's trade balance in refined products by selectively upgrading refinery process capabilities and expanding or refurbishing the transport and distribution infrastructure (including rail, pipeline, truck and storage). To encourage and finance such objectives, the Government must also allow refined product prices to rise sufficiently to recover the full cost of these critical investments. The introduction of competition and investment incentives will help to meet these objectives, but the immediate need is to gain a better understanding of the economic and financial data on which sound pricing, tax and investment decisions can be made.

In 1992, Kazakhstan produced an estimated 26 million tons (MMt) of crude oil and condensates, with approximately four MMt condensates and 22 MMt of crude[5]. Approximately 25 percent of the crude output was delivered to domestic refiners (notably the Aytrau refinery, and secondarily to Chimkent). Roughly 75 percent of crude and condensate exports moved to Russia and other NIS Republics in the first half of 1992[6] (of which Russia accounts for about 90 percent, and Azerbaijan and Ukraine the balance).

The price Kazakhstan receives from Russian refiners for its crude oil exports is limited by the domestic Russian price, adjusted for quality and location differentials. Most of the other 30 percent (approximately) of exports eventually delivered outside the NIS must first move through the Russian domestic pipeline system (operated by Rostnefttransport), and is therefore subject not only to the direct published "Transneft" tariff, but also the fixed hard currency fee (currently at $6.59/ton), port fees, and other payments to local Russian and other republic's jurisdictions outside of Transneft's direct control. As a result, the netted back wellhead price received for exported crude oil is reduced from free market levels by at least the sum of the rouble tariff imposed by Transneft, the hard currency fee, and port fee (e.g., $3.50/ton at Novorossiysk), and by any additional jurisdictional fees beyond these cited. The total cost to be netted out of a free market price appears to be at least the equivalent of $11-$12/ton, and possibly far more, given the selective ability of Transneft and other jurisdictions or qualified exporter/shippers to exercise a degree of monopolistic power to capture a significant portion of the difference between free market and domestic prices. Free market prices are currently around 120 $/ton and domestic prices are roughly one fifth that level (using a rouble price of 12,000 R/ton and a contemporaneous market exchange rate of 500 R/$).

[5] Ministry of Energy and Fuel Resources.

[6] Ministry of Energy and Fuel Resources, Kazakhstanmunaygas.

Although the Transneft system is purportedly open to all qualified shippers, limited access in certain segments, and the large potential gain to be made by moving crude from the domestic to international market can result in restricted access and discriminatory transportation fees. Oil export prices and related Government tax revenues will be linked largely to Kazakhstan's success in gaining increased access to "free" markets, and to the rate at which Russia and other NIS republics increase domestic and inter-republic trade prices to free market equivalents.

From January through May 1992, the domestic wellhead price of crude oil was fixed at 350 R/ton, or roughly $0.47/barrel, using a relatively low "purchasing power" exchange rate of 100 R/ton[7]. (Market rates averaged around 170 R/$ in early 1992.) In June this controlled price was increased in step with the rise in Russia's domestic crude price to 2,200 R/ton, or roughly $3.00/barrel, assuming a rouble/$ exchange rate of 100.

Under the terms of the Inter-Republic Trade Agreement with Russia, the price of crude oil traded between Kazakhstan and Russia was in principle set at parity, and the volume of crude oil exchanged between Kazakhstan and Russia was approximately equal (see **Appendix 2**, Table 2) at around 13 MMt per annum. In effect, a massive swap arrangement was in place between Kazakh crude exports to Russia in the west and Russian exports to Kazakhstan in the east, ostensibly based on the principle of price parity, with the domestic Russian price establishing the level of Kazakhstan's domestic price. In practice, by the late summer of 1992, both the principle of price parity, and the volume of oil transacted under this swap agreement were under strain. The traditional centralized negotiating and pricing function of the State Economic Committee was being usurped on the Russian side by the desire of producing associations to obtain a better price for their oil exports, and on the Kazakh side by their interest in obtaining a higher price for crude exports, in part by selling a greater portion outside the controlled inter-republic market.

Moreover, the Russian buyers of Kazakh crude were demanding an increasingly larger discount for the Kazakh crude based on its higher sulfur, metals and wax content in comparison to the Siberian and local Urals crude oils comprising the majority of the pipeline common stream. Discounts of as much as $1-$2/barrel equivalent, or roughly 1,500 - 3,000 R/ton (at 200 R/$), were reportedly sought in the third quarter of 1992. Until October 1992, when Russia affected its policy of de-centralized negotiations on inter-republic crude oil trade, the differentials problem could be managed in the context of overall inter-republic trade between Russia and Kazakhstan based on negotiations over the value of other bartered materials, so that any disadvantages in crude oil valuation could be offset by more favorable terms in other goods or resources.

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[7] Note that the selection of an appropriate exchange rate for purposes of converting rouble-denominated prices to hard currency equivalents is a somewhat capricious process. Both official and market-based rouble/dollar exchange rates have soared over the past year from around 100 R/$ in early 1992 to over 500 in early 1993. However, the choice of exchange rate used to value a commodity whose revenue is largely dedicated to the domestic market must also consider the purchase value of that currency measured against a basket of domestic goods. Thus, while the rouble/dollar exchange rates may have quintupled over the past year, the basket of goods may have increased only by a factor of two. Therefore, it is accepted practice to make comparative commodity valuation using an exchange rate based on a commodity basket measure, rather than through the direct use of the current quoted exchange rate. In this report alternative low or high exchange rate assumptions are made, reflecting the commodity basket or purchasing power parity concept vs. market exchange rates, respectively.

In October 1992, Kazakhstan raised the controlled domestic wellhead price of crude oil to 8,400 R/ton and, at the same time, sharply increased and formally established a land rental tax on crude oil. This tax was timed (and increased from its relatively low levels set in August 1992[8]) to capture a sizeable portion of the price increase (**Table 2.1**). Prior to August 1992, the only other significant tax was the 28 percent value-added tax (VAT) levy on the transfer price of crude between producer and refiner. As shown in **Table 2.1**, VAT is paid by the refiner, while the land rental tax is borne by the producer. The average level of the land rental tax stood at around 4,553 R/ton in late 1992, although the actual level varies among each producing association in accordance with its land characteristics and use. Individual rates of land rental tax for each major oil producing association effective December 1992 are shown in **Appendix 1**, Table 2b. The recent (January 28, 1993) energy pricing decree requires the Ministry of Finance and the Ministry of Energy and Fuel Resources to submit proposed new land rental tax rates by mid-February 1993. Table 2.1 assumes the old average rate holds, despite the rise in wellhead prices for crude oil.

Table 2.1. 1992 Domestic Crude Oil Price and Taxation Developments (R/ton)

	Month			
	Jan. - May	June - Sept.	Oct. - Dec.	Jan. - Mar.
Wellhead Price (Ex-Land Rental Tax)	350	2,200	3,847	10,447
Land Rental Tax	-	-	4,553	4,553*
Price to Refiner:				
Ex-VAT	350	2,200	8,400	15,000
Inc. VAT (@ 28%)	448	2,816	10,752	

Source: Pricing Committee, Pavlodar Refinery, Decree of the Cabinet of Ministers
Date: December 1992, January 1993 (decree).

In addition to the land rental tax and VAT, the upstream petroleum sector bears the following taxes:

- income or "profits" tax equal to 25 percent of revenues over established cost base
- a bonus tax on profits which is variable, depending on how specified in production agreements with foreign producers, and scaled according to production rate achieved
- a hard currency oil "export" tax of 40 percent of hard currency earnings on oil exports
- investment fund contribution equal to five percent of total cost of products

[8] The Ministry of Finance formally initiated the land rental tax on August 12, 1992, at relatively low levels ranging from 100-800 R/ton.

- pension fund tax of approximately 37 percent of the wage base
- employment fund tax of one percent of the wage base

Effective January 1993, the hard currency tax was eliminated and VAT tax reduced to 20 percent. In place of the hard currency tax it is likely that either an export tax/fee or more active use of the bonus profits tax will be used to capture a portion of the higher revenues attributable to rising export prices.

The Council of Minister's energy price "decree" of October 30, 1992 also moved Kazakhstan away from the previous Inter-Republic Trade Agreement policy of crude oil price parity, to a policy of establishing inter-NIS prices on the basis of ex-VAT "foreign trade prices", subject to agreement between parties on the method of clearing payment (i.e., hard currency vs. rubles vs. barter). This clause effectively recognizes the principle of market prices determining foreign trade prices, a policy which was essentially being effected by late October directly between Russian producing associations, refiners and their counterparts in Kazakhstan, with some oversight at the Ministerial level.

Evidence of the recently emerging cross border price relationships between Kazakhstan and Russia is seen in **Appendix 1**, Table 7 and 9's itemization of crude oil acquisition costs for the Pavlodar and Chimkent refineries, as summarized in **Table 2.2**. Line 1.3 of each table shows the ex-tax (VAT) cost of crude to begin to differ, effective October 1992, from the fixed 8,400 R/ton price (shown in **Table 2.1**), as the Russian import price increased to each refinery over the fourth quarter. Note that this increase was most pronounced for the Chimkent refinery in October and November, and then more pronounced for the Pavlodar refinery in December. This divergent pattern may simply reflect inconsistent cost reporting or timing procedures in addition to the higher crude oil transport costs to the Chimkent area in November. On the other hand, the higher November price recorded by Chimkent may reflect its less reliable (i.e., slower) payment terms, and a premium added by the Russian producing association (at Tyumen)[9]. In December, Chimkent's average cost of crude reportedly fell below Pavlodar's, perhaps reflecting the former's lower cost mix of domestic oil (15 percent of Chimkent's crude oil feedstock is obtained from the Kumkol region in central Kazakhstan), or again, inconsistencies in reporting or accounting practice. As discussed earlier in this report, ex-tax domestic crude oil wellhead prices were fixed by decree at 8,400 effective October 30, 1992. Thus, Russian ex-tax delivered price levels, ranging from 12,000-17,000 R/ton between October and December 1992, continue

[9] The payment arrears problem is significant throughout the CIS economies, and one which is severely affecting the flow of funds through the numerous links of the petroleum distribution chain: from consumers of petroleum products, back to the distribution company, to the refiner, on through the National Bank of Kazakhstan to the National Bank of Russia, which eventually pays the Russian producing association in Siberia. This process can take three months or more and, as prices increase, it intensifies. In early December 1992, the Tyumen producing association reportedly resorted to cutting off crude oil shipments to the Chimkent refinery as a result of slow payment.

to exceed the new controlled domestic price level, even after accounting for pipeline tariffs and a reasonable quality differential[10].

Table 2.2. 1992 Crude Oil Acquisition Costs to the Chimkent and Pavlodar Refineries (R/ton)

	Jan.- May	June-Sep.	Oct.	Nov.	Dec.
1.1 Delivered Crude Price:					
Chimkent	474	2,816	12,800	15,052	16,283
Pavlodar	448	2,816	11,760	12,753	16,819
1.2 Tax Component (28% VAT):					
Chimkent	104	616	2,800	3,292	3,562
Pavlodar	98	616	2,572	2,789	3,679
1.3 Ex-Tax Delivered Price:					
Chimkent	370	2,200	10,000	11,760	12,721
Pavlodar	350	2,200	9,187	9,964	13,140

Source: Chimkent and Pavlodar Refineries, Economics Departments

As Kazakhstan and other NIS Republics move rapidly into a rising and increasingly negotiated oil price marketplace, the importance of free market pricing principles, effective tax structures, negotiating power, increased efficiency in operating, financial accounting and management practices will similarly rise in importance. An ineffective tax structure, subsidy or operating inefficiency with crude oil and equivalent product prices at 350 R/ton will pale in comparison to inefficiencies with oil prices at 10,000 R/ton and rapidly rising towards a free market wellhead equivalent of around 120 $/ton. From the refiner's perspective, the importance of effective negotiation of crude prices and recapture of variable operating and fixed capital costs in product pricing can be seen in Appendix 1, Tables 7 and 9 (prices), 12 and 13 (costs), focussing on the rising price and cost trend in the fourth quarter of 1992. As Russian crude oil prices rise towards world market levels over the next two to three years, relative price relationships will also change, with greater disparities emerging among domestic and Russian crude input prices, and between crude oil and refined product prices, both within Kazakhstan and between Kazakhstan refiners and those in bordering NIS republics.

[10] The pipeline tariff between Omsk and Chimkent increased from 126 R/ton in October to 361 R/ton effective Nov. 1, 1992, while the Omsk to Pavlodar rate increased from 21 R/ton to 45 R/ton over the same period. Assuming a reasonable quality differential between average Kazakhstan crude in the west and Siberian crude is $1/barrel, or $7.40/ton, then at a rate of 200 R/$, the quality adjustment factor might be as high as 1,480 R/ton. Adding the 361 R/ton pipeline tariff results in a total quality and location difference which in October closely approximates the difference between domestic and imported crude costs, but which by November was substantially less than the ex-tax delivered price difference between Russian crude (at around 10,000 R/ton + in November and 13,000 in December) and domestic Kazakh crude at 8,400 R/ton.

Russia's crude prices to Kazakhstan refiners, while rising and arguably higher than domestic Kazakhstan prices on a pure quality and location-adjusted basis, are still well below prices reportedly charged to other NIS republics for which its economic and diplomatic relations are not as strong. For example, in early November, when the Russian price to Kazakhstan refiners was roughly 13,000 R/ton, the price to Uzbekistan (at the terminus of the north-south pipeline) was reportedly around 20,000 R/ton, and the price to Ukraine was around 26,000 R/ton. This reflects the overall location advantage of Kazakhstan, and the approximate trade balance (in crude oil) maintained, but more importantly the good economic and political relations with Russia, evidenced through Kazakhstan's continued use of the rouble, and through its mutually dependent trade relations in many other industrial, agricultural and mining products.

The price of Russian crude oil to Kazakhstan will continue to serve as a standard for adjusting domestic crude oil prices and tax levels in Kazakhstan, although it is not clear that domestic prices will increase automatically with Russian domestic levels. Nor is it clear whether prices received for Kazakhstan's crude exports to Russia will effectively keep pace with Russian import levels. The October 30, 1992 energy pricing decree established a state-controlled domestic wellhead price of crude oil and condensates, excluding the VAT, equal to 8,400 R/ton (increased to 15,000 R/ton effective Jan. 28, 1993). In addition, it established the principle of allowing refinery gate product prices to recover crude and refining costs, with maximum total profitability fixed at 25 percent. Given this principle of limited refinery mark-ups over crude costs, if domestic prices do not rise in tandem with Russian price levels, then regional disparities in crude input costs and refined product prices will be introduced, notably the domestically-supplied Aytrau refinery enjoying lower crude and refinery gate prices than the Pavlodar and Chimkent refineries. Pavlodar receives 100 percent of its crude feedstock from Siberia, while Chimkent receives about 85 percent from Siberia and 15 percent from the Kumkol area in central Kazakhstan.

In principle, adjustments to Kazakhstan domestic crude prices should be based on maintaining a reasonable quality and location differential with Russian levels. The appropriate width of the "band" around Russian levels might reflect a number of variables. For example, maintaining a lower domestic crude price is one way to shift revenue from the production to the refinery sector, as refiners would enjoy a more competitive input cost position relative to regional competition. At the same time, low domestic prices would encourage domestic producers to sell more oil to the export market. Higher profits on foreign sales could then be partially recouped through bonus taxes on profits or through the imposition of an export tax. Or, the profits could be left to the producing associations and refiners to re-invest in necessary equipment and upgrades. In a truly competitive, well-functioning market this might be advisable.

Given the current monopolistic structure and risks associated with domestic re-investment, however, it would appear more prudent to adjust the domestic price up to meet Russian levels. This adjustment would more accurately reflect and recover the fixed capital investment and depreciation costs needed to attract critical technologies in oilfield drilling, production and transportation. These investments are more likely to be successfully financed by raising prices to recover higher production costs (particularly capital equipment, depreciation and related investment costs), establishing investment incentives, and increasing the overall tax base (e.g., increasing the rental tax), rather than relying on excess company profits to be re-invested. A higher revenue base, resulting from higher prices, will be needed to finance these crucial investments to maximize production and finance the capital-intensive pipeline projects critical to Kazakhstan's increased access to more profitable export markets.

Recent crude oil production levels and the current (Jan. 1993) tax structure for Kazakhstan's six primary production associations are shown in **Table 2.3.** The Mangistau (neftegas) producing association accounts for nearly half of Kazakhstan's current crude oil output, although Mangistau's level and share is forecast to decline dramatically over the next five years (see **Appendix 2**, Table 5), as production from other fields increases, many on the basis of foreign investment (e.g., Tengiz, Aktiubinsk and Karachaganak).

Table 2.3. Projected 1993 Crude Oil Producers Revenue and Cost Structure

Producer	Volume (m tons)	Price (R/t)	Revenues (MMRs)	Gross Prod. Cost (MMRs)	Rental Tax (MMRs)	VAT (MMRs)	Gross Profits Tax Base (MMRs)
Mangistaumunaigas	11,370	8,400	95,908	38,785	28,135	18,325	10,263
Tengisneftegas	4,436	8,400	37,262	24,575	790	7,140	4,757
Aktyubinskneft	2,835	8,400	23,814	11,365	5,474	4,515	2,460
Embaneft	1,500	8,400	12,600	5,525	3,450	2,285	1,340
Yuzhkazneft	1,559	8,400	13,096	3,255	2,960	2,215	4,666
Karachanbasteruneft	1,250	8,400	10,500	4,730	2,588	1,750	1,432
TOTAL	22,950	8,400	193,180	88,235	43,397	36,230	24,918

Source: Ministry of Finance, December 1992.

The tax structure for oil production is rather straightforward. Total revenues, the multiple of volume and the assumed fixed 8,400 R/ton price are then reduced by the total of the production cost, rental tax, and VAT, to give a before tax net profit. The profit tax of 25 percent is then applied to this figure. Note that per-unit output production costs and rental tax vary between each producing association, but average around 3,845 and 1,891 R/ton of output, respectively. (This rental tax rate is relatively low compared to rates published in the Council of Ministers October 1992 petroleum pricing decree. As such, they could reflect the Finance Ministry's expectation regarding actual tax rate collections. This should be clarified.) The VAT declines to 20 percent in 1993, but is shown here to be slightly less, perhaps due to certain exemptions for non-marketed production. The profits tax equals 25 percent of the remaining difference between gross revenues and the total of production cost, rental tax and VAT.

Any increase in gross revenues attributable to higher export sales prices greater than the 8,400/ton domestic price would increase the profits tax base, or might be captured by the imposition of either a tax on exports or bonus tax on surplus profits. As the discrepancy between domestic and Russian prices becomes pronounced (i.e., beyond some reasonable quality and location differential), the rationale for increasing the production cost and rental tax levels would similarly increase.

B. Refining Sector

Kazakhstan's refining sector consists of three refineries of varying age and sophistication with current crude oil distillation capacity totaling 18.1 MMt/annum, including: 1) the relatively sophisticated and new (1984) refinery complex at Pavlodar near the Siberian border, with a

current crude distillation capacity of 7.5 MMt/annum, 2) the less sophisticated refinery at Chimkent in south central Kazakhstan constructed in 1978 with current crude distillation capacity of 6.0 MMt/annum, currently lacking a catalytic cracking unit, and 3) the antiquated (1945) Aytrau refinery on the north shore of the Caspian rated at 4.6 MMt capacity, and also lacking catalytic cracking. Both the Pavlodar and Chimkent refineries are in the midst of unit expansion which, if financed and completed, would add considerably to their total crude distillation and upgrading capacity. In addition, the Aytrau refinery is reportedly considering adding cat cracking and an asphalt plant. Finally, a feasibility study is underway for the evaluation of a new refinery in the Mangistau area with a total planned capacity of 6 MMt, broken into two separate units, one capable of processing traditional light Kazakh crude oil, and the other capable of processing the heavier (25° API), metals-laden Buzchansk crude produced in the Mangistau area.

A summary of reported current and planned refinery capacity and process configurations for each of the existing refineries is shown in **Appendix 1**, Table 4b. Note that the current ratio of downstream upgrading to crude distillation capacity is relatively high for Pavlodar (1.35), and progressively lower for Chimkent (0.60) and Aytrau (0.24). Completion of the coker unit at Chimkent and the addition of cat cracking at both Chimkent and Aytrau could add considerably to Kazakhstan's light product output without over-building the capacity for crude distillation, reducing long-haul imports of high octane gasoline and finished diesel fuel from Russia.

The key feature of Kazakhstan's refining sector is its currently low product upgrading capability relative to its currently high and projected excessive total distillation capacity. With the completion of the proposed units shown in **Appendix 1**, Table 4b, the upgrading problem would largely be solved, but a potentially greater cost related to idle distillation and upgrading capacity would arise. The completion of unit II at Pavlodar would add 6.0 MMt of distillation capacity, and the planned expansion of Chimkent another 1.0 MMt, raising total distillation capacity to 25.1 MMt, or well above most domestic product demand forecasts for the next 5-to-10 years. On the other hand, selective investment in downstream process units, particularly to increase Kazakhstan's production capacity of high (93) octane gasoline and finished diesel fuel at international quality specifications, would appear to be warranted, but perhaps difficult to finance, given the lack of demonstrated economically attractive export markets or internal markets for the incremental output.

Kazakhstan imported an estimated 4.2 MMt/annum of refined products in 1992[11], largely gasoline and diesel fuel from Russia. With exports estimated[12] at 1.1 MMt, the net import balance of 3.1 MMt represents approximately 20 percent of total domestic consumption of refined products, placed at 15.6 MMt[13].

Appendix 2, Table 8 details the petroleum product trade with Russia over the first nine months of 1992 relative to the first nine months of 1991, as reported by Kazaknefteproduct. **Table 2.4**

[11] Based on data provided by the Ministry of Energy and Fuel Resources, Kazakhstanmunaygas and Kazakhnefteproduct.

[12] World Bank estimate.

[13] By the World Bank.

presents the full year import data reported by Kazakhnefteproduct (see **Appendix 1**, Table 3b), and extrapolates **Appendix 1**, Table 8's nine months of export data to derive the net import trade balances with Russia for 1991 and 1992. Note that **Table 2.4** does not include in its import and consumption data products other than those shown (i.e., lubes, bitumen, aviation gasoline, petrochemicals not included). The data demonstrate that Kazakhstan's dependence on finished Russian refined product supplies has declined on an absolute basis over the past year, and as a percentage of consumption. However, the percentage of product imports obtained from Russia has apparently increased. Therefore, as with crude oil trade, which is linked to Russian domestic levels via the degree of mutual dependence on inter-republic trade to reach "free" export markets, Kazakhstan's pricing and taxation policy for refined petroleum products are necessarily intertwined with Russia for logistic (market access) and competitive reasons related to price and taxation policy.

Table 2.4. Refined Product Import/Export Balances with Russia Annualized* for 1991 and 1992 (000 tons)

	Gasoline	Diesel	Mazut	Total**
Imports from Russia:				
1991	1581	3132	1341	6054
1992	1024	2124	941	4089
Exports to Russia:				
1991	38	43	470	550
1992	35	34	292	361
Net Trade with Russia:				
1991	1543	3089	871	5504
1992	989	2090	649	3422
Supplies to Consumers:				
1991	4144	6953	5970	17067
1992	3448	5788	5186	14422
Percent Russian Imports:				
1991	38.2	45.1	22.5	35.5
1992	29.7	36.7	18.2	28.4
Percent Russian of Total Imports:				
1991	97.7	91.4	83.9	91.3
1992	99.6	99.5	100	99.3

Source: Kazakhnefteproduct, World Bank estimates.

* Export data annualized from nine months reported for 1992.

** Does not include lube oil and bitumen imports of combined 153 mt in 1991 and 100 mt in 1992, and consumption of 15 and 408 mt, respectively in 1991, 16 and 252 in 1992.

Efforts to obtain an accurate supply-demand balance for refined petroleum product in Kazakhstan are frustrated by inconsistent and perhaps incomplete volume-accounting procedures. These, in turn, may be related to uncertainties in measuring true import-export balances, as well as the reported fuel and loss figures at the refining and distribution stages. The result of an incomplete and inconsistent reporting structure is an uncertain estimate of total internal consumption and inter-regional trade flows.

Total domestic consumption of refined petroleum products is estimated[14] to have declined from 18.3 MMt in 1991 to 15.6 MMt in 1992, or nearly 15 percent. More recent, direct estimates from Kazakhnefteproduct suggest that the decline in consumption may have been even more severe, from 17.7 MMt in 1991 to 14.8 MMt in 1992 (-16.4 percent). Other unofficial data indicate the decline has not been quite as pronounced, perhaps down 12 percent from 1991 levels. Some of the uncertainties affecting the calculation of precise supply and demand balances are likely related to the use of inconcistent systems for product classification. Another factor may be the treatment of unsold inventory, whether this should properly go in the consumption or production column. Still another source of discrepancy may be the entrance of both approved[15] and unsanctioned participants in the petroleum import and export markets. Kazakhnefteproduct still controls the vast majority of inter-republic product trade, but as price and volume controls are relaxed, the entrance of both licensed and un-licensed importers and exporters is likely to increase the volume of unreported transactions. Finally, the opportunity for system loss or disguised theft is great, owing to the relatively antiquated process and transportation systems, as is the incentive to under-report volumes in a price and volume-controlled economy bordered by potentially lucrative export markets.

Table 2.5 provides an estimated 1991-1992 supply and demand balance for the major petroleum product groupings in Kazakhstan. The data are driven by the final consumption estimates provided by Kazakhnefteproduct (see **Appendix 1**, Table 3b), supplemented with refinery production data provided by Pavlodar and Chimkent, the trade balances shown in **Table 2.4**, and an estimate of the "other product" category, which includes aviation gasoline, lube oils, and bitumen. Production numbers are largely derived and, because inventory gains are not captured in this approach, these levels may be understated. Indeed, the separate summation of refined product output levels from Pavlodar and Chimkent refineries can be used to deduce output levels for the Aytrau refinery based on the totals shown below. This process (see **Appendix 1**, Tables 7 and 9 for details on Chimkent and Pavlodar output separately) results in an extremely low implied level of light product output from the Aytrau refinery, as the reported Chimkent and Pavlodar volumes account for most of the refinery production values derived in **Table 2.5** below. (As noted, the exclusion of any likely inventory building may account for a significant portion of the understated domestic refinery output levels). Data limitations prevent the itemized inclusion of lesser products such as LPGs, naphtha, and petroleum coke in the total supply and demand balance. Based on individual refinery responses, these products may add another 300 MT to the total production and consumption levels shown in **Table 2.5**. These balances indicate a year-to-year decline in consumption of nearly 16 percent, and a similar

[14] World Bank.

[15] Approved by the Foreign Relations Committee to engage in international trade of refined products.

decline in domestic refinery output. The decline in demand was spread rather evenly across the barrel.

Table 2.5. Estimated 1991-1992 Petroleum Product Supply-Demand Balances for Kazakhstan (000 tons)

Product	Domestic Production	Imports	Exports	Consumption
Gasoline:				
1991	3415	1629	900	4144
1992	2820	1028	400	3448
% Change	-14.4			-16.8
Diesel Fuel:	4921	3132	1100	6953
1991	4269	2019	500/	5788
1992	-13.3			-16.8
% Change				
Mazut:				
1991	5271	1599	900	5970
1992	4445	941	200	5186
% Change	-15.7			-13.3
Aviation Gasoline:				
1991	1085	0	15	1070
1992	1010	0	10	1000
% Change	-6.9			-6.5
Lubes:				
1991	15	67	0	82
1992	16	46	0	62
% Change	+6.7			-24.4
Bitumen:				
1991	408	111	0	519
1992	252	68	0	320
% Change	-38.2			-38.3
Total:				
1991	15,115			18,738
1992	12,812			15,804
% Change	-15.2			-15.7

Source: Kazakhnefteproduct, IRG estimates.

Not shown in **Table 2.5** are the fuel and loss levels from each refinery. Pavlodar was the only refinery to provide specific fuel and loss figures (see **Appendix 1**, Tables 7 and 9). These show fuel use and loss at 6.4 and 8.6 percent of crude runs to still in 1991 and 1992, respectively.

While high by Western standards, these figures are reasonable given the need for energy efficiency and technical operations investments. A fuel use and loss figure can be derived from Chimkent's volume report (**Appendix 1**, Table 10) by calculating the difference between total reported product output and crude runs to still. This approach yields a fuel and loss level of only 4 and 5 percent in 1991 and 1992, respectively. This is a surprisingly low level of apparent fuel and loss, approaching Western standards of around 3 percent, and should be verified with a more detailed flow accounting. Moreover, these directly reported fuel and loss figures are significantly below refinery loss totals reported by the Ministry of Energy and Fuels Resources, as reported in summary balance statements.

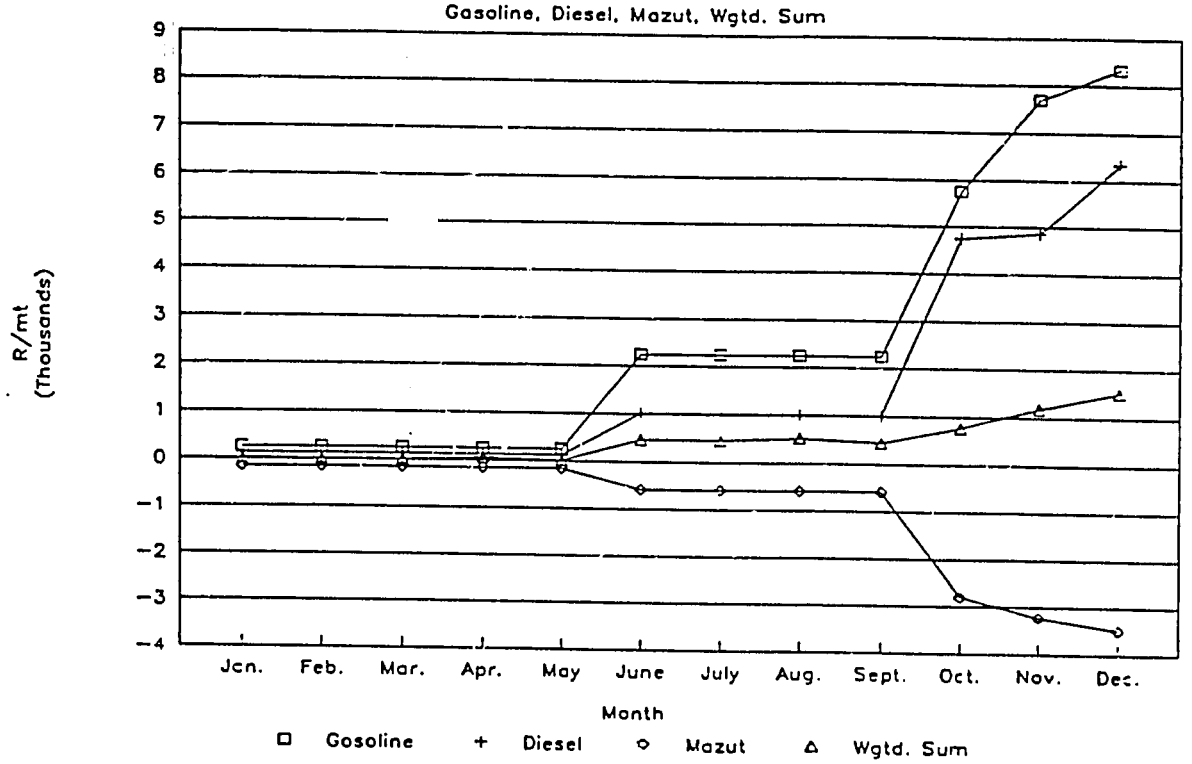
The basic economics of refinery operations are summarized in **Appendix 1**, Tables 7 and 9 for the Chimkent and Pavlodar refineries, respectively. These tables show the monthly evolution of refinery crude costs and product prices over the past year. Including the 28 percent VAT, delivered crude costs have risen from 448 R/ton over January through May 1992 (474 for Chimkent as a result of the higher pipeline tariff) to nearly 17,000 R/ton in December. At the same time, refinery gate prices of petroleum products have also risen, enabling the higher crude and transportation costs to be recovered with increasingly higher gross margins on an absolute R/ton basis. For purposes of evaluating gross refinery profitability, ex-tax refinery gate product prices are compared with the delivered price of crude oil, inclusive of the VAT. The ex-tax refinery gate sales price is used because the refinery does not receive the VAT payment. This comparison allows one to measure gross product values on both an individual product basis and on a total weighted average basis, using the volume data for the three major product groupings reported at the bottom of **Appendix 1**, Tables 10 and 11.

The trend in gross refining margins is shown graphically in **Exhibit 2.1** for individual products and on a weighted average basis. The gross product values for both Chimkent and Pavlodar rise markedly over 1992, but still remain low relative to Western standards, particularly after factoring in rising operating costs. Chimkent's December 1992 gross margin of roughly 1,500 R/ton converts to a level of $0.85/barrel using a "purchasing parity" exchange rate of 250 R/$, compared to Western levels which typically average $2-$3/barrel. (At the market rate of 500 R/$, this gross margin figure would be halved.) Gross margins will have to continue to rise to directly recover higher refining costs, and expand towards their Western equivalent if they are to recover the necessary investment costs needed to refurbish or modernize these facilities. By contrast, Pavlodar's weighted average gross margin of nearly 3,500 R/ton converts to $1.89/barrel on a purchasing power parity basis, a level comparable to relatively unsophisticated free market refineries, but with substantial room for improvement given Pavlodar's relatively high upgrading capacity.

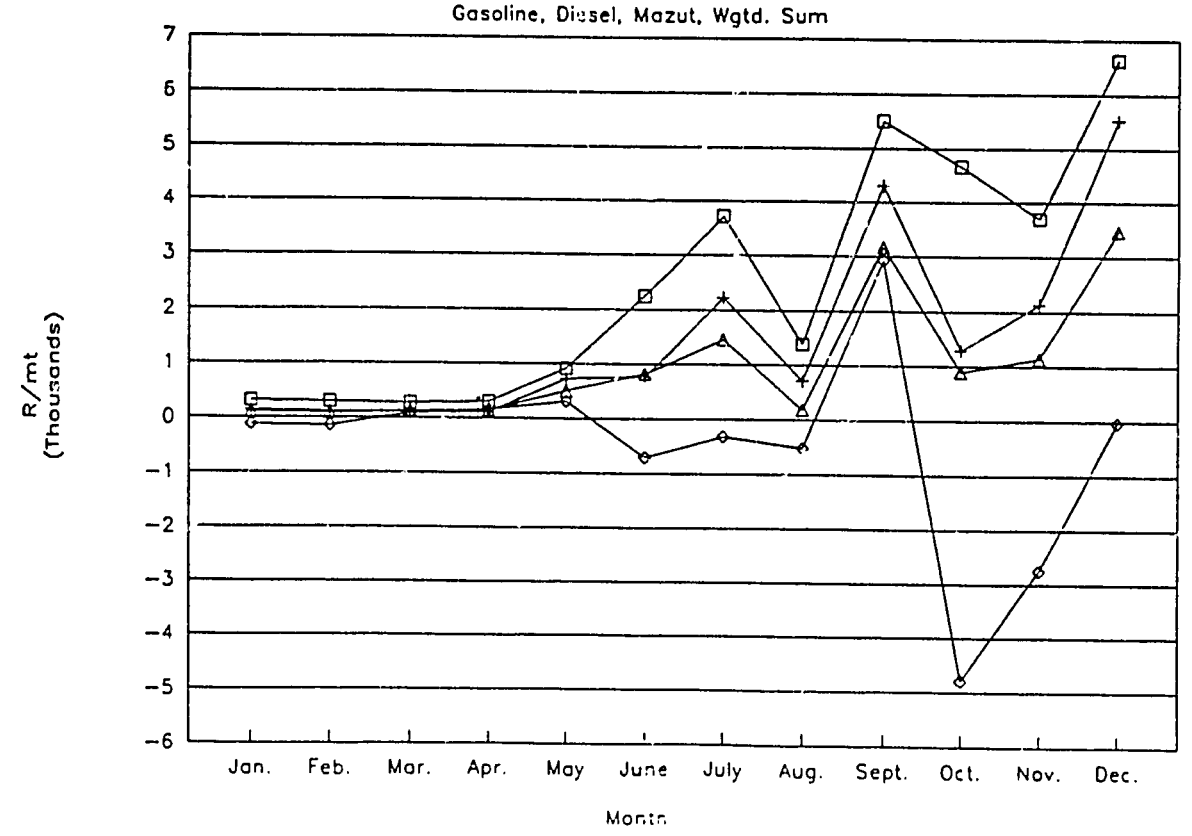
Chimkent's stable gross margin levels early in 1992 can be compared to operating cost data in **Appendix 1**, Table 12. Excluding the cost of crude oil (already netted out of the gross margins value), the key cost items are: 1) direct fuel use and electric power (stated in R/ton), 2) chemical and O&M expenses, 3) taxes, and 4) depreciation expenses. The most significant of these is the direct fuel and electric power cost, which averaged nearly 60 R/ton in 1991. On a per-ton processed basis, the chemical supply and O&M items totaled only about 3.5 R/ton in 1991. Similarly, allowable depreciation on an estimated plant value of 190 Mln Rs translates to only about 2 R/ton. This is an unacceptably low plant valuation base and depreciation rate to properly expense the cost of replacing or refurbishing the refinery. In the West, fixed capital recovery costs typically range from $0.75-$1.00 barrel, or the equivalent of nearly 2,000 R/ton. In 1992, Chimkent was allowed an increase in its depreciation rate to 14 percent, but its base

Exhibit 2.1

Chimkent Gross Margins: 1992



Pavlodar Gross Margins: 1992



plant in service value remained at just 190 million rubles. The asset value base should reflect replacement costs and the allowable depreciation rate needs to rise (i.e., by reducing the plant's useful life) to create a revenue flow which begins to recover the cost of anticipated plant investment. Similarly, Pavlodar was allowed a slight increase in its allowable depreciation rate in 1992, but its asset value base remains far too low.

The major tax items at the refinery stage consist of the VAT paid on crude and related feedstock receipts, the profits tax and the investment fund. The profits tax has uniformly been set at 25 percent of net income (revenues less costs). The investment/ capital fund is set at five percent of production costs (according to Pavlodar). Pension and employee taxes are percentages of the total wage base, and the land rental tax (only reported by Pavlodar) is fixed at a per hectare rate, which is insignificant compared to the land rental tax rates applied to oil and gas producers.

The overall profitability of the Chimkent refinery in 1992 was reported to be slightly over five billion rubles, compared to over 34 billion Rs at Pavlodar. This discrepancy reflects several items, including Pavlodar's higher gross refining margins, which in turn reflects its greater yield of light products. As seen in **Appendix 1**, Tables 10 and 11, Pavlodar's combined production of gasoline and diesel fuel accounts for nearly 55 percent of total output, compared to just 42 percent at Chimkent. In addition, the reported cost structure (notably in catalysts and chemicals and depreciation) is substantially higher at Chimkent than Pavlodar, although this figure is likely an error given the confirmed lower energy costs reported by Pavlodar in both **Appendix 1**, Tables 13 and 14. Again, discrepancies are likely attributable to inconsistencies in accounting practice and interpretation of the cost categories shown. Pavlodar's higher profitability is evident from a comparison of average gross margins reaching 3,500 R/ton by late 1992, relative to non-feedstock refining costs which totaled just 1,380 R/ton in late 1992, as summarized in **Appendix 1**, Table 14.

By late 1992, weighted gross refinery margins had increased substantially, as had the variation among individual product contributions to the gross. This variation underlines the increasing importance of effectively performing and integrating financial and operations management at the refinery. To attempt to optimize refinery economics under the constraints of volume obligations[16] and limits on profitability, urgent attention should be given to equipping the refinery managers with the basic process engineering, economic information and software tools (including basic refinery simulation tools) to assist them in planning refinery operations and pricing their product to maximize net income.

The October 1992 energy pricing decree of the Council of Ministers (COM) established the concept of de-controlled pricing for refined products up to a limit of demonstrable refining costs, plus a 25 percent return on the allowable cost base. This pricing rule will apparently apply to

[16] These are a vestige of the old state order system, which requires the refineries to sell a designated volume of their total output (typically ranging from 90-95 percent) to the state distribution company, Kazakhnefteproduct, who in turn exclusively met the volume needs of the state enterprises, as coordinated through the Economic Committee. This system is apparently being phased out. In the transition phase the old "state order" volumes are being referred to as contractual requirements. Owing to falling "contractual" volumes as prices rise and economic activity declines, incremental refined product output should increasingly be available beyond these domestic needs.

all domestic sales from "state enterprises". The "cost-plus" ceiling pricing structure should provide refiners with substantial latitude in pricing refined products compared to the previous system of uniform pricing throughout the nation. In particular, refiners will need to develop the capability to assign refining costs on a product-specific basis, increasing their skill and precision evaluating intra-barrel economic questions central to refinery operations in the free world.

Prior to this decree, refined product prices had been set at a fixed national level, without regional differentiation for refinery location, costs or competitive market (e.g., import/export) price equivalents. The refinery gate prices for gasoline, diesel fuel and mazut were constant, reflecting the volume focus of a command economy and the limited importance of relative or absolute prices in the former system. With increasing flexibility in pricing, it is equally important that refiners exert greater control over their volume of refined products marketed, in part through a more direct role in marketing to domestic and foreign customers. Poor coordination between the refining and distribution/marketing stages can frustrate otherwise well-intentioned efforts to optimize refinery operations.

Currently, Kazakhnefteproduct maintains its exclusive role in marketing to the traditional domestic customers whose volume needs fell under the state order system. Minor incremental product volumes were reportedly sold outside of the state order system and inter-republic trade agreements. The total of these was apparently less than one percent in 1992, but clearly will represent an increasing share in 1993 and beyond. **Appendix 1**, Table 11 provides some insight of this emerging downstream sales structure, showing a clear increase in the Pavlodar refinery's sales outside of the state order system into the non-NIS export market and to the remaining de-controlled domestic market.

C. Product Distribution

Kazakhnefteproduct (KNP) is the exclusive company for domestic petroleum product distribution and marketing in Kazakhstan, as well as the enterprise through which all inter-republic trade in refined products with other NIS nations is conducted. Historically, state order volumes represented about 80 percent of total sales, with inter-republic trade comprising at least 10 percent, and the balance to non-NIS exports and un-regulated domestic sales. Other firms are authorized to engage only in non-NIS trade or domestic sales outside the old state order customer base.

It is uncertain what KNP's role will be as volumes marketed outside of the old state order system increase, and as the structure of the inter-republic trade agreement de-centralizes, presumably to greater autonomy among producers, traders/transporters and end-users. As the operator of the pipeline system, for limited domestic refined product and similarly rail transport, it is unlikely that other parti s will be able to make serious in-roads to KNP's monopoly position. On the other hand, the Government of Kazakhstan (GOK) has over the past year issued export/import licenses to a small number of enterprises. These firms may either contract for transportation services, or perhaps increasingly look to foreign firms to provide truck or rail service. The monopolistic role of Kazakhnefteproduct in a market no longer under a formal state order system needs to be examined, and consideration given to opening up the downstream marketing and distribution function to other participants, including the refineries directly, end-users, and independent marketers.

The downstream pricing structure for the major refined products, effective December 1992, is shown in **Table 2.6**. Price data shown are representative averages only, and do not reflect the recent variation in prices under the "cost-plus" procedure allowed for in the COM's energy decree. Evidence of this is seen in **Appendix 1**, Tables 7 and 9, which show the variation in gate prices for the Chimkent and Pavlodar refineries. In addition, the summary table below does not include special subsidies allowed for certain consumer classes, as stated in the energy pricing decree (see discussion following).

Table 2.6. Downstream Prices and Taxes for Petroleum Products Effective Dec. 1992 (R/ton)

	Gasoline	Diesel	Mazut
Refinery Gate Price (including VAT)	30,913	28,971	16,398
Distribution Terminal Price (VAT Component)	35,893 10,050	32,847 9,197	20,229 4,425
Implied Terminal Margin	4,980	3,876	3,831
Local Station Price: (R/Litre) (R/ton) (VAT Component)	 35.0 45,943 12,864	 37.0 42,044 11,772	 N/A N/A

Source: Kazakhnefteproduct

The principle of regional variation in pricing is also established for the distribution stage of the petroleum market under the COM's October energy pricing decree. Item 4 of the decree specifically allows KNP the flexibility to achieve a weighted average price for refined product prices which accomodates differentiation among consumers, as long as the average profitability does not exceed 40 percent above distribution costs. As with the refining sector, the appropriate calculation of distribution costs needs careful examination, particularly the costs of modernizing and expanding the existing transportation and storage infrastructure in Kazakhstan, which currently is far too dependent on subsidized rail transport[17]. Item 9 of the decree establishes the principle of increasing transportation tariffs, and specifically rail tariffs, but does not specify the procedures by which these increases might be approved or limited.

Currently, four major pipeline systems for refined products have been proposed: one from Chimkent in the south, looping to Alma-Ata and other southern cities, two emanating from Pavlodar in the north, and one in the southwest serving either the proposed new Mangistau refinery or possibly the existing Aytrau refinery. Given the high cost of constructing these

[17] Reportedly, two thirds of total movement of refined products is by rail, with limited pipeline availability, the balance is presumably moved via truck.

systems[18], and their uncertain payback in potential throughput volumes and tariffs obtainable, it is unlikely that pipeline construction will be given high priority by foreign investors. On the other hand, progress in fully costing the price of rail transportation, and the displacement of some long-haul Russian imports, particularly to southern Kazakhstan, could justify a serious financial and rate analysis of the proposed southern system, and possibly one from the Pavlodar refinery as well. However, reform of rail tariffs could be slowed by the necessary cooperation with Russia on rail rates, as called for in the recent energy pricing decree.

Prior to October 1992, the degree of cross-sectoral or explicit subsidization in the price of refined products had been somewhat muddled, as certain sectors were reportedly subsidized from general revenues (e.g., for taxis, emergency services, agriculture), but no explicit subsidy was provided through KNP's pricing. General revenues were apparently utilized for such subsidies. The October energy pricing decree explicitly establishes guidelines, including a fund, for subsidizing petroleum product prices to named sectors directly through the petroleum tax revenues, specifically the VAT, rental and profits tax. Sectors qualified for subsidies, with the volume and price levels for individual consumers determined by the Ministry of Finance and other Ministries, include the following broad groups:

1. the housing, commercial and transportation sector,
2. the agricultural sector, and
3. retail food sector (e.g., animal meats and produce).

The range of consumers potentially subsidized covers much of the economic activity of Kazakhstan, with the notable exception of the industrial and utility sectors, largely dependent on coal, whose prices are nominally freed, but primarily constrained by Russian coal and electricity price levels. Clearly, the decree establishes a large degree of potential latitude regarding both the scope of potential subsidization and its degree for any given consumer or group. If managed effectively, this degree of flexibility may prove to be a benefit in the adjustment process, actually enabling a more rapid movement towards the objectives of free market equivalent price levels and/or full recovery of long-run marginal production and distribution costs. Of course, the ability to effectively subsidize through a targeted energy tax fund will also be determined by the size of the fund and the effectiveness of the taxation regime in capturing surplus earnings. Effectiveness refers both to the appropriate setting of tax rates and to the thoroughness in collecting taxes.

Sectoral consumption of petroleum products is skewed largely towards agriculture, with a sizeable portion of all fuels in the catch-all "other" category, which includes residential, industrial and commercial consumption (including aviation) in addition to the direct categories shown in **Appendix 2**, Table 9. A percentage distribution summary of these sectoral consumption data is provided in **Table 2.7**.

[18] Estimated at over $500 million dollars per system by the World Bank, ESR.

Table 2.7. Sectoral Distribution of Petroleum Product Consumption Projected 1992, Based First Nine Months Data

Sector	Gasoline (mt)	Gasoline %	Diesel (mt)	Diesel %	Mazut (mt)	Mazut %	Total (mt)	Total %
Agriculture	2070	55	3506	56	0	0	5572	38
Min. of Auto.	586	16	596	10	0	0	1182	8
Rail Trans.	0	0	1071	17	0	0	1071	7
Health Care	44	1	0	0	0	0	44	0
Min. Energy	0	0	0	0	2174	45	2174	15
Other	1065	28	1066	17	2689	55	4820	32
TOTAL	3765		6238		4862		14863	

Source: Kazakhnefteproduct, Oct. 1992

Agriculture captures an unusually large share of transport fuel consumption. This highlights the crucial interdependence of economic policy between the two sectors, particularly given the potential extent of continued fuel price subsidies to the agriculture sector. Any subsidy, however, should be carefully weighed and conservatively applied given the broad base of energy use in the agriculture sector, and the need to stimulate competition without over-reliance on inefficient subsidy policies. The Ministry of Automobiles apparently captures the direct retail sales of transport fuels to motorists, while the Ministry of Energy captures the use of mazut for power and heat production. Overall, transport uses of diesel, gasoline and aviation fuel (not shown) account for nearly 60 percent of total fuel consumption in Kazakhstan, based on this extrapolation of nine month's data. From **Table 2.5,** it is evident the addition of aviation fuel would add another seven percent (1,000 mt) to the transport use figures shown above.

A comparison of **Tables 2.5 and 2.7** also reveals the difficulty in obtaining consistent or accurate estimates of final consumption. These extrapolated data show both gasoline and diesel consumption to be greater than the full year estimate provided in **Table 2.5**, and mazut consumption to be less, even though the source of the data was the same - Kazakhnefteproduct. In fairness, the data above are projected from nine months of "actuals", and the internal data sources utilized may not have been consistent.

Taxation developments in the distribution and marketing stage have been somewhat restrained to date, in part because the economic hardship of additional taxes in the midst of unprecedented price inflation is viewed as politically unacceptable. Indeed, efforts to establish an excise tax on gasoline and diesel fuel appear to have been stalled in the fall of 1992. The resistance to additional taxes on petroleum products is related to the fact that a large portion of product consumption is for critical use sectors. A broad based consumer class that can afford the additional tax burden is not available as in the developed economies. One strategy to be considered is to selectively tax high octane gasoline, used largely in private vehicles, as well as certain high quality diesel fuels, typically used for high performance diesel engines (not by lorries or farm equipment). Such a tax might take the form of an import fee or an excise tax. An

import fee would have the effect of encouraging the domestic production of these fuels, largely imported from Russia at present. On the other hand, a special excise tax would be broader based, but would raise its own set of enforcement difficulties. A road fund tax, currently reported to equal one percent of the final sales price, should also be expanded in scope or increased in its level.

Since mid-1992 the difference between the refinery gate price of light refined products and the final retail price has increased from 4,500 R/ton to approximately 12,000 R/ton in December 1992. This difference is targeted towards the costs associated with transporting, storing, distributing and marketing refined products, including transport tariffs, labor, O&M, and various supply and financing costs. As noted, the recent energy pricing decrees (Oct. 1992 and Jan. 1993) allow KNP to achieve a weighted average profit of up to 40 percent, a high level compared to allowable rates of return at the refining and producing sectors. It is important that this profit be re-invested in the rehabilitation and expansion of the product transportation, storage and marketing system, including the creation of an investment fund for large infrastructure projects, such as a refined products pipeline. The cost structure of the downstream enterprises (KNP and the rail system), including the rail structure, needs to be carefully assessed. Allowance for capital reinvestment must be made via either the depreciation component of allowable cost, direct tax incentives, or mandatory set-aside funds to finance select rehabilitation and expansion of the pipeline, rail, terminal and truck transport system.

D. Natural Gas Sector

The natural gas sector in Kazakhstan is evolving rapidly from a throughput appendage of the old Soviet Gasprom network stretching into the southern republics to a central element of the nation's overall economic investment and development strategy. Far-sighted investment and related price, taxation and organizational planning needs to accompany Kazakhstan's rapid growth from a net gas importer to a prominent exporter.

Currently (1992), consumption of natural gas is estimated at around 16 bcm/annum[19], with 8.1 bcm produced domestically, 4.0 bcm exported and around 12 bcm imported. Reported figures vary, however, due to a number of variables, including the distinction between associated "wet" production and condensates; the volume of "transit" gas from Turkmenistan to Russia, which has varied substantially with the transit blockage in Ukraine; line losses; and the processing trade with Russia, whereby sulfur-laden gas is exported for processing and returned, possibly in lower volume, as compensation for processing.

Typically, gas imports come from Russia, at around 1.7 bcm/annum, Uzbekistan at 3 bcm and Turkmenistan at around 7.3 bcm.[20] Exports are dedicated exclusively to Russia, largely from the Karachaganak field for processing in Orenberg.

[19] From Ministry of Energy and Fuels Resources and the High Economic Council, as reported in Table 1.3 of the ESR.

[20] World Bank, ESR.

A detailed current and projected profile of Kazakhstan's gas production is provided in **Appendix 2**, Table 10. Total production levels are projected to increase threefold by the year 2000, with significant growth within each of the major producing areas. To accommodate this projected growth, access to foreign and domestic markets must be secured, as well as substantial additions in domestic gas processing capacity.

Consumption projections for natural gas vary markedly, however, depending largely on the assumed price path and price, income or GNP elasticity responses modeled. Estimates for the year 2000 range from 8 to 17 bcm/year, suggesting a similar wide range in potential export capacity and market growth. Low rates for internal demand growth will place greater urgency on developing export market connections through pipeline projects, and greater competition with Russia, as their domestic demand would follow a similar flat path. A rising demand profile suggests buoyant domestic growth, only likely if energy prices are restrained well below world levels. In this environment, gas production may be constrained as uneconomic. Thus, gas pricing and taxation policy requires a balance between domestic consumer and producer interests as Kazakhstan shifts from a net importer to exporter over the next 3-to-5 years.

The price and taxation policy needed to stimulate this growth must balance price incentives and tax revenue to finance pipeline and processing investments with demand incentives, both from domestic and foreign customers. This means that Kazakh gas must be priced to compete with imported gas on an price equivalent basis, and with the domestic Russian price, adjusted for quality and location, for exports. The Russian border price, approximately 1,600 R/mcm in October, was lower than the import price from Uzbekistan and Turkmenistan of 2,270 R/mcm. This figure is expected to rise to 3,500 R/mcm in late 1992, as Russia accelerates its liberalization of gas prices. The export price to Russia for un-processed gas is reported to have risen to 700 R/mcm[21] in late 1992, up from 243 R/mcm (including 28 percent VAT) through October, and will likely rise again in line with Russia domestic price movements. A summary of average wellhead, LDC sales, Russian export and import prices is provided in **Appendix 1**, Table 16.

Wellhead prices for finished gas are reported to average 2,048 R/mcm (see **Appendix 1**, Table 15), or roughly the border price equivalent for imports from the south (Uzbekistan and Turkmenistan). The October 1992 energy pricing decree (Item 6) established a target average wholesale price from Kazakhgas to the distribution company (Kazakhgasifikatsia) not to exceed 2,770 R/mcm, and otherwise to differentiate delivered costs to end-users based on transportation costs from the NIS Republic import source. This ruling, while capping average delivered-to-utility prices at levels approximating current border prices plus transportation costs, is a step in the right direction through its allowance for some degree of variation based on transportation. Previously (and perhaps still), Kazakhgas' transportation tariffs for main-line gas transmission were set at a fixed rate of 700 R/mcm, irrespective of distance, location or delivery service features. This is clearly an unacceptable condition, particularly given the importance of accurately costing transportation service to recoup the tremendous investment needs in facilities for gas pipeline transmission, distribution, storage and processing over the next several years. An analysis of the informational needs and reporting requirements to support a gas pipeline tariff study should be given high priority.

[21] World Bank, Country Economic Memorandum, Chapter 8.

The October 1992 energy pricing decree, similarly (Item 7) establishes the principle of a flat average allowable LDC resale price to all consumers at 4,350 R/mcm, with the exception of collective state farms which are subsidized at a price of 920 R/mcm. The January 1993 decree raised these allowable gas sales prices to 15,400 R/mcm and 2,760, respectively. Like the producer/pipeline price, however, the LDC is given the flexibility to negotiate variations in the target flat rate based on volumes consumed and structural pattern of consumption (i.e., seasonality, load variation., etc.).

For producers, the decree establishes the "principle of introducing free prices to a broad fraction of hydrocarbons" (Item 8), but clearly sets this aside as a future goal, currently only applicable to the constrained export market price. For "wet" or sulfur-laden gas requiring further processing, gas producers remain held to a fixed wellhead price, but reductions in the land rental tax will be allowed to offset increases in production costs. However, given the limited size of the land rental tax, the issue may be whether this deduction can keep pace with the rising cost of gas processing once western costs are factored in. The problem may be moot if Russian domestic prices rise rapidly enough to allow land rental and other taxes to rise sufficiently to recover rising capital costs related to gas processing and field operating expenses. These costs are significant, but should be recoverable with appropriate expensing procedures utilized as border price levels rise towards world market equivalents.

Kazakhstan's gas consumption is currently largely skewed towards industrial and electric power or heat generation. Precise information concerning the sectoral distribution of gas consumption has not been compiled, and recent estimates seem to differ regarding the split between industrial and power/heat consumption[22]. The composition of gas consumption is critical in developing pricing strategy because of such issues as load management, competitive inter-regional and alternative fuels price competition, and the need to subsidize gas priced to the utility market vs. the industrial market, which presumably would be less dependent on subsidies.

E. Coal Sector

Coal accounted for an estimated 70 percent of Kazakhstan's primary energy production and 55 percent of consumption in 1992[23]. Total production was placed at 123 million tons in 1992, with domestic consumption of 84 MMt and net exports of 39 MMt (see Appendix 1, Table 19 for detailed statistics). Production from the Ekibastus deposit, largely steam coal with a high (i.e., 40-45 percent) ash content accounts for roughly two thirds of total output, with the Karaganda deposit (60 percent coking coal and 40 percent steam) accounting for most of the balance. Both coal's production and consumption share are projected to decline over the foreseeable future. The decline in production share reflects the rise in oil and gas output relative to stable to declining coal output. The decline in consumption share will not be as pronounced, falling perhaps to 50 percent in the transition period, but the market for coal will be limited by power

[22] For example, Table 1.1 of the ESR suggests a 62 percent share to industrial use and a 27 percent share to electricity and heat consumption, versus Section 4.19 which suggests closer to a 50 percent share for the power and heat sector.

[23] Based on ESR Table 1.1, modified for preliminary multi-fuels data obtained for 1992.

demand and an increasing role for gas in the industrial, power and eventually the residential and commercial sector by the late 1990s.

Currently, the domestic use for coal shows a 60 percent share for power consumption, nine percent for household use, and 31 percent for other uses, including industrial, commercial and public buildings. Future coal consumption will hinge largely on demand for power and heat, and how rapidly prices increase relative to natural gas and oil. Prices for Ekibastus coal averaged 355 R/ton in 1992, up from 7 R/ton in 1991, while the Karaganda deposit yielded averages of 1,030 R/ton in 1992 and 33 R/ton in 1991. These prices vary substantially among specific deposits, and have risen steadily throughout the year. By the end of 1992, average Ekibastus prices were approaching 700 R/ton to utility customers, with the Karaganda deposit approaching 2,000 R/ton (see **Appendix 1**, Table 20). The January 1993 Energy Pricing Decree raised the prices to 1,204 R/ton for Ekibastus steam coal and 13,000 R/ton for Karaganda's lignite coal, a huge increase for the latter, mirroring the extreme increase in the Russian price equivalent for high quality industrial/coking coal. Reportedly[24], for similar quality coals, prices to industrial consumers are slightly higher than the utility sales prices, while household, public and agriculture prices are set at about 50 percent of industrial levels. However, other sources[25] indicate no subsidy to either the residential or industrial sector.

A detailed profile of mine mouth coal prices, volumes and rail costs to a large power plant is provided in **Appendix 1**, Table 21. These data demonstrate the variation in coal prices among specific mines, reflecting production cost, quality and location differences, as well as the steadily increasing (quarterly average) price trend in 1992. Similarly, rail rates have increased steadily, ranging from 50-200 R/ton for this utility, but overall the percentage increase in rail rates has not been as pronounced as the coal price, reflecting a similar pattern as pipeline rates. Assuming an average transport distance of 1,000 kilometers,[26] comparable Western tariffs for rail transport would be around 1,500 R/ton, compared to the 100-150 R/ton rates shown for the fourth quarter of 1992.

Coal pricing and production levels in Kazakhstan are largely constrained by Russian market prices and demand, specifically the utility demand for steam coal exports and industrial demand for coking coal. For the latter, the Russian price for Kuzbass coking coal serves as a competitive ceiling on achievable export prices, while the electricity tariff and price of competing steam coal imposes a ceiling on steam coal exports. The demand outlook for both of these export markets is not good, particularly if one assumes rising energy and rail transport rates in Russia. As a result, some consolidation in total production is needed in Kazakhstan, particularly the steam coal output in relatively inefficient mines within the Karaganda area.

[24] See Kazakhstan Coal Sector report to World Bank, Section 6.11.

[25] For example, see the ESR, Table 2.1, which indicates residential prices are higher than industrial and utility levels.

[26] This distance is in the low end of distances consistent with select long-haul rail rates quoted for the U.S.

Kazakhstan's coal production costs, particularly for the steam coal at Ekibastus, are among the lowest in the world[27]. As a result, despite declining export and flat or declining domestic demand, the opportunity exisits to maintain a favorable mining margin by setting prices to fully recover production and investment costs (including select mine close-down costs). The Pricing Committee is empowered to set electricity and heat rates such that energy costs, largely coal, can be recovered. To finance such potential projects as a mine mouth power plant or a major ash removal process at Ekibastus, the coal pricing and cost accounting structure needs to be adjusted to allow for the recovery of the investment costs of projects demonstrated to add significantly to the profitability of the sector through negotiation among the mining companies, Kazakhstanugol, the Ministry of Energy and Fuel Resources (representing Kazakhstan Energo) and the Pricing Committee.

Kazakhstan's coal sector is characterized by declining demand for its coking coal output from the Karaganda mines, and relatively stable demand for steam coal. The coal sector's primary role in utility and, secondarily, industrial power, coupled with its low production costs and continued high resource development and upgrading potential, should allow coal to continue to serve as an "anchor" on energy price movements in Kazakhstan. The immediate need is to set coal prices on a path which fully recoups transportation, production and upgrading investment costs, while rationalizing the sector by relocating labor and capital resources to the most economic mine development and upgrade projects. Although overall production levels are not likley to increase, the production, processing and transportation components of the final coal price need to be accurately costed and priced in a manner which will direct resources to their highest return on investment.

As with other primary fuels, a detailed analysis of the cost and market demand and price factors determining the potential return on investment is needed. An important component of this effort will be a thorough evaluation of the export market potential for Kazakhstan's current and potential coal production, focussing on the Russian export market, with distinctions for coal quality and potential mine mouth netback price levels achievable. The results of such a study will have important implications for domestic pricing and investment strategy, and will provide a better quantititative framework for shaping this strategy.

F. Inter-Fuel Price and Cost Comparisons

The examination of inter-fuel price relationships requires care in specifying not only a common reference point (i.e., delivered vs mine mouth, import vs. domestic), but also tax vs. ex-tax levels, subsidies and, perhaps most importantly, the date of the price determination. Prices of all primary fuels have been rising rapidly since early 1992, as indicated in **Table 2.8** . On a ton-of-oil equivalent basis (TOE), oil prices are clearly leading the increase to world market levels with (domestic) natural gas prices recently having been surpassed by equivalent coal price levels. However, within each fuel group there is substantial variation in regard to critical price determinants such as average production cost, quality characteristics and access to world markets and price levels in neighboring economies. In developing price and taxation policy, these variables must be taken into consideration, as well as other economic and environmental factors, such as the importance of each fuel as an input to critical industries; the percentage of

[27] See the detailed mine cost estimates contained in Annex Table 6.1 of the ESR.

personal income accounted for by the fuels' basic consumption needs; the availability and cost of substitutable fuels; the sectoral and broader economic impact of price increases associated with each fuel; the fuel's price and income demand elasticities; un-"costed" environmental and related externalities, such as import dependence; and contributions to gross national product and jobs. In summary, raw price comparisons cannot be evaluated at face value, but, similarly, the persistence of extreme imbalances between basic economic cost and market value standards will create distorting signals, and eventually result in inefficient resource development and use at a high cost to an energy-driven developing economy.

With these thoughts as background, Kazakhstan's primary fuel price evolution to date reveals a policy of "leading with petroleum", with natural gas poised to catch up to oil price equivalents perhaps with a one-to-two year lag, reflecting the likely time for major field and pipeline projects to be realized. While the absolute increase in petroleum prices, particularly refined product prices, is the most prominent aspect of Kazakhstan's price progression, the widening absolute spread between crude oil and refined product prices must be tempered by the fact that the petroleum market is more responsive to international market influences, and therefore reflects to some degree the rising rouble/dollar exchange rate. This rate averaged 59 R/$ in 1991, and had risen to around 500 R/$ by late 1992. Moreover, the rise in petroleum prices reflects a large (28 percent) VAT component at each stage of transfer price, and the recent imposition of sizeable land rent payments on the producing associations, which reduces the realized wellhead price of crude oil by nearly 25 percent, according to recent figures (see Table 2.3). The absolute surge in petroleum prices also conceals a fairly stable relationship in the ratio of natural gas and (to a lesser extent) coal prices to crude oil. In 1991 this ratio averaged 16 percent for both natural gas and coal (based on ex tax wellhead and mine mouth comparisons). In September 1992, these ratios were 19 and 13 percent, respectively, and in December had diverged to 21

Table 2.8. Energy Price Increases in Kazakhstan (R/TOE)

	1991	January 1992	September 1992	December 1992	February 1993
Crude Oil at Wellhead (ex-VAT incl. LRT)	80	350	2,200	8,400	15,000
Fuel Oil (ex-Refinery Fuel, VAT)	56	392	2,736	12,170	19,237
(Ratio to Crude)	(0.70)	(1.12)	(1.24)	(1.44)	(1.28)
Natural Gas at Wellhead	13	65	173	1,745	2,905
(Ratio to Crude)	(0.16)	(0.19)	(0.19)	(0.21)	(0.19)
Steam Coal Karaganda Mine-Mouth	13	99	294	798	4,065
(Ratio to Crude)	(0.16)	(0.28)	(0.13)	(0.10)	(0.27)

Source: Pricing Committee, Kazakhgas, Ministry of Energy and Fuels Resources, Chimkent Refining Economics Department

percent for natural gas and 10 percent for coal, but the large price increase for Karaganda coal in late January 1993 now places steam coal at 27 percent of the crude oil equivalent price.

As noted, however, the precise timing and selection of the fuel price reference utilized can alter these comparisons significantly. For example, reported December natural gas prices ranged from 190 R/mcm for unprocessed gas exported to Russia to 3,500 R/ton for Russian gas returned to Kazakhstan. Similarly, in the case of coal, quality and production cost factors create a wide range of commercial prices. Recent fuels cost data for a large regional power company show a range in mine mouth coal costs from 553 R/ton for low quality steam coal to 2,000 R/ton for high quality Russian imports from the Kuznets area. Average kilocalorie (kcal) content for these coals reportedly range from a low of around 4,000 kcal/ton for the Ekibastus steam coal to 5,000 kcal/ton for higher quality coking and steam coals from the Karaganda deposit.

Coal production costs also vary widely. Based on the first three quarters of 1992, and counting only marginal operating costs (not mine development and social costs), individual mine production costs were reported[26] to range from a low of 185 R/ton for the Molodezhny surface mine, to a high of 903 R/ton for the Toparskaya underground mine. Inclusion of mine development and social costs reportedly add another 70 percent to the average cost of surface mining and 50 percent to the cost of underground mining. From September through December 1992 these costs (measured in rubles) no doubt rose substantially, perhaps doubling if the cost of rail transportation and the overall depreciation of the rouble provide a reasonable indication.

The average production cost of the primary fuels appears to represent around 40-50 percent of average "field" price levels. Of course, these costs are similar to marginal operating costs since costing of existing plant/assets is usually based on extremely low rouble values, and the costs of field development and even basic maintenance and repair are often substantially understated. Assuming these understated costs add 50 -70 percent to the reported costs, then an indicative cost to price ratio of 0.40 to 0.50 would rise to 0.60 to 0.85. Data inadequacies and rapidly changing price, tax and cost variables make more precise analysis difficult, but clearly the process of establishing effective tax and resource development policies will require greater resolution on these critical cost parameters.

Perhaps the most critical short-term determinant of fuel price is the price in the Russian market, and both Russia's and Kazakhstan's access to free world markets. **Table 2.9** provides a detailed analysis of representative "netback" values of key fuels to a Kazakhstan wellhead/mine mouth or border price equivalent (in the case of natural gas), based on hard currency border prices at key world market pricing points, netted back by the cost of transport, related services, fees (e.g., storage, and export fees, where appropriate), loss and representative quality differentials between the "world" standard utilized in column 2 when estimable. In **Table 2.9** two currency conversion assumptions are utilized throughout: (3b) posits a 250 R/$ "purchasing parity" exchange rate, while (3c) utilizes the 500 R/$ "market" exchange rate in effect in December 1992. (The detailed calculation of cost elements to reach column 3a's U.S. $ value are available on request).

[26] See ESR Annex 6.1.

CRUDE OIL, DIESEL FUEL, NATURAL GAS & COAL PRICES COMPARISON OF WORLD NETBACK PRICES TO KAZAKH "DOMESTIC PRICES"

Table 2.9

Energy Type	World Price Assumption	US$/mt or US$/mcm	R/mt* or R/mcm*	R/mt** or R/mcm**	R/mt or R/mcm	Ratios	
(1)	(2)	(3a)	(3b)	(3c)	(4)	(3b)/(4)	(3c)/(4)
Crude Oil	Urals FOB Black Sea	Netback to Aktau from Novorrossiysk			Domestic Price		
	$18.50/b	$114***	28610	57221	8400	3.4	6.8
Diesel Fuel	Rotterdam Gasoil	Netback to Pavlodar from Rotterdam			Domestic Price		
	$201/mt	$156/mt	39085	78170	22350	1.7	3.5
Natural Gas	Estimated Russian Price to Germany PL System	Netback to Uralsk from Germany's PL System			Russia**** Import Price		
	$85/mcm	$40.29	10073	20146	3500	2.9	5.8
Coking Coal*****	EEC Import Price	Netback to Karaganda from Ukraine			Domestic Price		
	$61/mt	$38.87	9718	19435	1842	5.3	10.6
Steam Coal*****	EEC Import Price	Netback to Karaganda from Ukraine			Domestic Price		
	$50/mt	$27.30	6825	13650	706	9.7	19.3

* 250 R/US$: Representative of purchasing power parity rate.
** 500 R/US$: Approximate Market Rate in December 1992.
*** Equivalent to $15.45/barrel.
**** Import prices chosen as guidelines for the future domestic prices.
***** No adjustment has been made for differences in calorific values.

Looking first at crude oil, the estimated $18.50/barrel crude oil price FOB Novorossiysk is netted back to $114/ton ($15.45/barrel) at Aktau, and compared to the current official domestic price of 8,400 R/ton to arrive at the alternative "world market netback to domestic price ratios" shown in columns (3b)/(4) and (3c)/(4). A similar process was followed for diesel fuel; in this case utilizing a representative Rotterdam price netted back through the Baltic port of Ventspils and after deducting representative[29] rail transport costs. The resulting netback produced lower ratios of the estimated foreign netback to prevailing domestic price for diesel fuel, as would have been the case for any refined product given the lack of a more cost-effective pipeline transport system, as available for crude oil. The lower ratio for refined products also reflects the VAT tax on crude oil which is contained in the refinery gate price of petroleum products in Kazakhstan. For natural gas a "delivered German pipeline system" price estimate of $85/mcm was utilized and netted back for comparison with the Russian border price of 3,500 R/mcm effective December 1992. This calculation also includes a five percent pipeline loss factor. The final ratios, slightly lower than crude oils, demonstrate the importance of Kazakhstan's participation in additional regional export pipeline projects as an alternative to the Gasprom system, particularly if Gasprom's access is limited and its combined tariff and tax structure begin to approach even a "low-end" Western standard.

Separate calculations were made for coking and steam coal based on average EEC import prices. However, no adjustment was made for differing calorific or other quality levels between the EEC standard for each class and the typical energy and quality feature of Kazakh coal in each class. As a result, the netback values and ratios shown may be somewhat over-stated, particularly for the steam coal, which is reported to average around 4,000 Kcal/kg, compared to at least a 5,000 Kcal/kg average value for coking coal. For example, if an international standard of 6,500 kcal/kg were used for coking coal, the $61/mt EEC import price would be adjusted down by the multiple of the ratio of 5.0/6.5, representing the caloric ratio of Kazakh to the standard value coking coal. A similar adjustment would apply for steam coal, coupled with an additional deduction for Kazakhstan's typically high ash content in its steam coals. In addition, it should be noted that the per ton mile rail tariff utilized to net back to the mine mouth in Kazakhstan was the lowest long-haul rate available in the U.S. Utilization of average rail rates would move the netbacks well below zero. Thus, on balance, the analysis underlines the need for Kazakhstan to improve its coal export quality, particularily via ash removal at the mine mouth, to increase its export value and lower its transport cost, as rail costs are likely to rise towards at least the low end of international standards, and Kazakhstan' s distance from large consuming markets in the West places it at a disadvantage to Russia and other Eastern European producers, in part because of the latter's preferred access to rail systems.

G. International Price Comparisons

Two additional approaches to making international price comparisons are demonstrated in **Tables 2.10 and 2.11. Table 2.10** focusses on "vertical" price ratios among each major fuel group in Kazakhstan relative to a Western competitive market standard (in this case the U.S.). This analytic structure is intended to demonstrate the relative size of intermediate transport,

[29] The rail tariff estimates utilized included actual published data where available, and otherwise incorporated "low end" unit distance cost estimates representative of western rate structures.

processing or tax costs between major stages of the fuel delivery chain. In the case of petroleum, this difference reflects transport, storage, refining and distribution costs as crude oil moves from the wellhead to the refinery and on to the final consumer. The prices selected are representative of end-1992 levels, but are perhaps less indicative of actual average values for Kazakhstan than for the U.S., particularly in the case of natural gas and coal, owing to their range of price, quality and location end-user pricing terms compared to the more consistent U.S. average prices shown.

The most reliable average energy price levels are those for crude petroleum and products. The 8,400 R/ton price is an official level throughout the country effective late 1992. This price is relatively low compared to the real delivered cost of crude to Kazakh refineries (including taxes and imported crude costs), and in comparison to the typical U.S. spread between average refiner acquisition costs and the average wellhead price (shown as $16.50/barrel in **Table 2.10**). For example, the imported cost of crude oil, which accounts for approximately 80 percent of total feedstock to Kazakhstan's three refineries, is somewhat higher than the fixed domestic price, owing to both quality adjustments and the propensity of Russian crude prices to lead Kazakh prices up, sometimes with a lag of several months. As a result, the higher gasoline to crude oil price ratio shown has a bias in the form of understated delivered crude oil prices.

In addition, the retail price in Kazakhstan includes two stages of VAT tax, from wellhead to refinery and from refinery to downstream distribution and marketing. These 28 percent additions are somewhat offset, however, by the inclusion of federal and state gasoline taxes in the U.S., which add approximately 25¢/gallon ($10.50/barrel), on average, to the final price. On the other hand, the higher U.S. quality standard for gasoline (unleaded with 93 octane-equivalent vs. Kazakhstan's 76 grade) offsets at least half of the tax factor. The net result demonstrates that on a comparative international basis, Kazakhstan's refined product vs. crude oil price spread is relatively high, largely owing to the low crude price base. As crude oil prices rise, this ratio should decline toward more indicative western standards, despite the needed increase in refining margins.

For natural gas, the comparison between wellhead gas and average delivered power plant costs reflects the relatively efficient transportation structure in the U.S. By contrast, the Kazakh relationship is not based on economic costs, but reflects the difference between the official wellhead price, as reported by Kazakhgas (**Appendix 1**, Table 15), and the weighted average import cost of gas delivered to a utility. The difference is not directly related to transportation costs between the domestic producer and the next customer (i.e., the distributor or end-user). This latter is currently set at an average level of 722 R/mcm, based on an average wellhead price of 2048 (see **Appendix 1**, Table 16) and the energy pricing decree's policy (item 6) of limiting wholesale prices to 2,770 R/mcm, subject to differentiation based on delivery cost to the end-user. Assuming the full 722 r/mcm delivery cost, the ratio of end-user to wellhead prices rises to 1.35, or slightly more than the U.S. standard. As absolute gas price levels rise in Kazakhstan, this ratio is more likely to remain close to the U.S. standard, because both gas prices and average pipeline tariffs rates appear to be currently equivalent to about 10-15 percent of U.S. levels.

The coal price comparisons (lines 7-9) also may reveal more about the unique features of each market than the appropriateness of the ratios. Here, the mine mouth vs. delivered coal prices utilized are those reported by a major power plant consumer effective over the fourth quarter of 1992. Here, the implied rail transport rate accounts for the 47 R/ton difference shown. This

Table 2.10. Comparison of International Prices

	Kazakhstan (In Rubles)	U.S.A. (In U.S. Dollars)
(1) Wellhead Crude Oil	8400 R/MT	16.50/B
(2) Retail Gasoline	45943 R/MT	47.88/B
(3) Ratio: (2)/(1)	5.47	2.90
(4) Wellhead Gas*	2048 R/MT	1.77/MCF
(5) Power Plant Gas*	2233 R/MT	2.30/MCF
(6) Ratio: (5)/(4)	1.09	1.30
(7) Minemouth Coal (Karaganda)	1900 R/MT	22.18/S-T
(8) Power Plant Coal	1947 R/MT	30.64/S-T
(9) Ratio: (8)/(7)	1.02	1.38

* Needs verification, represents average of gas prices to utility reported by the State Economic Committee. Other delivered gas prices reported are higher (e.g., 2770 R/mcm to reseller to as high as 4,350 R/mcm for a specific utility).

Table 2.11. Comparison of International Electricity Generation Input Prices (Prices per TOE in local currency)

	Kazakhstan*	Germany	Turkey
(1) Heavy Fuel Oil	15,647	247.6	794,185
(2) Natural Gas	3,054	305.4	645,069
(3) Steam Coal	431	358.0	238,750
(4) Ratio: (1)/(2)	5.1	0.8	1.2
(5) Ratio: (1)/(3)	36.3	0.7	3.3
(6) Ratio: (2)/(3)	7	0.9	2.7

Source: Appendix 1, Table 20, and International Energy Agency, Energy Prices and Taxes, 1992: Q2.

* Effective December 1992.

is a relatively low rail tariff, even by Kazakhstan's standards, and has been surpassed by most mine-to-plant rates (see **Appendix 1**, Table 20). As the average rail rate rises (e.g., above 200 R/ton in 1993), the mine mouth to delivered utility spread will begin to rise towards the U.S. standard, but is unlikely to exceed this standard for at least the next several years, and then only if coal's mine mouth cost base does not rise relative to rail costs.

Table 2.11 applies the ratio approach to international inter-fuel price comparisons, rather than vertical price analysis among the same fuels. In this respect it is similar to **Table 2.8's** inter-fuel price comparison for domestic prices. The two markets selected are Turkey and Germany, due to their proximity to Kazakhstan and representation of rather different, but important, delivery points with access to the European markets. Here, the comparative pricing point is fuel delivered to an electric power generating plant. The caveat for the coal price and quality differences relative to average levels in Germany and Turkey are particularly relevant. All prices are shown in the local currency and TOE (tons of oil equivalent), thereby precluding the need for currency conversions.

The ratios derived in **Table 2.11** illustrate the both high price of oil in Kazakhstan relative to other fuels and the relatively low price of coal, particularly in comparison to Germany. These relationships suggest that a policy of raising oil prices to world market levels is being actively pursued in Kazakhstan, in response to Russia's pricing structure and energy resource development and usage policies. As petroleum prices lead the overall energy price advance, its domestic use is discouraged in comparison to the other fuels, barring extensive subsidization. This frees more resources to move to free markets at substantially higher prices and potential tax revenues. As natural gas resources are developed, its inter-fuel price ratios are likely to rise relative to coal, and at least keep pace with oil after perhaps a 1-to-3 year lag. Higher pipeline tariffs needed to recover new system investments will probably out-pace (on a percentage basis) the rise in gas prices. Once this market becomes more established with an integrated transportation infrastructure and expanded gas-fired power and distribution capacity, gas prices will begin to close some of the presently widening gap with oil. This rate of price convergence will likely accelerate after 1995.

Meanwhile, coal is likely to continue to "disengage" with the primary export fuels, acting as an energy cost buffer for critical power, heat and industrial needs until energy export revenues can stimulate economic growth and concurrent gains in personal income. During this transition period, the challenge will be to avoid a sharp decline in non-energy or energy-consuming sectors of the economy, and to maintain real incomes through wage adjustments and the creation of a favorable investment environment. The objective will be to stimulate economic growth and productivity by re-investing export revenues received largely from higher primary fuels prices, rather than expanding cost subsidy programs financed from energy taxes. Coal's relatively low cost and primary supply role to the power, heat and industrial sectors will help limit the need for extensive direct fuel subsidies for the emerging primary export fuels, as subsidies ultimately divert resources to less productive uses.

In general, it is instructive to monitor such international and inter-fuel price comparisons from a policy perspective, particularly for making comparisons with countries which represent real market outlets and potential trade and investment partners. Any nominal comparison of price levels is subject to numerous qualifying adjustments, as enumerated earlier. Nevertheless, through diligent examination of the costs and potential benefits associated with various energy

price and tax levels, these price relationships offer a useful guide for rationalizing price and tax levels internally and maintaining a competitive position in the international market. Moreover, as the resource development and related infrastructure funds are increasingly obtained from foreign sources at international cost levels, the cost-basis for balancing energy price relationships will force some of the current "transitional" distortions to more closely reflect international standards. This process will necessitate the development of timely and accurate price and cost data, including data needed for performing tariff studies, and for developing management information systems to document and monitor energy price and taxation levels internally and in the surrounding republics.

III. GUIDELINES, PRINCIPLES AND CONSTRAINTS TO FUEL PRICING APPLIED TO KAZAKHSTAN

A number of basic energy pricing principles are relevant to Kazakhstan as it evolves towards a more robust market led by energy exports and an energy-intensive domestic economy. Among these are the basic concepts of:

1) fully recovering marginal costs of energy production to ensure the financial viability of the enterprise; in the short-term to include all variable operating costs, and in the longer term to include fixed costs, inclusive of a fair market return for investment capital;

2) pricing to reflect the full border price equivalent of available import and export markets, fully accounting for transportation costs and quality differentials, appropriately measured;

3) achieving international free market price parity for commodities which are truly accessible to these markets, adjusting for the full cost of transportation and quality differentials;

4) establishing a realistic schedule to "ramp" previously controlled or subsidized domestic prices to reach both the appropriate border price and international equivalent levels cited above, with due consideration given to macro and sector-specific impacts, and price and taxation adjustments needed to ensure an optimal recapture of economic rents to recycle energy revenues to the economy generally, and to the energy sector specifically;

5) maintaining appropriate inter-fuel price differentials to achieve the desired consumption and resource investment incentives, consistent with the cost-recovery and external market pricing objectives cited above; and

6) allowing the free flow of energy supplies and capital to the extent practicable in response to price and investment incentives and the marginal value of the energy resource from the consumer or processor.

A. Cost Recovery on the Margin and in Consideration of Capital Investment Requirements

Energy prices should be raised to cover their full incremental cost of production in the short-run, and a full recovery of current asset depreciation and necessary investment costs (i.e., an adequate return on capital investment) in the longer term. From the perspective of crude oil production, this principle is most relevant to the production agreement terms and negotiations with both foreign investors and the Kazakh producing associations. The current price of domestic crude appears to exceed current estimated domestic production costs by a factor of more than 2 to 1, based on Table 2.3's estimated producer revenue and cost structure. This ratio is likely to sharply increase for existing production as Russian and free market export prices lead domestic prices up faster than cost increases. However, for new production, the technology required to fully develop fields will require more sophisticated western equipment at higher original costs and rates of escalation. As a result, production costs will require careful monitoring to maintain an appropriately responsive tax base and rate structure. Specifically, as

production costs rise relative to the achievable wellhead price, the land rental tax should be reduced, and vice versa. Alternatively, a temporary export tax or bonus profit tax might be utilized in place of frequent adjustment to the land rental tax.

Accurate cost projection and current accounting systems need to be established for the critical production cost base to be effectively monitored (in the case of existing production), and negotiated (in the case of future production under foreign production agreements). These should recognize the relative share of indigenous vs. international equipment and O&M costs, and provide a reasonable evaluation of current asset and replacement costs on which to base depreciation expense and imputed internal rates of return on capital. Once in place, domestic pricing policy should consider the full incremental and fixed capital costs of production, as external pricing is likely to allow the recovery of both as prices "ramp" up towards world market equivalents.

At the refining stage, similar policies of full marginal and fixed capital cost recovery should be established to create timely cost accounting systems for the purpose of both immediately recovering marginal operating costs in product pricing and more accurately estimating the cost of desired plant investments. These will be justified largely on the basis of potential cost recovery within a relatively tumultuous operating environment (e.g., see **Exhibit 2.1's** gross margin path). As discussed in **Section 2**, reported refinery operating costs have risen sharply in 1992, primarily in the feedstock and chemicals area. Depreciation costs remain low, as does the asset value of the plant. As with crude petroleum, it is likely that rising prices will out-pace the weighted average of domestic and foreign equipment and operating costs needed to maintain and selectively refurbish the country's three current refineries. That is, the increase in gross refinery margins is likely to exceed marginal operating costs on average over the next several years, owing to the allowed adjustment in petroleum product prices to recoup these costs plus a 25 percent return. However, for significant investments, such as the addition of a cat cracking unit at Chimkent or Aytrau, the highly variable equivalent gross refining margin averaging around $1/barrel is not likely to recoup this investment without a significant change in capital cost accounting and asset valuation procedures.

Another aspect of cost recovery which needs to be developed in Kazakhstan's refineries is the concept of product and process-unit specific cost accounting and recovery. As prices and margins are allowed to vary, the intra-barrel economics of the overall refinery and specific process units must be accurately accounted for to not only attempt to optimize the refinery's operation in an economic sense (vs. the old production maximization concept normally taking priority in planned economies), but also to be able to justify incremental process operations and potential return on investments on a process-specific basis. Basic refinery process simulation models and the proper input of key price and cost variables provide a useful tool to begin to quantify intra-barrel economics and the potential return on downstream process investments.

In petroleum distribution and marketing a similar problem exists as in refining. Prices are rising more rapidly than costs and the 40 percent average profit threshold leaves ample room to recover rising marginal operating costs. However, as with refining, the major cost items which must be recovered are fixed capital investments, such as new product pipelines, storage terminals, rail and truck fleets. These multi-million to billion dollar investments need to be recovered in the cost accounting procedures employed by Kazakhnefteproduct, and more broadly throughout Kazakhstan's end-use sectors using fuel transportation services. The GOK should seek to immediately internalize some of these higher operating costs, starting with

smaller investments in pipeline or terminal refurbishment, rail tank car or truck additions. As these costs are built into the allowable cost base for KNP, the ceiling profitability target of 40 percent over costs might be reduced, thereby capturing a greater portion of the total return in the legitimate cost base.

A central cost recovery issue for all fuels is the accurate costing of transportation, whether by rail, truck, or pipeline. **Appendix 1**, Table 24 provides a detailed breakout of the cost elements behind the eastern crude oil pipeline's operation in Kazakhstan, under the direction of the Pavlodar Regional Pipeline Board. The total cost increased by a factor of 13 times or one billion rubles between 1991 and 1992, and is projected to rise by a factor of three, or two billion rubles between 1992 and 1993. Interestingly, the primary cost component accounting for this increase is the direct cost of ecological damage (including damage control, presumably). By contrast, the allocation to the depreciation and the investment fund grew only modestly. The net result is a derived per unit pipeline operating cost which averaged 48.5 R/ton in 1992, projected to rise to 144 R/ton on average in 1993. Relatively small pumping and loading costs must be added to the transport costs to arrive at a fully priced service. The rate of return and degree of capital cost recovery allowed on this cost is apparently not sizeable, based on actual pipeline tariffs in effect at the end of 1992. This schedule is shown in **Appendix 1**, Table 25.

Assuming the average shipping distance is the distance between the Pavlodar and the Chimkent refineries, the tariff schedule (effective November 1, 1992) suggests an applicable rate of 105 R/ton, or roughly midway between the estimated 1992 and projected 1993 average cost level. The 126 R/ton tariff to Chimkent effective late 1992, translates to roughly $0.07/barrel using a "purchasing power parity" exchange rate of 250 R/$, or roughly 10 percent of comparable western rates for the same distance. Based on the cost projections shown, this average tariff should at least double in 1993, and perhaps approach 30-50 percent of western standards if an adequate amount for depreciation and investment were to be included.

Lacking full detail on the limited product pipeline system, we assume that the cost recovery situation is at least as severely understated with respect to refined products as to the main crude pipeline network. This is because the product system is in greater need of repair and system expansion, therefore, the variable and fixed cost increases needed to recover these investment needs are probably even more severely understated. **Appendix 1**, Table 24, provides a very summary assessment of average transport costs for refined petroleum products for various transport modes effective late 1992. Without knowing average distances involved, it is difficult to make inter-modal cost comparisons. Nevertheless, the costs shown are instructive of the degree to which the allowable cost base must increase to recoup huge investment needs, and to begin to approach world standards. Looking at **Appendix 1**, Table 24, the average product pipeline cost of 392.7 R/ton is roughly comparable to a tariff of $0.21/barrel, compared to rates of over $1/barrel for most long-haul routes in the OECD. This is a relatively high figure compared to the average crude oil pipeline costs discussed above. The shorter haul rail, truck and barge movements carry higher per unit costs, as would be expected, but without greater detail on their cost structure, it is difficult to determine the extent to which operating and capital costs may need to increase.

On a comparative basis, for example, the truck cost of 793 R/ton converts to approximately $0.43/barrel or about 1¢/gallon, using the lower 250 R/$ conversion factor. Again, without knowledge of average trucking distances direct comparisons are difficult. Nevertheless, a useful frame of reference may be a range of 2-to-5¢/gallon in the U.S., suggesting a cost factor 50 to

80 percent lower than in the West. Similar observations hold for the average rail costs. However, the barge costs appear to be more closely reflective of western cost standards, and may indeed primarily reflect traffic on the Caspian Sea towards Azerbaijan and on west through Turkey and the Black Sea for sale at free market prices. In the OECD, a more typical ratio of average barge to pipeline costs would not exceed 2:1, compared to the 3:1 ratio shown in **Appendix 1**, Table 24.

Cost recovery with respect to natural gas production raises many of the same issues as crude oil, with some additional complications related to the cost of gas processing and pipeline system investments. Domestic prices need to be set high enough to eventually recover these costs on a field-specific basis, with some allowance for adjusting rental tax as full production, separation and transportation costs are phased in, particularly for new fields requiring foreign technology and investment. The energy pricing decree's (item 8) policy of allowing land rent tax adjustments to offset rising gas processing costs is not an effective long-term method to insure full re-capture of these crucial investment costs. A variety of potential financial structures governing gas field concessions and processing equipment investment cost recovery should be investigated. The objective should be to balance the investment cost burden between consumers and producers, with potential risk and reward-sharing features applied to foreign investors in gas processing equipment. For example, an export fund could be set aside to pay for western equipment on a success formula basis, such as increased supply generated. Or, tax incentives could be given in the form of direct allowable cost deductions to the profits tax or land rental tax.

Substantial potential savings in current gas loss and reduced reliance on increasingly expensive processed gas from Russia will accrue from successful investment in gas processing plants. Reportedly, as much as half of Kazakhstan's current gas production is exported for further processing, at processing fees which are approaching world levels along with gas prices. Therefore, priority should be placed on encouraging gas processing facility investments and recovering these costs in both higher export prices and, similarly, higher allowable cost recovery or tax incentives for domestic sales. The costs of a typical large-sized gas processing facility are substantial. For example, a facility capable of processing up to 2 bcm/year would likely cost at least $200 million, depending on the gas' sulfur content, plant equipment and operating cost assumptions.[1] However, many relatively small scale field processing units may be appropriate, and pay for themselves within one-to-two years under the right pricing and cost recovery terms.

In general, the lack of cost data detailing gas production and transmission activity presents a major hurdle to developing effective marginal costing and rate-making principles. Evidence of this is seen in the flat transmission rate charged on the Kazakhgas transmission system. Steps to amend this problem have apparently been set in motion, as the energy pricing decree (item 6) allows for Kazakhgas to differentiate among its prices charged to gas re-sellers (distribution companies) based on delivery costs from the NIS republic from which the gas was obtained.

In the case of coal, marginal production costs for each activity seem to be fairly well documented, and reasonable standards exist for extrapolating from variable operating costs to the full costing of mine investment and supporting infrastructure. These known cost structures are evident in the price negotiations between the coal enterprises and the purchasing utility,

[30] More precise cost estimates for gas processing plants are currently under development.

which produce a wide variation for a given buyer amongst a variety of coal suppliers and coal qualities (see **Appendix 1**, Table 2.15).

B. Pricing to Achieve Border, International or Inter-Fuel Price Equivalents

Since October 1992, the domestic crude oil price has been set at 8,400 R/ton. The border equivalent price of imported Russian crude oil has been rising steadily relative to this fixed domestic price level. To some extent, this reflects rising transportation tariffs and related operating costs, but also the higher prices commanded by alternative markets for Russian crude oil. As a result, the Government of Kazakhstan should either consider decontrolling the domestic price of crude oil entirely, allowing negotiations between domestic and foreign (Russian) refiners to determine the ultimate level, or a more market-responsive price adjustment mechanism and basis for negotiation with Russian purchasers should be established. Ultimately, Kazakhstan's improved access to international markets will determine its ability to achieve international price level equivalents. Meanwhile, emphasis should be placed on both monitoring "border-equivalent" price levels, including accurate representation of appropriate transportation and quality differentials, and improving Kazakhstan's negotiating position in terms of its respective import and export pricing for inter-republic and international trade.

Prior to the last quarter of 1992, petroleum product prices for domestic sale were also set at uniform levels throughout Kazakhstan, although pricing terms for the inter-republic and ex-NIS trade are not so transparent. Further information needs to be collected on inter-republic petroleum product prices, including gasoline, diesel fuel and mazut, with particular attention given to the apparent quality and location differentials. Perhaps the most important quality differential from the perspective of refinery upgrade priorities is the price paid to Russian refineries for high octane (Grade 93) gasoline. Currently, a substantial volume of Russian gasoline and diesel fuel imports move all the way to southern Kazakhstan. The cost of this trade, measured in both transportation costs and the fuel quality premium, is likely to increase sufficiently to justify selective upgrades in Kazakh process unit upgrades and additions (e.g., focussing on cokers, crackers, reformers and blending).

Inter-regional and inter-fuel price relationships have already become quite variable, and will increasingly so as the supply sources, input cost and external border price standards change rapidly. This will necessitate increasing flexibility from Kazakhstan's refineries in changing their supply mix and pricing terms in response to changing market conditions. **Appendix 1**, Tables 5-9, demonstrate the change from uniform flat pricing to the regional and inter-product differences emerging since October. Detail provided in **Appendix 1** Tables 7 and 9, for Chimkent and Pavlodar, in particular, demonstrate these changing petroleum product price levels, as the spread between light and heavy products increases, and the light product location premium to Chimkent (in the south) increases.

More pronounced regional and quality differences would be evident if detailed price data were available from the Aytrau refinery, as it is the least sophisticated plant, with the lowest feedstock cost in the form of local domestic crude, but ultimately the refinery with greatest access (in terms of proximity and cost) to higher value international petroleum product markets. This inter-regional price variation should be closely monitored as border prices rise, because potential

investments in the Aytrau refinery need to be weighed carefully against the cost and future value of the proposed new refinery at Mangistau. Moreover, rail product pipeline links to the Caspian area from either Pavlodar or Chimkent should be evaluated for their potential return relative to new capacity being added in this region.

The greatest need for rationalizing inter-regional and quality-adjusted price relationships is in the gas sector. Through late 1992, gas transmission rates were set at uniform, fixed levels: 1,170 R/mcm for imported supplies (see **Appendix 1**, Table 15) and between 450 and 722 R/mcm for domestic movements, depending on whether **Appendix 1**, Table 16's ex-tax LDC sales price of 2,000 R/mcm or the 2,770 level reported in **Appendix 1**, Table 15 is used. In either case, as gas transmission and distribution systems are planned and developed, standardized procedures for costing and recovering system costs must adopted. Similarly, the economics of gas processing need to be carefully evaluated, both absolutely to determine the potential return on displacing some of the current trade with Russia, but also on a field-specific basis, so that these costs can be reflected in local gas contract prices to tariff structures.

At the LDC level, variable rate structures will also become increasingly more important in establishing a rational price of natural gas. This price should reflect both the cost of service needed to deliver gas to the specific user class, and the economics of alternative fuel prices to capture and retain a critical volume threshold to justify constructing a distribution system and establishing service in a given area. Item 7 of the October energy pricing decree allows for variable rate-making, but substantially more detail is needed, in the form of a regulatory system controlling rates. As the capacity for gas production increases, it will increasingly find opportunities to back out oil use and, potentially, coal. Therefore, LDC pricing of gas must be responsive both to inter-regional pricing, but also inter-fuel relationships. Currently, on average, these favor gas over oil. However, on a region-specific basis, and depending on the rate of external gas price increases (as presently determined by Russian pricing and export pipeline access), oil vs. gas relationships could change rapidly, particularly on a localized basis. This, in turn, will require the ability to price differentially among regions and users to capture and retain market share.

Inter-regional and quality-adjusted rates for coal are also quite variable, as demonstrated in **Appendix 1**, Table 21 for one major utility consumer of fuel. Absolute price levels have risen steadily over 1992, but relative prices and transport rates have risen less consistently. Much of this apparent inconsistency is a function of the contract negotiation process between the major utility buyer and the coal association, including access to and control over rail car capacity. A nationwide examination, encompassing all the major utility and industrial consumers, on the basis of both the delivered and "netted back" mine mouth price of coal paid for various producing areas and types, would likely reveal substantial variation and opportunity to rationalize coal quality and inter-regional pricing.

C. Allowing the Free Flow of Energy Supplies and Capital

The traditional state order system for allocating market demands to supply sources, as administered by the State Economic Committee, has reportedly been replaced in 1993 with an annual contracting system, still facilitated through the Economic Committee. A contractual approach may be a change in name only, but in fact the allocation system is under severe

stress owing to the rapid change in fuel demands driven by rising prices and worsening economic conditions as the economic transition intensifies. A contractual approach can better accommodate the need for flexibility or latitude in volume "ta'·es" in response to these economic variables. However, control over the contracting process should be given directly to the suppliers, rather than an administrative authority, as suppliers can best plan production and evaluate terms of supply with major consumers or marketers.

The state order or new contractual system is most evident in the petroleum sector, but encompasses coal and gas as well. Ideally, the transition to an administered contractual approach, under the supervision of the Economic Committee, can give way to direct contract negotiations between suppliers, consumers and marketers under a variety of contractual structures. Extensive training in contract design and negotiations will be needed to accomplish this transition. The alternative of holding to an administered annual process will increasingly constrain the ability of supply companies to optimize their operations, as price and cost relationships change. In this environment, maximum flexibility is needed to lock in both long-term contractual commitments to secure financing for major investments, and short-term flexibility to sell energy supplies on an incremental basis to maximize utilization rates and shorter-term operating economics.

D. Establishing a Price Ramp to Free Market Equivalent Levels

A suggested price "ramp" for moving oil and natural gas prices to international levels is presented in **Chapter 5's** recommendations. The exact path of this ramp should be a function of a number of variables, discussed below. In general, the objective is to achieve parity with world prices first for crude oil, as Kazakhstan's growth in energy production and export potential is likely to be led by crude oil. The rate of movement to the world equivalent goal is necessarily dependent on Russian pricing policy, at least until major export pipeline systems have been completed. Given the current mid-1995 forecast for completion of the proposed Caspian pipeline consortium' proposed line to Novorrosiysk, a ramp to free world prices by mid-1995 appears plausible for crude oil.

In the case of natural gas, the rate of movement to free world price equivalents will also be constrained primarily by Russian domestic pricing policy, and access to pipelines. Although a number of regional gas pipeline proposals have been forwarded, unlike crude oil, a consortium group has yet to emerge to endorse or seriously arrange financing for a specific proposal that Kazakhstan might participate in. Top priority should, therefore, be given on a regional basis to evaluating various regional efforts towards a proposal. At best, a regional gas system will lag oil by at least one year. Furthermore, natural gas has greater potential for indigenous use in Kazakhstan, in part displacing oil use for export. Finally, as a domestic energy "grid" emerges gas prices should be rationalized from transportation rate perspective before a policy of full "free world" price parity is pursued. For these reasons, the rate of escalation of gas export prices will likely be slower than for oil, with a target for world equivalent levels at the earliest in mid-1996.

A number of broader guidelines for determining the desired rate of full energy price and trade liberalization are presented below, specifically as potential constraints to an accelerated liberalization schedule, but also as standards to establish a more acceptable path of price and trade liberalization.

a. Rapid price decontrol could so strain personal/household incomes as to create a major slowdown in economic activity and increase the risk of civil unrest and ultimately political turmoil, discouraging badly needed foreign investment. One macro-policy guideline, therefore, is to evaluate the rate of energy price increases in terms of an average maximum acceptable percentage of household income spent on energy, and in the case of key economic sectors (e.g., agriculture) on the basis of the maximum acceptable percent of total operating costs accounted for by energy. These ratios could serve as guidelines for assessing the necessary degree and duration of subsidies to the household and key economic sectors, and suggest the necessary data to collect to make an informed assessment of energy subsidy policy and costs under alternative energy price decontrol paths. Complete price decontrol should not out-pace the ability of Kazakhstan to measure, analyze and develop a reliable response strategy to the income and social effects it generates.

b. Internal price and trade liberalization should also not out-run the development of realistic free world export market alternatives. Thus, if pipeline capacity to reach free markets is not available until 1995, efforts to accelerate decontrol ahead of this schedule will be constrained by the lack of legitimate market opportunities or outlets. On the other hand, a clearly stated and reasonably reliable schedule of a price liberalization is needed to encourage much of the foreign investment and financial participation needed to develop the infrastructure projects which increase access to export markets. A realistic schedule for the completion of these projects, and their potential volume and revenue impact, should serve as a guideline for the pace of domestic price reform (i.e., balancing inflation and growth concerns with export revenue considerations).

c. In the process of decontrolling absolute price levels, it is important a decontrol path for each major fuel be set which is compatible with the maintenance of realistic relative price levels among the fuels so distorting price signals which would mis-allocate resource investments will not be sent on either an inter-fuel or inter-regional basis. Such distortions affect the potential economic return on pipeline and transmission line investments, site and fuel selection for major end-use plants, processing or resource development projects. Price decontrol should not proceed without a better understanding of its likely impact on relative price levels, and the range of tax and tariff policies needed to correct perceived distortions.

d. Price decontrol should not out-pace the ability of key operating enterprises and policy-makers to measure real production costs, including capital investment and replacement costs, so that prices will be set to recover long-run marginal costs without allowing excess profits to develop untaxed. Price increases should at a minimum recover changes in marginal operating costs, and quickly seek to accurately measure and account for longer term investment requirements.

e. Price decontrol should also not proceed so rapidly as to worsen the energy payment and collection process. Price increases can negatively impact the quantity and quality of an energy supply service by worsening cash flow and the ability of the system to measure energy use and loss. Cash flow is needed to fund basic operating and maintenance activities and, secondarily, capital investments for upgrades and system expansion. In short, price increases should not out-run and threaten the liquidity of the financial system which supports the payment process, and ultimately the quality and

quantity of energy service provided. If too rapid, the price increase will not produce the intended result of improved efficiency, capacity and revenue flow to (and from) the energy sector.

f. Given the economy's high dependence on trade as a percentage of GNP, dominated by Russia and led by primary fuels and fuel-intensive extractive or manufacturing industries, any action which adversely affects trade flows will significantly delay the inflow of foreign capital. Previous studies addressing the evolution of economic reform in Eastern European countries have emphasized the importance of maintaining trade relationships with traditional partners to avert a substantial decline in national output, incomes and tax base necessary to insuring a stable investment environment.

IV. PETROLEUM LAW AND TAXATION

A. Objectives

The Government of Kazakhstan needs to design its petroleum law such that international oil companies are encouraged to participate in exploration and production, while at the same time safe guarding the country's long-term interests. This legislation should attempt to seek a balance between the following government policy objectives:

- Stimulating exploration activities through incentives;
- Generating national revenue without discouraging investment from foreign oil companies;
- Maintaining national control over resources; and
- Developing a national transfer of technology and training.

Most importantly, legislation must assure international oil companies that they can reasonably obtain a return on their investment commensurate with the risk involved.

Stated simply, the oil companies will assess whether it is probable that exploration in Kazakhstan will yield a drilling success that will provide an adequate return on its exploration, development and operating expenses. This decision is primarily based on the geological potential in Kazakhstan, the costs of exploration, development and production, future crude oil prices in world markets, and Kazakhstan's fiscal regime. Many costs faced by oil companies are beyond the control of both the company and the host country. For example, this includes the terrain, the remoteness of location, depth of wells, etc. Controllable costs include the signature bonus, purchases of data packages, the commercial discovery bonus, import duties on capital equipment, and requirements to train local personnel. The most critical parameter in attracting foreign oil companies is the promise of sizable oil discoveries. However, the simple fact is that wells are not always drilled where the largest reserve potentials are. For example, in 1990 the top five countries in exploration license awards included the Netherlands, Italy and Turkey. What these countries all have in common is a fiscal regime which is sufficiently attractive to offset or counter-balance the geological potential. The ideal fiscal regime results in a reasonable and equitable sharing of a successful exploration program.

B. Fiscal Regimes

There are a variety of petroleum fiscal regimes in place today. In general, they can be classified as service contracts, production sharing contracts and concession contracts. What is really important is not the type of contract but the terms of it, especially the economics of the contract. Kazakhstan and international oil companies should attempt to negotiate agreements which induce each other to withstand pressures to periodically modify the fiscal package as market conditions change. Economically, the contract terms should be designed to:

- improve the profitability of marginal fields;

- capture part of excessive profits resulting from either a large profitable discovery or a sharp rise in prices.

In general, incorporating "rate of return" based formulae into the contract assists in achieving these objectives and in providing a fair deal between the government and the oil company. A simple computer model can be constructed to appraise the economic effects of major contract options.

The rate of return of an exploration and development program is also affected by the general national tax structure as well as the special taxes imposed on the petroleum sector. The level of profit tax rates and profit surcharges are important to the economics of an exploration and development program. Insuring that tax payments in Kazakhstan qualify for offsets against U.S. income tax liability imposed on foreign income is of major concern to U.S. oil companies. A tax or revenue sharing scheme which allows the effective recovery of capital and operating expense through either a short depreciation period or high cost oil production split is of prime importance. Incorporating depletion allowances into the tax structure is another means by which to improve the economics of exploration and development projects. Finally, the ability to offset extremely high exploration expenses against taxes on a producing field can encourage a successful company to continue exploration efforts in Kazakhstan.

The current draft of the proposed petroleum law for the Republic of Kazakhstan does not provide sufficient information to investigate the structure and possible impact of the taxes imposed on the production of oil and gas. Also, at this time, there is only partial information available to develop a model by which to estimate tax revenues associated with the production of oil and gas through the end of this decade. Components of future agreements/contracts that need to be defined specifically prior to completing a revenue model include: bonus payments, state participation, royalty taxes, cost recovery, production split, etc.

Appendix 6 presents a framework by which to create reasonable estimates of the likely flow of tax revenues from the production of oil and gas through the year 2000. Key elements of the suggested framework are summarized below:

- Develop detailed production information for crude oil, condensates, and associated gas by each of the six major producing associations.

- Dis-aggregate production data by domestic (Kazakh) and foreign owned.

- Separate Kazakh gas production into the following three categories:

  — Domestically owned Karachaganak gas production
  — Foreign owned Karachaganak gas production
  — All other Kazakh natural gas production.

- Dis-aggregate sales volumes into the following categories:

  — Domestic, Russian, other NIS, and non NIS. This disaggregation is important at least through 1994-95 until complete market liberalization and world prices are achieved.

- Estimate production cost, if possible.

- Estimate the export tax or export fee likely to be effective February 1993 until world prices are achieved.

- Estimate relationships including levels and ratios for the profits tax, rental tax, VAT tax, and any other upstream tax such as bonus tax.

For purposes of converting rubles to dollars, this model uses an exchange rate based on a commodity basket measure rather than the direct use of the potential market exchange rate. The former is appropriate when converting hard currency earnings to rubles under a purchasing power parity concept, rather than the free exchange rate used in converting dollars to rubles.

Based on initial meetings and discussions, there is at this time no consensus view within the government on the likely revenues to flow from the production of oil and gas. The Ministry of Finance, the Ministry of Energy and Fuels, Kazakhstanmunaygaz, Kazakhgas and the individual producer associations, all have their own particular view. The Ministry of Finance provided **Table 2a in Appendix 1** which presents estimates of different tax revenues from the six producing associations in 1993. There is a wide variance of what the likely production of oil and gas in the year 2000 is likely to be. For example, the estimates obtained for the production of oil in 2000 range between 46 and 55 MMt. The estimates for the production of natural gas in the year 2000 vary between 12 and 27 bcm. These differences could reflect different premises. The revenue model presented in **Appendix 6** could be used as a tool to generate a set of consistent premises throughout the government. A consistent structure such as the one suggested in **Appendix 6** could be useful in working with each of these government entities in order to assist the government in accepting a realistic consensus view of the key assumptions and resulting revenues likely to be generated in the longer term from the oil and gas sector. The revenue model in **Appendix 6** would permit the government to generate different scenarios in order to establish the likely range of revenues over the next ten years. With this information, the government would be better equipped to make adjustments in their development plan as conditions change relative to the original assumptions on which the deve opment plan may have originally been established.

C. Provisions in Petroleum and Natural Gas Agreements

There are many standard provisions in petroleum agreements. Summarized below are a few provisions critical to attracting foreign capital to Kazakhstan.

- The length of the aggregate exploration period should involve a minimum period of between five and six years.

- The precise circumstances in which a renewal will be granted to a company should be clearly established in the agreement.

- At each stage of relinquishment, the area to be retained should always be of a shape and size which can be offered to other companies for exploration.

- The minimum work program and expenditure obligation associated with exploratory work must be written such that a cost effective company is not penalized for fulfilling its obligations with a lower than anticipated expenditure.

- Many governments require companies to make bonus payments in the form of signature, discovery, and production payments. The phasing of these bonus payments has the effect of making it less burdensome for the firm.

- The agreement should indicate that the government of Kazakhstan must either approve or disapprove a development plan within a reasonable period of time once the development plan has been submitted to the ministry.

Often special marketing arrangements have to be negotiated and established for a gas project. The development of a gas discovery may also critically depend on the development of transportation arrangements. Because a natural gas discovery presents special requirements, the agreement should provide special considerations for natural gas exploration and development. A partial list of special considerations with respect to the exploration of natural gas would include:

- The time required to make a decision on the commercial potential of a discovery of non-associated gas needs to be longer relative to oil to allow the contractor to carry out an appraisal program or an assessment of the markets for gas.

- The rights or obligations relating to access to either a current pipeline or the right to build a gas pipeline needs to be included.

- A longer period for the total maximum term of a natural gas contract is often justified; for example, the term could be thirty years in the case of oil and forty years in the case of gas.

- Special provisions related to gas marketing need to be considered.

- Special provisions related to gas pricing need to be considered; for example, often, the sales price to the domestic grid versus the export market needs to be established.

These are only a few of the specific provisions dealing with natural gas that should be incorporated in exploration and development agreements to meet the special needs of natural gas development.

D. Roles of Advisor and Models

It is recommended a Petroleum Economic Advisor be assigned to the Government of Kazakhstan to develop a model to enable a rapid appraisal of the direct and indirect effects of major contract options. The use of a model would contribute much to the negotiation process. The model could be used to evaluate the impact of various negotiating issues such as different royalty, tax, or participation rates under different scenarios. This analysis would assist in making the final petroleum agreement more flexible, equitable, and attractive to foreign investors. It

would ensure an appropriate distribution of the benefits and risk was achieved. The final standard petroleum agreement recommended to the Government of Kazakhstan should also take into account administrative requirements. The legislation should be designed in such a way that an adequate stream of government revenues is assured without the need for extensive, complex control measures. A revenue projection model, such as the one outlined in **Appendix 6**, needs to be undertaken in 1993. This study would emphasize institutionalizing a common methodology for projecting revenues within the key government entities. Such a model would begin to assist the Government of Kazakhstan and the donor agencies in developing a view of the likely revenues to be forthcoming from the petroleum and gas sector.

V. RECOMMENDATIONS

A. General Pricing and Taxation Policy Objectives

Any pricing policy reform in the Kazakhstan energy sector will be constrained by the inter-republic linkages between Kazakhstan and Russia and other Central Asian republics. A policy of close cooperation with Russia is critically important owing to the dependence of Kazakhstan on trade with Russia as well as their physical inter-dependence, especially through shared pipeline systems. For oil, coal and to a lesser extent natural gas, the current export and import market is largely defined by Russia's price and volume constraints. Because energy exports to the free world market must pass largely through Russia, any consideration of liberalizing Kazakhstan's energy prices and trade on a more rapid path than Russia must fully consider the immediate impact on realized energy (export) prices and on the volume of trade resulting from any further access limitations to Russia's still largely monopolistic capacity-constrained transportation system. If unilateral price liberalization negatively affects Kazakhstan's trade with Russia, the resulting revenue and output loss in key export sectors may offset any immediate gains attributed to energy price liberalization. Moreover, such unilateral action could negatively affect the flow of capital equipment and supplies from Russia, particularly in the key energy and energy-intensive processing industries.

Kazakhstan should, nevertheless, increase energy prices as rapidly as possible to reflect the full cost of supply. Prices of crude oil, refined products and coal should be decontrolled quickly within the constraints imposed by the Russian market, and "surplus" profit over cost captured and re-invested into either the energy sector directly or to other high priority economic development and investment activities. Natural gas price movements should be loosely tied to the increase in crude oil prices but with a delay, owing to the need for greater stability in gas prices. This need reflects gas' greater reliance on long-term infrastructure investments in pipeline systems, local distribution grids, processing and end-use technology. Natural gas has many of the capital investment and market characteristics of a grid-based energy system, and as a result its pricing will evolve in a more regulated framework compared to the oil market. As a primary industrial and utility fuel (vs. oil's transportation emphasis), natural gas will compete with coal, initially in the domestic market. However, gas production in excess of domestic needs should be priced and taxed in a similar manner to crude oil. As natural gas production, pipeline, and processing capacity increases, gas prices will increasingly be influenced by international markets, and greater pressure will exist to "ramp" prices towards free market and oil equivalents. This "ramping" process should be led by exports, with domestic supplies in the grid system eventually raised to an export-equivalent price.

For all fuels a policy of eliminating the state order system should be pursued and replaced with flexible term contract arrangements in the case of grid-based fuels, supplemented by spot arrangements to meet short term or uncertain seasonal or cyclical volume needs. Producers should be allowed greater freedom in pursuing direct sales and using independent marketers when reliability of service can be demonstrated and should be encouraged to develop new domestic, international and inter-republic markets with enterprises throughout the NIS.

Prices should be increased to initially cover marginal operating costs and over time raised to levels to recover the fixed investment cost. Over the short- to medium-term, prices should be raised to recover the cost of energy upgrading processes which add immediate value to the

energy produced and result in a rapid payback in the investment. This would include gas processing, gasoline octane enhancements, and coal ash removal. Kazakhstan should encourage foreign investment in such process and infrastructure upgrades through secure finance and contract performance packages and guarantees, in conjunction with the international banking and donor communities.

Taxes on primary fuels should be structured to capture a reasonable portion of the windfall gain or "surplus" profit resulting from rising energy price levels. Such calculations should be based on thorough and updated analysis of the appropriate cost base for energy production, transportation and marketing. With this information, energy tax levels should be set low enough to stimulate necessary investment in both productive and infrastructure activities, and provide some incentive for re-investing profits in the energy sector. To strike the proper tax balance for each fuel group and related infrastructure investment need, a variety of tax incentives, accelerated depreciation terms and rate structures should be considered. In addition, various royalty and bonus payment structures should be analyzed on a case-by-case basis for their usefulness in stimulating exploration and production activity leading to favorable revenue terms for the Government. For refined product sales, targeted user taxes or broader excise taxes should be considered for revenue generation. However, any structure must give careful consideration to the ability to establish appropriate rates and the likely effectiveness and cost of collection.

The current system of adjusting land rental taxes to reflect the market value of producing fields should be replaced with a more dynamic framework for calculating allowable costs or, perhaps temporarily, by an export tax on crude oil and natural gas sales to foreign destinations. Tax levels should provide for a reasonable rate of return, and include substantial investment or financing credits to encourage exports and capital investments to expand export market potential. Substantial resource investments in tax collection personnel and management reporting systems to document both import - export and domestic sales activities will be needed to monitor the increasing volume, price and cost complexity of transactions as market opportunities expand.

B. Crude Oil and Petroleum Products

Crude oil prices and petroleum products should be allowed to increase rapidly to free market prices under the constraint that until Kazakhstan obtains more direct access to world markets, its prices are likely to be tied to Russia's prices. The speed at which crude prices achieve free market levels will be a function of the completion of major pipeline projects or the pace at which Russia achieves free market prices. In 1993, the Council of Ministers should encourage price negotiations based on a concept of an acceptable band rather than pure price parity or barter terms on oil transactions. In most cases, the lower end of this band will be provided by the domestic Russian price. The higher end would be tied to a smooth gradual achievement of world prices by 1995. The "ramp" to world prices is expected to move from 8,400 R/ton in late 1992 to 28,000 R/ton in 1993, 50,000 R/ton in mid-1994 and finally 72,000 R/ton in 1995, or roughly world equivalent levels, given a market exchange rate of 600 R/$. By then, the Caspian crude oil pipeline project is scheduled to be completed, and numerous small development and transportation projects will be underway to supplement this major export line, allowing greater access to world markets and price levels.

Price levels for petroleum products should be flexibly set to allow refinery production operations to be optimized both in the short term with respect to obtaining maximum product value relative to operating costs for a given barrel of crude, and the longer-term to allow a reasonable degree of cost recovery for investment needs. Careful study of expansion plans and select unit additions or upgrades should take advantage of the refining sectors new found freedom to adjust relative product price levels within reasonable cost and allowed profit parameters. A policy of allowing refiners to directly market their product outside of contracted levels with KNG, and eventually engage directly in a wider volume of inter-republic and international trade. With greater freedom of volume control, refiners will be able to adjust their production and sales mix to optimize margins, increase cash flow and the potential return on select process unit upgrades and additions. On an absolute basis, refined product price should be set to loosely correlate to the overall "ramp" established for crude oil, with sufficient latitude provided to reflect the range of relative product values among the products. This, of course, assumes an ability to make defensible cost estimates on a product-specific basis.

Restructuring of the petroleum sector is also recommended, conducive to increasing operating efficiencies and competition. The restructuring should include a consolidation of government oversight entities, the formation of independent oil and gas production companies, the establishment of downstream (refining, transport, and distribution) companies, and the opening up of the upstream to competitive bidding for exploration and production.

Comprehensive studies should be undertaken to assist in market reform and the transition to a rational system of energy price and taxation. The following studies are recommended:

- Preparation of data packages for foreign upstream exploration and development firms, for oil and gas fields;

- Analysis of the potential return on various petroleum refinery upgrades based on import displacement and a more direct pricing and sales role for the refiners in both domestic and international markets;

- Economic and feasibility studies for the construction of proposed crude oil, and product pipelines, tied to demand forecasts and refinery optimization models, as well as an analysis of petroleum product storage costs and pipeline tariff structures in comparison to rail and truck alternatives;

- Assessment of the benefits to be gained from the centralization of supply and distribution operations (e.g., at Kazakhstanmunaygas), and the appropriate role for a coordinating organization between crude supply, pricing and import negotiations;

In addition to, and as a technical complement of these priority studies, a variety of training support needs have been identified as providing vital technical and institutional knowledge for various enterprises and Government agencies involved in the energy and fiscal sectors in Kazakhstan. Examples of these training needs include:

- Training in all aspects of crude oil and products operations, including:

    1) general courses on petroleum economics, joint interest operations and crude oil trading;

2) refinery economics and system optimization, including the costs of process unit operations, intra-barrel economics, pricing to recapture marginal and fixed investment costs, marketing and international sales strategies;

3) contract design and negotiation in the international crude oil and products markets;

4) Western techniques for cost evaluation applied to upstream, refining/processing, distribution and marketing to develop project analysis skills meeting western investor requirements;

5) basics of rate-making for oil pipelines, as well as rail and truck tariff analysis.

- Training in all software, hardware, related design and construction aspects of Management Information Systems (MIS) supporting energy data reporting and analysis, including tax collection, ongoing cost, price and volume - tracking systems.

It is also recommended a Petroleum Economic Advisor be assigned to the government of Kazakhstan to develop a model to enable a rapid appraisal of the direct and indirect effects of major contract options. The model could be used to evaluate the impact of various negotiating issues such as different royalty, tax, or participation rates under different scenarios. This analysis would assist in making the final petroleum agreement more flexible, equitable, and attractive to foreign investors. A revenue projection model, such as the one outlined in **Appendix 6**, needs to be undertaken in 1993. This study would emphasize institutionalizing a common methodology for projecting revenues within the key government entities mentioned. Such a model would begin to assist the Government of Kazakhstan and the donor agencies in developing a view of the likely revenues to be forthcoming from the petroleum and gas sector.

C. Natural Gas

Gas prices should be set to reflect both the full production cost of supply and its opportunity cost, based on import and export parity prices adjusted for transportation, and a realistic assessment of quality and regional price differentials. In Kazakhstan and throughout most of the FSU, accurate cost data are not available on which to base such inter-regional price comparisons. Another gas pricing principle concerns the objective of setting gas prices sufficiently high to encourage investment in gas processing facilities which will raise the market value of contaminated Kazakh gas so producers can gain better relative value for their gas exports. This price level is certainly well above the 300 R/mcm charged for domestic consumption in the fall of 1992, and also more than the 1600 R/mcm charged by Russia.

In the short term, price policy should focus on rationalizing internal price and transportation tariff relationships, creating price and tax incentives for investments in gas processing, pipeline transmission, distribution and gas storage, and related infrastructure, coupled with an overall gas resource development plan. Regional gas prices and tariffs should reflect the life cycle cost of new pipeline projects. Tariffs should be differentiated among customers based on the quality and consistency of the delivery service provided, so investment costs are fairly recouped among gas consumers. The GOK should begin to analyze variable rates, demand charges and other

contractual pricing or tariff structures to equitably spread the financing burden of new gas pipeline and field development projects.

Gas prices should generally be increased in line with crude oil prices, but with some lag allowed for gas, given its longer term project development and supply contract horizons. In addition, during the transition phase, the objective of achieving international price level equivalents should be established for gas' exportable surplus, but not immediately for indigenous gas supplies, given the undeveloped markets, lack of accurate rate-making procedures, and the need to develop a supply infrastructure and delivered price which allows for the full development of the indigenous market.

The "ramp" of natural gas price increases for exportable supplies, unlike crude oil's proposed "ramp" to world price equivalents, should take a concave shape, accelerating more rapidly as gas export capacity via new pipeline projects or Russian Gasprom system expansion comes to fruition in the 1995-1997 time frame. A representative "shape" of this curve would see gas export prices rising from a representative end-1992 level of 3,000 R/mcm to 6,000 R/mcm in 1993, 12,000 R/mcm in mid-1994, 20,000 R/mcm in mid 1995, and to an estimated world equivalent level of 25,000 R/mcm by mid-1996, assuming flat nominal world gas prices and a R/$ exchange rate of 600.

Technical experts should be assigned to Kazakhgaz to provide training in:

- The economics of international gas markets;
- Trends and practices in gas sales contracting;
- Gas pipeline tariffs and cost of service rate-making;
- Investment strategies for gas development plays.

A comprehensive feasibility study should be undertaken to develop an overall natural gas development plan for Kazakhstan over the next ten years. This study would focus on the projected development costs and infrastructure requirements for Kazakhstan to best integrate its domestic system with current inter-republic lines. The plan would include a detailed evaluation of potential gas demand, and the distribution and end-use technology necessary to achieve various gas consumption targets compatible with full cost recovery. The study would also focus on the expansion of the pipeline network, potential export markets for future gas production, and domestic resource development prospects. Other recommended studies include:

- An assessment of the market potential for domestic and foreign sales of Kazakh natural gas under alternative development plan assumptions;

- A preliminary study of natural gas tariff information support requirements, based on projected transmission and distribution investment and operating cost of service, the pricing constraints of competing fuels and export market alternatives for indigenous and imported gas supplies.

D. Coal

Coal prices were effectively decontrolled in the fall of 1992. Any effort to raise Kazakh prices above Russian levels would be constrained by both the allowable electricity tariffs in Russia, and by the comparative delivered cost of Russian coal, including Kuznets and Kansk-Achinsk grades. Efforts to increase movements of Kazakh coal to international markets would be constrained by rail capacity and tariffs. Any major effort to increase rail movements through Russia would likely stimulate a sizeable tariff increase. Domestically, because so much of the coal output is consumed by the electricity or district heat sectors, which in turn are largely residential, efforts to maintain subsidies for residential users would largely involve a transfer from general revenues to the coal production sector. While coal prices should be raised sufficiently to cover costs, and in the process reduce demand for the more inefficient incremental production, subsidization of this sector should not be necessary if low cost mines are effectively exploited. The policy of maintaining higher price levels to support marginal mines should be carefully assessed against the potential sector-specific and macro-economic damage accruing to key export sectors, such as steel and non-ferrous metals.

Coal will increasingly be a dual market, with higher value coking and low ash steam coal competing in Russia and as far as Eastern Europe, assuming rail rates remain comparatively low. Sufficient profitability exists among certain low cost mining operations to finance a next phase of development, and to pursue ash removal, blending and other cleaning processes to improve coal's longer-term position in the power and heat generation market. Relatively low cost steam coal will increasingly serve as a domestic "anchor" on fuel costs to the power and heat sectors, providing a modest measure of relative price stability as oil and gas prices lead the march to world standards. To continue to hold down average production costs, a degree of consolidation must occur. This may require restructuring of some of the less efficient coal enterprises, and specifically the shut-down or consolidation of high cost producers.

As with the oil and gas sectors, Kazakhstan's coal sector needs to engage in the selective upgrading of its raw material to produce a higher value finished product yielding positive economic returns within a reasonable time period. Coal washing, blending, storage facilities, mine development (e.g., at Shubarkol), and transportation infrastructure, as well as mine closing and relocation (including training) investments for displaced workers and equipment are some of the areas where economic returns could be demonstrated. However, to justify such investments, a functional cost accounting system must be in place and price, cost and operating assumptions on which investments are to be made must be reliable.

Coal prices should be based on principles of full cost recovery, including transportation and upgrading investments, but constrained by the netback price achievable in export markets, particularly the industrial and utility markets in Russia. Coal investment strategy should focus on low cost additions to the resource base, and the combined environmental, energy efficiency and export expansion returns from select coal upgrading investments. These include both large-scale mine-mouth washing and ash removal investments, and plant-level investments in benefaction technology. In this regard, coal pricing should eventually reflect the full cost of such treatment processes, and pricing and tax investment incentives should be provided to enterprises to encourage the acquisition of appropriate clean coal technology.

Recommended studies for the coal sector include:

- A complete examination of the export potential for Kazakhstan's indigenous coal supply, including coal netbacks and market alternatives outside of the traditional Russian destinations, and the potential return on alternative coal benefaction investments at the mine mouth or point of consumption; and

- A cost-of-service analysis for rail movements of coal and oil products, in order to more completely cost rail service and to make rational judgments on such critical issues as export potential and likely achievable netback prices, inter-fuel competition and inter-modal (e.g., rail vs. truck vs. pipeline) transportation infrastructure investment priorities for petroleum products.

E. Institutional Issues

The following broader institutional issues should also be incorporated in the recommendations to the Government of Kazakhstan:

- Establish reliable tax collection, administration, oversight and enforcement functions to prevent tax evasion.

- Address the payment arrears problem through a combination of creative banking and economic incentives. Fix wage or allowable price increases to enterprises on the condition of making late payments. Consider the use of external emergency funds and liquidity strategies, such as temporary injections of currency or energy reserve funds, to reduce the arrears backlog in advance of further price increases.

- Carefully scrutinize fuel price subsidy programs to be certain that incentives exist for consumers to increase fuel efficiency, in part by reducing subsidies over time, and providing tax or other incentives to ending dependence on fuel subsidies.

- Invest in metering systems, monitor consumption and create price incentives to promote energy conservation where greatest potential efficiency gains are identified, such as district heating systems and industrial facilities.

Most importantly, efforts should be made to initiate tariff, economic/financial and asset valuation studies to begin to better understand the costs of energy production, processing and transportation. This will enable energy officials to more accurately measure the incremental operating and fixed investment costs which energy price levels should recover. Western cost-recovery pricing procedures should begin to be taught and applied in a formal MIS reporting environment at the operating company and central ministerial levels.

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Appendix 1
Table 1

Crude Oil Prices, Taxes, and Transportation Expenses Associated with Kazakh and Russian Trade
(Prices and Taxes in R/ton, Vols. in 000 tons)
1992

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	expected Nov.-Dec.
I. Kazakh Crude Oil											
1.1 Price at the Wellhead	350					2200				3847	3847
1.2 Land Rental Tax										4553	4553
2.1 Price at Refinery (Refiner's Acqusition Cost)	350					2200				8400	8400
2.2 Total Taxes at Refinery											
2.3 Transportation Expenses From Wellhead to Refinery	53					100					
3.1 Export Price to Russia	350					2200				8400	
3.2 Taxes, Total	28%					28%					
4.1 Export Price to "World Market" (in $/mt)	127					127				127	
4.2 Taxes, Total ($/mt)											
II. Russian Crude Oil											
1.1 Price to Kazakh Refinery (Imported Acquisition Cost)	350					2200				*	
1.2 Total Taxes at Refinery											
1.3 Transportation Expenses (from Russia to Refinery)											

Source: Pricing Committee
Date: Oct. 1992
* Price not yet established

Crude Oil Producers Revenus and Cost Structure

(Projected 1993)

Producer:	Volume (000 tons)	Price (R/t)	Gross Revenues (Mln Rs)	Prod. Cost (Mln Rs)	Profits Tax (Mln Rs)	Rental Tax (Mln Rs)	VAT (Mln Rs)	Total Taxes (Mln Rs)
Mangistanmunaigas	11,370	8,400	95,508	38,785	2,565	28,135	18,325	49,025
Tengisneftegas	4,436	8,400	37,262	24,575	1,185	730	7,140	9,115
Aktyubinskneft	2,835	8,400	23,814	11,365	615	5,474	4,515	10,604
Emfaneft	1,500	8,400	12,600	5,525	335	3,450	2,285	6,070
Yuzhkazneft	1,559	8,400	13,096	3,255	1,190	2,960	2,215	6,365
Karachanbasteruneft	1,250	8,400	10,500	4,730	360	2,588	1,750	4,698
Total	22,950	8,400	192,780	88,235	6,250	43,397	36,230	24,918
Avg. Per Ton		8400		3,845	272	1,891	1,579	1,086
Karachaganakgasprom	4,300,000 (mcm)	180 (R/mcm)	570 (Mln Rs)					

Source: Ministry of Finance
Date: Jan. 1993

APPENDIX 1
Table 2b

Rent Payments on Oil, Including Gas Condensates

Name of Enterprise	In Rubles per 1 Ton
Producing association "Mangistaymynaigas"	4400
Producing association "Tengisneftigas"	4580
Producing association "Aktuibinskneft"	5170
Producing association "Embaneft"	5660
Producing association "Youzhkazneft"	3900
Experimental oil/gas mining management "Karazkhanbastermneft"	3750

Appendix 1
Table 3a

Prices & Taxes of Petroleum Products

(R/ton)

1992

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
I. Gasoline											(Agreed Prices)	
1.1 Ex-Tax Refinery Gate Price	724					5,063						24,151
1.2 Incl. VAT	927					6,481						30,913
2.1 Distribution Terminal Price (Ex-VAT)	1,084					7,968				23,651		35,893
2.2 VAT Component (@ 28%)												10,050
3.1 Local Station Price (R/ton)	1,170					10,198				30,595		45,943
(R/litre)	0.9					7.8				23.00		35.00
3.2 VAT Component (@ 28%)	327.6					2855.4				8,567		12,864
II. Diesel												
1.1 Ex-Tax Refinery Gate Price	558					3,625						22,636
1.2 Incl. VAT												28,974
2.1 Distribution Terminal Price (Ex-VAT)	653					5,985				21,660		32,847
2.2 VAT Component (@ 28%)												9,197
3.1 Local Station Price (R/ton)	952					7,760				23,280		42,044
(R/litre)	0.85					6.90				21.00		37.00
3.2 VAT Component (@ 28%)	267					2172.8				6,518		11,772
4.1 End-Use Price												32,847
4.2 Price Incl. VAT												42,044
III. Mazut (Fuel Oil) in R/ton												
1.1 Ex-Tax Refinery Gate Price	317					2,300				8,400		12,811
1.2 Incl. VAT												16,398
2.1 Distribution Terminal Price	412					3,350				10,825		15,804
2.2 VAT Component (@ 28%)												4,425
2.3 Price Incl. VAT												20,229
3.I Indus. & Comm. End-Use Price	412					3,350				10,825		15,804
3.2 Taxes, Total	28%					28%				28%		4,425
3.3 Price Incl. VAT												20,229

Source: Pr[illegible]ommittee and Kazakhnefteproduct Date: Dec. 1992

Refined Product Revenue Projections

(Volumes in 000 Metric Tons)

Export Sales:	To Russia:		Other CIS:		Non-CIS:		Transport & Storage	VAT	Currency Taxes	Profits Taxes	Customs Fee	Total Tax Revenues
	1991	1992	1991	1992	1991	1992	(MM Rs)	(R/ton)	(MM Rs)	(MM Rs)	(MM Rs)	(MM Rs)
Gasoline	32	9	815	400	37	10	3374	10050				
Aviation Gasoline												
Diesel Fuel	38	7	1152	460	190	57	2420	9197				
Mazut	443	219	723	561	5	208	1110	4425				
Total	513	235	2690	1421	232	275				1900*	1.2	96355.2*

Source: Kazakhnefteproduct
Date: Dec. 1992
* Sum of both domestic sales and export/import volumes

Oil Products Consumption, Imports and Taxes

Products	Domestic Consumption 1991 (mt)	Domestic Consumption 1992 (mt)	Imports: From Russia 1991 (mt)	Imports: From Russia 1992 (mt)	Other CIS 1991 (mt)	Other CIS 1992 (mt)	Domestic Prod. 1991 (mt)	Domestic Prod. 1992 (mt)	VAT (R/ton)	Profit Taxes (MMRs)	Employ. Tax (MMRs)	Pension Fund (MMRs)	Invest. Fund (MMRs)
Gasoline	4144	3448	1581	1024	38	4	2525	2420	10050				
Air Gasoline													
Diesel Fuel	6800	5673	2995	2014	279	5	3526	3654	9283				
Mazut	5970	5186	1341	941	258		4371	4245	4425				
Diesel Oil	153	115	137	110	16	5	0	0	13125				
Lubes	82	62	42	32	25	14	15	16	10937				
Bitumen	519	320	111	68			408	252	4156				
Total	17668	14804	6207	4189	616	28	10845	10587	78393	2936	75	9	1184

Source: Kazakhnefteproduct
Date: Dec. 1992
* Total Profits Tax includes all domestic and import/export volumes.

Prices, Taxes and Volumes: All Kazakhstan Refineries

(prices in R/mt: volumes in mt)

1992

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	expected Nov. – Dec.
1.1 Wellhead Price										3,847	3,847
1.2 Land Rental Tax										4,553	4,553
1.3 Crude Oil Price Delivered to Refinery (Refiners Acquisition Cost)	350					2,200				8,400	8,400
1.4 Value-Added Tax Component at Refinery Prior to Processing	28%					28%				28%	28%
1.5 Del. Price Incl. VAT	448					2,816				10,752	10,752
2.1 Ex-Tax Refinery Gate Gasoline Price	724					5,063					
2.2 Value-Added Tax Component	203					1,418					
2.3 Price Incl. VAT	927					6,481					
2.4 Ex-Tax Refinery Gate Diesel Price	558					3,625					
2.5 Value-Added Tax Component	156					1,015					
2.6 Price Incl. VAT	714					4,640					
2.7 Ex-Tax Refinery Gate Mazut Price	317					2,300					
2.8 Value-Added Tax Component	89					644					
2.9 Price Incl. VAT	406					2,944					
Units – Rubles/Metric Ton for all of Prior Series											
3.1 Volume of Crude Processed at Refinery											
3.2 Volume of Gasoline Produced at Refinery											
3.2 Volume of Diesel Produced at Refinery											
3.4 Volume of Mazut Produced at Refinery											
Units – Metric Tons for all of Volume Series											

Source: Pricing Committee
Date: Oct. 1992

Appendix 1
Table 4b

Kazakhstan

Refinery Process Capacities and Configuration

(Figures in thousand metric tons per year)

Refinery	Pavlodar		Chimkent		Atyrau (Guryev)	
	Present	After Ongoing Construction	Present	After Ongoing Construction	Present	After Proposed Construction
Refining Capacity	7,500	13,500	6,000	7,000	4,600	4,600
Year of Commissioning	1984	-	1978	-	1945	-
Processing Units:						
Fluid catalytic cracking	2,000	2,000	0	2,000	0	1,250
Catalytic reforming	1,000	1,200	1,000	1,000	360	360
Kerosene/diesel HDS	2,600	5,200	2,600	2,600	0	0
Vacuum gas oil HDS	2,000	2,250	0	0	0	0
Bitumen oxidation	500	500	0	0	0	200
Delayed coking	2,000	2,000	0	2,000	730	730
Crude processed	0.5% S	Russian	0.5% S and 0.1% S	Russian Kazakh	0.3% S (Mangystau)	Kazakh
Downstream Upgrading/ Distil. Capacity Ratio	1.35	0.97	0.60	1.09	0.24	0.55

Source: World Bank Energy Sector Review/Pavlodar and Chimkent Refineries
Date: December 1992

Prices, Taxes and Volumes at the Atyrao Refinery

(price in R/mt: volumes in mt)

1992

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov. – Dec.
1.1 Wellhead Price										3,847	
1.2 Land Rental Tax										4,553	
1.3 Crude Oil Price Delivered to Refinery (Refiners Acquisition Cost)	350					2,200				8,400	
1.4 Value-Added Tax Component at Refinery Prior to Processing	28%					28%				28%	
1.5 Price Incl. VAT	448					2,816				10,752	
2.1 Ex-Tax Refinery Gate Gasoline Price	724					5,063				15,000	
2.2 Value-Added Tax Component	203					1,418				4,200	
2.3 Price Incl. VAT	927					6,481				19,200	
2.4 Ex-Tax Refinery Gate Diesel Price	558					3,625				11,000	
2.5 Value-Added Tax Component	156					1,015				3,080	
2.6 Price Incl. VAT	714					4,640				14,080	
2.7 Ex-Tax Refinery Gate Mazut Price	317					2,300				8,400	
2.8 Value-Added Tax Component	89					644				2,352	
2.9 Price Incl. VAT	406					2,944				10,752	
Units – Rubles/Metric Ton for all of Prior Series											
3.1 Volume of Crude Processed at Refinery											
3.2 Volume of Gasoline Produced at Refinery											
3.3 Volume of Diesel Produced at Refinery											
3.4 Volume of Mazut Produced at Refinery											
Units – Metric Tons for all of Volume Series											

Source: Pricing Committee
Date: Oct. 1992

Prices, Taxes and Volumes: Chimkent Refinery

(prices in R/mt: volumes in mt)

1992

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov. – Dec.
1.1 Wellhead Price										3,847	3,847
1.2 Land Rental Tax										4,553	4,553
1.3 Crude Oil Price Delivered to Refinery (Refiners Acquisition Cost)	350					2,200				8,400	8400
1.4 Tax Component at Refinery Prior to Processing	28%					28%				28%	4,553 28%
1.5 Price Incl. VAT	448					2816				10,752	10,752
2.1 Ex–Tax Refinery Gate Gasoline Price	724					5,063				17,383	
2.2 Value–Added Tax Component	203					1,418				4,867	
2.3 Price Incl. VAT	927					6,481				22,250	
2.4 Ex–Tax Refinery Gate Diesel Price	558					3,625				16,433	
2.5 Value–Added Tax Component	156					1,015				4,601	
2.6 Price Incl. VAT	714					4,640				21,034	
2.7 Ex–Tax Refinery Gate Mazut Price	317					2,300				8,400	
2.8 Value–Added Tax Component	89					644				2,352	
2.9 Price Incl. VAT	406					2,944				10,752	
Units – Rubles/Metric Ton for ail of Prior Series											
3.1 Volume of Crude Processed at Refinery											
3.2 Volume of Gasoline Produced at Refinery											
3.3 Volume of Diesel Produced at Refinery											
3.4 Volume of Mazut Produced at Refinery											
Units – Metric Tons for all of Volume Series											

Source: Pricing Committee
Date: Oct. 1992

Prices, Taxes and Volumes: Pavlodar Refinery

(prices in R/mt: volumes in mt)

1992

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov. – Dec.
1.1 Wellhead Price										3,847	
1.2 Land Rental Tax										4,553	
1.3 Crude Oil Price Delivered to Refinery (Refiners Acquisition Cost)	350					2,200				8,400	
1.4 Tax Component at Refinery Prior to Processing	28%					28%				4,553 28%	
1.5 Del. Price Incl. VAT	448					2,816				10,752	
2.1 Ex–Tax Refinery Gate Gasoline Price	724					5,063				16,350	
2.2 Value–Added Tax Component	203					1,418				4,578	
2.3 Price Incl. VAT	927					6,481				20,928	
2.4 Ex–Tax Refinery Gate Diesel Price	558					3,625				13,100	
2.5 Value–Added Tax Component	156					1,015				3,668	
2.6 Price Incl. VAT	714					4,640				16,768	
2.7 Ex–Tax Refinery Gate Mazut Price	317					2,300				7,500	
2.8 Tax Component	89										
2.9 Price Incl. VAT	406										
Units – Rubles/Metric Ton for all of Prior Series											
3.1 Volume of Crude Processed at Refinery											
3.2 Volume of Gasoline Produced at Refinery											
3.3 Volume of Diesel Produced at Refinery											
3.4 Volume of Mazut Produced at Refinery											
Units – Metric Tons for all of Volume Series											

Source: Pricing Committee
Date: Oct. 1992

Prices, Taxes and Transportation Expenses Associated with Kazakh and Russian Natural Gas

(R/mcm)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	expected Nov. – Dec.
I. Kazakh Natural Gas											
1.1 Price at the Wellhead	75					190				190	
1.2 Taxes – Total at Wellhead											
2.1 Selling Price to LDC											
2.2 Taxes – Total at LDC's											
2.3 Transportation Expenses from wellhead to LDCs											
3.1 Export Price to Russia											
3.2 Taxes, Total											
4.1 Export Price to "World Market"											
4.2 Taxes, Total											
II. Russian Natural Gas											
1.1. Purchase Price at the Border of Kazak	75					1,600				1,600	
1.2. Taxes, Total – Purchase Price	28%					28%				28%	
2.1 Selling Price to LDC's	200					2,770				2,770	
2.2 Taxes, Total – at LDC's											
2.3 Transportation Expenses Included in Selling Price						1,100				1,100	

Source: Pricing Committee
Date: Oct. 1992

Prices, Taxes and Transportation Expenses Associated with Kazakh and Russian Natural Gas

(R/mcm)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	expected Nov. – Dec.
I. Kazakh Natural Gas											
1.1 Price at the Wellhead	211	211	211	256	256	2048	2048	2048	2048	2048	2048
1.2 Taxes – Total at Wellhead	62.2	62.2	62.2	75.5	75.5	604.2	604.2	604.2	604.2	604.2	604.2
2.1 Selling Price to LDC	256	256	858	858	858	3545	3545	3545	3545	3545	3545
2.2 Taxes – Total at LDC's	75.5	75.5	253.1	253.1	253.1	1045.7	1045.7	1045.7	1045.7	1045.7	1045.7
2.3 Transportation Expenses from wellhead to LDCs											
3.1 Export Price to Russia	96	96	96	96	96	243.2	243.2	243.2	243.2	243.2	243.2
3.2 Taxes, Total	28.3	28.3	28.3	28.3	28.3	71.7	71.7	71.7	71.7	71.7	71.7
4.1 Export Price to "World Market"											
4.2 Taxes, Total											
II. Russian Natural Gas											
1.1. Purchase Price at the Border	165	165	165	1,400	1,400	1,600	1,600	1,600	1,600	1,600	3,500
1.2. Taxes as % Purchase Price											
2.1 Selling Price to LDC's											
2.2 Taxes, Total – at LDC's											
2.3 Transportation Expenses Included in Selling Price											

Source: Kazakhgas
Date: Jan. 1993

Natural Gas Projections
(bcm)

	1992	1993	1994	1995	2000
Prod. in Republic	5.5	6.2	6.2	6.2	10
Imports:					
Russia	1.4	1.7	1.7	1.7	1.7
Turkmenistan	8.5	4.2	4.5	4.5	6
Uzbekistan	2.7	7.2	7.7	8.2	8.5
Exports					
Russia	3.9	4.3	4.3	3.5	0
Other CIS					
Non-CIS					
Consumption	11	14.9	16.7	19	26

Source: Kazakhgas
Date: Jan. 1993

Natural Gas* : Prices, Volumes and Taxes **

(R/mcm – except where noted)

	Volumes (000cm)	Transport Cost	VAT Cost	Land Tax	Pension & E.Fund Tax	Curr. Tax	Profits Tax	Bonus Tax	Rental Tax	Total Taxes	Consumer or Border Price	Wellhead Netback	Prod. Cost	Tax Rev.
Domestic (Consumption)	11,066,796	161.28	35.28	0.1	1.67		9.45			46.5	3545		2740	
Russia (Export)	3,915,000										190			
Other CIS														
Non-CIS														
Total														

** Volumes as total estimated 1992: Prices and Taxes effective Dec. 1992

* Separately for each major production association

Natural Gas Consumption

By sector:	Wholesale Price	Dist. Margin	VAT	Total Tax	Cons. Price	Tax Rev.
Power						
Industrial						
Commercial						
Social/Public						
Residential						

Source: Kazakhgas

Date: Jan. 1993

Appendix 1
Table 18

Summary Coal Statistics

	1991	1992
Consumption within the Republic: (million tons)		
Total	84.80	83.53
Power	48.47	49.60
Household	8.53	7.89
Other	27.80	26.05
Total Exports from the Republic (million tons)	51.17	43.30
Non-CIS	0.79	0.81
Imports (million tons)	9.41	4.38
Production (million tons)		
Total	126.56	122.46
Karaganda Deposit	42.57	40.33
Ekibastus Deposit	83.32	81.18
Other Deposits	0.66	0.95
Production Cost: R/Tons		
Karaganda Deposit	33.07	530.20
Ekibastus Deposit	4.18	134.25
VAT (million roubles)		
Karaganda Deposit	55.10	3833.00
Ekibastus Deposit	19.95	1212.58
Land Tax (million/roubles)		
Karaganda Deposit		200.00
Ekibastus Deposit		950.00
Other Taxes (million/roubles)		
Karaganda Deposit	227.00	2214.00
Ekibastus Deposit	33.43	404.16
Mine-mouth Price (R/Ton)* (roubles/ton)		
Karaganda Deposit	33.40	1030.00
Ekibastus Deposit	7.21	355.10

Source: Ministry of Energy & Fuel Resources

Date: Dec. 1992

Established Price Level for Fuel (Coal, Mazut & Gas) to a Consumer Power Plant

	Eff. Jan. 3, 1992	Eff. From Jan. 3, 1992	Eff. From June 1, 1992	Eff. End of 1992
Coal Total (R/ton):	16.95	119.65	915.23	1099.42
Karaganda deposit	30.88	235.00	1577.00	1842.00
Ekibastus deposit	6.30	31.50	409.50	717.00
Mazut (R/ton)	413.00	–	3350.00	16286.00
Gas from Turkmengasprom (R/mcm)	705.00	–	801.00	3500.00
Gas from Turkmenneft (R/mcm)	566.00	–	680.00	1600.00
Gas from Uzbehgasprom (R/mcm)	683.00	–	739.00	1600.00

Source: State Economic Committee
Date: Dec. 1992

Appendix 1
Table 20

To the Utility Electric Power and Thermal Market
1992

Type of Energy		Consumption (000 Tons) (or Rs/mcm)	FOB Fuel Price (R/Ton) (or Rs/mcm)	Fuel Costs (000 Rs)	Fuel Trans. Cost (R/Ton)	Railroad Trans. Costs (000 Rs)	Fuel Costs Plant Gate (R/Tons) (or Rs/mcm)
Karaganda Coal (import)		2389.80	359.57	859311.00	57.36	137091.00	416.93
	Quarter						
	1st	652.10	117.79	76809.00	27.74	18088.00	145.53
	2nd	499.40	217.12	108428.00	43.34	21645.00	260.46
	3rd	483.20	529.75	255975.00	47.78	23086.00	577.53
	4th	755.10	553.70	418099.00	98.36	74272.00	652.06
Shubarkol Coal	1992	1047.20	401.75	420721.00	131.76	137983.00	533.52
	1st	304.20	121.42	36935.00	63.76	19395.00	185.18
	2nd	214.20	277.39	59418.00	96.03	20570.00	373.42
	3rd	157.20	635.40	99885.00	105.44	16575.00	740.84
	4th	371.60	604.10	224483.00	219.17	81443.00	823.27
Borlinsky Coal	1992	3348.50	341.90	1144883.00	52.53	175899.00	394.43
	1st	1124.20	122.87	138133.00	26.89	30225.00	149.76
	2nd	714.90	260.78	186431.00	43.62	31186.00	304.40
	3rd	644.50	529.75	341424.00	48.83	31473.00	578.58
	4th	864.90	553.70	478895.00	95.98	83015.00	649.68
Karaganda	1992	970.70	0.52	1883.00	436.87	13028.00	783.37
By-Product	1st	348.20	0.52	673.00	179.63	4148.00	227.68
	2nd	179.80	0.51	351.00	312.37	1569.00	668.93
	3rd	182.50	0.51	360.00	676.00	2196.00	1533.91
	4th	260.20	0.52	499.00	706.42	5115.00	1947.14
Shlam	1992	418.60	311.71	130482.00	100.86	42220.00	412.57
	1st						
	2nd	127.00	169.61	21541.00	66.67	8467.00	236.28

	3rd	167.90	366.60	61552.00	55.21	9269.00	421.81
	4th	123.70	383.10	47389.00	197.93	24484.00	581.03
Karaganda	1992	1883.00	438.87	826399.00	22.09	41614.00	460.97
Indus. By-Product	1st	673.00	179.63	120894.00	11.73	7892.00	191.36
	2nd	351.00	312.37	109642.00	16.98	5960.00	329.35
	3rd	360.00	676.00	243360.00	16.35	5886.00	692.35
	4th	499.00	706.42	352503.00	43.84	21876.00	750.26
Kuznets Coal	1992	1000.00	646.56	646568.00	53.25	53252.00	699.82
(Russia)	1st	622.20	130.85	81415.00	42.80	26630.00	173.65
	2nd	106.50	493.08	52513.00	63.94	6810.00	557.02
	3rd	74.90	1600.00	119840.00	42.36	3173.00	1642.36
	4th	196.40	2000.00	398800.00	84.72	16639.00	2084.72
Maikjuben Coal	1992	604.00	554.02	334631.00	159.89	96576.00	713.91
	1st	80.00	150.07	12006.00	70.00	5600.00	220.08
	2nd	147.60	276.59	40825.00	105.59	15585.00	382.18
	3rd	104.00	679.71	70690.00	116.20	12085.00	795.91
	4th	272.40	775.00	211110.00	232.40	63306.00	1007.40
Ekibastuz Coal	1992	40038.40	340.52	13644448.00	29.85	1196126.00	370.38
	1st	11811.10	50.93	601535.00	16.70	197279.00	67.63
	2nd	8538.50	177.56	1516069.00	20.92	178590.00	198.48
	3rd	8492.80	409.50	3477802.00	25.20	213982.00	434.70
	4th	11226.00	717.00	8049042.00	54.01	606275.00	771.01
Central Asian	1992	953.20	653.94	623345.00	94.67	90243.00	748.62
Coal	1st	331.10	301.66	99880.00	37.27	12340.00	338.93
	2nd	188.00	307.57	57823.00	50.43	9481.00	358.00
	3rd	140.30	806.00	113082.00	94.00	13188.00	900.00
	4th	293.80	1200.00	352560.00	188.00	55234.00	1388.00
Mazut	1992	2935.00	4747.98	13935329.00			4747.98
	1st	1217.60	604.39	735905.00			604.39
	2nd	363.60	1238.13	450184.00			1238.13
	3rd	263.70	2875.01	758140.00			2875.01
	4th	1090.10	11000.00	11991100.00			11000.00

Gas	1992	4050.40	2350.69	9521259.00		2350.69
	1st	1173.20	677.82	795224.00		677.82
	2nd	1108.30	1570.04	1740070.00		1570.04
	3rd	787.50	3450.00	2716875.00		3450.00
	4th	981.40	4350.00	4269090.00		4350.00
Oil	1992	0.50	3786.00	1893.00		3786.00
	1st	0.30	710.00	213.00		710.00
	2nd					
	3rd					
	4th	0.20	8400.00	1680.00		8400.00
Diesel Fuel	1992	0.30	20000.00	6000.00		20000.00
	1st					
	2nd					
	3rd					
	4th	0.30	20000.00	6000.00		20000.00
Total	1992			42585245.00	1984032.00	
	1st			2775309.00	321597.00	
	2nd			4391595.00	299863.00	
	3rd			8417490.00	330913.00	
	4th			27000901.00	1031659.00	
For Electric Energy Production	1992					
	1st					
	2nd					
	3rd					
	4th					
For Thermal Energy Production	1992 r.					
	1st					
	2nd					
	3rd					
	4th					

Source: Ministry of Energy and Fuel Resources
Date: Dec. 1992

Crude Oil Pipeline Tariffs
Siberia–Pavlodar
(R/ton)

effective: Nov. 1, 1992

	Route:	Tariff	VAT	Tariff + VAT
1.	Tyumen–Omsk	252.55	70.71	323.26
2.	Omsk – Priirtishsk (@ Kazakhstan border)	32.34	9.05	41.39
3.	Priirtishsk – Pavlodar	40.68	11.39	52.07
	Total	325.57	91.15	416.72

Source: Pavlodar Refinery, Economics Dept.
Date: Dec. 1992

Appendix 1
Table 24

Transportation Expenses for Petroleum Products

Form of Transportation	Rubles per ton
Railway	563.9
Trucks	793
Pipeline	392.7
Barges	1,267.2

Source: Kazhneftеproduct

Date: January 1993

Appendix 1
Table 25

Tariffs for Oil Pumping, Transportation and Loading

Number	Segment	Tariffs in rubles/1 ton
1	Uzen-Atirau	273.72
2	Uzen-ANPZ	288.83
3	Zhetibai-Uzen	28.05
4	Kalamkas-Karazhanbas	25.35
5	Karazhanbas-Aktau	82.59
6	Aktau-Zhetibai	29.85
7	Koschagil-Kulsari-Atirau	77.69
8	Karaton-Koschagil	23.71
9	Tengis-Karaton	11.45
10	Sarikamis-Tengis	12.27
11	Tengis-Aktau	83.41
12	Tengis-ANPZ	83.42
13	NPSZ-Koschagil	48.66
14	Atirau Km No. 1218	218.75
15	Atirau-ANPZ	18.81
16	Martishi-Atirau	35.00
17	Atirau-Km No. 474	193.80
18	Zaburunye-Astrakhan	76.87
19	Zaburunye-Atirau	76.05
20	Dossor-Makat	14.02
21	Komsomolsk-Makat	19.46
22	Iskene-Estakada	7.69
23	Atirau-Bolshoi Chagan	183.58
24	Atirau-Isherskaya	334.05
25	Korsak-Atirau	45.38
26	Kalamkas-Aktau	108.02
27	Zhetibai-Aktau	26.58

Number	Segment	Tariffs in rubles/1 ton
28	Munaili-Kulsari	18.81
29	Kulsari-Koschagil	16.35
30	Atirau-Km No. 905	90.77
31	Km No. 905 - Km No. 1218	127.98

APPENDIX 2

Tables Furnished by World Bank Staff

Table 1. Kazakhstan Oil Balance
Table 2. Balance of Oil and Condensates
Table 3. World Bank Oil Price Forecast Assumptions for Kazakhstan CEM
Table 4. Crude Oil Supplies
Table 5. Production Oil and Condensates
Table 6. Crude Oil Exports
Table 7. Refined Product Supply Balances
Table 8. Refined Product Import/Export Balances
Table 9. Sectoral Consumption of Petroleum Products
Table 10. Natural Gas Production

Kazakhstan Oil Balance

	1990	1991	1992
Oil Prod.	25.6	26.6	25.7
Crude Imports	13.0	11.2	11.3
Refined Prod. Imports:			
– gasoline	2.2	1.7	1.0
– diesel fuel	3.7	3.2	1.9
– fuel oil	1.7	1.6	1.2
– other	0.5	0.4	0.2
Total oil prod. imports	8.1	6.9	4.2
Total Oil Imports	21.1	18.1	15.5
Crude Oil Exports			
– CIS	20.4	20.7	16.2
– ROW	0.0	0.0	6.0
Total crude oil exports	20.4	20.7	22.2
Refined Product Exports			
– gasoline	1.3	0.9	
– diesel fuel	1.1	1.1	
– fuel oil	1.5	0.9	
– other	0.1	0.0	
Total oil prod. exports	3.9	2.9	1.4
Total Oil Exports	24.3	23.6	23.6
Net Oil Exports			
– crude oil	7.4	9.5	10.9
– refined products	-4.2	-4.0	-2.8
Total Net Oil Exports	3.2	5.5	8.1
Refinery Losses	2.8	2.7	2.0
Domestic Consumption	19.6	18.3	15.6

Balance of Oil and Condensates

(Mt)

	Expected 1992	Forecast: 1993	1994	1995	2000
1. Total Production	26.0	27.5	30.5	33.5	51.4
Of Which Condensates	3.8	4.0	4.5	5.4	9.5
2. Oil Imports from CIS for Pavlodar & Chimkent	13.0	12.1	14.3	16.4	
Total Oil Resource	39.0	39.6	44.0	49.9	51.4
1. Supplies for Domestic Refineries	17.6	18.3	21.1	26.5	40.0
Supplies for Export (Crude & Product)	21.0	20.9	23.3	23.0	11.0
– to CIS	14.6	13.7	14.3	16.4	
of which crude	13.0	12.1	14.3	16.4	
of which product	1.6	1.6			
– to outside CIS	6.4	7.2	9.0	6.6	11.0
Kazakhstan share	6.2	5.2	5.9	3.2	5.8
foreign share	0.2	2.0	3.1	3.4	5.2
losses	0.4	0.4	0.4	0.4	0.4

Source: Draft Status Report, Ministry of Energy and Fuels Resources

World Bank Oil Price Forecast Assumptions for Kazakhstan CEM

Year:	91	92	93	94	95	96	97	98	99	2000
FSU:										
Rub/mt	80	4000	16800	130000	130000	130000	130000	130000	130000	130000
$/mt	0.8	40	77	105	122	126	130	133	137	141
ROW										
$/mt	108	111	115	118	122	126	130	1333	137	141
$/bbl.	14.6	15	15.5	16	16.5	17	17.5	18	18.5	19
Exchange Rate										
Rub/$	1.75	100	218.9	283.5	310.1	323.2	323.2	323.2	323.2	323.2

Appendix 2
Table 4

Crude Oil Supplies
(000 tons)

	September 1992						Total 9 Months 1992					
	Total:		State Order:		Direct Contract		Total:		State Order:		Direct Contracts:	
	Plan	Actual	Plan	Actua	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
I. Total in Country	1915	1754	1332	1333	582	421.	16415	15774	11901	11520	4514	4254
Kazakh	420	415.7	420	415.	0	0	3918	4022	3918	3950	0	72
Russian	604.4	803.5	482.2	767	121.6	36	6813	6942	5386	6494	1428	448
Azerbaijan	107.4	33	62.4	0	45	33	978	430	583	0	395	430
Export (ex CIS)	783	461	368	150	415.1	311	4706	3667	2015	1075	2691	2592
Other	0	40	0	0	0	40	0	712	0	0	0	712
II. Manguishlakneft Total	1022	894.7	786	756.	236	138.	8785	8603	6566	6533	2222	2070
Kazakh	310	268	310	268	0	0	2890	2914	2890	2914	0	0
Russian	425	438	306	438	119	0	3458	3511	2430.	3295	1027	216
Azerbaijan	35	19	0	0	35	19	345	278	0	0	345	278
Export (ex CIS)	251	169	170	50	81	119	2094	1662	1245	323	848.	1339
Other	0	0	0	0	0	0	0	237	0	0	0	237
III Embaneft Total	120	128.6	87	62	33	67	1079.	1121	808.3	814	271.	307
Kazakh	53	59	53	59	0	0	513.3	529	513.3	529	0	0
Russian	13	3	13	3	0	0	175	181	175	156	0	25
Azerbaijan	43	52	20	0	23	52	341.3	371	120	129	221.	242
Export (ex CIS)	0	15	0	0	0	15	0	15	0	0	0	15
Other	10	0	0	0	10	0	50	25	0	0	50	25
IV Aktiubinskneft Total	221	206	161	186	60	20	2008	1942.	1338	1762.	670	180
Russia	121	206	121	186	0	20	1598	1662.	1298	1642.	300	20
Export	100	0	40	0	60	0	410	280	40	120	370	160
V. Tenguisneftegas Total	328	338.5	152	190	176	149	2697.	2528	1826	1667	871.	861
Russia	40	106.5	40	90	0	15	1482	1437	1482	1350	0	87
Export	284	217	108	100	176	117	1191	857	320	301	871.	556
Others	0	15	0	0	0	15	0	217.7	0	0	0	217.7
Kazakhstan	4	0	4	0	0	0	24	15.7	24	15.7	0	0
VI Yuzkneftegas Total	106	111.7	54	88.7	52	23	875	832.7	630	662.7	245	170
Kazakhstan	54	88.7	54	88.7	0	0	490	517.7	490	490.7	0	27
Export	50	23	0	0	50	23	370	315	140	172	230	143
Russia	0	0	0	0	2	0	15	0	0	0	15	0

Appendix 2
Table 4

VI	Karambastemneft Total	117	74	92	50	25	24	968	746	733	80	235	666
	Russia	0	50	0	50	0	0	85	150	0	50	85	100
	Azerbaijan	62	14	62	0	0	14	583	127	583	0	0	127
	Export	55	0	30	0	25	0	300	182	150	30	150	152
	Others	0	10	0	0	0	10	0	242	0	0	0	242
	Kazakhstan	0	0	0	0	0	0	0	45	0	0	0	45
VI	Imports from Russia	977	993.3	977	968.	0	24.8	9680	8506	6908	7033	2777	1473
	to Pavlodar	576	558.2	576	558.	0	0	5360	4863	4288	4022	1072	841
IX	Joint Venture with to Chimkent	401	435.1	401	410.	0	24.8	4320	3643	2620	3011	1700	632
	Kazpromstavba Total	0	0.1	0	0	0	0.1	0	146.3	0	0	0	146.3
	Russia	0	0	0	0	0	0	0	20	0	0	0	20
	Export	0	0	0	0	0	0	0	111.5	0	0	0	111.5
	Kazakhstan	0	0.1	0	0	0	0.1	0	14.8	0	0	0	14.8

Production of Oil & Condensates

(000 mt)

	actual 1991	planned 1992	forecast: 1993	1994	1995	2000
Total (?)	26533.4	26021.3	27477	30501	33520	51426
Manguishlakneft	13182	11725.3	11370	10944	10909	13237
Embaneft	1559.4	1550	1600	1700	1800	1503
Aktuibinskneft	2773.9	2750	2805	2877	3156	3623
Tenguisneftegas	2332.7	3718	4516	6745	6992	15060
Tenguis	1319.9	2900	3650	5800	6000	13560
Yuhzkazneftegas	1169.2	1240	1870	2300	3413	3915
Karazhanbastermneft	1100.4	1040	1050	1070	1100	1630
Kazneftebitum	0	0	15	25	50	478
Karachaganakgasprom	4515.8	3000	4000	4500	5400	9500
joint ventures	0	190	251	340	700	2480
	27953.3	28113.3	31127	36301	39520	64986

Crude Oil Exports
(000 mt)
First 9 Months 1992

Supplier:	Plan 1992	Actual 1992	Plan 1st 9 mos.	Actual 1st 9 mos.	Plan 4th Qt. '92	
Manguishakneft	1850	770	1500	1449.1	1662	
Embaneft	260	67	221	229.3	371	
Autiubinskneft	370	148	370	278.1	780	
Tenguizneftgas	1000	230	871	727.7	857	
Yulikazneftgas	290	152	230	302.5	315	
Karazbanbastermneft	150	225	150	152.5	182	
Sub-total Kazakhstanmunaigas	3920	1592	3342	3139.2	3667	(?)
Business Centre Mangistau	150	149	150	84.4		
Kuzintorg	2000	420	2000	831		
Kazmetallexport	0	60	0	300		
Sub-total	6070	2221	5492	4354.6		
Joint Venture Kazpromstarba	235	65	150	144.3	146.3	
Total	6305	2286	5642	4499		

Refined Product Import/Export Balances with Russia...1st 9 months of year only

(000 tons)

	Imports from Russia		Exports to Russia		Supplies to Consumers		Percent Russian Imports	
	1991	1992	1991	1992	1991	1992	1991	1992
Gasoline	1317.3	751.6	28.3	26.5	3269.3	2823.8	40.3	26.6
Diesel Fuel	2418.3	1389	32	25.5	5348.7	4678.4	45.2	29.7
Mazut	939.4	696.4	352.2	218.6	4439	3646.8	21.2	19.1
Total (1st 9 Months)	4675	2837	412.5	270.6	13057	11149		
Net Imports from Russian Federation	4262.5	2566.4						

Sectoral Consumption of Petroleum Products
First 9 Months 1991 vs. 1992

	Gasoline		Diesel Fuel		Mazut		Total	
	1991	1992	1991	1992	1991	1992	1991	1992
Agriculture	1647.8	1552.2	2685.4	2629.2	0	0	4333.2	4181.4
Min. of Auto	512.6	439.6	535.6	446.6	0	0	1048.2	886.2
Rail Transport	0	0	1075.1	803.2	0	0	1075.1	803.2
Health Care	32.3	33.2	0	0	0	0	32.3	33.2
Min. of Energy	0	0	0	0	1988.6	1630.2	1988.6	1630.2
Other	1076.6	798.8	1052.6	799.4	2451.2	2016.6	4580.4	3614.8
Other (?)								
Total	3269.3	2823.8	5348.7	4678.4	4439.8	3646.8	13057.8	11149

Source: Kazakhnefteproduct

Natural Gas Production

(mcm)

	actual 1991	planned 1992	forecast: 1993	1994	1995	2000
Total	7884.9	8084.8	9331.8	11009.7	16119	27014
Manguishlakneft	2713.2	2469.4	2917.8	3788.7	4985.8	7080
Embaneft	21.7	24	24	244	24	24
Aktiubinskneft	229.4	224.4	240	247	2550	3050
Tenguizneftegas	661.6	1417	2100	2400	3000	6000
Yuzhkazneftegas	51	50	50	50	60	260
Karachaganakprom	4208	3900	4000	4500	5500	9800
Dry Production (?)	1481.4	2136	2837.8	3125.7	4516.8	8624
Manguishlakneft	517.7	421.4	423	404.7	382.8	490
Embaneft	21.7	24	24	24	24	24
Aktiubinskneft	229.4	224.4	240	247	1050	1050
Tenguizneftegas	661.6	1417	2100	2400	3000	6000
Yuzhkazneftegas	51	50	50	50	60	260
Wet Production (?)	6403.5	5948	6494	7884	11603	18390
Manguishlakneft	2195.5	2048	2494	3304	4603	6590
Aktiubinskneft	0	0	0	0	1500	2000
Karachaganakprom	4208	3900	4000	4500	5500	9800

Source: Draft Status Report, Ministry of Energy and Fuels Resources

APPENDIX 3

Assay Tables Completed for Preliminary Report

Table 1. Quality Certificate Crude Oil Western Siberian Deposit
Table 2. Quality Certificate Crude Oil Kumkol Deposit
Table 3. Quality Certificate Straight-Run Petrol Produced by Chimkent Refinery
Table 4. Quality Certificate Pure Summer Diesel Fuel Produced by Chimkent Refinery
Table 5. Quality Certificate Fuel Oil Mazut Produced by Chimkent Refinery

Appendix 3
Table 1

Quality Certificate
Crude Oil
Western Siberian Deposit

Density 37.8° API

No.	Quality Indices	Unit of Measurement	Crude Oil	Gas C1-C4	Gasoline	Kerosene	Diesel Fuel	Mazut
1	2	3	4	5	6	7	8	9
1	Distillation acc. to ITK? yield	% mass		1.4	22.44	25.42	32.06	43.75
2	Density	g/cm^3	0.8358	-	0.728	0.787	0.839	0.934
3	Total sulphur	% mass	0.42	-	0.01	0.02	0.2	0.9
4	Sour sulphur	ppm	-	-	-	N/A	-	-
5	Och?		-	-	54	-	-	-
6	Congelation temperature	C°	-17	-	-	-	-14	+19
7	Cloud temperature	C°	-	-	-	-	-3	-
8	Solidification Temperature	C°	-	-	-	-55	-	-
9	Aromatics	%	-	-	8.5	16	-	-
10	Paraffins	%	-	-	54	-	-	-
11	Naphthenes	%	-	-	37.5	-	-	-
12	Color		-	-	-	-	0.5	-
13	Resins	$\frac{mg}{100\ cm^3}$			N/A	N/A	5.0	
14	Aniline point	%	-	-	-	63.9	-	-

No.	Quality Indices	Unit of Measurement	Crude Oil	Gas C-C	Gasoline	Kerosene	Diesel Fuel	Mazut
1	2	3	4	5	6	7	8	9
15	Diesel index		-	-	-	-	59	-
16	Viscosity 20 C° 50 C°	 Centistokes Centistokes	 6.73 3.67	 - -	 - -	 1.38 -	 4.94 -	 - -
17	Acidity	mg conc. / 100 cm^3	0.78	-	N/A	0.49	0.17	-
18	Coking capacity	%	2.87	-	-	-	-	7.34
19	VNP	mm	-	-	-	25.5	-	-
20	Relative Viscosity 80 °C	degree relative viscosity	-	-	-	-	-	5.0
	Corresponding kinematic viscosity	centistokes	-	-	-	-	-	36.0
21	Asphaltenes	%	-	-	-	-	-	-
22	Vanadium	ppm	-	-	-	-	-	-
23	Nickel	ppm	-	-	-	-	-	-

Source: Chimkent Refinery
Date: Dec. 1992

Appendix 3
Table 2

Quality Certificate
Crude Oil
Kumkol Deposit

Density 42.5° API

No.	Quality Indices	Unit of Measurement	Crude Oil	Gas C-C	Gasoline 62-180 °C	Kerosene 120-240 °C	Diesel Fuel 180-350 °C	Mazut 350 °C
1	2	3	4	5	6	7	8	9
1	Distillation acc. to ITK? yield	% mass		1.7	24.0	18.5	29.6	44.4
2	Density	g/cm³	0.813	-	0.729	0.7742	0.8093	0.9048
3	Total sulphur	% mass	0.07	-	0.007	0.023	0.037	0.16
4	Sour sulphur	ppm	-	-	-	N/A	N/A	-
5	Octane number (motor method)		-	-	56	-	-	-
6	Flash point - in open crucible - in closed crucible	 °C °C	 15 -35	 - -	 - -	 - 28	 84 -	 237 -
7	Congelation temperature	°C	10	-	-	-	-3	+40
8	Cloud temperature	°C	-	-	-	-	0	-
9	Solidification temperature	°C	-	-	-	-48	-	-
10	Aromatics	%	-	-	8.1	22	-	-
11	Paraffins	%	-	-	30.9	-	-	-
12	Naphthenes	%	-	-	61.0	-	-	-

Table 2

No.	Quality Indices	Unit of Measurement	Crude Oil	Gas C-C	Gasoline 62-180 °C	Kerosene 120-240 °C	Diesel Fuel 180-350 °C	Mazut 350 °C
1	2	3	4	5	6	7	8	9
13	Resins	$\frac{\text{mg conc.}}{100\ cm^3}$	-	-	-	-	-	-
14	Aniline point	°C	-	-	-	65	-	-
15	Cetane number	-	-	-	-	-	62	-
16	Kinematic viscosity 20 °C 30 °C 50 °C	 Centistokes Centistokes Centistokes	 - 7.14 3.71	 - - -	 - - -	 1.41 - -	 4.16 - -	 - - -
17	Acidity	$\frac{\text{mg conc.}}{100\ cm^3}$	-	-	0.27	0.7	1.13	-
18	Coking capacity	%	1.08	-	-	-	-	2.32
19	Non-smoky flame height	mm	-	-	-	29.1	-	-
20	Relative Viscosity 50 °C 80 °C	 Engler degree	 1.28 -	 - -	 - -	 - -	 - -	 - 3.34
	Corresponding kinematic viscosity	centistokes	3.71	-	-	-	-	-
21	Asphaltenes	%	traces	-	-	-	-	-
22	Silica-gel resins	%	10	-	-	-	-	-
23	Paraffins with melting temperature	°C	15	-	-	-	-	-
24	Vanadium	m/g	0.2	-	-	-	-	-
25	Nickel	mg/g	4.6	-	-	-	-	-

Appendix 3
Table 2

No.	Quality Indices	Unit of Measurement	Crude Oil	Gas C-C	Gasoline 62-180 °C	Kerosene 120-240 °C	Diesel Fuel 180-350 °C	Mazut 350 °C
1	2	3	4	5	6	7	8	9
26	Nitrogen	%	0.1	-	-	-	-	-
27	Oxygen	%	0.18	-	-	-	-	-
28	Acid number	$\frac{\text{mg conc.}}{100\ \text{cm}^3}$	0.05	-	-	-	-	-

Source: Chimkent Refinery
Date: Dec. 1992

Appendix 3
Table 3

Quality Certificate
Straight-Run Petrol
Produced by Chimkent Refinery

No.	Quality Indices	Value
1	2	3
1	Density at 20°C, kg/cu.m, not more than	725
2	Detonation resistance, not less than	50
3	Fractional composition, °C N.K., °C, not less than 10% boils away at, °C, not more than 50% boils away at, °C, not more than 20% boils away at, °C, not more than K.K., °C, not more than	35 75 110 150 180
4	Saturated steam pressure, mm Hg, not more than	500
5	Acidity, mg conc./100 ml, not more than	1.0
6	Actual resin content, mg/100 ml of gasoline, not more than	2.0
7	Sulphur content, % weight, not more than	0.02
8	Lead content, mg/kg	
9	Copper strip test	withstands
10	Hydrocarbon composition: ■ naphthenes content, not more than ■ aromatics, not more than ■ paraffins content, not less than	 45 10 45
11	Acid and alkali content	no
12	Mechanical impurities and water content	no

Source: Chimkent Refinery
Date: Dec. 1992

Appendix 3
Table 4

Quality Certificate
Pure Summer Diesel Fuel
Produced by Chimkent Refinery

No.	Quality Indices	Value
1	2	3
1	Kinematic viscosity at 20°C, centistokes	3.0-6.0
2	Fractional composition, °C, N.K., °C 50% boils away at, °C, not more than 90% boils away at, °C, not more than 96% boils away at, °C, not more than	 180 280 340 360
3	Congelation temperature, °C, not more than	-10
4	Filterability limiting temperature, °C, not more than	-5
5	Flash point, °C, not less than	65
6	Fraction of total mass of sulphur, % weight, not more than	-0.05
7	Cetane number, not less than	45
8	Acidity, mg conc./100 ml, not more than	3.0
9	Copper strip test	withstands
10	Color unit? not more than	2.0
11	Ash content, % mass, not more than	0.01
12	Coking capacity of 10% residue, % not more than	0.2
13	Mechanical impurities content	no
14	Density at 20°C, g/cu.cm, not more than	0.845
15	Aromatic hydrocarbon content, % mass	22
16	Transparency at 10°C	transparent
17	Diesel index, not less than	53

Source: Chimkent Refinery
Date: Dec. 1992

Appendix 3
Table 5

Quality Certificate
Oil Fuel-Mazut
Produced by Chimkent Refinery

No.	Quality Indices	Value
1	2	3
1	Relative viscosity at 80°C, relative viscosity unit not more than corresponding kinematic viscosity, centistokes, not more than	6.0 43.9
2	Flash point, °C, not less than	140
3	Ash content, % mass, not more than	0.01
4	Fraction of total mass of sulphur, % weight, not more than	1.0
5	Fraction of total mass of water, % weight, not more than	0.3
6	Low heat value in terms of solid fuel, kkal/kg, not less than	9650
7	Water-soluble acid and alkali content	?
8	Fraction of total mass of mechanical impurities, not more than	0.2
9	Congelation temperature, 0°C, not more than	+25
10	Density at, 20°C, Kg/cu.m, not more than	1.015

Source: Chimkent Refineries
Date: Dec. 1992

APPENDIX 4

Tables Distributed but not Completed for Preliminary Report

Table 1. Annual Operating Costs of Mangistaumunaygaz Producing Association
Table 2. Annual Operating Costs of Kazakhgaz
Table 3. Mangistaumunaygaz Crude Oil Production: Prices, Volumes & Taxes
Table 4. Oil Consumption in Kazakhstan by Consuming Sector
Table 5. Oil and Gas Pipeline: Transport Cost Questionnaire

Appendix 4
Table 1

Annual Operating Costs of Mangistaumunaygaz Producing Association

	Average 1991	Current Estimate 1992	Projected 1993
Operating Costs (Rubles)			
1. Labor including social welfare and insurance payments			
2. Fuel, Power and Water			
3. Chemicals			
4. Truck/vehicle usage			
5. Maintenance			
a) Labor			
b) Workover and Remedial Services			
c) Equipment Repair			
d) Other Supplies			
6. Insurance			
7. Taxes			
a) Income or Profits Tax			
b) Rental Payment			
c) Land Tax			
d) VAT Tax			
e) Investment Fund			
f) Employee Wage Tax			
g) Pension Fund, if not included above			
h) Other Tax			
8. Capital and Fixed Costs			
a) Estimated Value of all Equipment			
- Producing equipment			
- Gathering system			
- All other equipment			
b) Allowable Depreciation of Equipment			
c) Cost of Financing (interest expenses)			
Production (Metric Tons)			
1. Volume of Crude Oil			
2. Volume of Associated Gas			
3. Volume of Condensates			
Sales of Crude Oil (Metric Tons)			
1. State Order			
2. Inter Republic Trade			
3. Non-CIS Exports			

Annual Operating Costs of Kazakhgaz

	Average 1991	Current Estimate 1992	Projected 1993
Operating Costs (Rubles)			
1. Labor including social welfare and insurance payments			
2. Fuel, Power and Water			
3. Chemicals			
4. Truck/vehicle usage			
5. Maintenance			
a) Labor			
b) Workover and Remedial Services			
c) Equipment Repair			
d) Other Supplies			
6. Insurance			
7. Taxes			
a) Income or Profits Tax			
b) Rental Payment			
c) Land Tax			
d) VAT Tax			
e) Investment Fund			
f) Employee Wage Tax			
g) Pension Fund, if not included above			
h) Other Tax			
8. Capital and Fixed Costs			
a) Estimated Value of all Equipment			
- Producing equipment			
- Gathering system			
- All other equipment			
b) Allowable Depreciation of Equipment			
c) Cost of Financing (interest expenses)			
Production			
1. Volume of Gas (000 cubic meters)			
2. Volume of Condensates (metric tons)			
Sales of Gas (000 cubic meters)			
1. State Order			
2. Inter Republic Trade			
3. Non-CIS Exports			
Imports (000 Cubic Meters)			
1. Russian			
2. Turkmenistan			
3. Uzbekistan			
4. Other			

Appendix 4
Table 3

MANGISTAUMUNAYGAS CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes 000 tons	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tex	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1992	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1993	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1994	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1995	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 2000	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											

Oil Consumption in Kazakhstan by Consuming Sector

(Tons/Year)

Product Name:	Sector: Transport	Housing	Chemical Industry	Steel Industry	Other Industries	Electric Power Stations	Other	Total
1. Refinery Gases								
2. Gasoline								
3. Aviation Gas								
4. Refinery Chemicals								
5. Kerosene – Jets								
6. Kerosene – Other								
7. Gas Oil (Diesel)								
8. Fuel Oil								
9. Lubricants								
10. Bitumen								
11. Paraffin								
12. Other Products								
13. Fuel Oil (Ships) Bonker								
14. Fuel Used in Processing & Losses								

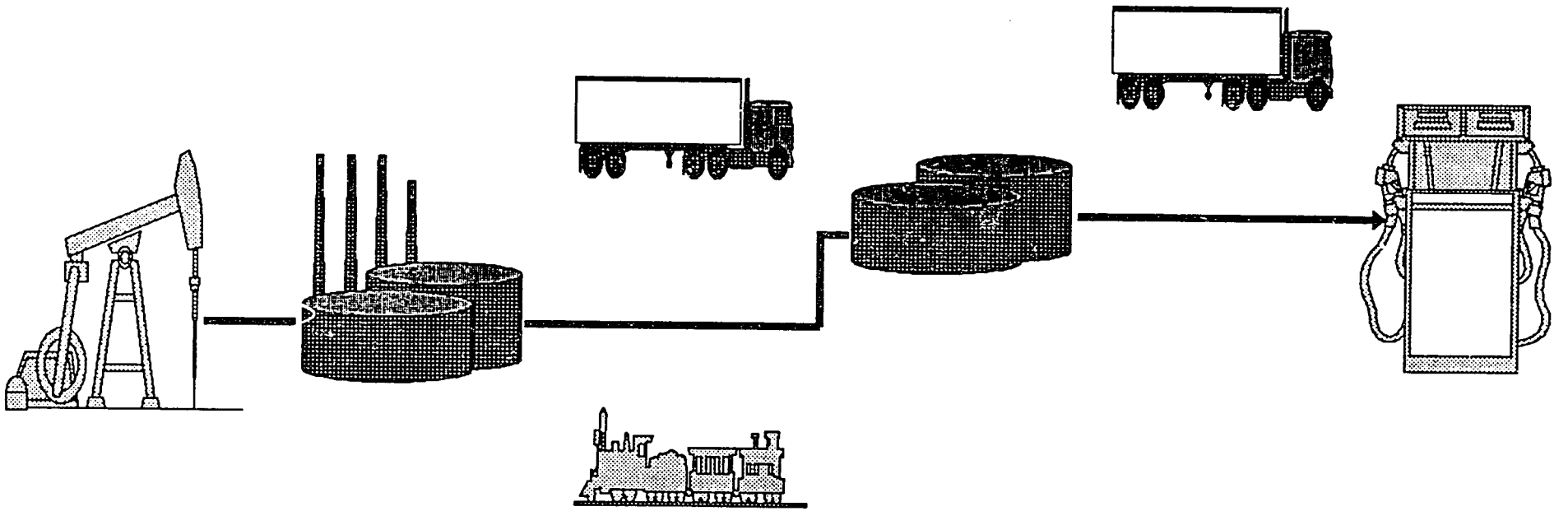
Oil/Gas Pipeline Transport Cost Questionnaire - Table 5

	Actual 1991	Estimated 1992	Projected 1993
1. Operating Expenses			
- Material & supplies			
- Power costs			
- Taxes & fees - Specify (excl. profit tax)			
-			
-			
- Depreciation/plant in service			
- Labor			
- Other operating & maintenance			
- Overhead (land, right of way)			
2. Interest Expense			
3. Profit or Return on Equity			
4. Tax on Profits			
5. Total Volumes Transported			
6. Average Distance Transported			

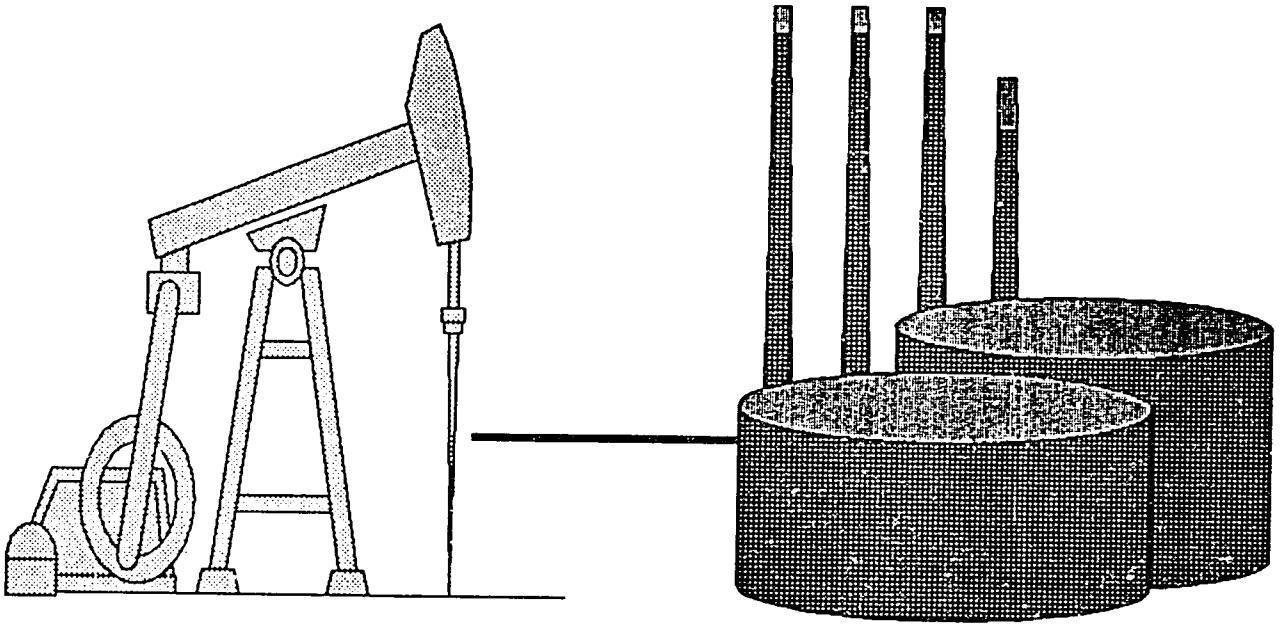
APPENDIX 5

Diagrams Used in Data Collection Process

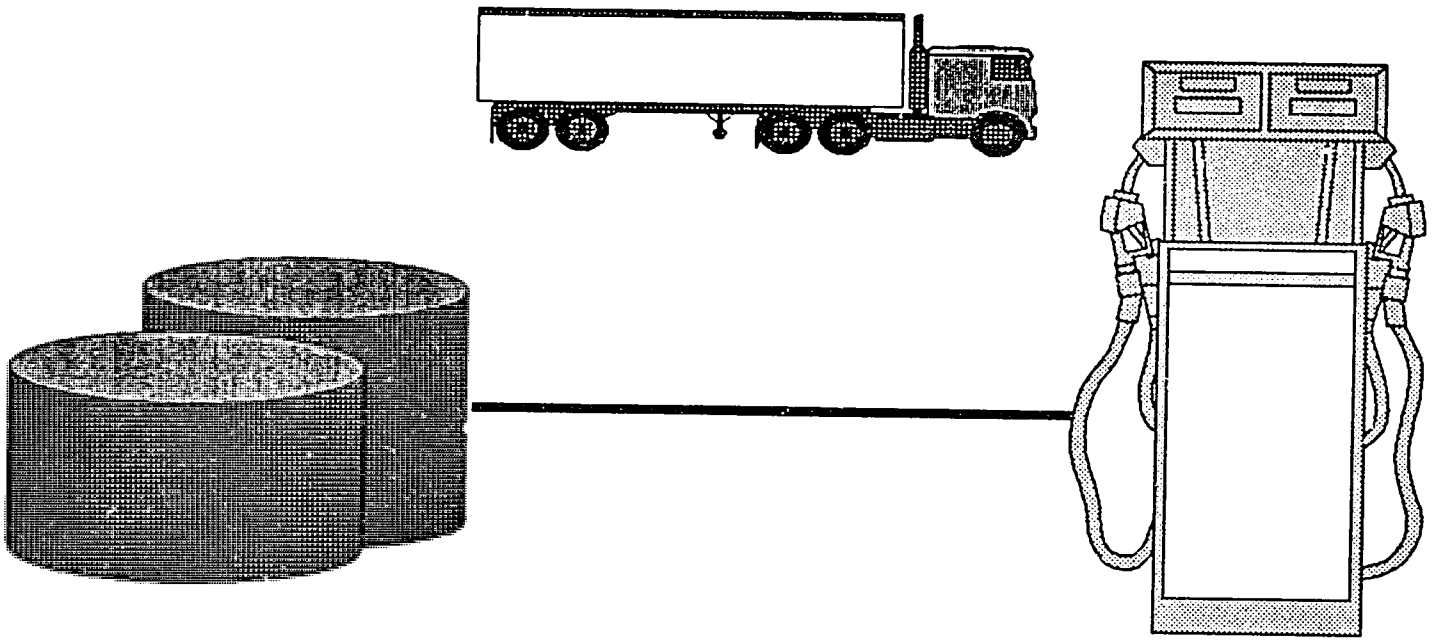
Appendix 5
Diagram 1



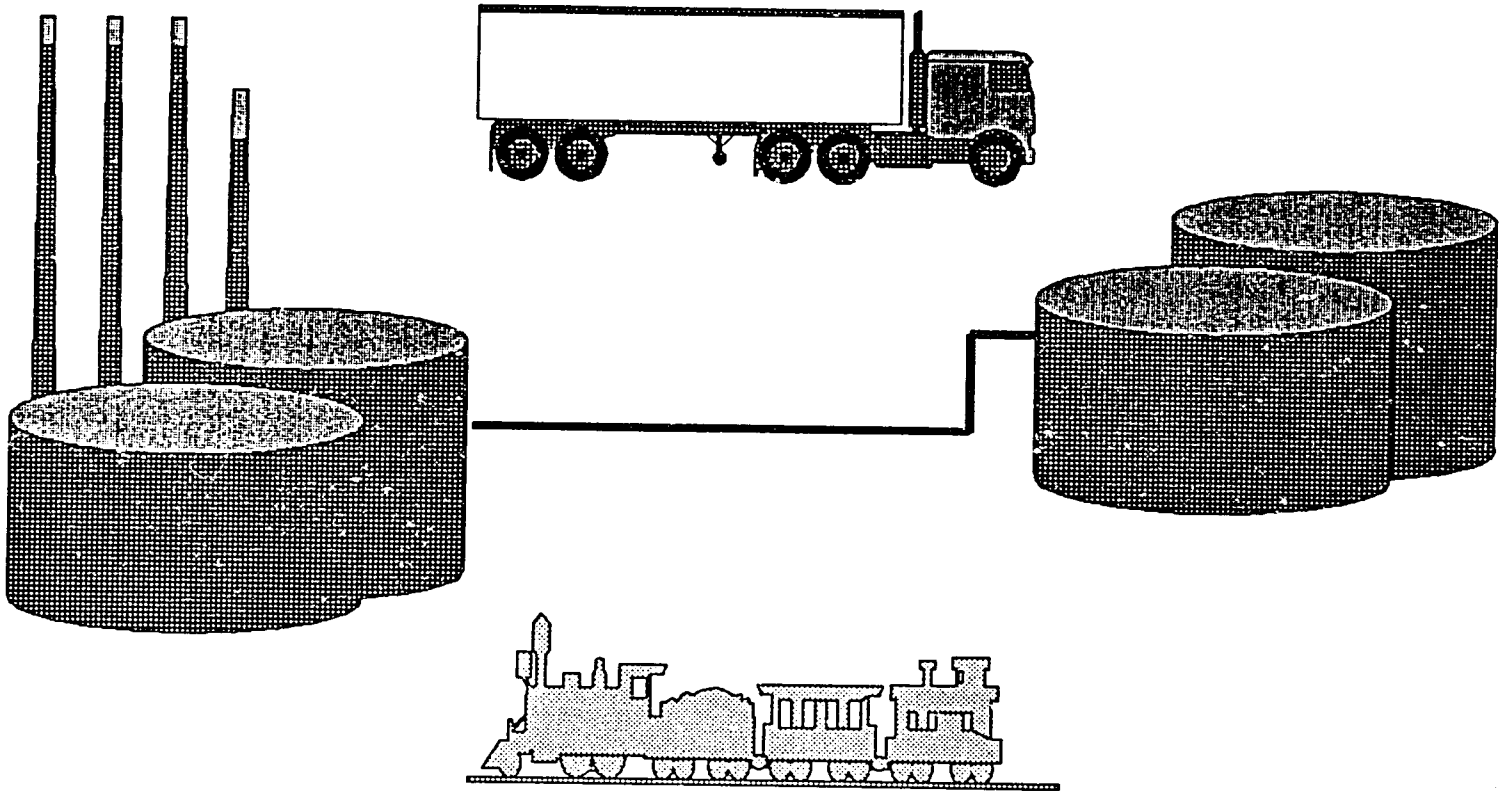
Appendix 5
Diagram 2



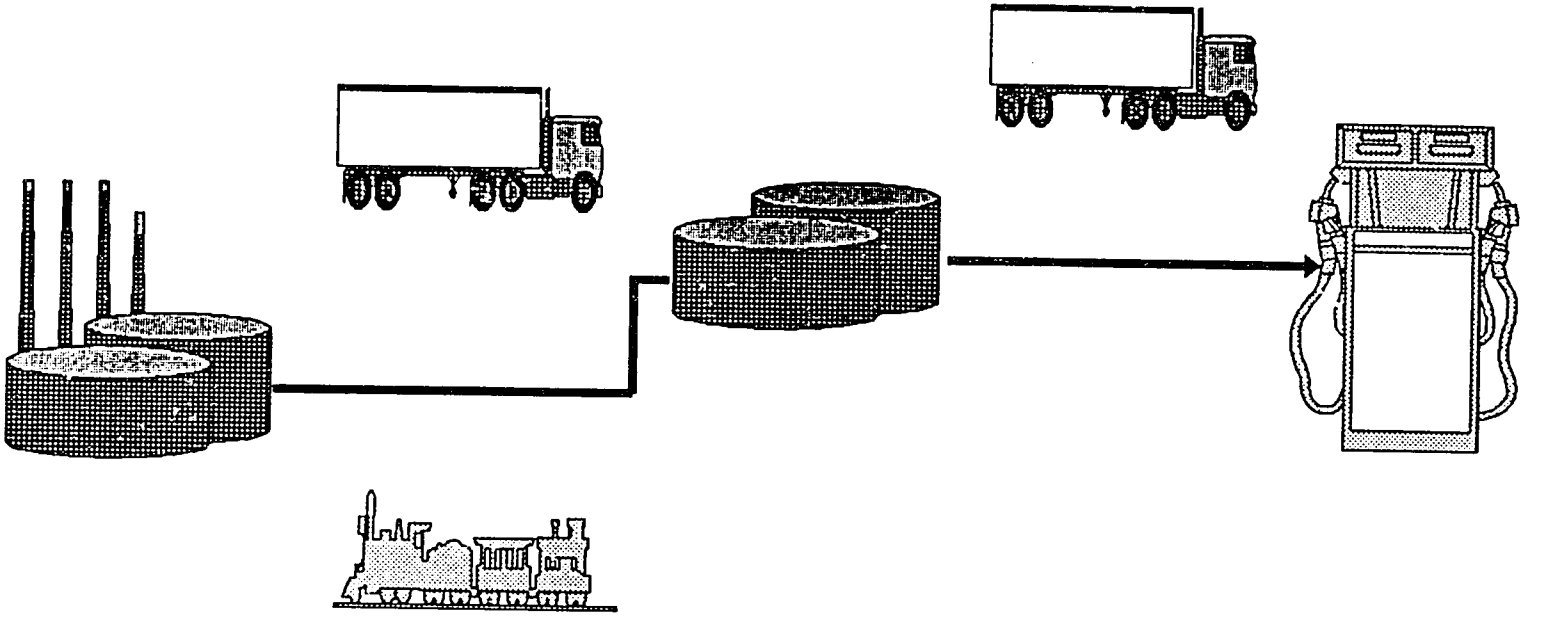
Appendix 5
Diagram 5



Appendix 5
Diagram 4



Appendix 5
Diagram 3



APPENDIX 6

Oil and Gas Revenue Model

Appendix 6
Table 1

TOTAL CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes 000 tons	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												

Appendix 6
Table 2

MANGISTAUMUNAYGAS CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes 000 tons	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												

Appendix 6
Table 3

TENGISNEFTEGAS CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year		Sales Volumes 000 tons	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1992	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1993	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1994	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1995	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 2000	Domestic											
	Russia											
	Other CIS											
	Non-CIS											
	Total											

Appendix 6
Table 4

AKTYUBINSKNEFT CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes 000 tons	Prices	Prod. Cost	Export T Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												

Appendix 6
Table 5

EMBANEFT CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes 000 tons	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												

Appendix 6
Table 6

YUZHKAZNEFT CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes 000 tons	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												

Appendix 6
Table 7

KARACHANBASTERYNEFT CRUDE OIL PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes 000 tons	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 Domestic												
Russia												
Other CIS												
Non-CIS												
Total												

TOTAL KAZAK NATURAL GAS PRODUCTION: Prices, Volumes & Taxes

Year	Sales	Volumes (mcm)	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												

TOTAL KARACHAGANAKGASPROM NATURAL GAS PRODUCTION (D & F): Prices, Volumes & Taxes

Year	Sales	Volumes (mcm)	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991	DomesticR											
	DomesticI											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1992	DomesticR											
	DomesticI											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1993	DomesticR											
	DomesticI											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1994	DomesticR											
	DomesticI											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 1995	DomesticR											
	DomesticI											
	Russia											
	Other CIS											
	Non-CIS											
	Total											
FY 2000	DomesticR											
	DomesticI											
	Russia											
	Other CIS											
	Non-CIS											
	Total											

Appendix 6
Table 10

KARACHAGANAKGASPROM NATURAL GAS PRODUCTION (DOMESTIC OWNER): Prices, Volumes & Taxes

Year	Sales	Volumes (mcm)	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes($)
FY 1991 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 DomesticR												
DomesticI												
Russia												
Other CIS												
Non-CIS												
Total												

KARACHAGANAKGASPROM NATURAL GAS PRODUCTION (FOREIGN OWNER): Prices, Volumes & Taxes

Year	Sales	Volumes (mcm)	Prices	Prod. Cost	Export Tax	Profits Tax	Rental Tax	Bonus Tax	VAT	Total Taxes	Exchange Rate	Total Taxes ($)
FY 1991 DomesticR												
Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1992 DomesticR												
Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1993 DomesticR												
Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1994 DomesticR												
Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 1995 DomesticR												
Domestic												
Russia												
Other CIS												
Non-CIS												
Total												
FY 2000 DomesticR												
Domestic												
Russia												
Other CIS												
Non-CIS												
Total												